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Effect of spraying with Ferti Mar and GROWX AMINO MIX on some chemical characteristics of Citrus aurantium seedlings Citrus aurantium L.

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Abstract

The experiment was carried out in the Saran-covered nursery of the Department of Horticulture and Landscaping - College of Agriculture and Marshes at Dhi Qar University during the growing season (2021-2022). One-year-old citrus seedlings were obtained as homogeneous in growth as possible from one of the Baghdad governorate nurseries on February 20. \2022 The seedlings were transferred to plastic pots with a capacity of 10 kg (26 cm diameter) filled with an agricultural medium consisting of mixed soil and moss in a ratio of 1:3. The process of servicing the plants was carried out in a similar way, such as pruning, hoeing, fertilizing and irrigation throughout the study period, the study was carried out as a two-factor experiment using the design of sectors Complete Randomization (R.C.B.D), The first factor represented the spraying with Ferti Mar compound at four concentrations (1.5,1,0.5,0) ml per liter^{-1} and the second factor spraying with the GROWX AMINO MIX compound at four concentrations (0, 1, 2, 3) g per liter^{-1}, and it was sprayed at a rate of three sprays Between one spray and another two weeks, and the results of the study can be summarized as follows: Ferti mar spraying treatments showed a positive effect on most chemical indicators of citrus seedlings. The spraying treatment with a concentration of 1.5 ml L^{-1} significantly outperformed by registering the highest rate for the character and content of leaves from total chlorophyll, carbohydrates and content of leaves from elements The nutritional value of nitrogen, phosphorous and potassium was 59.89 mg, 100 g^{-1} fresh weight, 11.260%, 1.83%, 0.24%, and 1.98%, respectively.Spraying treatments with Growx amino mix showed a positive effect on most of the chemical indicators of citrus seedlings. The spraying treatment with a concentration of 3 gm l^{-1} was superior by recording the highest rate of chlorophyll in leaves, carbohydrate percentage in leaves and leaf content of nutrients nitrogen, phosphorous, potassium, which amounted to 59 .88 mg 100 g^{-1} mw, 11.361%, 1.80%, 0.24%, 1.89%, respectively.The interaction treatments between the two factors of the study gave a positive significant effect in most of the studied chemical characteristics. The interaction treatment between the concentration of 1.5 ml L^{-1} of ertimar and 3 gm L^{-1} Growx amino mix recorded the best significant results for growth indicators.

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I. INTRODUCTION

belongs to the genus (*Citrus aurantium* L.) Citrus of the family Rutaceae, which grows in tropical and subtropical regions and is considered the original homeland of Citrus aurantium (Al-Khafaji et al., 1990).Most types of citrus are spread in the central regions of Iraq due to their suitability to the prevailing environmental conditions. The number of fruitful citrus trees is about 7,768,290 million trees, with a production of 176,117 tons (Central Statistics Organization, 2020).Citrus is of great importance among other fruit trees due to its nutritional, environmental, economic and medical importance, as its fruits are a rich source of vitamins, especially vitamin C, in addition to being rich in mineral elements necessary to build the human body (Ahmed and Daoud, 2020).The foliar fertilization method is efficient and effective in feeding plants by the vegetative parts, as well as providing the plant with nutrients in a homogeneous manner (Brayan, 1999).Seaweed extracts are considered from the organic sources used in agricultural production, as more than 15 million tons of them are used annually in the agricultural field. It contains macro and micro elements, auxins, cytokinins, vitamins, amino and organic acids and polysaccharides. It also acts as a regulator of osmosis at high concentrations and in increasing plant tolerance to salinity, drought and harsh environmental conditions. It also increases the efficiency of nutrient absorption and encourages photosynthesis and respiration (Rioux et al., 2007).The amino acids are compounds produced naturally by the plant that work to increase the balanced growth of the plant and increase the response to fertilization and disease resistance and increase the protein inside the cells and provide the plant's need for nitrogen as well as prevent poisoning resulting from high ammonia inside the plant cells (Abdul Hafez, 2006). Amino acids from the effectiveness of various physiological processes within the plant directly or indirectly, as well as being the main component for building proteins and many co-enzymes. Cell membrane permeability (Hassan et al., 2010).Due to the absence of previous studies on the effect of spraying with Ferti Mar and Growx Amino Mix on citrus seedlings in Dhi Qar Governorate, this study was conducted with the aim of knowing the effect of spraying with Ferti Mar and Growx Amino Mix individually or overlapping in improving the chemical properties of citrus seedlings in order to obtain Vigorous seedlings suitable for grafting, as well as reducing the environmental and economic impact resulting from the use of traditional fertilizers.

II. MATERIALS AND METHODS

Study site

The experiment was carried out in the Saran-covered nursery of the Department of Horticulture and Landscape Engineering, College of Agriculture and Marshes, University of Dhi-Qar, during the growing season 2021-2022, where a number of one-year-old citrus seedlings were selected to conduct this study. At a ratio of 1:3, a random sample was taken from the river mixture and analyzed in the laboratories of the Directorate of Agriculture in Dhi-Qar to identify some of the chemical and physical properties of soil (Table 1).

Table (1) the chemical and physical properties of soil properties

Characteristic	Measuring unit	Value
pH		٧,٥
EC	$ds.m^{-1}$	٢,٥١

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Texture	Silty loam	loamy sand
Sand	mg l^{-1}	٧٠,٢٣
Silt		١٤,٣٥
Clay		١٥,٤٢
N		٢٥,٨٩
P		٧,٥٥
K		١١٦,٧٨

Preparing and serving seedlings

Citrus seedlings were obtained from one of the nurseries of Baghdad governorate on 20.02.2022 and were approximately one year old, homogeneous in growth, and planted in plastic bags made of polyethylene. The seedlings were transferred to plastic pots of 10 kg (26 cm diameter). The process of servicing the plants was carried out. They were symmetrically pruning, hoeing, fertilizing and irrigating throughout the study period.

Study parameters

The first factor:

The shoots were sprayed with Ferti Mar at four concentrations:

1- Without spraying the compound Ferti Mar (spraying with distilled water).

2- Spray the Ferti Mar compound with a (0.5 ml l^{-1}) concentration.

3- Spray the Ferti Mar compound with a concentration of (1 ml l^{-1}).

4- Spray the Ferti Mar compound with a (1.5 ml l^{-1}) concentration.

The second factor:

It included spraying the shoots of the seedlings with the compound Growx amino mix in four concentrations:

1- Without spraying the Growx amino mix (spraying with distilled water).

2- Spray the compound Growx amino mix at a concentration of (1 g l^{-1}).

3- Spray the compound Growx amino mix at a concentration of (2 g l^{-1}).

4- Spray the compound Growx amino mix at a concentration of (3 g l^{-1}).

Studied traits

chemical properties

1-Total chlorophyll content of leaves (mg $100g^{-1}$ fresh weight)

The total chlorophyll content of leaves was estimated based on the method (Dere, S., Gunes 1998) by taking 1 gm of fresh leaves and crushing them in a ceramic mortar in the presence of 10 ml of acetone with a concentration of 80%. The filtrate was separated using a centrifuge at a speed of 3000 One cycle / minute and for 15 minutes, the process of separating the filtrate was repeated several times until the green dye disappeared from the sediment, after which the optical density of the filtrate was measured by means of an ultraviolet spectrophotometer at the two wavelengths (645 and 663 nm).

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2-Leaves content of total soluble carbohydrates(%)

The soluble carbohydrate content of the leaves was estimated, (1962) 0.2 g of the substance to be measured is weighed and 25 ml of perchloric acid (1N) is added to it and placed in a test tube, then the tubes are placed in a water bath at (60) temperature for (30 minutes) to be filtered by filter nominations. ١ml is taken from the last, 5% phenol and 5 ml concentrated sulfuric acid are added to it and left to cool. It is measured at a wavelength (490 nm) with a spectrophotometer that prepares several concentrations of glucose (0,0.2,0.3,0.4,0.5) and the absorbance of the above readings is recorded (to make a calibration curve). Then the absorbance of the model is read and projected onto the calibration curve and the concentration is extracted from it. Apply the following equation:

$$X = \frac{\text{Focus of calibration curve} \times (25\ \text{ml}) \times (10\ \text{ml})}{(0.2\ \text{gm} \times 1000)} \times 100\%$$

3-Nitrogen in leaves(%)

The total nitrogen content of the leaves was estimated using the Micro Kjeldahl device and using the method described by Page et al., (1982) by taking 10 ml of the digested sample and adding 10 ml of NaOH at a concentration of 40%, then distillation was carried out and the released ammonia was collected in a glass beaker. Containing 10 ml of a mixture of 2% boric acid with Methyl Red and Bromocresal Green lead, the collected ammonia was wiped with HCl (0,005) N.C. After knowing the amount of scavenged HCl, the percentage of nitrogen was calculated according to the following equation:

$$N\% = \frac{\text{The volume of the acid consumed by grinding} \times \text{its acidity} \times 14 \times \text{the dilution volume}}{\text{Volume of sample taken at distillation} \times \text{weight of digested sample} \times 1000} \times ١٠٠$$

4-Phosphorous in leaves(%)

Phosphorous was determined chromatically by the Ascorbic acid method described in (Page et al., 1982). By using a spectrophotometer with a wavelength of 700 nanometers.

5-Potassium in leaves(%)

Potassium was determined after diluting the digestion solution with distilled water, using a JEN WAYPFP 7 Flame photometer, and potassium chloride was used to prepare standard solutions for potassium standard curve (Page et al., 1982).

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III. RESULTS AND DISCUSSION

1-Total chlorophyll in leaves (mg 100gm-1 fresh weight)

The results in Table (2) indicate the different response of citrus seedlings when spraying with different levels of Ferti mar in the chlorophyll content of leaves. The concentration exceeded 1.5 ml l^{-1} by giving it the highest chlorophyll content with a value of 59.89 mg 100 gm^{-1} fresh weight, while the lowest rate was The chlorophyll content of leaves when treated was 0 ml L^{-1} and it reached 48.00 mg 100 g^{-1} fresh weight.The results of the same table also showed that spraying the leaves of citrus seedlings with Growx amino mix had a significant effect in increasing the content of chlorophyll in the leaves. The spraying treatment of 3 gm l^{-1} was characterized by giving it the highest content of chlorophyll, which amounted to 59.88 mg 100 gm^{-1} fresh weight. While the treatment (without spraying) gave the lowest content of this trait and it was 48.92 mg 100 g^{-1} fresh weight.The effect of the interaction between the study factors varied in increasing the chlorophyll content of the leaves, as the treatment showed 1 ml L^{-1}Ferti mar and 3 gm L^{-1}Growx amino mix significantly superior by giving it the highest rate of chlorophyll, which amounted to 68.25 mg 100 g^{-1} fresh weight compared to the interaction factors under study, which In turn, it outperformed the control treatment in which the lowest rate of chlorophyll was achieved, which was 42.94 mg 100 g^{-1} fresh weight.

Table (2) Effect of Ferti mar and Growx amino mix and the interaction between them on total chlorophyll in leaves of Citrus aurantium seedlings (mg 100gm^{-1} fresh weight).

levels Ferti mar ml l^{-1}	levels Growx amino mix g $^{-1}$				average effect Ferti mar
	0	1	٢	٣	
٠	٤٢,٩٤	٤٦,٧٢	٤٩,٦١	٥٢,٧١	٤٨,٠٠
٠,٥	٤٧,٨٧	٥٠,٥٤	٥٤,٦٧	٥٣,٩٣	٥١,٧٥
١	٥٣,٠٤	٥٧,١٢	٦١,٨٠	68.25	59.56
١,٥	٥١,٨٦	٥٤,٩٣	66.13	٦٦,٦٤	59.89
average effect Growx amino mix	٤٨,٩٢	٥٢,٣٢	58.05	59.88	
LSD 0.05					
Ferti mar = 0.572		Growx amino mix = 0.572		Interaction=١,١٤٤	

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2-Total soluble carbohydrates in leaves(%)

The results of Table (3) show significant differences in the carbohydrate content of the leaves when spraying with Ferti mar and Growx amino mix, and on the effect of spraying with Ferti mar, the results showed an increase in the carbohydrate content of the leaves with an increase in spray levels, as the concentration gave 1.5 ml L^{-1} the highest percentage. It reached 11.260%, compared with the comparison treatment, which gave the lowest rate of 9.969%.Also, spraying with Growx amino mix led to an increase in this trait, as the treatment was superior to 3 gm l^{-1} by giving it the highest percentage of carbohydrates, which amounted to 11.361%, compared to the lowest percentage of carbohydrates when treated (0 without spray), which amounted to 10.073%, and the results of the interaction were shown in the table (3) There was an increase in the carbohydrate content of the leaves, with the highest value reaching 11.953% when treating 1.5 ml L^{-1}Ferti mar + 3 g L^{-1}Growx amino mix, while the lowest percentage was achieved when the comparison treatment, which amounted to 9.573%.

Table (3) Effect of Ferti mar and Growx amino mix and the interaction between them on total soluble carbohydrates in leaves of Citrus aurantium seedlings(%).

levels Ferti mar ml l^{-1}	levels Growx amino mix g $^{-l}$				average effect Ferti mar
	0	1	٢	٣	
٠	٩,٥٧٣	٩,٧٠٣	٩,٩٩٠	١٠,٦١٣	٩,٩٦٩
٠,٥	٩,٨٧٦	١٠,١٧٣	١١,١٤٣	١١,٢٨٣	١٠,٦١٨
١	١٠,٣٠٣	١٠,٧٩٦	١١,٤٤٣	١١,٥٩٦	١١,٠٣٤
١,٥	١٠,٥٤٣	١٠,٩٦٠	١١,٥٨٦	١١,٩٥٣	١١,٢٦٠
average effect Growx amino mix	١٠,٠٧٣	١٠,٤٠٨	١١,٠٤٠	١١,٣٦١	
LSD 0.05					
Ferti mar = 1.08		Growx amino mix = 1.08		Interaction=٢,١٧	

3- Nitrogen in leaves(%)

It is clear from the results of Table (4) that spraying citrus seedlings with Ferti mar has a significant effect on the percentage of nitrogen in the leaves. The concentration of 1.5 ml L^{-1}Fertimar exceeded the rest of the treatments, so it came with the highest nitrogen content in the leaves, which was 1.83%, while the nitrogen ratio in the control treatment was 1.42%.As for the effect of spraying with Growx amino mix on the nitrogen content of leaves, the results of Table (4) showed a

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significant difference. The treatment of 3 gm l^{-1} was superior in giving the highest percentage of nitrogen in leaves by 1.80%, while the lowest percentage was when treated with Growx amino mix. The comparison amounted to 1.47%.

The interaction between Ferti mar and Growx amino mix had a significant effect on the percentage of nitrogen in the leaves. The results of Table (4) showed that the treatment was superior to 1.5 ml L^{-1} Ferti mar and 3 g L^{-1} Growx amino mix, and it came with the highest nitrogen ratio of 1.97%, while it was the lowest. The percentage of nitrogen in the leaves in the comparison treatment was 1.17%.

Table (4) Effect of Ferti mar and Growx amino mix and the interaction between them on the percentage of nitrogen in leaves of citrus seedlings(%).

levels Ferti mar ml l^{-1}	levels Growx amino mix g $^{-1}$				average effect Ferti mar
	0	1	٢	٣	
٠	١,١٧	١,٣٩	١,٥٣	١,٦١	١,٤٢
٠,٥	١,٤٠	١,٦٠	١,٧٧	١,٨٢	١,٦٤
١	١,٦٤	١,٧٢	١,٨٢	١,٨٢	١,٧٥
١,٥	١,٦٩	١,٧٦	١,٩٢	١,٩٧	١,٨٣
effect average Growx amino mix	١,٤٧	١,٦١	١,٧٦	١,٨٠	
LSD 0.05					
Ferti mar = 0.093		Growx amino mix = 0.093		Interaction=٠,١٨٦	

4-Phosphorous in leaves(%).

The results in Table (5) indicate that there were significant differences when spraying citrus seedlings with Ferti mar in the percentage of phosphorous in leaves. The results showed that the treatment was superior to 1.5 ml l^{-1} of Ferti mar by giving it the highest percentage of phosphorous, which amounted to 0.24%, while giving the concentration 0 ml L^{-1} had the lowest rate of phosphorous, which was 0.15%.The results also showed in the same table that increasing the levels of spraying with Growx amino mix led to an increase in the phosphorous content of the leaves, especially the treatment of 3 gm l^{-1}, which gave the highest phosphorous rate of 0.24% compared to the lowest rates of phosphorous content that were found when the comparison treatment was 0.16%.The results of Table (5) indicate that the interaction of Ferti mar and Growx amino mix spraying treatments led to an increase in the percentage of phosphorous in the leaves of the citrus seedlings. The concentration of 1.5 ml L^{-1} Ferti mar and 3 gm L^{-1} Grox amino mix gave the highest percentage of phosphorous in the leaves. It was 0.28% compared to the comparison treatment in which the lowest percentage of phosphorous was 0.13%.

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Table (5) Effect of Ferti mar and Growx amino mix and the interaction between them on the percentage of phosphorous in leaves of citrus seedlings(%).

levels Ferti mar ml l^{-1}	levels Growx amino mix g $^{-l}$				average effect Ferti mar
	0	1	٢	٣	
٠	٠,١٣	٠,١٦	٠,١٦	٠,١٧	٠,١٥
٠,٥	٠,١٧	٠,٢٠	٠,٢٥	٠,٢٥	٠,٢١
١	٠,١٨	٠,٢٢	٠,٢٨	٠,٢٧	٠,٢٣
١,٥	٠,١٩	٠,٢٤	٠,٢٦	٠,٢٨	٠,٢٤
average effect Growx amino mix	٠,١٦	٠,٢٠	٠,٢٣	٠,٢٤	
LSD 0.05					
Ferti mar = 0.0048		Growx amino mix = 0.0048		Interaction=٠,٠٠٩٧	

5- Potassium in leaves(%)

The results of Table (6) showed that there were significant differences in the potassium percentage in the leaves of citrus seedlings when spraying with Ferti mar and Growx amino mix, as the results of spraying 1.5 ml l^{-1} of Ferti mar by giving it the highest percentage of potassium in the leaves was 1.98%, while the lowest percentage of potassium In the leaves of citrus seedlings when treated without addition, it was 1.36%.The results in Table (6) indicated that there were significant differences between the treatments when spraying the citrus seedlings Growx amino mix in the percentage of potassium in the leaves, as the treatment of 3 gm l^{-1} was superior to it by giving it the highest percentage of potassium in the leaves and it was 1.89% superior to the control treatment which gave 1.51%.As for the effect of the interaction between the factors of the study, the results in the same table showed a significant increase in the proportion of potassium in the leaves. Spraying 1.5 ml L^{-1} Ferti mar and 3 g L^{-1} Growx amino mix gave the highest percentage of potassium, which amounted to 2.17%, while the lowest percentage of potassium In the papers, it was achieved when the comparison treatment amounted to 1.27%.

Table (6) Effect of Ferti mar and Growx amino mix and the interaction between them on potassium percentage in leaves of Citrus aurantium seedlings(%).

levels Ferti mar ml l^{-1}	levels Growx amino mix g $^{-l}$				average effect Ferti mar
	0	1	٢	٣	

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٠	١,٢٧	١,٣٢	١,٣٦	١,٥٢	١,٣٦
٠,٥	١,٤٨	١,٥٣	١,٩٤	١,٨٧	١,٧٠
١	١,٦٢	١,٨١	٢,١٠	١,٩٦	١,٨٧
١,٥	١,٦٩	١,٩٠	٢,١٦	٢,١٧	١,٩٨
average effect Growx amino mix	١,٥١	١,٦٤	١,٨٨	١,٨٩	
LSD 0.05					
Ferti mar = 0.038		Growx amino mix = 0.038		Interaction= ٠,٠٧٧	

IV. DISCUSSION

The results of tables (2, 3, 4, 5 and 6) showed that chlorophyll and the percentage of carbohydrates, nitrogen, phosphorous and potassium in the leaves were significantly affected when spraying citrus seedlings with Ferti mar, because it contains marine algae extracts and some important nutrients in increasing plant growth. In increasing the content of chlorophyll in the leaves to increase the percentage of nitrogen in the leaves, as it is considered one of the basic elements in the molecular composition of chlorophyll, as the Ferti mar's containment of some major elements in a form that can be absorbed by the leaves is of great importance in improving plant growth through the arrival of nutrients in a manner faster than if It was added to the soil as it is subject to sedimentation, washing and stabilization processes, especially in the basal soils prevalent in Iraq (Abu Dahi and Younis, 1988). The content of the leaves is increased from nitrogen and phosphorous as a result of the presence of growth-stimulating substances. Ferti mar contains marine algae extract, growth regulators and hormones. Which leads to an increase in the activity of growth processes and thus increases the activity of enzymes that stimulate growth (Zodape, 2011) and agrees with him in this study (Ismail and Ghazai, 2012) in their study on olive seedlings when sprayed with marine algae extract, as it led to an increase in the concentration of nitrogen, phosphorous and potassium elements.The increase that we obtained when spraying the citrus seedlings with Growx amino mix represented by chlorophyll and the percentage of carbohydrates, nitrogen, phosphorous and potassium as shown in tables (2, 3, 4, 5 and 6) respectively. The amino acids, which are the main component of the Growx amino mix, play a direct and indirect role in the physiological activities inside the plant, its growth and development (Peoples and Dallin, 1988) and it is agreed with him (Al-Dulaimi and his collection, 2012) on grape bushes. Also, the direct effect of amino acids on the enzymatic activity accelerates the absorption of nutrients and their transfer within the plant, so they are clearly affected. In increasing the content of the branches of nutrients, including nitrogen, phosphorous and potassium, and this indicates that the plant has obtained elements that enable it to build new elements, whether in carbon metabolism or the vital processes associated with it. In its composition, which leads to an improvement in the nutritional status of the plant, an increase in the processes of carbon metabolism and an increase in the products of food processing and carbohydrates, and this is reflected in an increase in growth activity (Hassan et al., 2010).

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