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STUDY OF HEAVY METAL SALTS OF PHYSALIS ANGULATA BY ICP-MS METHOD

Abstract

The obtained data show that due to the very small amount of heavy metal salts, this plant species is a very safe and useful raw material for creating biologically active supplements.

Key words: *Solanaceae, Physalis angulata*, elements, mass spectrometry.

Introduction. One of the important representatives of the *Solanaceae* family is the *Physalis* genus, which includes about 120 plant species. *Ph. angulata* originates from tropical America and is found in many countries in tropical Africa [1, p.427]. *Ph a.ngulata* is an annual herb 80-100 cm tall. The flowers are yellow, small, bell-shaped, 7-8 mm in diameter, but the main distinguishing feature is the calyx of the fruit, which enlarges to cover the fruit and hangs down like a lantern. Each fruit looks like a lantern shaped like a yellow pearl. *Ph. angulata* is a plant that grows as a weed in oases, gardens and cultivated fields as well as plowed areas [2, p.12].

The chemical composition of representatives of the genus *Physalis* is unique and includes flavonoids, saponins, physalins, vitamins, glycosides, polyphenols and other useful substances [3, c.94]. Pharmacological studies show that *Ph. angulata* plant substances showed a certain level of cytotoxic activity in HeLa and Hep-2 tumor cells. This serves as a basis for the hypothesis that there are compounds with high cytotoxic activity among the extractive substances and for further research in the study of plant chemical components. Based on the

above information, it is an actual task to study the element composition of plant raw materials [5-11].

The purpose of this research work is to study the content of heavy metal salts of *Ph. angulata* plant by mass spectrometry method with inductively coupled argon plasma.

Materials and research methods. An accurate sample of 0.05-0.5 g is weighed on an analytical balance and transferred to Teflon autoclaves. Then the appropriate amount of purified concentrated mineral acids (nitric acid (reagent grade) and hydrogen peroxide (reagent grade)) is poured into the autoclaves. The autoclaves are closed and placed in a Berghoff microwave digestion device with MWS-3+ software or a similar type of microwave digestion device. Determine the decomposition program based on the type of substance being tested, indicate the degree of decomposition and the number of autoclaves (up to 12 pcs). After decomposition, the contents in autoclaves are quantitatively transferred into 50 or 100 ml volumetric flasks and the volume is adjusted to the mark with 0.5% nitric acid. Quantification is carried out using ICP MS. When constructing a sequence of tests, indicate the amount in mg and the degree of its dilution in ml. After receiving the data, the true quantitative content of the substance in the test sample is automatically calculated by the device and displayed in the form of mg/kg or μg/g with error limits - RSD in%.

The plant for research was harvested in August 2020 in the Kibray district of the Tashkent region. The study of heavy metal salt content was carried out by inductively coupled plasma mass spectrometry (ICP-MS). Sample preparation was carried out using the method of wet acid-peroxide ashing on an X-Expert device.

For quantitative determination, standard solutions of multielements were used. To eliminate the background, the UCT™ quadrupole universal background elimination system was used in the range from 1 to 285 amu.

Analysis conditions: Device: NexION-2000. Perkin-Elmer with Syngistix™ software for ICP-MS (USA); argon gas flow – 15 l/min; peristaltic pump speed - 1.2 ml/min; detector – quadrupole mass analyzer; generator power – 1500W.

To verify the device, standard samples of solutions of elements GSO 7759-2000 (Be), GSO 7268-96 (Co), GSO 7252-96 (Pb), GSO 7472-98 (Cd) were used (relative error limits (P = 0.95) ±1.0%). The experimental results are shown in Table 1.

Table 1

Data from a comparative analysis of the elemental composition of the roots, stems and leaves of the plant *Ph angulata*

№	Elementy	Root (mg/kg)	Stem (mg/kg)	Leaf (mg/kg)
1	Ag	0.015	0.018	0.119
2	Sb	0.020	0.015	0.022
3	Hg	0.407	2.104	0.455
4	Pb	0.656	0.224	0.684
5	Bi	0.218	0.031	0.058
6	U	0.031	0.010	0.022
7	Ta	0.001	0.001	0.000
8	Cd	0.035	0.018	0.025
9	Co	0.203	0.170	0.243
10	Mo	0.279	0.555	1.275

Results. As can be seen from the table, *Ph. angulata* plant has the highest amount of heavy metal salts corresponding to lead, 656 mg/kg in the root of the plant, 224 mg/kg in the stem and 684 mg/kg in the leaf. The remaining heavy metals were found in very small amounts. Heavy metals and their compounds accumulate in tissues and cause a number of diseases. Some

elements, such as vanadium or cadmium, may be beneficial for some species in small concentrations [4, c.262].

Conclusion. The obtained data show that due to the very small amount of heavy metal salts, this plant species is a very safe and useful raw material for creating biologically active supplements.

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