International Symposium “Root Research and Applications”
RootRAP, 2–4 September 2009, Boku – Vienna, Austria

P depletion in the rhizosphere of *Brassica napus*: Diffusive gradients in thin films (DGT) in comparison to conventional extraction methods

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Several methods are available to estimate plant-available phosphorus in soil (e.g., Olsen method, Ca-lactate-acetate method, etc.). However, many studies have shown that the correlation between extractable P and P accumulation in plant was hardly significant. Additionally, P depletion in rhizosphere soil could not be fully assessed. Thus, there is a need for new methods which provide more detailed insight into P availability and P depletion in rhizosphere soils. The method of “diffusive gradients in thin films” (DGT) has been developed to assess the effective soil solution concentration of major and trace elements. Additionally, DGT can be used to determine the kinetics of resupply. Therefore, we have conducted a pot experiment with three soils having similar pH, but different levels of total and extractable P. *Brassica napus* L. was planted on each soil and grown for 60 days. After harvesting, roots were separated from soil and shoots were separated from roots. Biomass and P concentration were determined in order to calculate the total P content in plant. The rooted soil was treated as rhizosphere soil and compared with non-planted control soils. CAL-extractable P as well as the effective soil solution P concentration using DGT (C_E) were determined for rooted and non-rooted soils. Only for one of the three soils, CAL-extractable P concentration was clearly different between rooted and non-rooted soils. For two soils, the soil solution P (determined using soil solution samplers) was higher in planted soils. In contrast to CAL-extractable and soil solution P, the effective P concentration in soil solution (C_E) was clearly decreased in all rooted soils. Thus, the difference of C_E-P between rooted and non-rooted soils had a better correlation with P concentration and total P content in shoots compared to the difference of CAL-P.

Keywords: phosphorus, Brassica, rhizosphere, DGT, soil solution