Geophysical Research Abstracts
Vol. 18, EGU2016-1827, 2016
EGU General Assembly 2016

Screening for new accumulator plants in Andes Range mines

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Toxic metal pollution of waters and soils is a major environmental problem, and most conventional remediation approaches do not provide acceptable solutions. The use of plants or plant products to restore or stabilize contaminated sites, collectively known as phytoremediation, takes advantage of the natural abilities of plants to take up, accumulate, store, or degrade organic and inorganic substances. Although not a new concept, phytoremediation is currently being re-examined as an environmentally friendly, cost-effective means of reducing metal contaminated soil. Plants growing on naturally metal-enriched soils are of particular interest in this regard, since they are genetically tolerant to high metal concentrations and have an excellent adaptation to this multi-stress environment. Processes include using plants that tolerate and accumulate metals at high levels (phytoextraction) and using plants that can grow under conditions that are toxic to other plants while preventing, for example, soil erosion (phytostabilization). Soil and plant samples were taken at polymetallic mines in Peru, Ecuador and Chile. It is suggested that Plantago orbignyana Steinheil is a Pb hyperaccumulator. Moreover, unusually elevated concentrations of Pb (over 1000 mg kg^{-1}) and Translocation Factor (TF) greater than one were also detected in shoots of 6 different plants species (Ageratina sp., Achirodine alata, Cortaderia apalothica, Epilobium denticulatum, Taraxacum officinalis and Trifolium repens) of a Caroline mine in Perú. Among the grass species (Poaceae), the highest shoot As concentration were found in Paspalum sp. (>1000 μg g-1) and Eriochola ramose (460 μg g-1) from the Cu mine in Peru and in Holcus lanatus and Pennisetum clandestinum (>200 μg g-1) from the silver mine in Ecuador. The shoot accumulation of Zn was highest in Baccharis amdatensis (>1900 μg g-1) and in Rumex crispus (1300 μg g-1) from the Ag mine in Ecuador (Bech et al., 2002). Paspalum racemosum also accumulated considerable concentrations of Cu and Zn. The species from the genus Bidens (Asteraceae) were able not only to accumulate high shoot As concentrations (> 1000 μg g-1 in B. cynapiifolia from Peru) but also considerable amounts of Pb (B. humilis from Chile). The highest Cu shoot concentrations were found in Mullinum spinosum (870 μg g-1) and in B. cynapiifolia (620 μg g-1). The shoot accumulation of Zn was highest in Baccharis amdatensis (>1900 μg g-1) and in Rumex crispus (1300 μg g-1) from the Ag mine in Ecuador (Bech et al., 2002). In the Peruvian Andes, B. triplinervia can be considered interesting for phytostabilization, due to its capacity to restrict the accumulation of elevated amounts of Pb and Zn in the shoots.