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Trace element accumulation in plants from mine soils at a silver mining area in southern Ecuador.

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The San Bartolomé mine, located in the Royal Andes (3200 m altitud) at Azuay Province (2º55'59"S:78º52'0"W) is Ecuador's largest historic silver producer. Andorite, Freibergite, Freieslebenite, Miargyrite, Owyheeite, Polybasite, Pyrargyrite, Stephanite, Tennanite, Tetrahedrite, are the Ag-containing minerals found at the site. Carbonate–containing minerals (calcite, dolomite, rhodochrosite) and sulphide minerals containing As, Fe, Zn and Cu (arsenopyrite, chalcopyrite, galena etc.) are also found (www. mindat.org). The processing of minerals has produced spoils with a large range of pH: acidic sites with pH values as low as 2.3-2.6 and in some specific cases (around the grounds of a mill) alkaline sites with pH between 8.7 and 9.3. Soil and plant samples were taken both from the upper and the lower part of the mine basin. Trace element concentrations in aqua regia soil extracts and in plant shoots were analyzed. Cortaderia nitida, (Poaceae, common name sigse) was among the most abundant species. Growing at the most contaminated sites this species accumulated in shoot tissues up to 590 μg/g dry weight of Zn, 390 Pb, 11 Cd, and 104 As. Highest shoot Zn concentrations were found in Pennisetum clandestinum (1350 μg/g), followed by Holcus lanatus (760). In most plant species shoot Ag concentrations were usually below 1.0 μg/g and only at a few sites concentrations between 2 and 3 μg/g were observed. An exception were Holcus lanatus and Cortaderia nitida where shoot Ag concentrations reached values up to 7.8 and 10μg/g, respectively. Among the three Poaceae species, Cortaderia nitida can be considered as the most useful for restoration purposes. This pioneer plant, that efficiently prevents soil erosion, combines high biomass and high soil to shoot transfer of Zn, Cd and Pb with low palatability. In contrast, Pennisetum clandestinum is an invasive pasture plant and consumption by animals of these plants with high shoot metal concentrations could favour undesirable food chain effects.

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