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A field study on phytoremediation of a lead-contaminated soil by Eucalyptus globulus in an abandoned mine site – Alagoa, Portugal

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Current engineering-based technologies used to clean up soils are very costly and need lots of work. Phytoremediation is the use of plants to remove pollutants (i.e. heavy metals) from the environment or render them harmless. In the phytoremediation process several plant species can be used to reduce the concentrations of heavy metals in contaminated soils to environmentally acceptable levels. The idea of using rare plants which hyperaccumulate metals to selectively remove and recycle excessive soil metals has increasingly been examined as a potential practical and more cost effective technology than soil replacement, solidification, or washing strategies presently used. However, most hyperaccumulator species are not suitable for phytoremediation application in the field due to their small biomass and slow growth.

Cultivation of woody plants in contaminated soils has showed potential for use in phytoremediation but also it provides aesthetic improvement in the field. In this study we studied the possibility of using the approach of phytoremediation of lead by Eucalyptus globulus in a lead-contaminated soil from an abandoned mine.

Although Eucalytpus globulus prefer good ecological conditions in humid temperate climates, there are few studies that have showed their great potential in contaminated areas and important biomonitors of environmental quality.

A test field was set up in an abandoned mine site (Alagoa, Portugal) in order to investigate the feasibility of phytoremediation of lead by Eucalyptus globulus. The field soil was characterized as follows: humus – 2.56-7.08%, pH in the soil water – 4.50-5.10, silte – 18-15% and total Pb – 67-239 mg/kg. The soils in some areas exceed the critical value (150 mg/kg) according with Portuguese law. Eucalytus globulus growing on the abandoned mine, contaminated with lead was studied. The results of shoots sample analysis (n = 15) show the total Pb levels of 0.170-0.093 mg/kg in the stem and 2.94-5.14 mg/kg in the leaves. The results obtain from this work suggest potential indicators for use of Eucalytus globulus in mining areas. Also the presence in the field of several generations of Eucalytus globulus and the existence of young plants near the main gallery suggest good adaptation in lead-contaminated soil.