Ksenia Tsunik
O.S. Kovrov, research supervisor
S.I. Kostrytska, language adviser
National TU «Dnipro Polytechnic», Dnipro, Ukraine

Investigation of Cadmium Contamination Via Vegetation Tests

Pollution of the environment by heavy metals and their migration through food chains of terrestrial and aquatic ecosystems is an urgent problem. First of all, metals are of interest that are most widely and in considerable volumes used in human production, accumulating in the external environment and representing a serious danger from the point of view of their biological activity and toxic properties. These include: lead, mercury, cadmium, zinc, bismuth, cobalt, copper, tin, antimony, vanadium, manganese, chromium, molybdenum, arsenic etc.

The relevance of the selected topic is that heavy metals possessing high toxicity, are able to accumulate in the human body, to have a harmful effect even in relatively low concentrations. One of such metals is cadmium, which is highly toxic and has a cumulative effect. The sources of cadmium are zinc mines and metallurgical plants, plastic waste, used batteries, industrial and domestic wastewater and fertilizers, as well as cigarette smoke. When the body accumulates higher doses of cadmium compounds, the nervous system is affected. Chronic poisoning leads to anemia symptoms.

At the Department of Ecology and Environmental Technologies, laboratory experiments were carried out, that included study of the influence of cadmium on the growth of plants-bioindicators. For the vegetation tests, Petri dishes were used, in which seeds of wheat and mustard were planted. Seeds were irrigated with a solution of cadmium chloride in increasing concentrations. The volume of a single dose of the solution is 20 ml. A series of dilutions for irrigation have been prepared, which contain different values of cadmium concentrations in relative units of maximum permissible concentration (MPC): 0.1, 0.25, 0.5, 1.0, 2.0, respectively. During the 14 days of the experiment, the growth of plants was observed in comparison with the control dish, in which the seeds were watered with distilled water. It is assumed that after 4 waterings, cumulative concentrations in MPC units will be 0.4, 1.0, 2.0, 4.0, and 8.0 MPC respectively, taking into consideration evaporation of water from Petri dishes and absorption of the solution by plants. An explicit effect of the plant growth inhibition with an increase of cadmium concentration is established. Compared with the control sample, where all the seeds germinated, in 1 and 2 cups with the lowest concentrations, a decrease in the number of germinated seeds by 10% and 25%, respectively, with a decrease to 20-25% of the length of roots and sprouts. In 4 and 5 cups with maximum concentrations of cadmium, seed germination was 25% and 10%, respectively, with significant growth inhibition.

The obtained results allow determine the range of tolerance of various plants to heavy metals and their adaptive properties under conditions of environmental contamination.