Geophysical Research Abstracts, Vol. 7, 09325, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09325
© European Geosciences Union 2005

Application of TDR - Technique in Pot Experiments

M. Himmelbauer (1), W. Loiskandl (1), S. Klepsch (2,3) and A.Schnepf (1)

(1) Department of Water, Atmosphere, and Environment, Institute of Hydraulics and Rural Water Management, BOKU - University of Natural Resources and Applied Life Sciences (2) Department of Forest and Soil Sciences, Institute of Soil Research, BOKU - University of Natural Resources and Applied Life Sciences (3) Austrian Research Centers GmbH - ARC, Seibersdorf, Austria
(ml.himmelbauer@boku.ac.at / Fax: +43-1-36006-5499 / Phone: +43-1-36006-5450)

The aim of the project is to generate realistic data for the validation of a rhizosphere simulation model. The uptake of the whole root system is based on the mathematical model of Roose et al. (2001). The model should be adapted to the specific research topic of heavy metal uptake by hyperaccumulating plants. A pot experiment with two willow species grown on metal contaminated soils under green house conditions was conducted in collaboration with the rhizosphere research group (W. Wenzel, BOKU Vienna). Soil water content has to be maintained at about 60 % of the water held at field capacity. A common practice in green house experiments is to control the soil water content of the whole pot volume weekly by weighing. To advance these process and to acquire the necessary model input parameters, a systematic monitoring of soil water is needed.

Soil water measurements were conducted using Time-Domain Reflectrometry (TDR) technique. The value of volumetric water content is derived from an electromagnetic measuring signal. The TDR measurements can be tricky, since the propagation of the signals is affected by soil properties (i.e. salt, clay and organic matter contents, bulk density and temperature) as well as by the sensor-soil contact. On the other hand, each TDR sensor has its optimum range of application and limitations. Criteria for sensor selection are also sensing volume, disturbance, accuracy, automatic recording capability, ease of use and costs. Accuracy is especially critical, and relies on good calibration procedures. Manufacturer's accuracy specifications often relate to the electronic system, and to measurement under very controlled conditions (e.g. in sand or glass beads). Hence, a preliminary condition-specific calibration is recommended to find

the relationship between the signal output and water content.

LOM/RS equipment (EASY-Test Ltd, Poland) is designed for controlling long-term laboratory experiments, and can be combined with minitensiometers to measure matric potential. The supplied software handles the operation of the system (start of measuring cycles, data transfer, etc.) and performs the data conversion. The rod sensors with length of 50 mm and interrod distance of 5 mm were horizontally installed at 25 mm depth increments. Five probes per pot (6 liter) were used. Water measurements were taken every 30 minutes during the experiment. Thus, soil wetting-drying cycles over the pot depth were continually observed.

This paper aims to contribute to the establishment of easily applied methods of soil water measurement at laboratory conditions and to point at potential difficulties and errors.

References

Roose , T., A.C. Fowler, P.R. Darrah 2004. A mathematical model of plant nutrient uptake. J. Math. Biol. 42: 347- 360