Survey of the heavy metal accumulation abilities of plant species indigenous to a metal polluted region in Portugal: metal uptake by plants and its relation with soil levels and mycorrhizal status

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Contamination by HM in ecosystems poses major environmental problems worldwide with substantial consequences. The off-site migration of contaminants, when not controlled, can cause serious damage on ecossistems and affect public health. These and other reasons bring up the need for new solutions of remediation, to stop the dissemination of the contaminants in the environmental compartments.

Phytoremediation - the use of plants to remove or immobilise contaminants - may offer a low cost method for the remediation of HM contaminated soil. The search for plants adapted to metal-stressful field conditions may be an adequate approach to find species with the capacity to be applicable in further phytoremediation strategies. The region of Estarreja is known for its strong industrial complex, composed essentially by chemical facilities. For many years, several of these industries have discharged its solid residues in improvised parks in the surrounding area, and conducted its wastewaters into the streams nearby. Therefore, the levels of contaminations, mainly heavy metals such as Cd and Zn, in the soils, water and sediments of the area are above the limits established by EC Directive 86/278/EC - Atkins (1999). It is known from previous studies that the contamination distribution is very heterogeneous, a condition that will allow profiting from the coverage of a diverse range of soil HM concentrations, potentially toxic to plants. This environmental risk cenario is aggravated by the high permeability of the soils and the intensive agriculture in the area. Nevertheless, in the areas surronding these industrial zone the vegetation remains proliferous. The purpose of this study was to identify plant species indigenous to the site and to determine their ability to uptake heavy metals: The levels of Cd and Zn in the plant tissues and adjacent soil were analysed for samples of several plant species found in the area, such as Solanum nigrum, Rubus ulmifolius, Convolvulus sp., *Ptreridium Aquilinum, Aster squamatus*, *Conyza sumatrensis, Paspalum urvillei, Calluna Vulgaris,* found throughout the year, *Spergularia* sp., *Conyza bilbaoana, Agrostis stolonifera, Holcus lanatus, Hipochoeris radicata, Verbascum virgatum, Cyperus eragrotis, Hirschfeldia incana, Conyza bonariensis, Cyperus eragrotis, Phalaris arundinacea, Juncus effuses, Atriplex prostate and Agrostis castellana* in the summer time and *Spergularia capillacea, Salix atrocinera, Apium nodiflorum* and *Juncus effusus* amongst other in the winter season.

Plant development in toxic environments can be influenced by soil microorganisms that associate with plant roots to form the rhizosphere community, namely arbuscular mycorrhizal fungi (AMF) - a group of soil organisms that form symbiotic associations with the majority of land plants – which hamper plant survival, growth and reproduction in disturbed ecosystems. Therefore, an additional goal of the study was to prospect for the mycorrhizal status of the plants growing in the selected areas, in order to draw a possible relation of AMF presence with metal tolerance or uptake by plants in heavy metal contaminated soils.

References:

Atkins, WS, 1999. "Estratégia de redução dos impactes ambientais associados aos resíduos industriais depositados no CQE", Instituto de Promoção Ambiental: Estudo de Impacte Ambiental (Environmental Impact Study), N.º 595, Lisbon..