

NEUCLEAD AND RELATED ANALYTICAL TECHNUQUES FOR STUDYING THE PROSPECTS OF USING ECHINOCHLOA FRUMENTACEA FOR PHYTOREMEDIATION OF SOILS WITH GEOCHEMICAL ANOMALIES

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The prospects of using japanese millet on urban soils with polyelement anomalies have been studied using nuclear and related analytical techniques INAA and ICP-MS. The plants were grown for six months in a model laboratory experiment on the soils of the sanitary protection zones of metallurgical industries and highways of the city in closed ornamental flowerpot under laboratory conditions: lighting was natural, temperature was 20-25 °C. To avoid possible additional introduction of elements with irrigation, the plants were watered with distilled water. Characteristics of the urban soils on which the plants were grown: the Kosogorsky metallurgical plant (KMP) soil was characterized by a high content of Fe (78100 mg / kg), an excess of MPC for Mn (3.8 - 4.4 times), and Zn (41%); Tulachermet soil was characterized by a very high content of Fe (120600 mg / kg), exceeding the MPC (APC) for V-Mn (by 40-50% for V and 10% for Mn), Ni (by 110-175%), Cu (by 127%), Zn (by 29-192%), As (by 115-220%) and oil products (by 4 times); the soil of Lenin Avenue. was characterized by a high content of Fe (37400 mg / kg), exceeding the permissible concentrations of Mn (by 6%), Cu (by 186%). As a control, the soil from the territory of the L.N. Tolstoy Yasnaya Polyana was used. In the background soils, the excess of the MPC and APC for the standardized elements was not observed. In the course of the research, it was found that the content of soil pollutants in the japanese millet shoots was: V- 0.12-12.2 mg / kg of dry matter. Cr - 1.5-18.5 mg / kg of dry matter. At the same time, the accumulation of the element by plants grown on the Tulachermet soil was 100 and more times higher than the control values. Mn accumulation did not depend on the degree of contamination by the soil element and amounted to 107-181 mg / kg of dry matter. The accumulation of Fe in the shoots of japanese millet ranged from 200 to 6470 mg / kg of dry matter, and on the soils of PAO Tulachermet exceeded the average values in the soils of the world by 2 times, the toxic content for plants by 13 times. However, taking into account the abnormally high values of the element in the soils of the SPZ of Tulachermet, the transfer factor of the element was 0.05. The Ni content in the shoots of japanese millet grown on experimental soils was 3.3 - 11.7 mg / kg and was the maximum for Tulachermet soils. The Zn content in the shoots of the japanese millet grown on the soils of the background zone was 30 mg / kg of dry matter. On the soils of the SPZ of metallurgical enterprises it was 4 times higher: 124-126 mg / kg of dry matter. The As content in the japanese millet shoots on soils with geochemical anomalies varied from 0.21 to 2.02 mg / kg dry matter and was maximum for the soils of Tulachermet. The copper content in the japanese millet shoots on the soils of the background zone and KMP differed insignificantly and amounted to 12.5-13 mg / kg. The results of the study made it possible to establish that japanese millet is a promising crop for phytoremediation of soils from V, Cr, Fe and Zn on soils with geochemical anomalies in the complex of heavy metals.

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