

## Research Article

# The effect of spraying amino acid fertilizer on the growth characteristics and mineral content of pomelo (*Citrus grandis*) seedlings

Ayad H.E. ALALAF<sup>1\*</sup>, Ayad T. Shayal ALALAM<sup>1</sup>, Sulaiman Mohammed Kako AL-ZEBARI<sup>2</sup>

<sup>1</sup>College of Agriculture and Forestry, Mosul University, Mosul, Iraq.

<sup>2</sup>College of Agriculture and Engineering Sciences, Duhok University, Duhok, Iraq.

\*Email: [ayad\\_alalaf@uomosul.edu.iq](mailto:ayad_alalaf@uomosul.edu.iq)

### Abstract

This study aimed to investigate spraying two organic fertilizers viz. Delfan plus and Vegeamino, which contain amino acids, on the vegetative growth of pomelo seedlings using concentrations of 0, 1, 2, 3, and 4ml/l. The study was designed according to a completely randomized block design, and each treatment was repeated three times, and one experimental unit included four seedlings. The results showed that the application of organic had containing amino acids especially at the levels of 3 and 4 ml/l of Vegeamino, which achieved a significant increase in all the studied traits except the zinc content of the leaves.

**Keywords:** Seedlings, Citrus, Foliar spraying, Amino acids, Vegetative growth.

**Citation:** Alalaf, A.H.E.; Alalam, A.T.S. & Al-Zebari, S.M.K. 2022. The effect of spraying amino acid fertilizer on the growth characteristics and mineral content of pomelo (*Citrus grandis*) seedlings Iranian Journal of Ichthyology 9(Special issue 1, 2022): 123-126.

## Introduction

Using amino acids fertilizers for fruit seedlings improves the soil mineral content for the plant and increases the strength of its vegetative and root growth i.e. it is positively reflected in the growth of the vegetative system (Al-Alaf 2017). Amino acids are organic nitrogen fertilizers, and natural compounds helping to balance plant growth and increase its response to fertilizers, especially when amino acids are used as a spray on the plant's vegetative complex, as they move quickly to all leaf cells and increase the concentration of chlorophyll and the energy required for protein synthesis within the plant (Nag et al. 2001). In addition, these fertilizers improve the permeability of cell membranes and the efficiency of the photosynthesis process encouraging the formation of the root system and chlorophyll, which leads to increased absorption of nutrients and water (Singh 1999).

Spraying amino acids on plant seedlings has a great effect on stimulating physiological processes. It also moves easily through the root system and plays an important role as a chelating substance that facilitates the absorption of micro-nutrients (Abdul Hafez 2006). Several works have shown the importance of spraying amino acids fertilizers on the vegetative sum of fruit crops (Al-Thafi et al. 2013; Al-Zubaidi 2017; Muhammad 2019; Qabaa 2019; Alalaf 2019; Al-Shareefi et al. 2020). This research also aimed to investigate the response of seedlings of pomelo (*Citrus grandis*) by spraying liquid organic fertilizers containing amino acids (Delvan Plus and Vegemino).

## Materials and Methods

The research was carried out during the 2021 growing season on grafted two-year-old pomelo seedlings with 80-90cm high and 6-8mm main stem

**Table 1.** The components of the organic fertilizers used in the study.

Vegeamino	Delfan plus
24 organic materials	Free amino acids: 28.8% (g / l)
20 free amino acids	Total nitrogen: 10.8% (g / l)
3.9 total nitrogen	Protein nitrogen: 6.0% (g / l)
3.85 organic nitrogen	Organic carbon: 27.6% (g / l)
0.03% ammonium nitrogen	Organic matter: 44.4% (g / l)

**Table 2.** The effect of fertilizer treatments on the content of mineral elements in the leaves of Pomelo seedlings.

Treatments	Studied traits			
	% N	% P	% K	The leaf content of protein
Zero	1.51 <sup>c</sup>	0.144 <sup>c</sup>	0.85 <sup>d</sup>	9.43 <sup>d</sup>
Delfan plus 1 ml.L <sup>-1</sup>	1.68 <sup>c</sup>	0.161 <sup>bc</sup>	1.12 <sup>cd</sup>	10.50 <sup>cd</sup>
Delfan plu 2 ml.L <sup>-1</sup>	1.75 <sup>bc</sup>	0.158 <sup>bc</sup>	1.21 <sup>cd</sup>	10.95 <sup>b-d</sup>
Delfan plus 3 ml.L <sup>-1</sup>	1.76 <sup>bc</sup>	0.178 <sup>b</sup>	1.13 <sup>cd</sup>	11.01 <sup>b-d</sup>
Delfan plus 4 ml.L <sup>-1</sup>	1.91 <sup>a-c</sup>	0.171 <sup>b</sup>	1.37 <sup>bc</sup>	11.97 <sup>a-c</sup>
Vegeamino 1 ml.L <sup>-1</sup>	1.71 <sup>bc</sup>	0.165 <sup>bc</sup>	1.32 <sup>c</sup>	10.72 <sup>b-d</sup>
Vegeamino 2 ml.L <sup>-1</sup>	1.84 <sup>bc</sup>	0.203 <sup>a</sup>	1.54 <sup>a-c</sup>	11.49 <sup>b-d</sup>
Vegeamino 3 ml.L <sup>-1</sup>	2.27 <sup>a</sup>	0.224 <sup>a</sup>	1.78 <sup>ab</sup>	14.22 <sup>a</sup>
Vegeamino 4 ml.L <sup>-1</sup>	2.10 <sup>ab</sup>	0.218 <sup>a</sup>	1.82 <sup>a</sup>	13.16 <sup>ab</sup>

diameter planted in 8 kg plastic anvils in a growth medium consisting of a mixture of soil. The seedlings were sprayed by amino acids fertilizers twice during the growing season with one-month intervals using two liquid organic containing amino acids, namely Delfan plus and Vegeamino each with four concentrations of each (0, 1, 2, 3, and 4ml/l) as treatments. Spraying treatments with fertilizers were carried out on 25/4 and 25/5 of the year 2021.

The study was performed according to the Randomized Complete Block Design (R.C.B.D) design. Its transactions were repeated three times, and the number of seedlings for each experimental unit was four. The averages of the transactions were compared using Duncan's polynomial test (Al-Rawi & Khalaf Allah 1980). The characters of (1) the nitrogen content of the leaves (%), (2) the phosphorous content of the leaves (%), (3) potassium content in the leaves, (4) the protein content of the leaves (%), (5) increasing in seedling height (cm), (6) increase in seedling diameter (mm), (7) the iron content of leaves (mg.l<sup>-1</sup>) and (8) leaf content of zinc (mg.l<sup>-1</sup>) were measured.

## Results and Discussion

Table 2 shows the significant effect of the spraying liquid amino acids fertilizers on plants. The concentration of 3ml/l of Vegeamino had the best results in the ratio of nitrogen, phosphorous, and protein in the leaves. The treatments of Vegeamino had an increase in the potassium percentage in the leaves, especially in 4ml/l. The 3ml/l Vegeamino treatment showed the highest increase in the length of seedlings while the 4 ml/l had the highest average of seedling diameter and iron content in leaves significantly higher than other treatments. There were no differences in all the treatments in the terms of the content of the leaves zinc (Table 3).

Adding organic fertilizers to leaves especially in 3 and 4ml/l treatments of Vegeamino showed increasing the content of the leaves of elements. Amino acids are important in accelerating the physiological processes in the plant, especially the structure of vitamins, growth regulators, nucleotides, and enzymes, which leads to improving the efficiency of the photosynthesis process encouraging the formation of the root system and chlorophyll

**Table 3.** The effect of fertilizer treatments on measurements of vegetative growth and the content of iron and zinc in the leaves of Pomelo seedlings.

Concentrations	Studied traits			
	The increase in the height of seedlings (cm)	The increase in the diameter of seedlings (ml)	Fe ppm	Zn ppm
Zero	12.95 <sup>d</sup>	1.23 c	56.78 <sup>d</sup>	33.59 <sup>a</sup>
Delfan Plus 1 mL.L <sup>-1</sup>	27.29 <sup>c</sup>	1.74 b	67.56 <sup>bc</sup>	33.62 <sup>a</sup>
Delfan Plus 2 mL.L <sup>-1</sup>	28.62 <sup>c</sup>	1.86 b	64.96 <sup>cd</sup>	32.44 <sup>a</sup>
Delfan Plus 3 mL.L <sup>-1</sup>	34.43 <sup>bc</sup>	1.93 b	70.62 <sup>a-c</sup>	35.40 <sup>a</sup>
Delfan Plus 4 mL.L <sup>-1</sup>	34.29 <sup>bc</sup>	2.01 b	70.15 <sup>a-c</sup>	33.78 <sup>a</sup>
Vegeamino 1 mL.L <sup>-1</sup>	36.71 <sup>a-c</sup>	1.77 b	67.22 <sup>bc</sup>	34.40 <sup>a</sup>
Vegeamino 2 mL.L <sup>-1</sup>	39.60 <sup>ab</sup>	1.83 b	74.51 <sup>a-c</sup>	37.25 <sup>a</sup>
Vegeamino 3 mL.L <sup>-1</sup>	45.97 <sup>a</sup>	1.88 b	76.37 <sup>ab</sup>	36.84 <sup>a</sup>
Vegeamino 4 mL.L <sup>-1</sup>	40.00 <sup>ab</sup>	2.33 a	78.81 <sup>a</sup>	35.96 <sup>a</sup>

(Singh 1999). This increases the transport of nutrients through the roots and their transfer to the vegetative system to accumulate in the leaves. Application of amino acids also leads to a decrease in the value of the osmotic potential and in turn reduces the water potential of the cell, which leads to an increase in the ability of the plant cell to withdraw the nutrients dissolved in it and water from the growth medium (Singh 1999).

The high iron content in the leaves may be due to the importance of the amino acids in the fertilizers as a chelating substance that facilitates the absorption of micro-nutrients (Abdul Hafez 2006). Vegeamino contains organic matter, and when it is sprayed, a part of it falls on the soil, so the organic matter improves the properties and characteristics of the soil, improving its aeration and its ability to retain water, and its content of nutrients increases, which leads to an increase in the transfer of these elements from the soil and accumulate in the leaves (Al-Shibiny 2005). The spraying with organic vegeamino had the highest increase in the height and diameter of the seedlings. It may be as a result of containing a number of amino acids that increased the protein concentration in the leaves, which contributes to stimulating plant growth by increasing the speed of vital processes. However, organic nitrogen includes in the synthesis of amino acids, plays a major role in stimulating cell division, as it is one of the components of auxins and

cytokinins that stimulate vegetative growth (Jundia 2003; Mohamed 2018). As a conclusion, spraying amino acids fertilizers especially Vegeamino at concentrations 3 and 4ml/l showed fast growth in seedlings of pomelo.

## References

- Abdel-Hafiz, A.A.A. 2006. The use of amino acids and vitamins in improving the performance, growth and quality of horticultural crops under Egyptian conditions. Agricultural Bulletin. Scientific Office of the United Company for Agricultural Development. Cairo.
- Alalaf, A.H. 2019. Effect of budding date and Chemical, Organic and bio fertilization on budding success of local orange and subsequent growth of the seedlings. Ph.D. Thesis. Hort. and Landscape Design Dept. College of Agriculture and Forestry, Mosul University, Iraq. 145 p.
- Al-Alaf, A.H.I. 2017. 150 questions and answers in orchid fertilization programs. Dar Al Moataz for Publishing and Distribution. Jordan.
- Al-Rawi, K.M. & Abdul Aziz M.K.A. 1980. Design and Analysis of Experiments Agricultural. University of Al Mosul. Dar Al Ketub Printing and Publishing Est. Ministry of Higher Education and Scientific Research. Iraq.
- Al-Shabini, J. M. 2005. Fruit gardens fertilization programs. The Egyptian Library for Publishing and Distribution. Alexandria. The Egyptian Arabic Republic.
- Al-Shareefi, A.H.; AL-khafaji, H.M. & Alkadem, A.A.

2020. Effect of spraying organic fertilizer (vigamino) and licorice extract on the vegetative and chemical traits for apricot seedlings (*pruns armeniaca* l.). Journal of the Science of Food and Agriculture 8(1): 1-4.
- Al-Tahafi, S.A.; Al-Hamami, S.A. & Yacoub, N.A. 2013. The effect of ground application and spraying with Siapton 10L compound on the vegetative growth of *Citrus aurantium* L. seedlings. Anbar Journal of Agricultural Sciences 11(2): 74-82.
- Al-Zubaidi, M.A.H. 2017. Effect of adding liquid organic fertilizer and spraying with some micro-elements on the vegetative and fruiting characteristics of olive cultivar Nabali. PhD thesis. faculty of Agriculture. Baghdad University. Iraq. 187 p.
- Jundia, H. 2003. *Physiology of fruit trees*. Arab House for Publishing and Distribution. The Egyptian Arabic Republic. 125 p.
- Muhammad, W.K.R. 2018. Improving the growth of seedlings of two olive cultivars by some fertilizer treatments and spraying with salicylic acid. Master Thesis. College of Agriculture and Forestry. The University of Al Mosul. Iraq. 127 p.
- Nag, S.; Saha, K. & Choudhuri, M.A. 2001. Role of auxin and polyamines in adventitious root formation in relation to changes in compounds involved in rooting. Journal of Plant Growth Regulation 20:182-194.
- Qaba, A.H.S. 2019. Response of olive seedlings *Olea europaea* L. Bashiqi and Ashrassi cultivars to the addition of sulfur, compound fertilizer and Amino Alexin. Master Thesis. College of Agriculture and Forestry. University of Al Mosul. Iraq. 146 p.
- Singh, B.K. 1999. *Plant Amino Acids: Biochemistry and Biotechnology*. Marcel Dekker Inc.; New York, USA. 648 p.