THE INFLUENCE OF MERCURY POLLUTION ON THE GROWTH OF BIO-INDICATOR PLANTS

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Heavy metals are found naturally in the earth, and become concentrated as a result of human caused activities. Common sources are from mining and industrial wastes, vehicle emissions, lead-acid batteries, fertilisers, paints, treated woods, aging water supply infrastructure, and microplastics floating in the world's oceans. Heavy metals enter plant, animal and human tissues via air inhalation, diet and manual handling. Most of these chemicals including mercury, lead, cadmium and their compounds are among the most common and highly toxic substances capable of accumulation in living organisms. Heavy metals with excessive exposure to environmental objects behave like ecotoxicants that negatively affect not only individual organisms, but also the ecosystem as a whole.

Mercury (Hg) enters the environment as a result of its natural evaporation from the Earth's crust, and as a result of industrial pollution. The urgency of the problem of environmental pollution by mercury is explained, first of all, by a wide range of its effects on the human body.

One of the methods for assessing the toxicity and soil contamination is the growth vegetation test, which makes it possible to evaluate the effect of toxic substances, in particular heavy metals, on the growth of plant-bioindicators.

A characteristic feature of heavy metals is their ability to transfer, absorb and localize in certain parts of the plant tissues. Some plants have the ability to excess accumulation of heavy metals in special vacuoles of the cell, without involving them in the physiological processes of the cell (hyperaccumulators).

To assess the effect of metals on the physiology of the plant, a number of bioindication tests were performed. Wheat seeds (Tríticum) and mustard seeds (Sinapis alba), which have hyperaccumulative properties, were chosen as the object of the study.

As a substrate for seeding test plants, a standard ground mixture with a pH of 5.0–7.0 was selected containing common black chernozems, complex organic fertilizers and a natural growth promoter – biohumus. A mixture of soil soil for seedlings weighing 100 grams was placed in special containers for growing seedlings with a volume of V = 150 cm^3.

For watering plants, the solution of mercuric chloride ($HgCl_2$) was taken. The maximum permissible concentration (MPC) of mercury in soils is 2.1 mg/kg. The main idea of the experiment was to study the impact of various concentrations of mercury on phytoindication activity of plants. At the same time, the amount of working solution of mercury to irrigate 100 g of soil in each container with plant seedlings was estimated as 20 ml. In this volume, the mercury content in MPC units was 0.05, 0.1, 0.25, 0.5, and 1.0, respectively. It is assumed that the volume of the 20 ml solution is calculated for consumption by plants in 100 g of soil and evaporation, but without the formation of a filtrate. The duration of the laboratory experiment covered 21 day.

During the experiment, the intensity of growth of plant biomass and the phenomenon of phytotoxic effect were observed. It has been established that an increase in mercury concentrations to 3…5 MPC causes an average phytotoxic effect in the form of a slowing down of plant growth. Nevertheless, with little mercury concentrations, a visible phytotoxic effect was not observed, that can be explained by the ability of the soil humic complex to bind and fix heavy metals.

Key words: Heavy Metals, Mercury, Growth Test, Phytotoxic Effect