AquaConSoil Lyon 2017

14th International Conference on

Sustainable Use and Management of Soil, Sediment and Water Resources

26–30 June 2017 • Lyon • France

BOOK OF ABSTRACTS

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RHIZOtest: an innovative tool for phytoavailability assessment and risk management in polluted soils

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Keywords: risk assessment, phytoavailability, metals, decision support

Resulting from 25 years of research at Inra and Cirad in France, RHIZOtest is a plant-based test that was standardized at ISO to assess the phytoavailability of trace elements in polluted soils. Initially, mainly developed on moderately contaminated soils, the objective is now to apply the RHIZOtest as a tool to assess the phytoavailability in heavily Polluted Sites and Soils.

The RHIZOtest concretely measures the transfer of soil contaminants (mainly trace elements) to the plant, i.e. the phytoavailability. It takes into account the interactions between several contaminants, i.e. the mixture effect. By mimicking soil-plant interactions specific to each type of soil and plant species, the RHIZOtest reproduces natural processes to assess the actual risk. Finally, the RHIZOtest allows to reproduce, in few weeks in a laboratory, widely generalizable studies hardly achievable in the field for reasonable implementation time and cost.

Today operational for transfer analysis of trace elements in the agricultural context, the RHIZOtest deployed by the spin off MetRHIZLab, offers new perspectives for the risk assessment and management of polluted sites and soils, such as: (i) assessing risk of transfer according to use, (ii) proving the effectiveness of remediation techniques, (iii) optimizing a site, (iv) attending revegetation or (v) characterizing the state of contaminated soil to be recycled.

In order to test these new perspectives for the risk assessment and management of polluted sites and soils, a preliminary study was conducted on three soils from polluted sites. Soil 1 and 2 were collected in an ancient mine in southern France. Soil 1 and 2 are exhibiting high concentrations in Zn, Pb and Cd. Soil 3 is highly contaminated with As, Cd, Cr, Cu, Ni, Zn and even more Pb by atmospheric fallouts from a battery recycling plant. The three reference plant species, cabbage, fescue and tomato, were cultivated on these soils according to the ISO 16198 standard. Firstly, no difference of plant biomass was observed between the three soils. This shows that the RHIZOtest was able to assess phytoavailability of trace elements without any phytotoxic artefact. Secondly, the three plant species highlighted the same phytoavailability for each soil and each trace element. Thus, the RHIZOtest showed its capacity to give a robust measure of the phytoavailability of trace elements in heavily contaminated soils.

Based on this preliminary study, a R&D program is underway to confirm these results with soils exhibiting contrasted physical-chemical properties and contaminations. Soils will be selected among different types of polluted sites such as ancient mines and industrial wasteland managed with various techniques (washing, phytomanagement or bioremediation), to create a decision support method based on RHIZOtest.

Dedicated to design offices, laboratories and experts, the RHIZOtest is an innovative decision support tool that should enable soon to assess risks and to optimize the management of polluted sites and soils.