# SECTION II.
# AGRICULTURAL SCIENCES

DOI 10.36074/21.08.2020.v1.25

## HEAVY METAL CONTAMINATION AND BIOTECHNOLOGICAL CLEANING METHODS

**Olga Bryninger**
Postgraduate student of the Department of plants protection
*Kharkiv National Agrarian University named after V.V. Dokuchayev*

*UKRAINE*

With the industrialization and urbanization of developing countries and the increasing demand of humanity, the consumption of heavy metal elements has been growing enormously [1].

Geological and anthropogenic activities are sources of heavy metal (HM) contamination. Sources of anthropogenic metal contamination include industrial effluents, fuel production, mining, smelting processes, military operations and utilization of agricultural chemicals, small-scale industries and coal combustion. One of the prominent sources contributing to increased load of soil contamination is disposal of municipal wastage. These wastes are used as landfills, while sewage is used for irrigation, also these wastes, are sources of carcinogens and toxic metals. Many of them (Hg, Cd, Ni, Pb, Cu, Zn, Cr, Co) are highly toxic both in elemental and soluble salt forms. Their presence in the atmosphere, soil and water, even in traces can cause serious problems to organisms. HM bioaccumulation in the food chain especially can be highly dangerous to human health [2].

Methods for cleaning soil from contamination are subdivided into physical, chemical, physicochemical and biochemical.

Conventional physical and chemical methods of HM removal from a polluted environment are usually not usable at large scales, and are often costly and not well accepted by the public. In contrast, bioremediation (phytoremediation), the use of living organisms or their for remediation, is a group of methods that are highly applicable in large contaminated areas, especially in cases where the removal of HM [1].

Thus, there are different types of phytoremediation:

phytoextraction (plants absorb contaminants and store in above ground shoots and the harvestable parts of roots);

phytostabization (roots and their exudates immobilize contaminants through adsorption, accumulation, precipitation within the root zone, and thus prevent the spreading of contaminants);

phytodegradation (plant enzymatic breakdown organic contaminants, both internally and through secreted enzymes);

rhizodegradation (plant roots stimulate soil microbial communities in plant root zones to break down contaminants);

phytovolatilization (contaminants taken up by the roots through the plants to the leaves and are volatized through stomata where gas exchange occurs).

Absorption of HM and their distribution in plants depends on their bioavailability, which consists of the availability of pollutants (their physicochemical

properties: solubility in water, molecular weight, etc.), environmental characteristics (acidity, particle size distribution of soil, humus level, humidity, etc.) and physiological and morphological features of plants (level of resistance to action pollutants, the level of development of the rhizome, etc. The science of phytoremediation has shown promising results as an innovative cleanup technology. However, it is still in a developmental stage and more research is needed to increase the understanding and knowledge of this remediation technology [3].

**Conclusion.** Phytoremediation is a potential remediation strategy that can be used decontaminate soils contaminated with inorganic pollutants. Also, phytoremediation has been perceived to be a more environmentally-friendly "green" and low-tech alternative to more active and and intrusive remedial methods.

## References:

[1] Jachym Suman, Ondrey Uhlik, Jitks Viktorova, Nomas Macek (2018). Phytoextractaion of Heavy Metals: A promising tool for clean-up of polluted environment? Frontiers in Plant Scince. (9). www.frontiersin.org doi:10.3389.

[2] Chhotu, D. Jadia and M. H. Fulekar (2009). Phytoremediation of heavy metals: Recent techniqes. African Journal of Biotechnology. (8): 921-928.

[3] Jeanna, R. Henry (2000). An Overview of the Phytoremediation of Lead and Mercury. National Network of Environmental Management Studies (NNEMS) Fellow. pp. 9-22.