Scientic Paper:

Plant Soil DOI 10.1007/s11104-009-0190-z, 2009

Rhizosphere pH dynamics in trace-metal-contaminated soils monitored with planar pH optodes

Stephan Blossfeld[1], Jérome Perriguey[1], Thibault Sterckeman[1], Jean-Louis Morel[1], Rainer Lösch[2]
Institut für Ökologische Pflanzenphysiologie und Geobotanik, Universität Düsseldorf, Universitätsstrasse 1, D-40225 Düsseldorf, Germany
[1]Nancy Université, INRA, Laboratoire Sols et Environment, 2, avenue de la Foret de Haye, BP 172, 54505 Vandoeuvre-lès-Nancy cedex, France
[2]Nebensteingasse 1, 63739 Aschaffenburg, Germany

Abstract:

Abstract The present study presents new insights into pH dynamics in the rhizosphere of alpine pennycress (*Noccaea caerulescens* (J. Presl & C. Presl) F.K. Mey), maize (*Zea mays L.*) and ryegrass (*Lolium perenne L.*), when growing on three soils contaminated by trace metals with initial pH values varying from 5.6 to 7.4. The pH dynamics were recorded, using a recently developed 2D imaging technique based on planar pH optodes. This showed that alpine pennycress and ryegrass alkalinized their rhizosphere by up to 1.7 and 1.5 pH units, respectively, whereas maize acidified its rhizosphere by up to −0.7 pH units. The alkalinization by the roots of alpine pennycress and ryegrass was permanent and not restricted to specific root zones, whereas the acidification along the maize roots was restricted to the elongation zone and thus only temporary. Calculations showed that such pH changes should have noticeable effects on the solubility of the trace metal in the rhizosphere, and therefore on their uptake by the plants. As a result, it is suggested that models for trace metal uptake should include precise knowledge of rhizospheric pH conditions.

Key-words: Maize, Alpine pennycress, Ryegras, Cadmium, Alkalinization, Acidification