Canola cell (*Brassica napus*) responses to europium(III) exposure: a spectroscopic study

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Rare earth elements (REE, e.g. lanthanides) and radionuclides are released in the environment. Hence, detailed knowledge of the fate of these elements in the ecosphere including the food chain is required for a reliable assessment of the resulting risk potential for humans and wildlife. Our aim is to explore the complex processes of trivalent actinides with plant cells on a molecular level using europium(III) as an analogue for trivalent actinides. Callus cell cultures are suitable models for studying cell metabolism processes in plants. They retain the ability to form metabolites characteristic of intact tissues for an adaptation to stress conditions, in this case europium.

We studied the response of *Brassica napus* cells to europium(III) exposure (30 µM and 200 µM). Time-resolved laser-induced fluorescence spectroscopy (TRLFS) was used as direct speciation technique to explore the Eu(III) speciation on callus cells and cell compartments after cell fractionation. The possible release of plant cell metabolites (e.g. phenolic compounds) promoted due to the cell contact with Eu(III) was investigated.

After an exposure time of 42 days and at 200 µM Eu(III) the growth of the calli was inhibited by ca. 50 % compared to 30 µM Eu(III) and the control. This correlates with increased amounts of secreted phenolic compounds. Callus cells accumulated 7.2 to 100 µg Eu/$g_{whet\ cells}$ depending on $[Eu(III)]_{initial}$. Cell fractionation studies revealed that 98 % of the Eu(III) was located on large cell fragments and 2 % was found in the cytoplasm. TRLFS studies showed a different Eu(III) speciation on callus cells (active uptake) compared to those found on suspension cell cultures (bioassociation).

This knowledge contributes to an improved understanding of REE/radionuclide interactions with plants on a molecular level.