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Heavy metals bio-accumulation in Silver Birch (*Betula Pendula*, Roth) from an extremely hostile mine waste

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Acid mine drainage (AMD) is generally outlined as one of the largest environmental concerns, characterized by very low pH value of mine waste, heavy metals and high sulphate content. This extremely hostile environment reduces plant ability to develop and grow. Present study focuses on a silver birch (*Betula pendula,* Roth), a pioneer species that grows on an extremely hostile gold mine waste, to investigate the bio-accumulation of rare metals (thallium (Ti) and indium (In)), as well as nine other more common heavy metals (bismuth (Bi), cadmium (Cd), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni), silver (Ag) and zinc (Zn)). Additionally, parameters determining AMD process and overall contamination (pH, electrical conductivity (EC), sulphates (SO42-), arsenic (As), iron (Fe), oxidation-reduction potential (ORP), turbidity, dissolved oxygen (DO), total dissolved solids (TDS), acidity, hardness, X-ray diffraction (XRD) and radioactivity) were determined in mine waste and drainage water samples. To assess the heavy metals bio-accumulation and mine waste status, statistical geochemical indices were determined: bio-accumulation factor (BCF), pollution load index (PLI), geochemical abundance index (GAI) and exposure index (EI). The results show that silver birch bio-accumulate the essential elements Cu, Ni, Mn and Zn, and the nonessential elements Ti (average BCF = 24.99), In (average BC = 23.01) and Pb (average BCF = 0.84). Investigated mine waste was enriched by Bi, Ag and Cd according to positive values of GAI index. Present research provides a novel insight into bio-accumulation of nonessential heavy metals in pioneer plants which grow on the extremely hostile mine waste.