DYNAMICS OF HEAVY METALS CONTENT IN RAW MATERIALS FOR OBTAINING HEART GLYCOSIDES ON THE EXAMPLE OF CONVALLARIA MAJALIS L

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ДИНАМИКА СОДЕРЖАНИЯ ТЯЖЕЛЫХ МЕТАЛЛОВ В СЫРЬЕ ДЛЯ ПОЛУЧЕНИЯ СЕРДЕЧНЫХ ГЛИКОЗИДОВ НА ПРИМЕРЕ CONVALLARIA MAJALIS L

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Аннотация. *Для подтверждения нашей гипотезы о связи географии онкологических заболеваний с содержанием на территориях тяжелых металлов, мы начали изучать их содержание в лекарственных растениях, в частности, в* CONVALLARIA MAJALIS L.

Introduction. It is known that heavy metals have a toxic effect on human health. Microelements, being a part of enzymes, hormones, vitamins, biologically active substances as complexing agents or activators, participate in metabolism, reproduction processes, tissue respiration, neutralization of toxic substances. Microelements actively affect the process of hematopoiesis, oxidation, recovery, permeability of vessels and tissues. The mechanism of toxic effects of heavy metals, arsenic and antimony depends on the nature of the compound and the body under consideration. Copper, for example, binds to the cell surface where can be observed caused by damage, mercury gets inside cells by binding with sulfhydryl groups, inactivating vital molecules – enzymes. A special role of arsenic and antimony is that they play the role of antimetabolites, form stable precipitation, chelates with important metabolites, or catalyze the disintegration of metabolites, structurally replace important elements in violation of cellular function and, most importantly, in the literature, many indications that these elements accumulate, cause cancer.

The toxic effect of antimony is similar to arsenic. Large amounts of antimony cause vomiting, in chronic poisoning by antimony, there comes a disorder of the digestive tract followed by vomiting and low temperatures. Arsenic in nature is present in the form of sulfates. Its content in lead-zinc concentrates is about 1%. Due to volatility, it easily enters the atmosphere.

The strongest sources of pollution by this metal are herbicides (chemicals for fight against weed plants), fungicides (substances for fight against mushroom diseases of plants) and insecticides (substances for fight against harmful insects).

On toxic properties of arsenic refers to the accumulating poisons. In terms of toxicity should distinguish between elemental arsenic and its compounds. Elementary arsenic is relatively little toxic, but has terenie properties

Arsenic compounds are slowly absorbed through the skin, rapidly absorbed through the lungs and gastrointestinal tract. The lethal dose for humans is 0.15-0.3 g. Chronic poisoning causes nervous diseases, weakness, numbness of limbs, itching, darkening of the skin, atrophy of the bone marrow. Arsenic compounds are carcinogenic to humans, belong to the II class of danger:

The study of the causes of the geography of cancer diseases in our area is an extremely urgent task, today it is difficult to unexplained. According to the statistics in the republics of the Volga they are not geographically associated with the harmful chemical production. We have proposed a hypothesis about the connection of foci of cancer with high content of heavy metals (TM) – especially arsenic and antimony in the studied sources of water supply. In addition, the purpose of our work is to study the elemental composition of some plants for the accumulation of these elements and identify areas of contamination with these trace elements. In particular, the dynamics of accumulation of a number of heavy metals (TM) in widely spread Lily of the valley plants (Convallaria majalis L - LM) was studied. LM, can be used in the future as the objects of analysis on TM. For centuries, they have been used in folk medicine to treat the cardiovascular system. Despite the fact that Lily of the valley is a poisonous plant, its cardiac glycosides are characterized by high cardiotonic and biological activity. We believe that the soil composition of LM growth affects the elemental composition of this plant material, and therefore the processes of metabolism and synthesis of biologically active substances (BAS) [1, 2]. All samples of plants we took not less than 200 meters from the roads, as known the possibility of soil contamination by road and rail.

Materials and methods of research. Herbal drugs were collected in the area adjacent to the lake, and Luxer tract Yeon Zhah Zvenigovsky district of the Mari El Republic. Harvesting of raw materials was carried out during the formation of the first pair of leaves (early June) and the budding and flowering phase (July) according to generally accepted rules. The average sample was prepared by quartering in accordance with GOST 24.027.0-80. The elemental composition of Convallaria majalis L. herb was determined by atomic absorption spectrometry with electrothermal atomization [2, 3] and photochemical determination [4]. The contents of As, Sb, Pb, Cd, Hg, Cu, Zn, Mn, Ni, Co, Fe, Cr were analyzed. It is known that Lily is able to concentrate Cd, Zn, Pb, as it turned out, and

Results. According to the obtained results found that grass of Lily of the valley largely accumulates metals-biofile - Fe ((of 26.81-24,40) mg/kg), Mn (161,23-192,65), Cu ((9,51-10,27) mg/kg), Zn ((43,73-48,88) mg/kg), Cr (0,71-0,95). A similar situation can be linked with their participation in the vital biochemical processes [5] and the lack of a physiological barrier in plants. The content of copper and zinc is close to the lower limit of the range of normal concentrations for growth, which is more likely due to the low availability of the studied soil samples with their mobile forms [6, 7]. In addition, it should be noted a fairly high content of Lily of the valley Ni ((0.40-0.45) mg/kg), Co (0.28-0.35) mg/kg), As ((0.12-0.16) mg/kg) and a clear decrease the content of Cu (3.26 and 2.43 %), Fe (4.05 and 6.52 %), Cr (7.53 and 23.66 %) in the flowering phase for raw materials. During budding and flowering Lily of the valley in the grass observed an increase in the content of heavy metals (TM) and arsenic – Ni ((0.40-0.45) mg/kg), Co ((0.28-0.35) mg/kg), As ((0.12-0.16) mg/kg) and a decrease in the number of metals-biofilms Cu (3.26 and 2.43 %) and Cr (7.53 and 23.66 %).

Summary. Observed in LM redistribution of trace elements can be associated with an increase in the number of mobile forms of TM and arsenic in the soil and the rapid consumption of biofilms in the metabolism of the plant. The method is applicable to the determination of heavy metals in soils.

Studies to clarify the impact of TM and, especially, arsenic on the safety and biological activity of plant raw materials and risks of oncological diseases will be continued.

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