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ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
АО «Институт топлива, катализа и
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AMINO ACID AND VITAMIN COMPOSITION OF *CRATAEGUS ORIENTALIS PALL*

Abstract. The genus hawthorn (*Crataegus*) belongs to the apple subfamily (*Maloideae* Focke) of the *Rosaceae* Juss family. The hawthorn genus includes about 1500 species distributed in warm temperate and subtropical regions of the northern hemisphere, mainly in North America. Over 80 wild and 90 introduced species grow on the territory of the CIS. Kazakhstan belongs to the forest-deficient regions; the forest cover of the territory is 3.87%. The hawthorn, which grows in flat areas, at the foot of the mountains, in the mountains, in the steppe and forest-steppe, is quite common here, is part of the undergrowth of deciduous forests, forms thickets with other shrubs. 7 wild-growing species are found in Kazakhstan: *Crataegus almatensis* A. Pojark., *Crataegus pontica* A. Koch, *Crataegus turkestanica* A. Pojark., *Crataegus sanguinea* Pall., *Crataegus altaica* Lge., *Crataegus transkaspica* A. Kocharus., *Crataegus transkaspica* A. Kocharus., The range of arboretums in Kazakhstan includes up to 40 - 50 species of hawthorn. In various elements of landscaping, hawthorns of various origins found; in particular, at least 20 species grow in urban plantings of Almaty. The hawthorn is widespread in the Northern Tien Shan Mountains: Zailiyskiy, Dzhungarskiy and Kungey Alatau. Plants of the genus Crataegus are rich in vitamins A, C, E, K and group B, and also contain sugars, flavonoids, saponins, phytosterols, glycosides, tannins, organic acids, amygdalin, essential oils. Thus, hawthorn is a promising raw material for the creation of domestic medicines. This article examines the study of the quantitative composition of amino acids and vitamins in the fruits of the species of the genus Crataegus widespread in Kazakhstan in a supercritical extract isolated and the fruits of the *Crataegus orientalis Pall* plant, in order to establish the possibility of using and with subsequent cultivation of the selected species.

Keywords: *Crataegus.*, *Crataegus orientalis Pall*, amino acids, vitamins, SFE extraction.

Introduction. The genus hawthorn (*Crataegus*) belongs to the apple subfamily (*Maloideae* Focke) of the *Rosaceae* Juss family. The hawthorn genus includes about 1500 species distributed in warm temperate and subtropical regions of the northern hemisphere, mainly in North America. Over 80 wild and 90 introduced species grow on the territory of the CIS. Kazakhstan belongs to the forest-deficient regions; the forest cover of the territory is 3.87%. The hawthorn, which grows in flat areas, at the foot of the mountains, in the mountains, in the steppe and forest-steppe, is quite common here, is part of the undergrowth of deciduous forests, forms thickets with other shrubs. Seven wild-growing species found in Kazakhstan: *Crataegus almatensis* A. Pojark., *Crataegus pontica* A. Koch, *Crataegus turkestanica* A. Pojark., *Crataegus sanguinea* Pall, *Crataegus altaica* Lge., *Crataegus transkaspica* A. Kocharus., *Crataegus transkaspica* A. Kocharus., The range of arboretums in Kazakhstan includes up to 40-50 species of hawthorn. In various elements of landscaping, hawthorns of various origins found; in particular, at least 20 species grow in urban plantings of Almaty. The hawthorn is widespread in the Northern Tien Shan Mountains: Zailiyskiy, Dzhungarskiy and Kungey Alatau. Hawthorns are deciduous small trees, often multi-stemmed, 5 - 7 m high or tall shrubs from 1.5 to 4 m. The bark of the trunk is brown or gray, fissured. The crown is spherical or ovoid, often asymmetric. The branches are straight or zigzag. Most species have spines, which are modified shortened shoots.

This work is devoted to the study of individual species of hawthorn *Crataegus orientalis* Pall, the botanical description of which given below. We made a decision to study the amino acid and vitamin composition of the selected type. The most important in chemistry are α-amino acids, mainly because they are monomers of proteins - they can called the basis of life. The most important α-amino acids include not only aliphatic, but also aromatic and heteroaromatic radicals. Unlike all other vital nutrients (essential amino acids, polyunsaturated fatty acids, etc.), vitamins have no plastic properties and are not used by the body as an energy source. Participating in a variety of chemical transformations, they have a regulatory effect on metabolism and thereby ensure the normal course of almost all biochemical and physiological processes in the body. Most of the known vitamins represented not by one, but by several compounds (vitamers) with similar biological activity. Letters used to name groups of similar related compounds. In the presented work, we will consider the quantitative composition of vitamins A, B and C. Preparations based on hawthorn are used in the complex therapy of functional disorders of cardiac activity, cardialgia, climacteric syndrome, hypertension, astheno-neurotic conditions. At the same time, the solvent used often cannot completely removed from the obtained extract; in addition, the feedstock undergoes a number of changes due to the use of chemical solvents, which casts doubt on the "nativeness" of such extracts. In addition, solvents are not able to ensure the extraction of the full complex of biologically active substances. The current environmental and social situation in the world urgently requires new approaches to the extraction of biological components. In the food industry, the use of a number of extractants capable of toxic or mutagenic effects is restricted, and in the pharmaceutical industry. One of the solutions to this problem is the use of supercritical carbon dioxide as an extractant. In addition, the technology itself received the name - supercritical fluid carbon dioxide extraction of plant raw materials.

Materials and methods. Determination of vitamin C content: A sample in an amount of at least 0.3 g placed in a centrifuge tube. The walls of which covered with sodium citrate powder, after centrifuging the sample for 30 minutes at 3000 rpm, it transferred to another tube and an equal amount of bidistilled water and a double amount of freshly prepared water added thereto.

The protein precipitate stirred with a stick and centrifuged for 10 min at 3000 rpm. The supernatant liquid in an amount (0.1-0.5 ml) is introduced into porcelain titration cuvettes (2 parallel samples) and titrated with 0.001 n - 0.0005 n solution of 2, 6-dinitrophenolindophenol sodium salt from a special micropipette with a capacity of 0.1 ml. In parallel, a "blind" experiment performed with a 5% solution of metaphosphoric acid and bidistilled water (1: 1).

At the same time, a fluoreometric determination of the concentration of vitamins A and E carried out. To 0.2 ml of the sample, add 1 ml of bidistilled water and shake for 30 seconds. Then add 1 ml of 96% ethanol and shake again for 30 seconds. Then, adding 5 ml of hexane, repeat the procedure, shaking again. After the sample centrifuged for 10 minutes at 1500 rpm. For spectrometry, a clearly separated hexane layer (3 ml) taken, which can be stored for 2 hours in tightly sealed tubes in a dark place. Standard and control (blank) samples are prepared in parallel with the test samples. In standard samples, 0.2 ml of a standard solution (tocopherol and retinol acetate in ethanol) taken instead of a prototype. In control samples, water used instead of experimental samples. Spectrofluorimetry (spectrofluorimeter "Hitachi", Japan) of tocopherol carried out at an excitation wavelength of 292 nm and fluorescence of 310 nm; retinol - at 335 and 340 nm, respectively.

Study of the amino acid composition of the obtained extracts by the GLC method

1 g of the analyte is hydrolyzed in 5ml of 6h hydrochloric acid at 105ºC for 24 hours, in ampoules sealed under a jet of argon. The resulting hydrolysate is evaporated three times to dry on a rotary evaporator at a temperature of 40-50ºC. The resulting precipitate is dissolved in 5ml of sulfosalicylic acid. After centrifugation for 5 minutes, the supernatant is passed through a column with an ion-exchange resin Daux 50, with a speed of 1 drop per second. After that, the resin is washed to a neutral pH.

For elution of amino acids from the column, 3ml of 6h NH_4OH co solution is passed through it at a rate of 2 drops per second. The eluate is collected in a round-bottomed flask with distilled water, which is used to wash the column to a neutral pH. Then the contents of the flask are evaporated dry on a rotary evaporator at a pressure of 1 atm. and a temperature of 40-50ºC.

After adding to this flask, 1 drop of freshly prepared 1.5 % $SnCl_2$ solution, 1 drop of 2.2-dimethoxypropane and 1-2ml of hydrochloric acid-saturated propanol, ee is heated to 110 ºC, maintaining

this temperature, for 20 minutes, and then the contents are again evaporated from the flask on a rotary evaporator.

In the next step, 1 ml of freshly prepared acelizing reagent (1 volume of acetic anhydride, 2 volumes of triethylamine, 5 volumes of acetone) is injected into the flask and heated at a temperature of 60 ^{0}C for 1.5-2min. Then the sample is again evaporated on a rotary evaporator to dry and 2ml of ethyl acetate and 1ml of saturated NaCl solution is added to the flask. The contents of the flask are thoroughly mixed and, as 2 layers of liquids are clearly formed, the upper one (etiacetate) is taken for gas chromatographic analysis, which was performed on the gas-liquid chromatograph "Carlo-Erba-4200" (Italy-USA)

The data presented in figures 1 and 2.

Results and discussion.

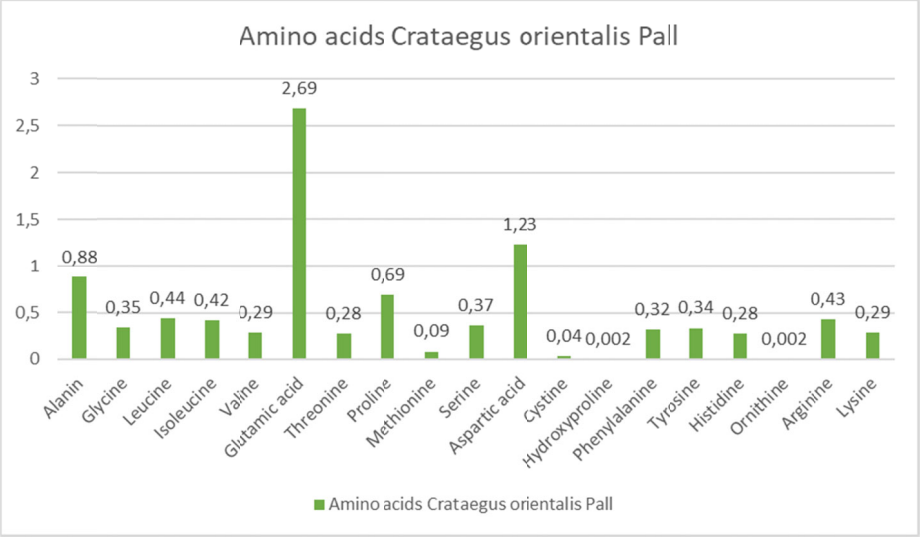

Figure 1 - Amino acid composition of the fruits
of the hawthorn *Crataegus orientalis* Pall

From the data shown in figure 1, it can concluded that in the fruits of the hawthorn *Crataegus orientalis* Pall. Amino acids are contained in greater amounts: glutamic (2.69%) and aspartic (1.23%) acids, alanine (0.88%) and proline (0.69%), which is typical for these plant objects, the total amino acid content is 9.784%.

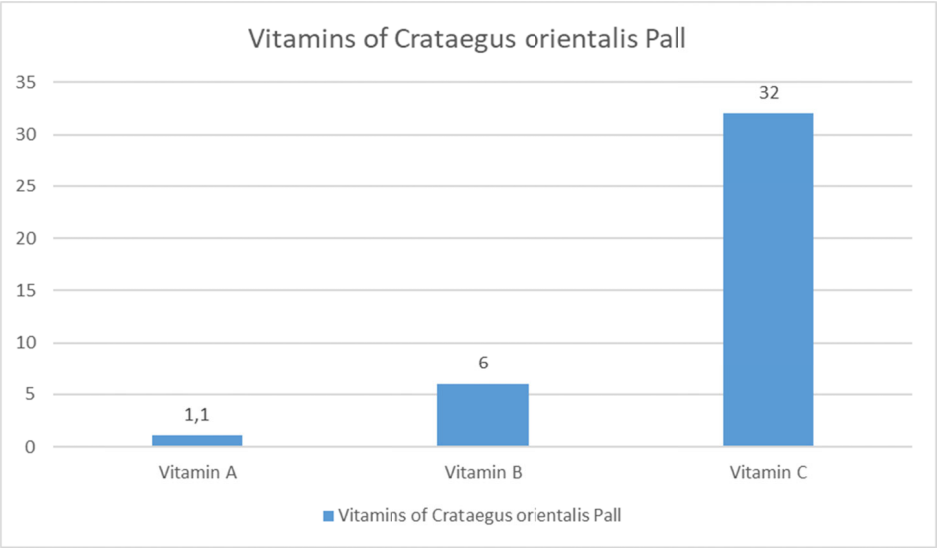

Figure 2 - Quantitative content of vitamins A, E, C
in the of fruits of the hawthorn *Crataegus orientalis* Pall

According to the results of the study, it can concluded that the fruits of the hawthorn *Crataegus orientalis* Pall are rich in vitamins; therefore, they can be used in the food industry, as well as in medicine as biologically active food additives. The data obtained do not contradict the data on the *Crataegus* family, for the fruits of which a high content of ascorbic acid is typical.

Conclusion. As a result, the vitamin and amino acid composition of the fruits of *Crataegus orientalis* of the genus *Crataegus* established, in accordance with the data obtained, the amino acid composition generally corresponds to that typical for the genus *Crataegus,* as well as the vitamin composition. Previously, we found that the pharmacopoeial parameters of the harvested medicinal plant raw material meet the established standards, which allows us to consider *Crataegus orientalis* as an independent herbal medicinal product and as a raw material for the isolation of vitamins and amino acids.

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CRATAEGUS ORIENTALIS PALL АМИН ҚЫШҚЫЛЫ ЖӘНЕ ВИТАМИНДІ ҚҰРАМЫ

Аннотация. Долана (*Crataegus*) тұқымдасы *Rosaceae* Juss тұқымдасына жататын алма тұқымдасына (*Maloideae* Focke) жатады. Долана тұқымдасына солтүстік жарты шардың орташа жылы және субтропикалық аймақтарында, негізінен Солтүстік Америкада таралған 1500-ге жуық түр жатады. ТМД аумағында 80-нен астам жабайы және 90 енгізілген түрлері өседі. Қазақстан орман жетіспейтін аймақтарға жатады, аумақтың орман жамылғысы 3,87% құрайды. Тегіс жерлерде, таулардың етегінде, тауларда, далада және орманды далада өсетін долана бұл жерде кең таралған, жапырақты ормандардың өсінді бөлігі болып табылады, басқа бұталармен қопалар құрайды. Қазақстанда 7 жабайы түрі кездеседі: *Crataegus almatensis* A. Pojark., *Crataegus* pontica A. Koch, *Crataegus turkestanica* A. Pojark., *Crataegus sanguinea* Pall., *Crataegus altaica* Lge., *Crataegus transkaspica* A. Kocharus., *Crataegus trans*. Қазақстандағы дендробақтардың ауқымына долананың 40-50 түріне дейін кіреді. Көгалдандырудың әртүрлі элементтерінде әр түрлі шыққан долана кездеседі, атап айтқанда, Алматының қалалық екпелерінде кем дегенде 20 түрі өседі. Долана Солтүстік Тянь-Шань тауларында кең таралған: Іле, Жоңғар және Күнгей Алатау.

Crataegus тұқымдасының өсімдіктері А, С, Е, К дәрумендеріне және В тобына бай, сонымен қатар құрамында қанттар, флавоноидтар, сапониндер, фитостеролдар, гликозидтер, таниндер, органикалық қышқылдар, амигдалин, эфир майлары бар. Осылайша, долана - отандық дәрі-дәрмектерді құрудың перспективалы шикізаты.

Бұл мақалада Crataegus orientalis Pall өсімдігінің оқшауланған және өсімдігінің жемістері, суперкритикалық сығындыдағы Crataegus тұқымдасының Қазақстанда кең таралған жемістеріндегі аминқышқылдары мен витаминдерінің сандық құрамын зерттеу және таңдалған түрлерді өсіру арқылы зерттеледі.

Түйін сөздер: *Crataegus., Crataegus orientalis Pall,* аминқышқылдары, дәрумендер, СКФ экстракция.

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АМИНОКИСЛОТНЫЙ И ВИТАМИННЫЙ СОСТАВ CRATAEGUS ORIENTALIS PALL

Аннотация. Род боярышник *(Crataegus)* относится к подсемейству яблоневых *(Maloideae* Focke*)* семейства розоцветных *(Rosaceae* Juss*).*

В состав рода боярышник входит около 1500 видов, распространенных в умеренно теплых и субтропических областях северного полушария, главным образом в Северной Америке. На территории СНГ произрастает свыше 80 дикорастущих и 90 интродудированных видов.

Казахстан относится к лесодефицитным районам, лесистость территории составляет 3,87%. Здесь довольно часто встречается и боярышник, который растет на ровных участках, у подножий гор, в горах, в степи и лесостепи, входит в состав подлеска широколиственных лесов, образует заросли с другими кустар-

никами. В Казахстане встречается 7 дикорастущих видов: *Crataegus almatensis* A. Pojark*., Crataegus pontica* A. Koch*, Crataegus turkestanica* A. Pojark*., Crataegus sanguinea* Pall*., Crataegus altaica* Lge*., Crataegus transkaspica* A. Pojark*., Crataegus songarica* Koch*.* В ассортименте дендропарков Казахстана насчитывается до 40–50 видов боярышника. В различных элементах озеленения встречаются боярышники различного происхождения, в частности в городстких посадках Алматы произрастает не менее 20 видов. Распространен боярышник в горах Северного Тянь-Шаня: Заилийский, Джунгарский и Кунгей Алатау.

Растения рода *Crataegus* богаты витаминами А, С, Е, К и группы В, а также содержат сахара, флавоноиды, сапонины, фитостерины, гликозиды, дубильные вещества, органические кислоты, амигдалин, эфирные масла. Таким образом, боярышник является перспективным сырьем для создания отечественных лекарственных препаратов.

В данной статье рассматривается изучение количественного состава аминокислот и витаминов в плодах распространённых в Казахстане видов рода *Crataegus* в сверхкритическом экстракте, выделенном и плодов растения *Crataegus orientalis Pall,* с целью установления возможности применения и с последующей культивацией выбранных видов.

Ключевые слова: *Crataegus., Crataegus orientalis Pall,* аминокислоты, витамины, СКФ экстракция.

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