

Heavy metals accumulation of *Athyrium yokoscense* in polluted river basin, southeast Japan

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Abstract

Phytoremediation is a technique for the cleanup of contaminated soil and water, and it takes advantage of plant physiology and metabolism. The fern, *Athyrium yokoscense*, is well known as a hyperaccumulator of Cu, Zn, Cd, and Pb. This fern can grow vigorously in heavy metals contaminated soil. Therefore, it has possible application to phytoremediation. However, it is not clarified that detail of mechanisms of heavy metal accumulation in the *A. yokoscense*.

In this study, the plants were collected 5 times (May, June, August, October, and November) along a stream flowing mine waste dump at an abandoned mining site, and stream sediments were taken 2 times (August and November) nearby the plants to clarify the relationship between accumulation of heavy metals in the *A. yokoscense* and stream sediment, and change in concentration of the plant every month. The plant samples were separated into shoots, dead shoots, and roots. In addition, the roots were collected in November separated into every layer of the stream sediments. The stream sediments were also divided into every layer and only sample that was less than sand size were crashed. Then, these samples were analyzed to clarify heavy metals concentrations.

As a results, the *A. yokoscense* accumulated high concentrations of Fe, Cu, Zn, and Cd (10700, 42400, 8910, and 2180 mg/kg-DW). The stream sediments include high concentrations of Fe, Cu, Zn, As, and Pb (102000, 4100, 5300, 1960, and 1290 mg/kg-DW) The results did not show simple trend between depth and the heavy metal concentrations of roots. However, there is relationship between the heavy metal accumulations in roots of the *A. yokoscense* and grain size of the stream sediments. Bioconcentration factor of roots of the *A. yokoscense* increase when the grain size become small . The results indicated that the *A. yokoscense* can accumulate heavy metals more efficiently in silt than sand. Furthermore, it is clarified that concentrations of heavy metals in shoots of the *A. yokoscense* show the maximum in early autumn.