Geophysical Research Abstracts
Vol. 12, EGU2010-1000, 2010
EGU General Assembly 2010

Plant material as bioaccumulator of arsenic in soils affected by mining activities

Salvadora Martínez-López, Maria Jose Martínez-Sánchez, Maria Luz García-Lorenzo, and Carmen Pérez-Sirvent
Faculty of Chemistry, Agricultural Chemistry, Geology and Pedology, Murcia, Spain (melita@um.es, 34 968 364148)

Heavy metal contamination is an important environmental problem, since the metals are harmful to humans, animals and tend to bioaccumulate in the food chain. The aim of this study was to determine the total concentration of As, As (III) and As(V) in soil samples, leaves and roots of plant material, growing in a mining area in Spain (Murcia). Ditichia viscosa was used as the plant of reference. The concentrations of bioavailable As in plant samples were calculated by different soil chemical extraction methods; deionized water, 0.5N NaHCO3 (Olsen extraction), oxidizable medium, 0.5 HCl, 0.05M (NH4)2SO4, 0.005M DTPA and Mehra-Jackson extraction.
For this study, fourteen samples were collected in the surrounding area of Sierra Minera and Portman Bay (Murcia, SE Spain). Samples were air dried and sieved to < 2mm for general analytical determinations. To determine the As content, soil samples were first ground to a fine powder using an agate ball mill. Fresh vegetable samples were separated into root and aboveground biomass and then lyophilized.
Arsenic levels were obtained by using atomic fluorescence spectrometry with an automated continuous flow hydride generation (HG-AFS) spectrometer.
Samples showed pH average values close to neutrality. Most samples showed a very low organic matter percentage. Electrical conductivity and calcium carbonate content were considerably low in most samples. The mineralogical analysis showed that the main minerals were quartz, muscovite, kaolinite and illite, while the minority minerals were alteration products derived of mining activities (iron oxides and hydroxides, siderite, jarosite and gypsum), calcite and feldspars.
Although the plants do not absorb arsenic in the same proportion, the results suggest that a good relationship exists between the total content of As in soil and the total content in plant.
The results showed that the arsenic content in roots was positively correlated with the oxidizable-organic matter and sulfides fraction (oxidaizable medium extraction procedure). Arsenic concentration in leaves was positively correlated with the arsenic extracted by HCl, with the oxidizable-organic matter and sulfides fraction and with the arsenic extracted by Mehra-Jackson extraction. According to our results, As is accumulated in the leaves of the plants and is linked with iron oxides of these soils affected by mining activities.