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Availability of heavy metals in minesoils measured by different methods

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Most of environmental regulations concerning soil pollution commonly include the total heavy metal content as the reference for determining contamination levels. Nevertheless the total content includes all different chemical forms and it rarely gives information on mobility, availability and toxicity (Pueyo et al., 2004). To be able to determine the concentrations of contaminants that cause toxicity it is important to study the available content, the one that can interact with an organism and be incorporated in its structure (Vangronsveld and Cunningham, 1998).

There are many techniques that determine the operationally defined as available content in soils. Most of them use a reagent that causes the displacement of the ions by electrostatic attraction (Pueyo et al., 2004). The aim of this work is to compare the agreement among different extractants (Cl2Ca, EDTA, DTPA, bidistilled water (BDW) and low molecular weight organic acids (LMWOA) when Ni and Zn concentrations are measured in the extractions from five mine soils (Touro, Spain).

The sequence of soils according to total contents of Ni and Zn is S4>S5>S1>S3>S2 and S4>S1>S5>S2>S3, respectively. In all cases Zn total contents are higher than Ni varying from two times higher (S5) to four times higher (S2). Zn concentration is also higher than Ni in the Cl2Ca extractions but the opposite happens in DTPA extractions. Both metal concentrations in the EDTA, BDW and LMWOA extractions are quite similar in each soil. This first approximation already shows there is no agreement among the different techniques used for determining heavy metal availability in soils. Nevertheless it was found that soils sequence according to Zn and Ni concentrations in all available extractions techniques (with the exception of BDW) is the same. According to the Ni and Zn contents in Cl2Ca, DTPA, EDTA and LMWOA extractions the sequence is S3> S4> S5> S1> S2. The S3 is the soil with the highest content of available Ni and Zn whilst it is the soil with the lowest total Zn content and one of those with the lowest Ni one. Even the sequence obtained from BDW extractions is different (S4> S3> S2> S1> S5) the S3 soil also possess one of the highest amounts of available Ni and Zn. Therefore the information given by the BDW technique is different than the other ones used for determining available contents of Ni and Zn since DTPA, Cl2Ca, EDTA and LMWOA cause the displacement of both ions from soil matrix towards the soil solution.

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