

HEAVY METAL ACCUMULATION AND RELATION WITH SOIL CONTAMINATION IN *RUBUS ULMIFOLIUS* GROWING IN ESTEIRO DE ESTARREJA, PORTUGAL.

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The present work investigates the potential of *Rubus ulmifolius*, indigenous to a metal contaminated site – Esteiro de Estarreja -, for phytoremediation purposes. The site has a long history of metal contamination. The accumulation of Pb, As and Ni in different sections - roots, stems, and leaves - of the plant was assessed, and compared to the levels of those metals in the soil and in the available fraction. Accordingly to the accumulation patterns and abilities of *R. ulmifolius*, the analysis of its possible application in soil phytoremediation – either phytoextraction or phytoestabilisation - was evaluated.

Plant and soil sampling was made at four different spots in the bank where this species was predominant. Soil samples were analysed for water and organic matter content, pH, total phosphorous and nitrogen, and total and available Pb, As and Ni. Plants were separated in roots, stems and leaves and biomass and Pb, As and Ni contents were determined.

The soil collected from the banks of the stream presented a range of pH from 6.33 to 7.14, a water content ranging from 1.4 to 1.6%, and organic matter contents ranging from 7.9 to 10.1%. The nutrient content of the soils was variable. The distribution of metals in soils throughout the area was quite heterogeneous with the highest levels of As, Pb and Ni being 3078, 1400 and 135 mg kg⁻¹, respectively. Regression analyses of the levels of metals in the soils versus the available (EDTA extractable) fractions were performed and strong positive correlations were found between total concentration in the soil and the metal levels in the available fractions.

The metal content in the sections of *R. ulmifolius* collected in the banks of the stream also varied among sites of collection: As levels (mg kg⁻¹) ranged from 277 to 1721 in the roots, 30 to 110 in the stems, and 60 to 265 in the leaves; Pb concentrations (mg kg⁻¹) ranged from 248 to 1178 in the roots, 35 to 133 in the stems, and 25 to 149 in the leaves; and Ni (mg kg⁻¹) ranged from 48 to 151 in the roots (no Ni was found in the remaining plant tissues). Significant correlations were only found between the total levels of Pb and As in the soil and the levels in the roots of the plant; further correlations between total and available levels in the soil and metals in plant tissues were generally found as non significant..

Bioconcentration factors (BCFs) were determined for the different plant sections (root, stems and leaves), expressed as the ratio between the metal concentration in the plant section and in soil and higher BCF values were registered for the roots of *R. ulmifolius* - in some of these cases values higher than 1 were observed.

R. ulmifolius established successfully on this metal polluted soil, with metals being retained in the belowground sections, as shown by the metal accumulation patterns and BCF values. Additionally, this species presents significant biomass production in the field, is well disseminated throughout the region and easy to propagate, characteristics that are desirable for a plant to be used in phytostabilisation approaches.