

Summary of a doctoral dissertation of Agnieszka Szczodrowska, M.Sc., Eng

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***Lepidium sativum* L. as a consumer model plant to abiotic stress**

Chemical contaminants such as heavy metals, occurring quite commonly in the environment, can have a negative impact on plants, causing tissue damage, abnormal biochemical processes and in extreme cases, lead to cell death. Harmful effects of heavy metals on plants is associated with the increased generation of reactive oxygen species, which can directly damage proteins, amino acids, nucleic acids or may cause lipid peroxidation of membranes, thereby inhibiting normal functioning.

Plants colonizing the environment contaminated with heavy metals, have developed a number of mechanisms allowing vegetation in difficult conditions. Activation of the antioxidant system may be regarded as the ability of plants to control levels and overcome the toxic effects of reactive oxygen species in the cells. The antioxidant system consists of both plants antioxidant enzymes, for example catalase, superoxide dismutase, guaiacol peroxidase, ascorbate peroxidase and non-enzymatic compounds are regarded as antioxidants, for example vitamin C, polyphenols, flavonoids, glutathione, chlorophyll, carotenoids and others. In addition to the enzyme and non-enzymatic antioxidant system plants are able to synthesize specific groups of proteins (eg. phytochelatins, metallothionein) with the task of creating connections with heavy metals, which have already penetrated into the cells, thereby protecting such enzymatic proteins.

The aim of the study was to determine the effect of the presence of metal ions in the soil on the garden cress *Lepidium sativum* L. and performance characteristics of the enzymatic and non-enzymatic antioxidants.

The tests have been cress plant seed, which was a stressed metal ions: zinc, nickel, copper, manganese and cobalt. In the first step the material was characterized depending on the presence of a suitable concentration of metal ions in the medium. The next step was to characterize the protein profile and changes therein of the additive under the influence of ions of various metals. The system further characterized by enzymatic and non-enzymatic antioxidants, which has been activated under the presence of metal ions in the soil.

It has been found that plants respond differently cross seed in addition to the substrate selected metal ions. In general trend observed, that metals used in the experience varying degrees result in an antioxidant response system, through the production of new secondary metabolites, or increase the activity of specific enzymes.

The experiment used the concentration of metal ions which are not detrimental to plants, and plants in full vegetative reached maturity. Furthermore, metal concentrations do not cause significant damage to the system antioxidant beyond minor modifications in the functioning of enzymatic and non-enzymatic antioxidants.

The tested samples *Lepidium sativum* L. in stressed metal ions, it was found that the range of operation is a defensive response by the production of plant defense various compounds, including proteins. The application concentrations of metal ions do not have significant adverse protein synthesis, but is modified protein expression. Changes in the profile of proteins in the test plant can cause changes in its allergenicity, because some of these proteins (especially storage proteins) are potent allergens.