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Effect of free amino acids spray on the some nutrient elements accumulation in pistachios (pistachio Vera L.), Ohadi (Fandoghi) cultivar

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ABSTRACT

In this article studied, the effect of amino acids spray together with tree nutrient elements such as N, P, K on the Ohadi cultivar of pistachio was studied in the gardens of Iran Research Institute of Pistachio in Kerman Station. The experiment was done as a complete randomized block design with 5 treatments in three replicates. Then, nutrient control such as Cu, Mn, Mg, Ca, Fe, P, Zn and K were measured in fruits and leaves. The data were analyzed by SPSS software version 12.0, in the meaningful level of 5%. For comparing the variables, the unilateral variance analysis and Duncan test were used. The results were shown that treatments of amino acid had a significant effect on elements accumulation in leaves and fruits compared with the sample plants. Treatments, were used the significant change in the contents of some elements Mg and K of fruits, Ca, Fe, P, Zn of leaves and also P in leaves and fruits. Therefore, using amino acids containing of nutrient elements could change the amount of pistachio elements accumulation that could cause alteration in other qualitative and quantitative parameters. Because of, these elements play an important role in other process such as fruit growth and photosynthesis, This way of spraying could be as an appropriate method for replacing different fertilizers of pistachio.

Key words: solution spraying - free amino acid – pistachio - nutrient elements

Introduction

Pistachio production has a historical background in Iran and Iranian know its properties especially for increasing intelligence and its vital properties. Ohadi cultivar of pistachio is one of the widest commercial cultivars in Iran.

The production of hollow fruits (without kernel) is not only in pistachio but also is common in the other fruits. Since some of the plant organs such as fruit to total plant require to nutritient foods e.g. more calcium or in the early of sprig season, when the roots could not absorb the nutritient elements because of soil low temperature, they need the nutritient foods such as Br and zinc, severally, that by solution spraying, when the shoots are swelling, we could satisfy their need, easily [1,2,8].

Nowadays, solution spraying of nutritient elements became as a common method in most gardens and its optimal effects on the growth characteristics, fruit performance and its quality are so obvious. In the fast growth period in which the competition for nutritient elements absorption between vegetative and generative organs and roots decrease the roots activity, therefore, the absorption of nutritient foods decrease by solution spraying, in the end this competition will decrease [16].

The utilization of foliar feeding consists of foliar feeding with nutritient elements, foliar feeding with carbohydrates and foliar feeding with organic materials. The virtues of foliar feeding included as the following:

- Low absorption of elements in soil,
- Decreasing the roots activity during the vegetative and yield fruit stages,
- Making rich the agricultural and animal productions [4,5,11].

The aim of this research is to study the accumulation changes of some important nutritious elements in the Ohadi Cultivar of pistachio under the treatment of amino- acid solution spraying.

Methods and materials

Present search was done because of the effect of solution spraying of some amino-acids complexes on nutrient elements, content of Ohadi Cultivar (Fandoghi) in 2009. This study was done in the garden of Iran Research Institute, Kerman Station on the Ohadi Cultivar. The age of tested trees was about 30 years. In this garden, irrigation was done

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with the period of 30-35 days. The water electrical conduction was about 2/5 Deci Zimens/ meter. This experiment was done in a complete randomized complete block design (RCBD) with 5 treatments in 3 replicates on the Ohadi Cultivar. Solution spraying of each treatment was done in two stages (15-30 May) with the recommended quantities related to fertilizer on 3 trees for each treatment. Treatments were done in two periods in this manner:

1- The first stage of solution spraying was done in the time of endoscope growth.

2- The second stage of solution spraying was done in the time of endoscope growth completion.

The considered treatments consist of:

1- The control treatment which was irrigated with water (Control)

2- Complex of free acid amino with phosphorous (AA+P)

3- Complex of free acid amino with potassium (AA+K)

4- Free amino acid complex with P, K, N. (AA+NPK)

5- Free amino acid (AA)

Solution spraying was done in the morning (at 7 A.M.) under the condition that the minimum of temperature and maximum of humidity were governed on the region and the conditions were provided for surface absorption in the crest by a 100 liter barrow sprayer and it was done to the extent that all of leaves become wet. The solution spraying of each row contains of several treatments and each treatment consists of three and among each row, several rows were considered as a guard. After the second stage of solution spraying in on turn, the sampling was done for measuring the amount of spraying effect with amino acid on the amount of elements absorption in fruits and leaves, accidentally. Then the sample were dried in the mortar and then they were broke into small pieces in a mill. After that they were transferred through a screen for determining the amount of Ca, Zn, P, N, Fe, Mn, Br and Cu were transferred to a laboratory.

After acidy digest of samples, the amount of considered elements was measured by the atomic absorption machines and photometer fleme. All resulted data from variables measurement were analyzed by SPSS Software version 12.0, in the significant level 5%. For studying these differences in this software, the unilateral variance analysis and Duncan test were used.

The characteristics of sprayed amino acid:

The characteristics of amino acid which were used in this solution:

Percentage	***Name of the amino acid***
11/3	Hodroxyprolin
4/5	Aspartic acid
3/0	Threonine
3/9	Serine
8/4	Praline
0/9	Glumatic acid
11/34	Glycine
13/21	Alanine
8/4	Agrinine
4/2	Methionine
4/5	Isoleucine
16/51	Leucine
1/5	Tyrosine
5/1	Phenylalanine
5/1	Lysine
3/0	Histidine
5/1	Valine
0/3	Sisteien
0/4	Asparghen
0/4	Treptophan

Results:

Data show that the effect of treatments on Cu accumulation of fruits and leaves was not the significant in level of 5%. Therefore, we could not expect that the application of amino acids or nutrient elements NPK could change the quantity of leaves and fruit Cu of pistachio.

But generally, the amount of leaves Cu in comparism to the Cu fruits less in all treatments. Amino acid treatment had a great effect on the amount of fruits Mn as the minimum level of Mn is related to the sample and the maximum of it is related to AA+P treatment in which the quantity of Mn was approximated 35ppm. In the other treatment, the quantity of fruits Mn is in the medium level.

Treatments had not any significant effect on the leaves Mn accumulation and only the amount of fruits Mn under the influence of treatment had a significant increase in the level of 5%. The effect of treatment on the accumulation is not significant but these treatment had a significant effect on the amount of leaves Zn. According to treatment of AA

decreased the amount of leaves Zn and it was achieved the extent of 7.5ppm.

But in the treatments of AA+K and AA+P, it was in the maximum level, about 10ppm. Generally the studies show that the increasing difference was not high in relation to the control. The effect of treatments of fruits Fe was not significant and the amount of fruits Fe is about 60ppm. From control treatment to AA treatments amount of Fe was decreased.

Table: complexes of considered treatments

complexes of considered treatments	*Treatments*
Complete azote (nitrogen) (3/8%), ammonic nitrogen (2/1%), nitric nitrogen (1/4%), organic nitrogen (0/3%), organic materials (2%), p_2o_5(soluble in water) (6%), complex of free acid amino 3750 mg. / liter	*AA+P*
Complete azote (nitrogen) (5%), ammonic nitrogen (1/6%), nitric nitrogen (3/1%), organic nitrogen (0/3%), organic materials (2%), k_2o(soluble in water) (6%), complex of free acid amino 3750 mg. / liter	*AA+K*
Complete azote (nitrogen) (6%), ammonic nitrogen (1/4%), nitric nitrogen (0/5%), uric nitrogen (3/7%), organic nitrogen (0/3%), organic materials (2%), p_2o_5 (soluble in water) (5%), complex of free acid amino 3750 mg. / liter	*AA+NPK*
Complete azote (nitrogen) (1/1%), uric nitrogen (0/8%), organic nitrogen (0/3%), organic materials (2%), complex of free acid amino 3750 mg. / liter	*AA*

It means that the maximum amount of leaves Fe in the control is about 160ppm and its minimum relevant to AA treatment is about 60ppm. Based on the data, using the nutrient elements NPK increases the leaves Fe to the AA treatment. The analysis of data relevant to the fruits Mg measurement will be determined that the effect of treatments on the amount of fruits Mg is not significant and there is no considerable difference in the level of 5% in the amount of fruits Mg accumulation.

But the effect of treatments on the amount of leaves Mg is significant. The treatment of AA+PK, AA+P decreases the amount of leaves Mg accumulation in comparison control according to the minimum level of leaves Mg related to the treatment of AA+P, is about 0.5ppm.

But generally, the amount of fruits Mg in relation to the leaves Mg is less. The effect of treatments on Ca is not significant. But the effect of treatments on the leaves Ca accumulation is meaningful, as the maximum amount of it relevant to the treatment, AA+P that is about 2.5ppm. In the other treatment, the quantity (amount) of leaves Ca in comparison control is less.

But the leaves Ca changes are not to significant but in any case, the effect is so optimal, however, the amount of leaves Ca changes in relation to fruits Ca is so high. The minimum amount of fruits K connected to AA treatment about 1.75ppm.

But the other treatment have not any significant difference with each other. The effect of treatments on the leaves K of Ohadi Cultivar is not significant. The total level of Ca in the leaves and fruits is the same. The effect of treatment in the leaves and fruits is significant, but the effect of other treatments is so different.

There is a significant difference in the amount of fruits P between two treatments, AA and AA+P and the amount of fruits P in AA is less than AA+P treatment. But there is not a significant difference in the amount of fruits P in all treatments. However, about the leaves P, it is necessary to mention that the treatments of AA+P and AA+NPK have minimum level and the other three treatments have a maximum level. The control treatment has a maximum level of about 0.12.

Discussion:

When the stomata are closed, the nutrient solution and available elements in water are absorbed through cuticle. This event could occur in night. Using the radio nucleotides in night and its absorption was approved in most scientific reports such as in persimmon *(Diospyros discolor)*.

The phosphate absorption was proved through this way. If the phosphate is used as the fertilizer in soil, it will bind to the soil particles and in addition to the soil hardening, it can't absorb the plants roots. When the aerial stomata are close from morning to the evening, the absorption of materials are doing through the hydathode and cuticle.

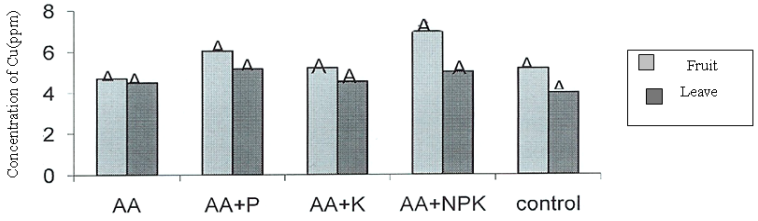

Fig. 1: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruits and leaves' Cu accumulation of Ohadi Cultivar.

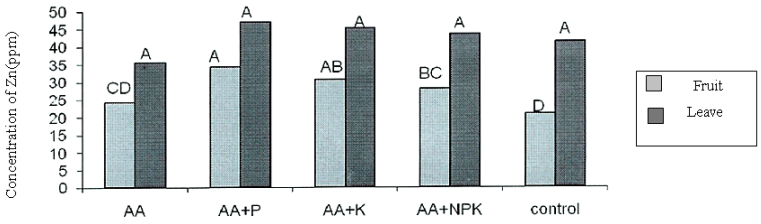

Fig. 2: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' Mn accumulation of Ohadi Cultivar.

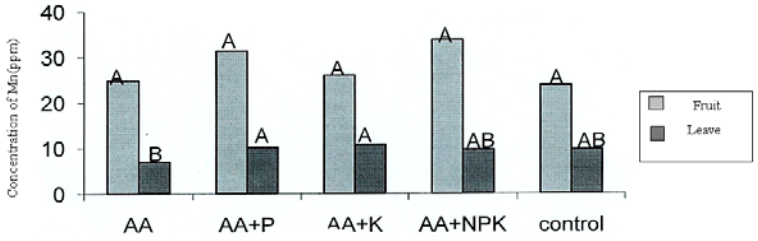

Fig. 3: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' Zn accumulation of Ohadi Cultivar.

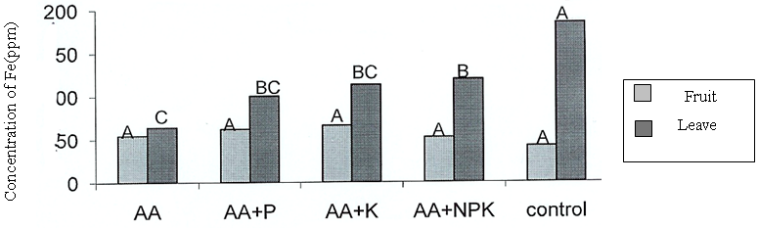

Fig. 4: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' Fe accumulation of Ohadi Cultivar.

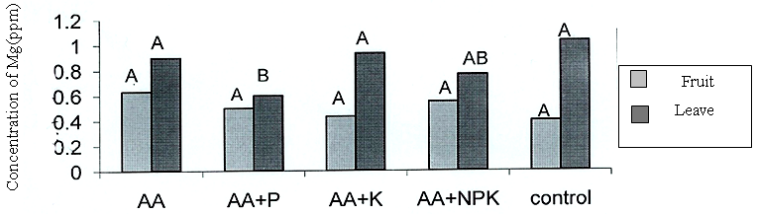

Fig. 5: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' Mg accumulation of Ohadi Cultivar.

Adv. Environ. Biol., 6(5):1780-1785, 2012

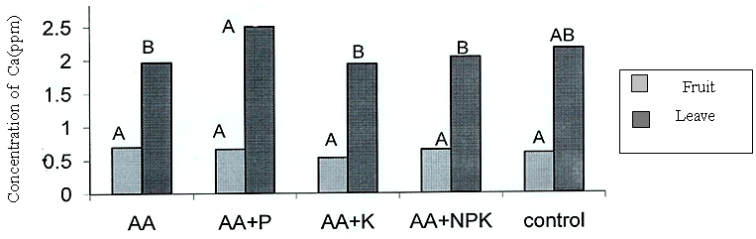

Fig. 6: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' Ca accumulation of Ohadi Cultivar.

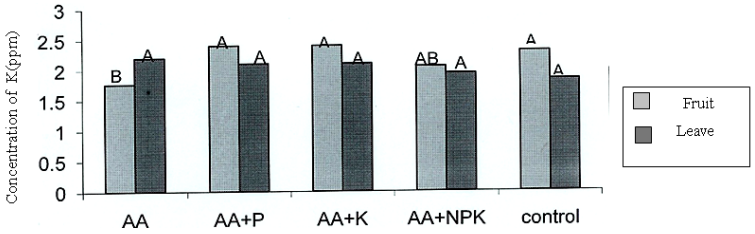

Fig. 7: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' K accumulation of Ohadi Cultivar.

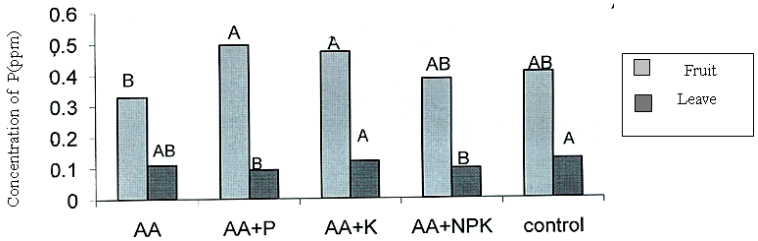

Fig. 8: Comparison the effect of amino acid treatment (AA) and nutritient elements (N, P, K) on the quantity of fruit and leaves' P accumulation of Ohadi Cultivar.

Of course, the efficiency of this method is low, because the hydathode is always open but aperture diameter in comparison stomata is so less. The cuticle absorption also due to its less relative impenetrability to the water and solutions has a efficiency in this field. We should note that the number of stomata are more in the under surface of the leaves and the absorption of spray fertilizers is being done in this part.

Any amount become more leave surface, the number of stomata also are more and as the result, the absorption will be done in best way. The high density of stomata could help obviously and compensate the leave surface in some extent but the leave surface due to having the cuticle surface is so important. Amino acid treatment with nutrient elements such as N, P, and K increase the leaves surface of Ohadi cultivar.

P is as a root fertilizer increase the root performance and growth and also increase water and mineral absorption and finally the quality of raw sap complex will rise

Transforming this type of sap to the leaves will cause the cellular division and the better growth of plant's leaves and the leaves' expansion will be better under the studied plant at the end, leave surface in the above mentioned optimal treatment increase, significantly. P will increase the quantity of crop and its quality.

Because of associated in nitrogen metabolism with treated amino acids increase the plant nitrogen feeding and helps the growth of leaves. In the other report which published in 2000 indicates that foliar treatment of nutrient elements had an effect on some tree species such as two types of pines. In the above study, treatments were consisted of N, P and Sulfur.

These treatments caused the change in the internal concentration of some elements such as n, P, K, sulfur, Ca and Mn especially in pines. Therefore, foliar treatment could effect on the nutritent relationship of plant. In general, we could conclude that solution spraying with the above mentioned treatment included amino acid treatment without the elements such as N, K and P and also the treatment with these elements are useful and could increase the quality and the performance of Ohadi Cultivar, significantly.

This effect of treatments' solution spraying on the leaves could be relevant to the pistachio's fruit and kernel. Therefore, by considering this study and the other studies relevant to it, the better planning must be dine for using the applicable nutritent solutions as a spray in the pistachio gardens that this issue has extensive aspects.

It will be better to study the several cultivars of pistachio under these treatments in a near future and the cultivar consider as the statistical factor until determine the efficiency of different pistachio cultivars in response to amino acid solution spraying.

References

1. Andrade.Sara A. Priscila. L., Schiavinato. Marlen A., Silveira. Adriana P. D. 2009. Zn uptake, physiological response and strees attenuation in mycorrhizal Jack bean growing in soil with increasing Zn concentrations. Chemosphere. 75: 1363-1370.
2. Apaydin-Varol. E., Pu tu n E., Pu n. Ays_e E. 2007. slow pyrolysis of oistachio sell. Fuel. 86: 1892-1899.
3. Arena. E., Campisi. S., Fallico. B., Maccarone. E. 2007. Distribution of fatty aacidsand phytosterols as a criterion to discriminate geographic origon of pistachio seeds. Food chemistry. 104: 403-408.
4. Vernal. M., Cases. R., Picorel. R., Yruela. I. 2007. Foliar and root Cu supply affect differently Fe- and Zn-uptake and photosynthetic activity in soybean plants. Environmental and Experimental Botany. 60: 145-150.
5. Bittelli. M., Flury. M., Campell. Gaylon S., Nichols. Everett J. 2001. Reduction of transpiration through foliar application of chitosan. Agricultural and Forest Meteorology. 107: 167-175.
6. Blandio. M., Pilati. A. and Reyneri. A. 2009. Effect of foliar treatments to drum wheat on flag leaf senescence, grain yield, quality and deoxyinvalenol contaminatin in North Italy. Field Crops Research. 114: 214-222.
7. Chen. F., Fahey. Timothy J., Yu. M., Gan. L. 2009. Key nitrogen cycling processes in pine plantations along a short urban-rural gradient in Nanchang, China. Forest Ecology and Management. Article in press.
8. Garrison. Mariann T., Moore. J.A., Shaw. Terry M., Mika. Peter G. 2000. Foliar nutrient and tree growth response of mixed-conifer stands to three fertilization treatments in northeast Oregon and north central Washington. Forest Ecology and Management. 132: 183-198.
9. Ge. T., Songa. S., Roberts. P., Jones. D.L., Huang. D., Iwasaki. K. 2009. Aminoacids as a nitrogen source for tomato seedings: The use of dual-labeled (13C, 15N) glycine to test for direct uptake by tomato seedings: Envirnmental and Experimental Botany.66: 357-361.
10. Gijon. M.C., Guerrero. J., Couceiro. J.F., Moriana. A. 2009. Deficit irrigation without reducing yield or nut splitting in pistachio (Pistacia vera cv Kerman on Pistacia terebinthus L.) agricultural water management. 96: n12-22.
11. Goli. A.H., Barzegar. M., Sahari. M. A. 2005. Antioxidant activity and total phenolic compounds of pistachio (Pistachia vera) hull extracts. Food Chemistry. 92: 521-525.
12. Gullner. Gabor and Dodage. Alan D. 2000. Effects of singlet oxygen generating suvstances on the ascorbic and acid and glutation content in pea leaves. Plant Science. 154:n 127-132.
13. Hjorth. M., Mathiassen. Solvejg K., Kudsk. P., Ravan. H. W. 2006. Amino acids in loose silky-bent (Apera spica-venti (L.) Beauv.) Responding to prosulgocarn exposure and the correlation with physiological effects. Pesticide Biochemistry and physiology. 86: 138-145.
14. Hossain. M.B. and Ryu K. S. 2009. Effect of foliar applied phosphatic fertilizer on absorption pathways,yield and quality of sweat persimmon. Scientia Horticulturae. 122: 626-632.
15. Hunt. J. F., Ohno. T., Fernandez. I. J. 2008. influence of foliar phosphorus and nitrogen contents on chemical properties of water exterctable organic matter derived from fresh and decomposed sugar maple leaves. Soil Biology & Biochemistry. 40: 1931-1939.
16. Jonesa D. L., Shannon. D., Junvee-Fortune. T., Farrer. J. D. 2005. Plant capture of free anino acids is maximized under high soil amino acid concentrations. Soil Biology & Biochemistry. 37: 179-181.
17. Sauheitl. L., Glaser. B., Weigelt. A. 2009. Uptake of intact amino acids by plants depends on soil amino acid concentrations. Environmental and Experimental Botany. 66: 145-152.
18. Simoglou. Kostas B., Dordas. Christos. 2006. Effect of foliar applied boron, manganese and zinc on tan spot in winter durum wheat. Crop Protection.25: 657-663.
19. Xu. Y. C., Shen. Q. R., Ran. W. 2003. Content and distribution of forms of organic N in soil and particle size fractions after cong-term fertilization chemosphere. 50: 739-745.