

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES CHEMISTRY AND TECHNOLOGY

ISSN 2224-5286

Volume 2, Number 428 (2018), 52 – 55

A.K. Umbetova, G.O. Slan, A.T. Omarova, G.Sh. Burasheva, K. T. Abidkulova

Kazakh national university named after al-Farabi, Almaty, Kazakhstan

E-mail: slangulnur@gmail.com, guni_9645@mail.ru

THE STUDY OF CHEMICAL COMPOSITION
OF *ATRAPHAXIS VIRGATA* FROM THE ALMATY REGION

Abstract: The qualitative composition (moisture, total ash content, extractive substance) of the *Atraphaxis virgata* plant, *Polygonaceae* family harvested in the ravine Aksay of the Almaty region was determined. Atomic-absorption spectroscopy studied the composition of macro- and microelements of the plant. The qualitative and quantitative composition of the basic biologically active substances groups was studied, as well as the basic technological parameters for obtaining the biologically active complex.

Keywords: *Atraphaxis virgata*, moisture, total ash content, extractive substance, macro- and microelements, biologically active substances.

The study is aimed at finding and improving new drugs based on the local flora. Unlike synthetic drugs, there is a chain of privileges, such as a lack of (or fewer) side effects in phytopreparations, biological similarity to the human body, lightness, long and steady effect, relative simplicity of production, low cost with high demand.

The search for promising plants became possible due to the use of empirical data from folk and folk medicine, from the least studied taxon and photochemical studies of taxa and related species.

At the same time, research aimed at using extracts of biologically active compounds in medicine and industry, the use of new sources of raw materials, their use and storage are very important. This issue is very important for Kazakhstan with a rich and unique flora. In this case, the plant *Atraphaxis atraphaxis virgata* of the *Polygonaceae* family is of interest.

Objective: Determination of biologically active substances on the surface of the plant *Atraphaxis virgata*, belonging to the family *Polygonaceae*, collected from the Aksay gorge of Almaty, qualitative and quantitative analysis.

Object of the study: Plants *Atraphaxis virgata* family *Polygonaceae*, collected in the Aksay gorge of Almaty region of Kazakhstan.

Objectives of work: To achieve this goal, the following tasks were put forward:

- Authenticity of the plant surface *A. virgata* (moisture, total ash, extractives)
- Quantitative analysis of raw materials using spectrophotometry and titrimetry
- Development of basic technological parameters for obtaining a biologically active complex based on plant raw materials.

The *Polygonaceae* has about 1250 species, distributed in about 55 genera. Here mainly perennial grasses, although there are several tree-like and shrubby plant [1].

Atraphaxis - a height of 0.2 to 2 m, usually significantly branched directly from the soil level. The bark is gray or brown, scaly. Shoots are elongated and shortened, often ending with thorns. Flowers in apical small hands, bisexual, perianth simple 4-5-membered. Stamens 6-8, at the base of fused into a glandular ring, with nectaries. Leaflets of the perianth do not fall off with fruits and grow; outer, smaller, bend downward; Internal, much larger[2].

In many places of the universe, as well as in the desert, in the foothills, in clay, it grows in 14 species on the territory of Kazakhstan from 18 species of the Flora of the USSR [3].

Biologically active preparations were obtained from rich flavonoids of *Atraphaxis* species [4,5]. In addition, polyphenolic compounds of some species of *Atraphaxis* plants are growing in Kazakhstan, which for the first time were analyzed by Chumbalov T.K., Mukhamedyarova M.M. and Omurkamzinova V.B.

Doctor of Chemical Sciences Omurkamzinova V.B. studied the chemical composition of the plant *Atraphaxis* in 1978. As a result, 21 phenolic substances and new derivatives not included in the literature were identified: 8-oxflavonol and O-acylated flavonoid glycosides [6,7].

Atraphaxis is used to treat stomatitis, bleeding and acetaminophen tissue. In addition, in the desert, some species of plants are used for feeding camelids [8].

Practical part and results

The qualitative analysis of plant raw materials was carried out according to the methods adopted in the 1st edition of the State Pharmacopoeia of Kazakhstan. The moisture, total ash content of the model were determined during the drying of the *Atraphaxis virgata* plant growing in the Almaty region

Table 1 - Results of raw materials authenticity determination.

Name of plant	Amount for absolute dry raw material.%	
	Humidity	Total ash content
<i>A.virgata</i>	8.02	8.94

Extractive substances are a complex of organic and inorganic substances that dissolve plant raw materials in suitable solvents. Presence of extractant substances in vegetable raw materials is the main quantitative indicator of its reliability [9].

Depending on the chemical composition of plant raw materials and the solvent used, the active and additives therein may pass into the solvent as the results of the determination of extractives (Table 2)

Table 2 - Results of quantitative determination of extractive substances of the plant *Atraphaxis virgata*

№	Extragent	X, amount of extractive substances
1	Ethanol (50%)	27.26
2	Ethanol (70%)	21.27
3	Water	26.59

In the table 2, it can be seen that the amount of extractant in the 50% alcohol solution is greater than water and the extractant is 70% alcohol solution.

The total amount of macro- and microelements in the spectroscopic ash method was absorbed in the ash (Table 3)

Table 3 - The amount of macro- and microelements of *A.virgata* plants

Macro and Microelements	Amount in ash,%	Macro and Microelements	Amount in ash,%
Zn	0.025	Mn	0.078
Cd	0.0002	K	6.990
Cu	0.007	Na	1.396
Pb	0.0007	Mg	2.224
Fe	0.228	Ca	21.897
Ni	0.004		

According to the results of the study, the most important element of the *A.virgata* plant is Ca, Na K, Mg, Fe and the smallest number of elements of Cd, Cu, Ni and Pb. the number of toxic elements does not exceed established concentration [10].

Phytochemical analysis of *A.virgata* plant surface using the developer showed the main groups of biologically active substances: amino acids, organic acids, carbohydrates, tannins, phenolic compounds, flavonoids, alkaloids (Table 4)

Table 4 - Phytochemical analysis of *A. virgata*

Biologically active substances	Developer	<i>A. virgata</i>
Amino acids	ninhydrin	Purple
Carbohydrates	O-Toluidine	Brown, green
Tannins	Iron alum	Blue-green
	Vanillin	Red color
Phenolic compounds	FeCl ₃	Blue-green
Flavonoids	NH ₃	White-yellow
	AlCl ₃	Yellow
Phenolic acids	Diazotization of p-nitroaniline	Red-yellow

This table shows the groups of biologically active substances *A. virgata* plant.

For determination of quantitative analysis of raw materials in groups of biologically active substances using spectrophotometry and titrimetry.

Table 5 - Quantitative analysis of *A. virgata* plants

Name of plant	Amount for absolute dry raw material. %			
	Polysaccharides	Organic acids	Tannins	Flavonoids
<i>A. virgata</i>	1.12	3.45	3.59	5.5

As shown in the table, the plant contains a large number of flavonoids and tannins.

Extraction of dried and crushed material is a complex physicochemical process (diffusion). The efficiency of the extraction process in the diffusion process depends on many factors that can be obtained from the choice of extraction conditions. [11] The effects of an extractive, crude solvent, labor-consuming effects are investigated. The choice of the extractant was determined using ethyl alcohol at various concentrations and the cost of the biologically active complex from the plant *Atraphaxis virgata* (Table 6).

Table 6 - The yield of the biologically active complex obtained from *Atraphaxis virgata* when used with various extractants

Extragent	Ethanol (50%)	Ethanol (70%)	Ethanol (90%)
Output of the complex, %	25.74	20.27	12.83

Also, the ratio of the raw material to the biological activity is affected. Extragenic amount determines the total release of biologically active substances in raw materials (Table 7).

Table 7 - Complex yield, depending on the "crude-solvent" ratio

Шикізат (г) және экстрагент (мл) қатынасы	1:4	1:5	1:6	1:8
Output of the complex, %	4.19	15.71	25.74	19.35

It was found that the selected extractant is optimally equal to 1: 6 in the ratio of the starting material to the extractant. The definition of "extract-raw material" parameters is mainly determined by the economic concept, since the quantity of extractant used for the production enterprise is significant.

Table 8 - *A. virgata* is a complex of extraction processes that are time-dependent

Time, hours	24	48	72
Output of the complex, g	0.5851	0.4903	0.4344

Based on the properties of the raw materials and the extraction process, the extractant is 50% ethyl alcohol, the ratio of crude and solvent is 1: 6, 24-250 °C, twice the extraction time is 24 hours.

Conclusion:

As a result of the quantitative analysis of *A. Virgata* plant raw materials collected from the Aksay gorge of Almaty region in accordance with the State Standard of Pharmacopoeia of the Republic of Kazakhstan: humidity, ash content and extractives.

Atomic absorption spectrometry studied the mineral content of ash and identified 11 elements, of which four are macro-elements: magnesium, sodium, calcium, calcium, and the remaining trace elements, copper, zinc, iron, nickel.

Within the biological active biological raw materials, tannins, organic acid, flavonoids and polysaccharides have been identified.

The technology of extraction of plant raw materials is being studied. The investigations made it possible to obtain the optimum value of the parameters (extraction agent, its ratio with raw materials, extraction time and multiplicity), which influence the extraction of biologically active substances in the *A. Virgata* plant. Based on the properties of the raw materials and the extraction process, the extractant is 50% ethyl alcohol, the ratio of crude and solvent is 1: 6, 24-250 °C, twice the extraction time is 24 hours.

REFERENCES

- [1] Cherepanov S.K. Svod dopolnenii i izmenenii k «Flora SSSR» (t.t. 1 15), Leningrad, **1973**. 114-116 s.
- [2] Baitenov M.S. Flora Kazakhstana. Rodovoi kompleks flory.- Almaty, **2001**. T.2. 280 s.
- [3] Iclambekov Sh.Iu., Cadykov A.C., Kapimdzhanov A.K., Icmailov A.I. Fenol'nye coedinenie nekotorykh pachtenii cemeictva gpechishnykh. "Tezicy vtopogo Cimpoeiyma po fenol'nym coed." A-Ata, **1970**. 19-25 c.
- [4] Pavlov N.V. «Flora Tsentral'nogo Kazaxctana».Almaty, **1936**, tom 3, 110-118 s.
- [5] Omypkamzinova V.B. Dissertatsionnaia rabota. Almaty, **1978**.44-45 s.
- [6] Chymbalov T.K., Myxamed'iapova M.M., Omypkamzinova V.B. Polifenoly nekotorykh vidov kypchavki Kazaxctana. Almaty, **1978**. 3-8c
- [7] Chymbalov T.K., Myxamed'iapova M.M., Omypkamzinova V.B. 3-ramnozid 7-O-metilgossipetina iz *Atraphaxis fritesceps*.**1974**. 793-794 s.
- [8] Chymbalov T.K., Omypkamzinova V.B. *Atraphaxis fritesceps*. Ximiia ppidodnykh coedinenii. Almaty, 1971. – 91-93c.
- [9] Gosudarstvennaia Farmakopeia RK. **2008**. T. 1. 591 s.
- [10] Muzychkina R.A., Korul'kin D.Iu., Abilov Zh.A. Kachestvennyi i kolichestvennyi analiz osnovnykh grupp BAV v lekarstvennom rastitel'nom syr'e i fitopreparatakh – Almaty: Kazak Universiteti, **2004**. 116-117 s.
- [11] Gosudarstvennaia Farmakopeia SSSR. Vyp.2: Obshchie metody analiza. M.: Meditsina, **1991**. 387 s.

Умбетова А.К., Слан Г.О., Омарова А.Т., Бурашева Г.Ш., К.Т. Абидкулова

эл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан

**АЛМАТЫ ӨНІРІНДЕГІ *ATRAPHAXIS VIRGATA* ӨСІМДІГІНІҢ
ХИМИЯЛЫҚ ҚҰРАМЫН ЗЕРТТЕУ**

Аннотация: *Polygonaceae* тұқымдасына жататын 2016 жылы даярланған Алматы қаласы Ақсай шатқалынан жиналған *Atraphaxis virgata* өсімдігінің шынайылығы (ылғалдылық, жалпы күлділік, экстрактивті заттар) анықталды. Биологиялық белсенді заттардың негізгі сандық және сапалық құрамы белгілі болып, биологиялық белсенді кешен алу үшін негізгі технологиялық параметрлер өңделді. Атомды-абсорциялы спектроскопиялық әдісімен өсімдіктің макро- және микроэлементтерінің мөлшері анықталды.

Түйін сөздер: *Atraphaxis virgata*, ылғалдылық, күлділік, экстрактивті заттар, микро-, макроэлементтер, биологиялық белсенді заттар.

А.К. Умбетова, Г.О. Слан, А.Т. Омарова, Г.Ш. Бурашева, К.Т. Абидкулова

Казахский национальный университет имени аль-Фараби, Алматы, Казахстан

**ИССЛЕДОВАНИЕ ХИМИЧЕСКОГО СОСТАВА *ATRAPHAXIS VIRGATA*
АЛМАТИНСКОГО РЕГИОНА**

Аннотация. Определен доброкачественный состав (влажность, общая зольность, экстрактивная вещества) растения *Atraphaxis virgata* семейства *Polygonaceae* заготовленные в ущелье Ақсай Алматинской области. Изучены качественный, количественный состав основных групп биологически активных веществ. Отработаны основные технологические параметры для получения биологически активного комплекса. Изучен методом атомно-абсорбционной спектроскопией состав макро- и микроэлементов растения

Ключевые слова: *Atraphaxis virgata*, влажность, общая зольность, экстрактивное вещество, макро- и микроэлементы, биологически активные вещества.