DESCRIPTION FOR THE GENERAL PUBLIC

Heavy metals belong to the group of the most dangerous pollutants. This is caused by their high toxicity as well as by the fact that those elements are released into the environment in significant amounts. Therefore, this problem creates the need to conduct an interesting research, focused on the assessment of the impact of heavy metals on living organisms and individual elements of the environment. A large part of ecotoxicological studies concerning heavy metals focuses on their impact on plants. One of the species capable of colonizing areas with a high content of heavy metals is *Armeria maritima* (Mill.) Willd (sea thrift). *A. maritima* plants growing on metalliferous areas differ in morphological features, tolerance level and degree of development of resistance mechanisms against heavy metals, compared to individuals of the same species, growing on non-metalliferous areas. One of the mechanisms of heavy metals detoxification by *A. maritima* plants is the release of metals in a form of crystals by the salt glands located on their leaves (Wierzbicka 2015).

The aim of the planned research is to evaluate the role of salt glands in mechanisms of heavy metals detoxification in *A. maritima* plants. Its role is probably different between plants from population from metalliferous areas and population from non-metalliferous areas, as our preliminary studies have shown. Therefore, it is possible that the mechanism of detoxification of excess amount of heavy metals by the salt glands in *A. maritima* plants occurring in metalliferous areas is different, and more advanced than in plants from non-metalliferous areas. If this is true, it would be a new information for the science.

The planned research are interdisciplinary: biological, chemical and physical sciences. The study of salt glands of *A. maritima* plants from the metal-tolerant population (from Bolesław near Olkusz) and metal-intolerant population (from Laski near Warsaw) will be carried out. For the research, various microscopic techniques will be applied, such as scanning and transmission electron microscopy as well as light and confocal microscopy, which enable observations and imaging of plant tissues. With use of crystallographic techniques, such as single crystal X-ray diffraction analysis it will be possible to discover the structure of crystals as well as their chemical composition. As supplement for techniques mentioned above, atomic absorption spectrometry and inductively coupled plasma mass spectrometry, AAS and ICP MS, will be used for determination of total content of heavy metals in plant tissues.

Examination of nature of the crystals secreted by plants from the metalliferous population and non-metalliferous population will indicate on the mechanism of detoxification excess of heavy metals by salt glands in plants from these two types of population. If they are in fact different, it will be have a great cognitive value. Our previous research has shown that *A. maritima* plants growing in zinc-lead areas differ genetically compared to individuals of the same species, growing under "normal" conditions. Microevolutionary processes in the *A. maritima* population from zinc-lead areas of the Olkusz Ore-bearing Region led to development of a separate subspecies, with increased resistance to heavy metals (Abratowska et al. 2012; Wierzbicka 2015). The studies planned under this project will be a continuation of our long-term research on plants from zinc-lead waste heaps.

This project will allow to gain new knowledge about the possibility of plants adaptation to the extremely difficult conditions prevailing on zinc-lead waste heaps. These studies will show which features of *A. maritima* plants enable microevolutionary success. These results may be applicable in the long term at reclamation of soils contaminated with heavy metals (biological deserts), through the use of phytoremediation, or in obtaining valuable metals from waste heaps (phytomining).

References:

Abratowska A., Wąsowicz P., Bednarek P., Telka J., Wierzbicka M. 2012. Morphological and genetic distinctiveness of the metallicolous and non-metallicolous populations of *Armeria maritima* s.l. (Plumbaginaceae) in Poland. Plant Biology 14: 586–595.

Wierzbicka M. 2015. Monograph. Ecotoxicology. Plants, soils, metals. Warsaw University Press, Warsaw. (in Polish).