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Colocalization analysis to understand Yttrium uptake in *Saxifraga paniculata* using complementary imaging technics

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Over the last decades, yttrium (Y) has gained importance in high tech applications. Due to its chemical similarities with the lanthanides, Y is often considered a rare earth element (REE). Despite their increased usage, the environmental behaviour of REEs remains poorly understood. Especially regarding their interactions with plants many uncertainties exist as both, positive and negative effects on plant development have been observed [1]. In order to understand these phenomena a precise knowledge is necessary about how Y is absorbed by the plant and how it is handled once inside the organism. Contradictory studies exist, stating that due to similar ionic radius, Y and the other REEs might be absorbed through Ca^{2+}-channels while others suspect a shared pathway with Al^{3+} [2].

In this study, we used laser ablation coupled ICP-MS and synchrotron-based micro-X-ray fluorescence spectroscopy (µXRF, beamline Nanoscopium, SOLEIL, France) to localise Y within the plant tissue and identify colocalized elements. The plant used in this study is *Saxifraga paniculata*, a rugged alpine plant that has shown an affinity for Y in a previous study (in prep.). The results show that after growing on a Y-doped soil (500mg/kg), Y is mainly concentrated in the roots of *Saxifraga paniculata* and only a small amount is translocated to the aerial parts.

µXRF analysis indicates that within the roots the majority of Y remains in the outer cortex and epidermis and hardly penetrates the stele. Laser ablation coupled ICP-MS confirms this finding and shows a colocalization between Y, Fe and Al and to a lesser extent Ca. In the stem and the leaves Ca disappears from this group of correlated elements while especially in Y-hotspots, Fe and Al remain strongly associated. Accordingly, a relation between Ca and Y during root uptake remains possible whereas the correlation to Fe and Al appears to be dominant in the aerial parts, indicating the formation of complexes or a shared pathway during translocation.

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[2] Yuan, Guo, Liu, Liu, van der Ent, Morel, Huot, Zhao, Wei, Qiu & Tang, Plant Soil. 421