



## **The exogenous particles of heavy metals and/or radionuclide interaction with cellular organelles in *Phragmites australis* (Cav.) Steudel leaf**

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*Phragmites australis* (Cav.) Steudel (reed), is a phytoremediatory species, meet in the swampy areas, being a hyperaccumulator for chromium (Calheiros et al., 2008; Ait Ali et al., 2004, a/o). In nature there are cytotypes with a different somatic chromosome number ( $6x - 16x$ ), with a good adaptation at various environmental conditions. Weis and Weis (2004) consider that reed is an invasive species, sequester more metals than some native species and recommended to use it, in wetlands, for phytoremediation and marsh restoration. Researches performed by Hakmaoui et al. (2007) regarding the ultrastructural effect of cadmium and cooper on reed, evidenced the presence of the ferritin aggregates in the chloroplast stroma, as well as some reversible modifications in chloroplast. In this paper, the ultrastructural features of the leaf in three *Phragmites australis* genotypes, from the Middle Jiu river valley (Gorj county, Romania), were analyzed: Control (Țânțăreni village); a population from neighbourhood of TEPP-Turceni; and other population developed at the basis a sterile waste dump of 40 years-old (near Cocoreni village). The heavy metal and radionuclide content of the soil was different in the three sites, with the lowest values in Control and the highest values for many heavy metals (Zn, Mn, Ni, Co, Cd) and radionuclide's (U-238, Ra-226, Pb-210, Bi-214, Pb-214, U-235, Ac-228, Pb-212, Cs-137) on the sterile waste dump. The analysis of the ultrastructural features of the leaf in mature plants revealed some differences between the three *Phragmites australis* genotypes. The ultrastructural investigations underlined the adaptation of this species against the stress factors (heavy metals and radionuclides). The exogenous particles penetrated the foliar tissue through the epidermis and stomata, being spread in the cells, at the plasmodesmata level, through endoplasmic reticulum, and through the vascular system. The exogenous particles were present on the endoplasmic reticulum, in vacuoles, as well as in nucleus, mitochondria and chloroplast. The presence of a moderate amount of heavy metals and radionuclides (near TEPP-Turceni) induced reversible modifications and in chloroplast are present usually one-two starch grains. In the genotype developed at the basis of the sterile waste dump from Cocoreni (with the greatest amount of most radionuclides and heavy metals), were recorded reversible modifications in cell (the absence of starch grains in chloroplast, a smaller cristae number in mitochondria and lyses areas in their matrix, dilatation of the mitochondrial cristae, a chelating substance in vacuoles and in cells of circulatory system), as well as irreversible lesions (tonoplast and cell wall breaking).