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STUDY OF THE AMOUNT OF HEAVY METALS IN PHYSALIS ALKEKENGI BY ICP-MS METHOD

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Abstract:

The amount of heavy metals in the plant Physalis alkekengi was studied using the mass spectrometry method. Due to the low content of heavy metals in Physalis alkekengi, it is a safe raw material for creating biologically active supplements

Keywords: Solanaceae, Physalis alkekengi, elements, mass spectrometry

INTRODUCTION. The genus *Physalis* consists of annual or perennial plants and includes about 120 plant species. Representatives of *Physalis* are cultivated for industrial purposes in some countries [1-7]. *Physalis* fruits, leaves and roots have medicinal properties that are actively used in folk medicine [8-11].

The chemical composition of plants of the *Physalis* genus is, without exaggeration, unique. Plant fruits contain many active substances, in particular, vitamins, flavonoids, saponins, glycosides [12-19]. In the flora of Uzbekistan, the chemical composition of plant species belonging to the genus *Physalis* has not been studied until now. Several species of this family can be found in Uzbekistan. *Ph. alkekengi* - widespread in the tropical regions of the earth. Perennial plant 30-60 cm tall [20-25]. The fruits of the plant ripen in July-August and become large golden or red in color. Unripe fruits cause poisoning. It is grown as a medicinal and ornamental plant in wet and shady places in gardens, in moist places where trees shade it, and in most households. *Ph. alkekengi* plant is used in the treatment of various diseases in traditional medicine [26-31]. Based on the above information, it is an actual task to study the element composition of plant raw materials.

The purpose of this research work is to study the content of heavy metal salts of *Ph. alkekengi* 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 collected from the Tashkent Botanical Garden in 2020. 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. alkekengi

№	Elementy	Root (mg/kg)	Stem (mg/kg)	Leaf (mg/kg)
1	Ag	0.041	0.094	0.104

2	Sb	0.062	0.017	0.091
3	Hg	9.411	4.176	5.702
4	Pb	1.456	1.021	2.048
5	Bi	0.085	0.130	0.089
6	U	0.027	0.030	0.033

RESULTS. As can be seen from the table, *Ph. alkekengi* plant has the highest amount of heavy metal salts corresponding to mercury, 9,411 mg/kg in the root of the plant, 4,176 mg/kg in the stem and 5,702 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.

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

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