ZINC ACCUMULATION IN PLANT SPECIES FROM A CONTAMINATED PORTUGUESE SITE

Helena Moreira
A. P. G. C. Marques, A.O.S.S. Rangel and P. M. L. Castro
CBQF/Escola Superior de Biotecnologia – Universidade Católica Portuguesa
Rua Dr. António Bernardino de Almeida, Porto, Portugal
apmarques@ mail.esb.ucp.pt

Introduction

Contamination by heavy metals 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 to stop the dissemination of the contaminants in the environmental compartments.

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 Zn, in the soils, water and sediments of the area are dangerously high. 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 metal concentrations, potentially toxic to plants. Nevertheless, in the areas surronding these industrial zone the vegetation remains proliferous.

Objectives

The present study aimed at examining the pedological and botanical characteristics of a contaminated site in a one year screening.

Materials and methods

Plant and adjacent soil samples were collected in the area of study; total, available and extractable Zn levels and nutrient availability in the soils were determined, as well as metal accumulation in the roots and shoots of plants. Plants were also screened for arbuscular mycorrhizal fungi colonisation.

Results

Twenty seven species were found. Zinc levels in the tissues of the collected plant samples ranged from 34 mg kg^{-1} in shoots to 2440 mg kg^{-1} in roots of different species. Species as *Verbascum virgatum*, *Hypochoeris radicata*, *Phalaris arundinacea*, *Conyza bilbaoana, Paspalum urvillei*, and *Aster squamatus* have shown high Zn shoot accumulation and bioconcentration factors ($BCF_{shoots}>1$), and high metal translocation factors (TF>1). Others, namely *Spergularia capillacea*, excluded Zn from the shoot tissues and stored the metal at the root zone ($BCF_{roots}>1$), behaving as tolerant plants. Only few species showed mycorrhizal presence, namely *Conyza bilbaona*, *Hirschfeldia incana*, *Epilobium tetragonum*, *Conyza sumatrensis*, *Pteridium aquilinum*, *Paspalum urvillei* and *Aster squamatus*.

Conclusions

The present work showed important indigenous species that can cope with installed harsh conditions and with potential for utilisation in revegetation strategies of contaminated sites, through metal immobilisation in the root zone, therefore avoiding percolation of metals to deeper soil horizons or even to groundwater, and also the translocation to the aboveground tissues and consequent contamination of the food chain via animal consumption.