

GLOBAL MEET ON CLIMATE CHANGES AND SUSTAINABILITY



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Screening of heavy metal responsive biomarkers for the creation of biosensors for environmental pollution

Abstract: Different structural, biochemical, and molecular responses are recently proposed as biomarkers of environmental pollution. To test them, we used two liverworts regarded as a "champion" in the response to environmental pollution, so to engage a race between the different biomarkers in relation to efficiency, reliability, speed, and economy. The liverworts *Lunularia cruciata* and *Conocephalum conicum*, known for being a pollution-tolerant species were collected in areas with different degree of anthropic pressure to investigate the biological effects of heavy metal pollution. Biological responses were investigated considering heavy metal bioaccumulation (ICP-MS), changes of physiological parameters as vitality, ultrastructural alterations (TEM), tissue and cell localization (TEM and SEM microanalysis), oxidative stress (ROS), heat shock proteins HSPs (SDS page) enzyme antioxidant activity and fitochelatins, (biochemical analyses), gene expression (differential display and semi-quantitative PCR), and DNA damage (comet assay). All the responses and damages were related to the environmental conditions in the sites. Kruskal Willis ANOVA and One way ANOVA were used to mark significative differences between the measured responses. Correlation between data was tested through Spearman correlation test. Results showed that between the considered biomarkers the winner are fitochelatins and HSPs. These data will be used for the creation of biosensors for the detection and, possibly, for the quantification of environmental pollution by heavy metals, as part of a project carried out with the support of the Italian Ministry of Economic Development (MISE-LIMBB Project) The ultimate goal of the LIMBB project is to create a new supervision and control system based on new and innovative biosensors interconnected via wireless transmission. These biosensors will be able to detect heavy metals, polycyclic aromatic hydrocarbons and neurotoxic agents such as organophosphate pesticides. These biosensors are particularly innovative in their conception, especially with regards to the application intended for the identification of heavy metals and PAHs, and make glimpse new applications not only in the environmental field but, more generally, for safety human health. The project constitutes the first technologically advanced "stone" towards the construction and development of increasingly sophisticated devices and technologies aimed at human well-being and health.

Biography: Full professor in Botany. Main research topic concerns the cyto-morpho-physiological responses of plants to environmental stresses. In detail, she dealt with the tissue and cellular localization of heavy metals and their effects on the morphogenesis and ultrastructure of bryophytes and higher plants; the production of bioactive molecules; monitoring of environmental pollution by means of mosses, lichens and aquatic plants; biological interactions between plant and environment. She sits on the editorial board of *Plants*, *Peer J*, *Applied Biosciences*. She was Guest Editor of 3 special issues for the MDPI publishing house.