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Difference in sources of rare earth elements in plants depending on type of infected fungi

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Recently a number of papers have suggested plant induced chemical weathering of soil minerals. It is conceivable that plant-induced weathering is operative for plants to assimilate inorganic elements (nutrient elements) from soil minerals directly. Mycorrhizal fungi have been reported to play a role in this process.

In this study, Eu anomaly and Nd isotope ratio of plants were measured to understand the sources of REEs in plants, assuming that no biological selection of both the elements is operative. The rationale of the assumption is the similarity in chemistry the trivalent rare earth elements.

The uppermost Strengbach catchment is situated in the eastern part of the Vosges mountains (Northeastern France), where various species of plants (ex. Fern, Maple, Pine) were sampled.

In measurement, leaves of each plant sample were used. Plant sample was dissolved with HNO_3 and HF, then REEs in the solution were preconcentrated with solvent extraction (Shabani et al., 1990; Fu et al., 2001), andwere determined by ICP-MS.

Nd isotope ratios were determined by TIMS after Nd was separated using LN resin.

The values of Eu anomaly and Nd isotope ratio of plant samples could be understood by mixing appatite, feldspar and soil solution of Strengbach.

If plants assimilated inorganic elements only from the soluble fraction of soil, value of Nd isotope ratio and Eu anomaly of plants can be similar to those of the fraction. However, the values of some plant species were rather close to those of the minerals than those of the soluble fraction of soil. This suggested that plants assimilated inorganic elements from minerals as well as the soluble fraction of soil.

The difference in the values was found to be well-related with types of infected fungi: EcM-infected plants gave the values close to silicate minerals, whereas AM-infected ones those close to the soluble fraction in soil. It is considered that a difference in symbiotic mycorrhizal fungi may produce a difference of weathered minerals.

Keywords: rare earth elements, plant - mycorrhizal fungi, chemical weathering, silicate mineral, Nd isotope ratio, Eu anomaly