

# The contamination of soil with metal ions and a content of biologically active compounds in the selected consumer plants

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## INTRODUCTION

Soil has been habitually the most common sink for wastes containing heavy metals [1]. Higher metal ions concentration in plants caused several physiological and biochemical disorders including reduced growth and yield, nutrient uptake, changes in chloroplast ultrastructure and initiation of oxidative stress [2, 3]. Antioxidant enzymes are one mechanism plants have evolved as a response to metal-induced toxicity [4]. For example, guaiacol peroxidase (POD), ascorbate peroxidase (APX), superoxidase dismutase (SOD), and catalase (CAT) significantly contribute to regulate the cellular redox homeostasis to a safe level [5]. The present study investigates the biochemical effects of metal ions-poisoning on plants from a *Lamiaceae* and *Brassicaceae* families.

## EXPERIMENTAL METHODS

The garden cress *Lepidium sativum* from *Brassicaceae* family, mentha *Mentha piperace* and basil *Ocimum basilicum* from *Lamiaceae* family were investigated. The plants were cultivated on the universal soil with pH  $6.45 \pm 1$  in the photoperiodic system day/night 14 hours. The temperature was  $22/18 \pm 1^\circ\text{C}$ . An irrigation was provided in amount sufficient for the plant growth, relative humidity was about 50%. To contaminate the soil acetates of metals (nickel, cooper, zinc, manganese and cobalt) were used in the range from 10 to 3000 ppm. When the cultivation phase was commenced the samples of aboveground part of plant were collected. In the received samples, the concentration of enzymatic and non-enzymatic antioxidants was determined.

## RESULTS AND DISCUSSION

Exposure of *Lepidium sativum*, *Mentha piperita* and *Ocimum basilicum* to increasing metal ions levels significantly increased new biologically active compounds such as polyphenols, flavonoids, proteins and enzymes: catalase, ascorbate peroxidase, guaiacol peroxidase, superoxidase dismutase. For example: an increasing trend in polyphenols contents was observed in garden cress plants under various metal ions concentrations.

## CONCLUSIONS

In all variants of concentrations of metal ions there is an increase in the content of polyphenols. The content of polyphenols significantly increased under copper (600 ppm) and manganese (2000 ppm) stress. The accumulation of different metals is correlated with the antioxidants level (polyphenols) in investigated culinary plants.

## REFERENCES

1. Jadia C.D., Fulekar M.H., Environ. Eng. Manag. J. 7:547-558, 2008.
2. Gill S.S. et al., Plant Signal. Behav. 6:293-300, 2011.
3. Wang C., Environ. Toxicol. 24:271-278, 2009.
4. Piotrowska-Niczyporuk A. et al., Plant Physiol. Biochem. 52: 52-65, 2012.
5. Yin H. et al., J. Plant Growth Regul 54:45-54, 2008.