The uptake of lead, zinc, arsenic and mercury in plant species endemic to a polluted stream near an industrialized region of Portugal

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Introduction

The region of Estarreja is known for its strong industrial complex, composed essentially by chemical facilities. For several years, several of these industries have discharged its solid residues in an improvised park in the surrounding area, and conducted its wastewaters into a stream nearby ("Esteiro de Estarreja"). Therefore, the levels of Pb, Zn, As and Hg in the sediments of this stream, to a depth of 50 cm, are above the limits established by EC Directive 86/278/EC[1]. Nevertheless, in the banks of the stream, the vegetation remains proliferous. Three plant species, present in a larger amount, were collected from that area and were tested for the content of the above metals. The purpose of this study is to identify plant species endemic to the site and to determine their ability to uptake heavy metals.

Materials and Methods

The tested plants were: *Phragmites australis*, *Convolvulus* sp. and *Solanum nigrum.* The plants were collected near the former exit of wastewaters proceeding from the refered industries. The plants were washed, dried and ground. Dry plant material, including roots, shoots and leaves, was then digested with acids. The metals were determined in the resulting solutions by EA-AAS for Pb, FA-AAS for Zn, FI-HG-AAS for As and FI-CV-AAS for Hg.

Outcome

Pb does not seem to be significantly accumulated in any of the plants. However, high levels of Zn were detected in all of them, especially on *S. nigrum,* that also had the highest level of As. The highest level of Hg was registered for *P. australis*.

Table 1. *Metal concentrations (mg/kg dry plant) for different plant species (average values are shown)*

Plant species	As	Hg	Zn	Pb
Phragmites australis	2.9	13	118 – 629	2.7
Convolvulus sp.	2.3	1.6	599	2.8
Solanum nigrum	5.4	9.1	1130	2.6

Conclusions

Considering the results obtained, and the distribution of the plants in the area, the one that seems to be more appropriate for further research is *Solanum nigrum*. Future studies will include a larger extent of plant sampling and the determination of the metals level in different parts of the solanaceae, in order to obtain more information about their uptake.

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References

1. Atkins WS (1999) Environmental Impact Study.IPAMB. No. 595, Lisbon