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DETERMINATION OF AMINO ACIDS CONTENT OF MACLURA POMIFERA FRUIT GROWING IN UZBEKISTAN AND TURKEY

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Abstract
In this article, the content of amino acids in the fruit of Maclura pomifera growing in Uzbekistan and Turkey was determined and analyzed using the USSX method. 16 types of amino acids in the fruit of Maclura pomifera growing in Uzbekistan were studied by us. The content of amino acids in the fruit of Maclura pomifera growing in Turkey was determined by Rifat Battaloglu, a scientist at Nigde Omer Halisdemir University . In the fruit of Maclura pomifera growing in Uzbekistan, 1 gram of Maclura pomifera fruit extract contains 3.06 mg/g of proline, 2.39 mg/g of glycine , and 2.33 mg of histidine. In this, the effect of amino acids on human health was analyzed and studied based on scientific sources. The level of study of the obtained plant was calculated and it was concluded that the research is still insufficient.

Introduction

Maclura pomifera, Maclura apple, dye mulberry, false orange (Latin name Maclura pomifera) - Moraceae is a fruit tree in the mulberry family. The plant is also known as "Chinese orange", "Indian orange" and " Adam's apple". It is native to the southeastern United States , especially in Central Texas [1].

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Appearance of the flower and fruit of the Maclura pomifera plant

Maclura pomifera grows well in light and partial shade. It grows on normal soil and on saline soil. Currently, this plant is cultivated in Central Asia (Uzbekistan , Kazakhstan , Turkmenistan), Turkey, Crimea and the Caucasus , in the Krasnodar and Stavropol Territories [2].

Maclura pomifera contains many cyclic triterpene alcohols in the form of fatty acid esters. This class of biologically active substances widespread in the plant world includes sterols , bile acids and saponins . The total content of triterpenoids in the fruit of Maclura pomifera reaches 4%. Similar to mulberries, the fruits of Maclura pomifera are also very diverse in their chemical composition. However, the fruits of Maclura pomifera are not consumed. The fruits contain a lot of sugar , up to 10% pectin substances , and the leaves contain almost 13% citric acid . The seeds are small nuts located inside the fruit, and 30% of them are fatty acids . However, the most valuable substances in the fruit of Maclura pomifera can be considered flavonoid compounds (this group of substances is similar in structure to vitamin P). Of the flavonols, the largest amount is kaempferol , up to 1.2% [3].

The fruits also contain a large amount (about 6%) of isomeric flavonoid compounds - isoflavones . Like many polyphenols with vitamin P activity, they strengthen blood vessels and capillaries [4].

In folk medicine, the fruit of Maclura pomifera is also used to treat and prevent various skin diseases, dermatitis , eczema , internal and external wounds , skin cancer , radiculitis , rheumatism , polyarthritis , hypertension , and hemorrhagic pathologies [5].

Maclura pomifera fruit is one of the promising and economically valuable plants for use in ornamental gardening due to its high decorative properties. It is recommended for use in gardens and parks as thorny hedges, borders, group and single plantings , as well as for creating protective strips and land reclamation plantings [6].

In ornamental gardening, it is valued for its original fruit. In the medical industry of many countries, its fruits are used to prepare medicines (cardiac stimulants, antibiotics), and in folk medicine, it is also used as a remedy for wound healing and rheumatic diseases [7].

Experimental Part

Amino acids in plant samples were qualitatively and quantitatively determined using standard samples from Sigma Aldrich (Germany) using a Y u SSX Agilent 1260 II Infiniti Fluorescein (FLD) instrument manufactured by Agilent Technologies, USA (Agilent). detector determined using . Fixed phase Poroshel 120 EC-C-18 (150 mm × 4.6 mm × 4 μm) A US column was used. Pre-column derivatization was performed in an automatically programmed mode. As a mobile phase for the analysis of aminoxylate A - sodium dihydrogen phosphate solution (40 mM) pH 7.8 and mobile phase B - acetonitrile: methanol: water (45:45:10) implemented on a variable basis.

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Time	Phase A % sodium dihydrogen phosphate solution (40 mM) pH 7.8	Phase B %Acetonitrile : methanol:water (45:45:10)
0.0	98	2
16	70	30
23	57	43
26	0	100
28	98	2
30	98	2

Sample volume injected at a flow rate of 1 ml/min and a thermostat temperature of 40 ^{0} C
5 µl, analysis time was 30 minutes, and chromatograms were obtained as follows.

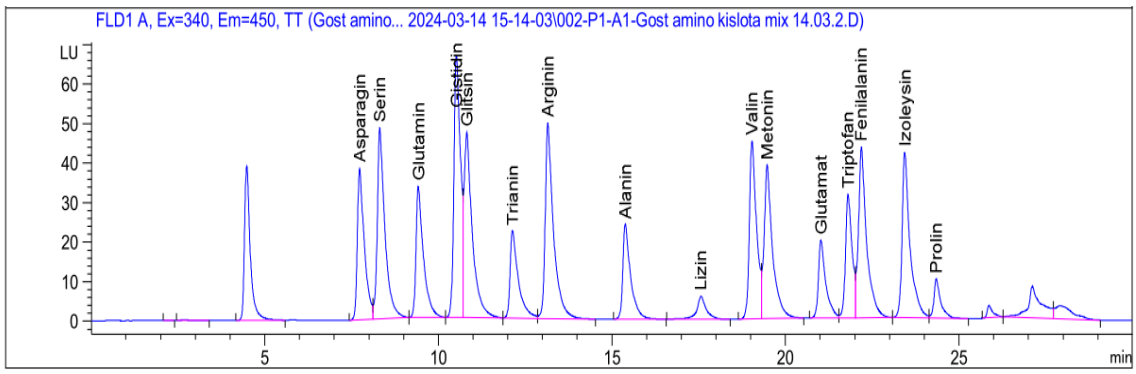

Figure 1: Chromatograms of 16 different types of amino acids from standard samples

Amino acid hydrolysis in the sample was performed as follows: Initially, all samples were ground to a size of 1 mm and the prepared sample was weighed with an accuracy of 0.001 mg on an analytical balance of 5.0 g (FA220 4N) . Then, 50 ml of 6 N hydrochloric acid solution was added to a 200 ml flask equipped with a reflux condenser and placed in a thermostat at 110 °C. Hydrolysis was stirred for 24 hours on a magnetic stirrer. After the hydrolysis was completed, the solution was cooled to room temperature and 10 ml of the sample was taken and centrifuged at 12,000 rpm for 10 minutes. Then 5 ml was taken and neutralized using 6 N sodium hydroxide, then 1 ml of the solution was filtered through a 0.45 µ m filter and placed in a vial, and the results in Table 1 were obtained.

The results were recalculated using the following formula and converted from the device's mg/l unit to mg/g.

$$M_{\text{amino acid}} = \frac{C*V*2}{m*1000}$$

Here $M_{\text{amino acid}}$ - amino acid quantity (mg/g)
C- Result from USSX (mg/l)
v-total volume of solution used for hydrolysis (ml)
m- mass of sample taken for hydrolysis (g)
2 – neutralization coefficient

Results and Discussions

The amino acid content of Maclura pomifera fruit growing in Uzbekistan was determined using the USSX method and the following results were obtained.

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Table 1. Amino acid content of Maclura pomifera fruit

No.	Indicator name	Maclura pomifera fruit extract from Turkey (mg/g)	Maclura pomifera fruit extract growing in Uzbekistan (mg/g)
1.	Asparagine	0. 32	0.46
2.	Serene	0. 11	0.17
3.	Glutamine	0. 09	0.13
4.	Histidine	1. 03	2.33
5.	Glycine	1. 45	2.39
6.	Threonine	0. 15	0.38
7.	Arginine	0. 19	0.30
8.	Alanine	0. 89	1 .0 2
9.	Lysine	0. 56	1 .0 5
10.	Valine	0. 15	0.23
11.	Metinone	0. 78	1 .0 5
12.	Glutamine	0. 25	0.27
13.	Tryptophan	0. 47	1 .0 9
14.	Phenylalanine	0. 36	1 .0 6
15.	Isoleucine	0. 25	0.31
16.	Proline	2. 15	3.06

1-As can be seen from the table, the amino acid content of Maclura pomifera fruits growing in Uzbekistan and Turkey was determined and compared using the USSX method. It was found that proline, glycine, and histidine in Maclura pomifera fruits growing in Uzbekistan were 1.42, 1.65 , and 2.26 times higher , respectively, than in Maclura pomifera fruits growing in Turkey .

synthesized in the body, which is part of proteins . It is involved in many biological processes in the body and has several positive effects on human health. Mainly, **it is involved in skin health and collagen synthesis. It also plays an important role in** skin regeneration and rapid wound healing. In **joint and bone health,** it supports the regeneration of joints and bone tissue through collagen synthesis, and can be an aid in the prevention of diseases such as arthritis and osteoporosis [8].

Proline also contributes to the formation of collagen, which strengthens blood vessel walls and may reduce the risk of cardiovascular disease. It helps the immune system function properly by maintaining tissue health . Proline is important in accelerating wound healing [9].

The amino acid glycine, on the other hand, acts as **an inhibitory neurotransmitter in** the brain and spinal cord **, calming the human nervous system** . This helps reduce stress, anxiety, and nervousness. It improves sleep and can be an effective remedy for insomnia . It helps increase mental activity, attention, memory , and thinking ability. It is considered beneficial because it enhances cognitive function. Glycine is involved in the detoxification of toxins by the liver. It helps cleanse the body, especially when exposed to alcohol or chemicals. Glycine reduces inflammatory processes and increases the body's resistance. It can have antibacterial and antioxidant effects. **It is beneficial for muscles and tissues.** It participates in protein synthesis, helping to restore and develop muscles. It is involved in regulating blood pressure and supporting heart function [10]

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This article found that the content of proline, glycine, and histidine in the fruit of Maclura pomifera growing in Uzbekistan was 1.42, 1.65 , and 2.26 times higher, respectively , than in the fruit of Maclura pomifera growing in Turkey. As we know, proline is an amino acid **synthesized in the body,** which is part of proteins . It participates in many biological processes in the body and has a positive effect on human health. The amino acid glycine **calms the human nervous system, acting as an inhibitory neurotransmitter in** the brain and spinal cord . This helps reduce stress, anxiety, and nervousness.

Currently, the Maclura pomifera plant is widely cultivated in the southern regions of Uzbekistan as an ornamental plant and building material. However, insufficient research has been carried out on its useful properties and chemical composition. Taking this into account, we set ourselves the goal of studying the fruit of Maclura pomifera .

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