



## **Root exudation and rhizosphere processes involved in iron mobilisation by *Arabidopsis thaliana***

Theresa Rosenkranz (1), Matthias Baune (2), Eva Oburger (1), Günther Weber (2), and Markus Puschenreiter (1)  
(1) University of Natural Resources and Life Sciences, Institute of Soil Research, Tulln, Austria, (2) Leibniz-Institut für Analytische Wissenschaften – ISAS, Dortmund, Germany

Iron (Fe) is an essential nutrient for plants. However, the bioavailability of Fe in soil is limited, especially in calcareous soils. Plants developed at least two different strategies to overcome Fe limitation in soil: a chelation-based mechanism which involves exudation and uptake of phytosiderophores (strategy II) and a reduction-based mechanism (strategy I) which involves acidification of the rhizosphere, reduction of Fe(III) and uptake of Fe(II). In hydroponic studies the exudation of phenylpropanoid-derived coumarins has been reported for *Arabidopsis thaliana* growing under Fe deficiency at high pH. Up to now, those compounds have not been characterized in root exudates from soil-grown plants.

This study aimed to characterize coumarins that have been previously found in root exudates in response to Fe deficiency, in the exudates of soil-grown *A. thaliana*. Six soils with varying carbonate content (ranging from 10 g kg<sup>-1</sup> to 500 g kg<sup>-1</sup>), pH (ranging from 4.9 to 8.2) and DTPA-extractable Fe concentrations (ranging from 47.3 mg kg<sup>-1</sup> to 3.4 mg kg<sup>-1</sup>) were selected for two pot experiments with *A. thaliana*. In both experiments *A. thaliana* wild-type (Col-0) was grown on the six soils for eight weeks. In experiment 1, plant-induced chemical changes in the rhizosphere (pH, element concentrations) were assessed in the soil solution throughout the duration of the experiment. In experiment 2, root exudates were sampled hydroponically after carefully washing the roots and inserting them in the sampling solution (deionized water, 1 mg L<sup>-1</sup> Micropur, Katadyn) for two hours.

Scopoletin was the major coumarin exuded by the plants on all soils. Exudation rates of scopoletin tended to increase with decreasing bioavailability of Fe in soil, with the exception of the acidic soil where plants showed exudation rates similar to the rates measured on alkaline soils with low Fe availability. The variability within the replicates of each treatment were rather high, which could be attributed to the manner of sampling. Therefore, a less invasive sampling approach has been followed in a next experiment using a rhizobox in combination with a root exudate collector. This set-up allowed to sample exudates from an undisturbed root mat. Results from this experiment are currently under evaluation.

This is the first study showing exudation of coumarins from soil-grown *A. thaliana* plants. Root exudation sampling from soil-grown plants remains challenging and this study contributes to a better understanding of exudation patterns influenced by limiting Fe bioavailability in soils.