THE IMPORTANCE OF HEAVY METALS IN PLANT AND SOIL LIFE

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Annotation. Heavy metals already occupy the second place in terms of degree hazards, yielding to pesticides and well ahead of well-known pollutants such as carbon dioxide and sulfur. In the future, they can become more hazardous than nuclear waste and solid waste. Heavy metals contamination is associated with their widespread use in industrial production. Due to imperfect cleaning systems heavy metals enter the environment, including the soil, polluting and poisoning it. Heavy metals refers to special pollutants, observations which are required in all environments.

Keywords: Soil, heavy metals, chemical pollution, atmosphere, production, toxic effects, harmfulness, environment, agriculture, emissions.

Recently, the term “heavy metals” has appeared in specialized scientific and agricultural literature, which immediately had a negative sound. This term has been found to be toxic, dangerous to living organisms. Heavy metals are a group of chemical elements with a density higher than 5 g / cm3. The term is derived from the technical literature, which classifies metals as light and heavy. For biological classification, it is necessary to classify all metals as heavy, not by density, but by atomic mass, i.e., the relative atomic mass above 40.

The idea of binding toxicity of heavy metals is primary because copper, zinc, molybdenum, cobalt, manganese, iron, i.e. elements that have long been discovered and proven to be of great positive biological importance, belong to the same group. Some of them got the name of micronutrients in agriculture, which was not related to their size, but to the concentrations they required for living organisms. Consequently, micronutrients and heavy metals are concepts that belong to the same elements, but are used in different senses, describing their concentration in soil, fertilizers, plant and livestock products. It would be fair to use the term “heavy metal” when referring to a concentration of an element with a relative atomic mass exceeding 40 which is dangerous to animal organisms and in the case of “soil”. Plant, animal organism and humans are used to feed plants and animals in non-toxic concentrations or in small amounts as fertilizers or mineral supplements to improve growth and development conditions. However, there is only one group of metals that is defined by a negative concept - “heavy” in the sense of “toxic”. This group includes mercury, cadmium, and lead. By all accounts, they are the most dangerous and dangerous pollutants.

It should be noted that the evolution of human society was closely linked to the technology of extraction and processing of metals. It is no coincidence that sociologists distinguish the Bronze Age and the Iron Age in human history as stages of social development. The times we live in are often called the atomic age or the electronics age. It would be fair to call it the polymetallic age, because both nuclear energy and electronics are associated with many different metals and their alloys.

Naturally, by mining, processing, and purifying metals, man not only gives them new life, but also contributes to their dense distribution in the environment. Metals enter the atmosphere as part of gaseous wastes and fumes, as well as in the form of industrial dusts; they enter water bodies with wastewater, passing from water and the atmosphere to the soil, where their migration processes are significantly slowed down. The soil has a clear cationic absorption capacity, retaining positively charged metal ions very well. Therefore, their constant supply, even in small amounts over a long period of time, can lead to a significant accumulation of metals in the soil.

Zinc, lead, mercury, cadmium, chromium are common in the cultural landscape. The set of metals that enter the landscape depends primarily on the nature of human activity in the region. The introduction of cadmium into the landscape may be due to the widespread use of phosphates in agriculture (a phenomenon observed in the U.S. where local raw material sources of phosphates contain significant cadmium), as well as the widespread use of compounds of this metal without which the electronics and paint industry will be developed. Mercury in

the cultural landscape occurs in pulp and paper mills where its compounds are used as fungicides in agriculture and in the production of cellulose, from where wastewater and solid waste are released into the environment during wastewater treatment. Presumably, mercury can fall into the soil with compost from household waste, where it in turn comes from used fluorescent lamps.

Large amounts of chromium can be found in the landscape as a result of the use of sewage sludge as fertilizer in cities with counterfeit manufacturing, leather and heavy industry, as well as when liming soils with slag from the metallurgical industry containing chromium.

Zinc enrichment of the landscape can occur during regular use of urban wastewater sludge as an organic fertilizer, as well as during the incineration of rubber waste in fields introduced as an element to improve vulcanization. Uranium can enter plants from the soil due to radium phosphorus mineral fertilizers, as well as from the atmosphere in areas where large amounts of coal containing these elements are burned.

Stable strontium enters the landscape with simple superphosphate and phosphogypsum derived from apatites. This element is widely used in the fight against diseases of grapes In areas of intensive viticulture, significant pollution of the environment with copper is observed.

Cadmium is a rare divalent element in the landscape. It is characterized by migration in hot groundwater along with zinc and other elements. Cadmium comes with zinc and often accompanies it, forming many basic, double, and complex compounds. In contaminated soils it is equal to one-tenth of a milligram per kilogram. Mercury belongs to a very rare element and in nature migrates mainly in the gaseous state and in aqueous solutions. In the landscape it is mostly diffuse and can only be absorbed by insignificant amounts of mud. In pure soils its content reaches one hundredth of a milligram per kilogram, and in soils of intensive economic use it reaches one whole milligram.

Lead is the most common element. In the landscape it migrates mainly in the form of bicarbonate, as well as in organic complexes. It is easily absorbed from the mud and multiplies in its composition. Under the conditions of the washed water regime, some lead mobility is observed. However, it washes less than cadmium, zinc and copper.

A comparison of the disturbances that occur in plants in a chemically altered environment with ordinary plants that grow under the background composition of heavy metals reveals the nature of the consequences of such changes. Contamination of the atmosphere, soil and water with heavy metals in cultural landscapes not only significantly reduces the productivity of plants (primarily necessary for agriculture, human nutrition and feeding of farm animals), disrupts naturally occurring phytocenoses , is frightening because it can be caused under certain conditions. , the risk of serious destruction of the assimilation potential of phytomass leads to disruption of normal processes of organogenesis - the emergence of specific teratological changes in plants from different systematic groups, as well as because it inevitably leads to human degrades the hygienic quality of the environment, including the hygienic quality of agricultural products.

The content of radionuclides and heavy metals in plant ash increases, and the ash content of plants should be considered as one of the important quality indicators, because the plant with a flawless biochemical composition worthy of the highest nutritional value is dangerous to farm animals or human health, if its ash contains an unacceptable amount of radium, polonium, lead, strontium, joint balt, mercury, cadmium and other heavy metals, no poisoning and pathological exacerbating the problem is the fact that higher plants that do not have changes may have concentrations of heavy metals that are dangerous to animals and humans.

The very high hygienic value of the minerals that make up plants is confirmed by cases of endemic diseases caused by acute deficiencies or excesses in the geochemical cycle of substances of any biologically important element or a number of elements. The nature of endemic manifestations can vary: when a mass disease is observed, from an acute illness to a very weak manifestation, some individuals are more prone to disease and are more susceptible to adverse conditions.

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