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Limitations for revegetation in metallic minesoils from Rubiais mine (Galicia, Spain)

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Metal mining activities are the main cause of soil contamination by heavy metals. Mine tailings and minespoils generally present hostile environments for plant growth (Mendez and Maier, 2008) due to low nutrient availability, low organic matter content, and elevated trace metal content (Becerra, 2012). This study was carried out in the minespoils of the abandoned Pb-Zn mine of Rubiais in Lugo province (NW Spain). The objectives were to characterize soils derived from the tailings of this area, to determine the chemical and physical soil quality indicators, the limiting edaphic factors for plant production, the vegetation effect on the soil characteristics, and the fixing trace metals, as well as to suggest corrective measures for soil recovery. The sampling sites (nine, with varying degrees of vegetation cover) were selected in such a way to obtain a representative picture of pollution in this minespoil. Unpolluted area (control, Umbric leptosols, outside of the mining exploitation) is a meadow (*Festuca rubra L.*) in which also grow brooms (*Cytisus scoparius* (L.) Link) and some birchs (*Betula celtiberica* Rothm Vasc.), as in most minesoils. Three topsoil samples were taken and pooled. Three subsamples of each pooled sample were analyzed for particle-size distribution, stoniness, density, porosity, pH, nitrogen, OM, CEC, exchangeable cation and heavy metal (dissolved, available and total) contents. Mineral composition of the soil samples was determined using an X-ray diffractometer. Morphology, structure, and chemical composition were investigated using a FE-SEM and a HR-TEM equipped with an energy dispersive X-ray detector and a STEM unit. The data were treated statistically using SPSS version 19.0 for Windows (LSD at 5% level, ANOVA and bivariate correlation analysis). The results indicate that the main physical limitations of minesoils are their low effective depth, their high porosity and stoniness. Therefore main chemical limitations are their low OM content, low CEC, imbalance between exchange bases, and high levels of Zn and Pb. The HR-TEM/EDS/SAED results combined with FE-SEM/EDS confirmed the effect of vegetation on mineralogy of the soil (Cerqueira et al., 2012), with neoformation of new nanocrystals, hydroxypolymers and amorphous minerals that contain Zn and Pb. Minesoils are strongly limited by the high Zn and Pb levels (negatively correlated with the OM content, and plant cover) that may seriously threat the revegetation. The Zn and Pb levels mean that it is advisable to redirect the restoration in order to prevent the continuous oxidation processes releasing these elements, and adding organic amendments that benefit its immobilization, which can improve the soil properties and enhance soil quality. So, the establishment of vegetation in a polluted area can contribute to soil formation and favour the restoration process. References Becerra C. 2012. PhD. Thesis. Santiago de Compostela University. Cerqueira B, Vega, FA, Silva LFO, Andrade M L. 2012. Sci.Total Environm. 421-422: 220-229. Mendez MO, Maier RM 2008. Rev. Environ. Sci. Biotechn. 7:47-59.