DUCKWEED AS AN INDECATOR FOR ECOLOGICAL AND GEOCHEMICAL STATE OF THE ENVIRONMENT

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Today, biogeochemical research is the most appropriate and objective way to assess ecological-geochemical state of the territory. Many scientists have paid attention to the aquatic plants of the Lemnaceae family, and the research of plant is relevant today. It is used as object for biotesting and phytoremediation of soils and of waste water [3, 1]. Scientists at the BIEGEL laboratory, such as V. I. Vernadsky and A. P. Vinogradov investigated the duckweed as a biogeochemical indicator of the environment.

Purpose of the work: to study the of the concentration of several chemical elements in plants of the family Lemnaceae (Lemnaceae) in the Tomsk region.

Macrophyte samples were taken in 3 areas of the Tomsk region: Kozhevnikovskogo, Tomsk and Alexander. The investigated areas differ in their degree of anthropogenic load and geochemical environment. Industry enterprises and antropogenic are unevenly distributed on the Tomsk area. North-east part this territory have high technogenic load. There are main pollutant industries such as: SCC, oil refinery, coal power plant [4].

Sampling was conducted during the vegetative period (June-August). Sampled plants were dried at room temperature until air-dry state. Hydrobotanic Specialist Kapitonova identificated species of plants in the samples. Then Samples were homogenized in an agate mortar [1].

The concentration of chemical elements in the duckweed was measured by using following analytical methods: atomic emission spectrometry (AES) inductively coupled plasma (Scientific analytical center of TPU), instrumental neutron activation analysis (INNA) and scanning electron microscope.

The results of INNA showed that the areas have individual biogeochemical specificity. In the Alexander area only the accumulation of Tb exceeded average regional value, whereas the contents of other analyzed elements in the duckweed did not. In the Tomsk district the content of rare earth, radioactive and some chalcophile some elements (Cd and Zn) exceed the average concentration of the region.

The calculation results of relationships of radioactive elements, thorium to uranium and rare earth elements are Also interesting. We see that the two graphs are allocated the same group of villages, they are all in North-Eastern part of the Tomsk area. It should be noted that North-Eastern part of the Tomsk district is characterized as areas with high technogenic load. Tuganskoe and Georgievskoe of zircon-ilmenite mine are located there, enriched in the same radioactive elements.

The concentration of many REE in the territory of Kozhevnikovskiy area was one order and more higher than the average content in the Tomsk region.

The contents of mercury in plants of the ryaskovye family varies from 7.0 to 34.1 ng/g. The Average mercury content of duckweed in the Tomsk area (18 ng/g) exceeds background values for macrophytes (20 ng/g). Identified areas exceeding the local background values of mercury content in plants (20% of the total sample). High concentrations of this element found in the samples taken in the following localities: D. Georgievka, D. Hope, S. Naumovka, p. Mihaylova and D. Kuzovleva that talks about uneven distribution of mercury in the study area. These sampling positions located to the North of the Siberian Chemical Combinat to the so-called Northern industrial node (SPU) Tomsk region, i.e. in the direction of the prevailing winds.

As a summary, Plants of the family Lemnaceae can reflect the geochemical situation of the environment, accumulate a huge range of chemical elements, whose concentrations are several times higher than in the reservoir. This object is highly sensitive to the content of mercury in the environment. The relationship between the location of man-made sources of this ecotoxicant and its concentration in duckweed has been obtained. This study proves that the plants of the family duckweed are one of the most suitable biogeochemical indicators of the state of aquatic ecosystems that can reflect the objective ecological and geochemical situation of the environment.

References

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