

INVESTIGATION OF PHYTOINDICATION EFFECTS DUE TO CADMIUM CONTAMINATION

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Heavy metals are one of the most dangerous contaminants in the natural environment that cause toxic effects in the cells of plants and animals. They are not decomposed in the environment but consequently accumulated in the tissues of living organisms. Penetrating, for example, plants, heavy metals can adversely affect the metabolic processes, which ultimately leads to a reduction in yield and poses a threat of contamination by toxicants to the further food chain.

Cadmium is generally one of the most dangerous heavy metals for environmental components that easily migrates through the trophic chains of terrestrial and aquatic ecosystems accumulating in plant and animal cells.

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

A characteristic feature of heavy metals is their ability to transfer, absorb and localize in certain parts of the plant. Some plants have the ability to hyperaccumulate 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 carried out. Wheat seeds (*Triticum*) and mustard seeds (*Sinapis alba*), which have hyperaccumulative properties, were chosen as the object of this study.

For seeding purposes, a soil mixture according to the Ukrainian standard TU U 26.8-2976501030-001:2006 was applied. The soil with pH value of 5.0–7.0 contains the following ingredients: common black chernozem, peat, lowland peat, complex organomineral fertilizers and natural growth stimulant – biohumus, natural structuring components (coarse-grained sand, coniferous land, perlite). A mixture of soil for seedlings weighing 100 grams was placed in special containers for growing seedlings with a volume of $V = 150 \text{ cm}^3$.

For pouring the seedlings the working solution of cadmium chloride (CdCl_2) was applied. The working solution was prepared on the basis of the following calculations: 1 maximum permissible concentration (MPC) = 0.1 mg Cd/100ml.

The working solution was watered in a volume of 20 ml per 100 g soil in each experimental container with seedlings, without the formation of a filtrate. At the same time, watering of plants was carried out in various dilutions, which contributed to a different accumulation of heavy metal in containers and, accordingly, phytotoxic effect. So with one-time irrigation, the following doses of cadmium (in MPC fractions) were received in the tank: 0.05, 0.1, 0.25, 0.5 and 1.0, respectively. The duration of the laboratory experiment was 21 days.

During 21 days the intensity of plant biomass growth was recorded, however, the differences in dependence on different cadmium concentrations were not significant, which is related to the ability of the humic complex of soils to bind and fix heavy metals.

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