

Phytoremediation of toxic heavy metals in soil and water on mine tailing sites

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Our long-term goal is to enable highly productive plant species to extract, resist, detoxify, and/or sequester toxic heavy metal pollutants by an approach called phytoremediation. Toxic heavy metals and metalloids, such as cadmium, lead, mercury, arsenic, and selenium, are constantly released into the environment. The use of native plants with high tolerance and capacity to remove heavy metals from the environment is a very convenient approach. Phytoremediation is relatively inexpensive since they are performed in situ and are solar-driven. Acid-producing mine tailings are present at many active and inactive mine sites and pose an environmental liability due to the potential for future acidification caused by pyrite oxidation.

A project was initiated in 2005 at a mine tailing site in Okayama Prefecture to determine the potential for revegetation, phytoremediation and phytomining of silver and gold mine tailings through (1) the identification of plant species that can avoid or tolerate the presence of heavy metals and (2) experiments of plant uptake of heavy metals from mine tailings in the greenhouse. Preliminary results have shown that several plant species, *Pteris vittata* and *Eleocharis acicularis* are able to survive for growing seasons on the mine tailing with or without some additional treatment. *Eleocharis acicularis* demonstrated the highest survival rate in mine tailing and its water in both the greenhouse and field experiments, and it accumulated substantial levels of heavy metals (Cu, Zn, As, Pb and Ag) in shoots. We discuss the potential application of phytoremediation in remediating acid mine drainage, mine tailing and its water.