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Investigation of the Mercury Contamination Via Vegetation Tests

Among the pollutants of the biosphere, which are of greatest interest to various quality control services, heavy metals present the most important environmental issue. The special interest to researchers poses the group of the most toxic metals–xenobiotics such as mercury, lead and cadmium.

The penetration of heavy metals into the environment has both natural and anthropogenic origin. In the air, heavy metals are presented in the form of dust and aerosols of organic and inorganic compounds but mercury mainly exists in elemental state. Metals and their compounds in air are washed out by atmospheric precipitation or settle naturally on the surface of soil and plant cover.

Mercury is a heavy metal, which under normal conditions appears in a liquid aggregate state. In recent years, the annual production of mercury is 10 thousand tons. The enterprises, where mercury is one of the elements of the production cycle, include electronic, electrotechnical industries, chemical industries (fungicides, dyes, chlorine, caustic soda, etc.), as well as various branches of medical equipment, industrial and household appliances. Intoxication with mercury causes damage to the nervous and cardiovascular systems, disorders of the digestive tract, metabolic processes, disorders of the endocrine glands, etc.

To study the toxic effects of mercury on plants, laboratory experiments with plant-bioindicators were conducted at the Department of Ecology and Environmental Protection Technologies. For the vegetation tests, the set of Petri dishes were used for planting seeds of wheat and mustard. Seeds were irrigated with a solution of mercuric chloride in increasing concentrations. The volume of a single application of the solution is 20 ml. A series of dilutions for irrigation have been prepared, which contain different concentrations of mercury 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. After 4 waterings, taking into account evaporation of water from Petri dishes and absorption of the solution by plants, the accumulation concentrations of mercury in MPC units collect 0.4, 1.0, 2.0, 4.0, and 8.0 MPC, respectively. An explicit effect of inhibiting plant growth with increasing mercury concentration has been established. The vegetation tests revealed the following results. When compared with the control sample in the dishes with dilutions of mercury the number of sprouted seeds decrease by 5%, 15%, 20%, 35%, 40%, respectively. The decrease in the average length of roots and plant sprouts compared with the control probe was 15%–40%, respectively, which is due to the inhibition of growth rates. The received results allow us to understand more deeply the effect of environmental pollution by heavy metals and their influence on growth indices of plants.