Ba concentrations and availability in soil

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Abstract

Although Ba is a non-regulated element in soil in most European countries, some countries, such as Canada, are adopting quality guidelines because this element can be toxic at high concentrations. The aim of the present study was to assess Ba concentrations and availability in Flemish floodplain soils. For a rapid screening of availability, single extractions recommended by BCR (with $CaCl_2$ 0.01 mol/L, acetic acid 0.43 mol/L and ammonium-EDTA 0.05 mol/L) were performed. Additionally, a 0.1 mol/L $CaCl_2$ extraction was used, to determine 'soluble barium' as stipulated in the Canadian guidelines established by Alberta Environment. A comparison was also made to concentrations reported in literature, and with Ba concentrations in subsoils, topsoils and floodplain soils included in the FOREGS database.

Single extractions indicate that only a very small proportion of Ba is readily available for uptake by living organisms or for leaching. Elevated total Ba concentrations are not indicative of a higher risk of mobilization, even when other parameters such as matrix composition and pH are taken into account. The use of single extractions should be considered when environmental quality guidelines are set up for Ba, as they can be useful for a fast screening of potential Ba contamination with an unacceptable risk for the environment. Moreover, regression equations with major elements as independent variables allow to predict Ba concentrations in soils, and also enable to detect potential anomalies.