



## **Oxygen isotope equilibration of phosphate in the soil /plant system – an $^{18}\text{O}$ - $\text{PO}_4$ organic fertilizer test**

Elvira Goloda (1), Gerhard Soja (2,3), Kathrine Zwölfer (2), Rebecca Hood-Nowotny (1), and Andrea Watzinger (1)

(1) Institute of Soil Research, Department of Forest- and Soil Sciences, University of Natural Resources and Life Sciences, Tulln, Austria (andrea.watzinger@boku.ac.at), (2) AIT Austrian Institute of Technology, Environmental Resources and Technologies, Center for Energy Tulln, Austria (gerhard.soja@boku.ac.at), (3) Institute for Chemical and Energy Engineering, Department of Material Sciences and Process Engineering, University of Natural Resources and Life Sciences, Vienna, Austria (gerhard.soja@boku.ac.at)

In natural ecosystems the phosphorus (P) cycle is "tight", which means transfer between soil and biota is efficient and little P is lost from the system. However, the increasing human P input via fertilizers from rock phosphate has increased losses of phosphate from the terrestrial system into freshwater systems, leading to eutrophication issues. Targeting  $\text{PO}_4$  by stable isotopic methods better enables us to define the origin of P sources and hence improve mitigation measures. However, during  $\text{PO}_4$  uptake and cycling in cells the original isotope oxygen signature equilibrates, which complicates identification of the source. We monitored the extent of alterations of the oxygen isotope signature and hence defined the involvement of soil microbial processes in the desorption and transport of phosphate derived from an organic P fertilizer. The organic fertilizer was a biochar produced by pyrolysing apricot kernels, surface-modified with Mg. In a first pot experiment, a modified Neubauer test, around 11 mg  $^{18}\text{O}$  enriched  $\text{PO}_4$  with a target  $\delta^{18}\text{O}$  value of 9600 ‰ was bound onto one gram of biochar. 5 % of biochar (w/w) was mixed with a P deficient soil and planted with rye. The alteration of the oxygen signature in the available (anion exchange membrane bound) and the HCl extractable  $\text{PO}_4$  soil pools and the available (TCA extractable)  $\text{PO}_4$  in plants was determined after 17 days. Our final goal is to resolve the time related impact of microbial turnover in various soil pools and consequently to improve methods for source identification using  $^{18}\text{O}$   $\text{PO}_4$ .