

**DNA-DAMAGE AND TOTAL ANTIOXIDANT STATUS IN TWO SELECTED MEDICINAL PLANTS
SUBJECTED TO HEAVY METALS PHYTOTOXICITY**

Gjorgieva Darinka¹, Kadifkova-Panovska Tatjana², Ruskovska Tatjana², Maksimova Viktorija²

¹Faculty of Medical Sciences, "Goce Delčev" University, Krste Misirkov str. bb, POB 201, 2000 Štip, FYROM.

²Faculty of Pharmacy, "St. Cyril and Methodius" University, Vodnjanska str. 17, 1000 Skopje, FYROM.

Since heavy metals are accumulated by plants important for human nutrition, the present study aimed to analyze the biological effects induced by bioaccumulation of metals in two selected medicinal plants. Heavy metal exposure in all living organisms often results in the production of reactive oxygen species and induction of damage to different cellular components such as membranes, proteins and DNA. The purpose of the present study is to examine whether chronic heavy metals exposure modifies the total antioxidant content and induce DNA-damage in selected medicinal plants: *Urtica dioica* (Urticaceae) and *Matricaria recutita* L. (Asteraceae).

Samples from selected plants were sampled from two different areas, region with high industrial activity (city of Veles, around the lead-zinc plant) and naturally clear area, Mountain Plačkovica. Metal contents (Cu, Pb, Cd and Zn) in different plant organs were analyzed by ICP-AES (Varian 715-ES) and values for total antioxidants were obtained by using ferric reducing/antioxidant power (FRAP) assay. DNA based technique, Random Amplified Polymorphic DNA (RAPD) was used to evaluate the variations at the DNA profiles.

DNA damage induced by heavy metals was observed in obtained RAPD profiles as disappearance and/or appearance of bands in compared DNA fingerprints. Metals, also, induced oxidative stress in investigated plants, as evident from the decreased values for total antioxidants (expressed in $\mu\text{mol FeSO}_4 \text{ L}^{-1}$) in samples collected from Veles area: *U. dioica* leaves (Veles) – 1847; *U. dioica* leaves (Plačkovica) – 4849; *U. dioica* stems (Veles) – 639; *U. dioica* stems (Plačkovica) – 961; *M. recutita* leaves (Veles) – 2080; *M. recutita* leaves (Plačkovica) – 3960; *M. recutita* flowers (Veles) – 2822; and *M. recutita* flowers (Plačkovica) – 2908.

Tissue damage and additional DNA changes occurs when the capacity of antioxidative systems becomes lower than the amount of ROS generated. In summary, this study has shown that heavy metals can induce oxidative stress and DNA damage. Antioxidative system of *M. recutita* and *U. dioica* seems to be influenced by environmentally encountered heavy metals concentrations. The presence in the DNA "fingerprint" of any variable RAPD profiles can be evidence for genotoxicity and used for hazard identification of environmental pollutants like heavy metals are.

Keywords: medicinal plants, antioxidants, DNA-damage, metals.