



**Elemental composition and features of biological accumulation of elements in plant raw materials of blue cyanosis cultivated in the Voronezh region**

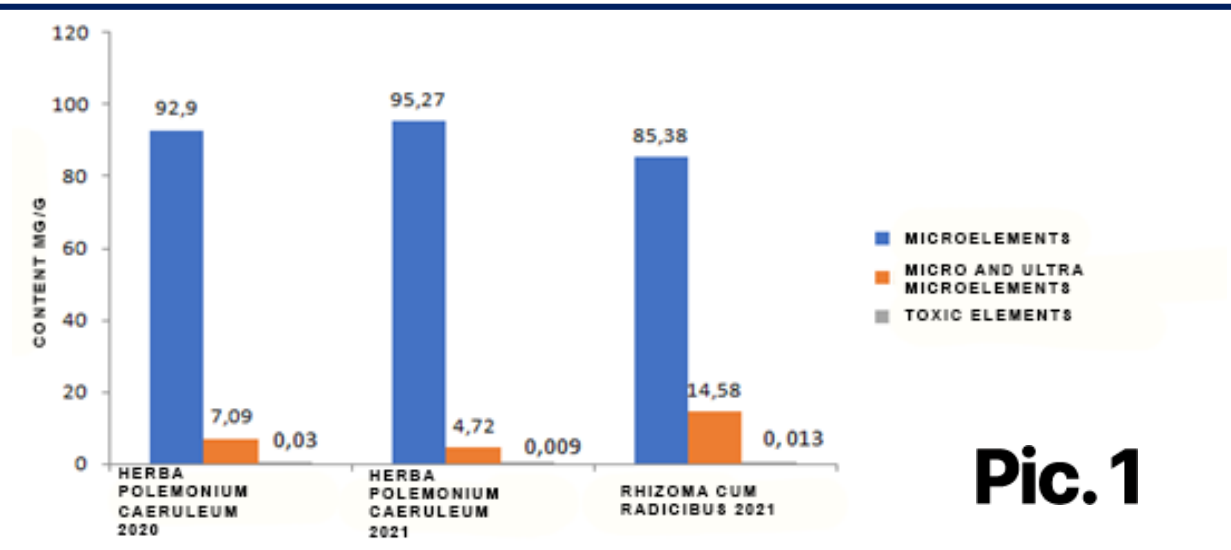
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One of the sources of mineral components entering the human body is plants, which absorb them in various ways and accumulate in tissues. For humans, mineral components play an important role in regulating various vital processes of the body. However, in addition to the mineral elements necessary for humans, plants can accumulate various compounds of anthropogenic origin, for example, heavy metals. They may also contain some mineral components in quantities exceeding their maximum permissible concentrations, which makes it unsafe to use this type of plant material in medical practice. The study of the elemental composition and characteristics of the accumulation of elements by plant raw materials allows us to solve important problems of modern pharmacy and medicine related to both assessing the environmental safety of the use of plant raw materials and solving the problem of nutrient deficiency in human nutrition.

The purpose of the study was to study the elemental composition of blue cyanosis harvested in the Voronezh region and to assess the characteristics of their biological accumulation.

The objectives of the work were to analyze the elemental composition of the grass and rhizomes with blue cyanosis roots, as well as the soil from the place where the plant grows, as well as to evaluate the characteristics of the biological accumulation of mineral components by the grass and rhizomes with blue cyanosis roots.

The objects in the work were dried blue cyanosis grass, collected in July for the first and second years of the plant's life, as well as rhizomes with blue cyanosis roots, harvested in the fall for the second year of the plant's life. Harvesting was carried out in the ecologically clean territory of Bobrov in 2020 and 2021; no mineral fertilizers were used when cultivating plants. We also analyzed the elemental composition of the soil from the plant cultivation site.

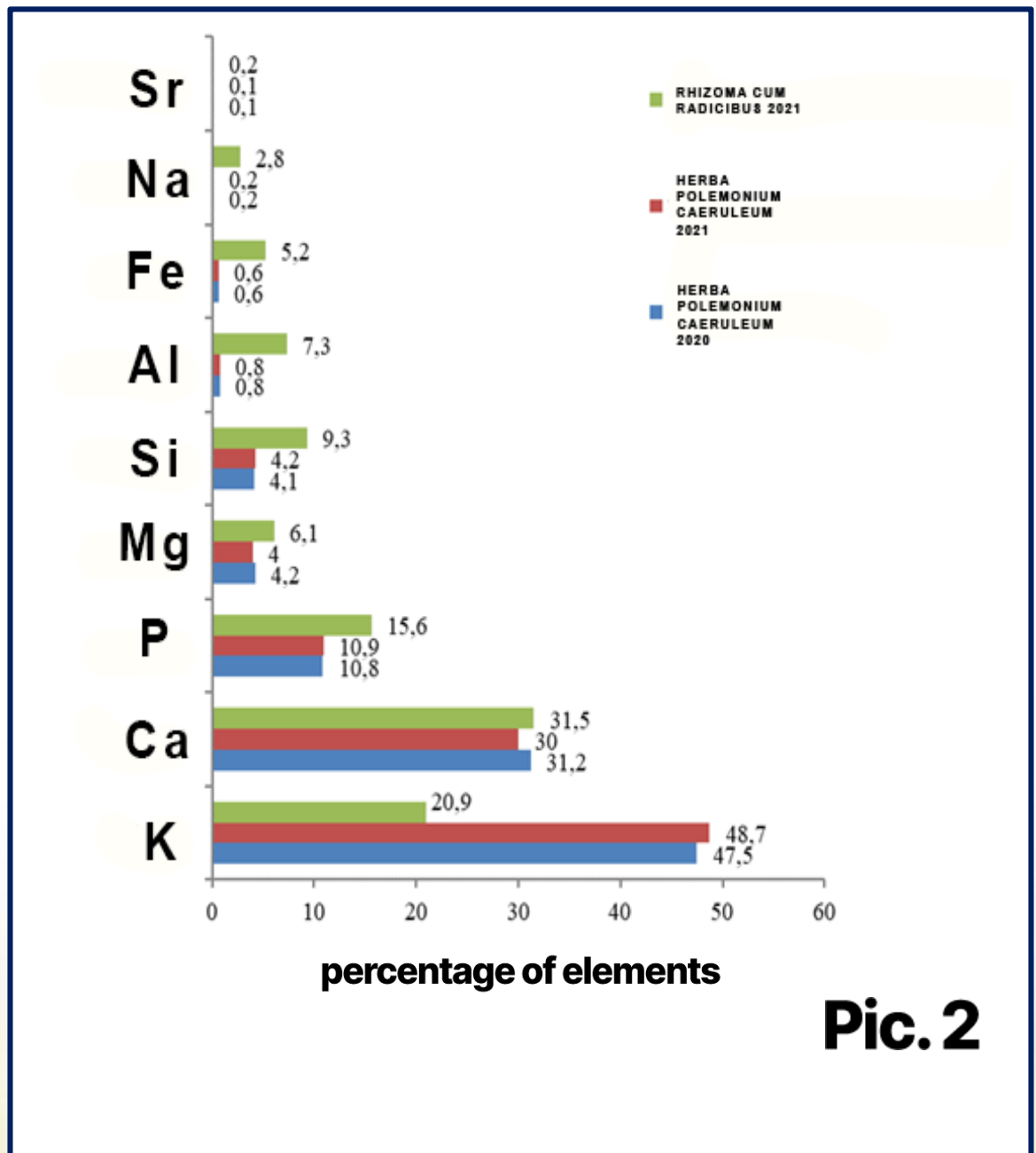


**Pic. 1**

The mineral composition of the studied objects was studied by chromatography-mass spectroscopy with inductively coupled plasma using the ELAN-DRC system. As a result of the study, the presence of 58 elements was established in the objects studied. It has been established that the amount of macroelements predominates in the above-ground part of the plant, especially in herba 2 years of life, and micro- and ultramicroelements are found in larger quantities in rhizomes with roots (pic. 1)

Toxic elements are at the level allowed by regulatory documentation. Analyzing the component composition of each group of elements, it should be noted that in blue cyanosis grass the predominant elements are potassium, calcium, phosphorus, magnesium and silicon, and in underground organs - calcium, potassium, phosphorus, silicon, aluminum and magnesium. It has been established that the sodium content in the underground organs is 11 times higher, magnesium 1.5 times and phosphorus 1.2 times higher than in the herba of the plant harvested in the second year of life. However, the amount of potassium and calcium is significantly lower than in the aerial part (by 64% and 12%, respectively). The total content of microelements in the Rhizoma cum radicibus Polemonium caeruleum is 3 times higher than in the grass, which is especially important for essential microelements. Micro and ultramicroelements are distributed as follows. Herba 1 and 2 years old contains more iron, sodium, strontium, manganese, zinc, titanium and beryllium, rhizomes with roots - titanium, manganese, zinc, strontium, barium and copper.

Next, an assessment was made of the coefficient of biological accumulation of elements in blue cyanosis plant materials. It was found that phosphorus, potassium, calcium and mercury were among the elements highly accumulated in the grass of the first year of life. In rhizomes with roots, elements that are highly accumulated include phosphorus, zinc and strontium. Elements of weak accumulation and average capture include magnesium, copper, zinc, selenium, strontium, molybdenum and antimony for the grass of the 1st year of harvesting; rubidium and bismuth are additionally captured in the 2nd year of life. In underground organs there is lithium, calcium, potassium, cobalt, copper, germanium, rubidium, molybdenum, antimony, bismuth and uranium. Considering that the content of toxic elements (mercury, etc.) in the plant is at an acceptable level, it is necessary to take into account the fact of accumulation of these elements during plant cultivation.



**Pic. 2**

