

Evaluation of aided phytostabilization of Pb and Zn in Santa Antonieta tailing pond two years after its remediation

Silvia Martínez-Martínez, Aurore Neveu, Jose A. Acosta, Raúl Zornoza, M. Dolores Gómez, and Ángel Faz
Sustainable Use, Management and Reclamation of Soil and Water Research Group, Universidad Politécnica de Cartagena, Spain

Mining and its subsequent activities have been found to degrade the land to a significant extent. Phytostabilization aims to generate a functional soil ecosystem that supports plant growth over contaminated wastes, lessening surface and subsurface water flow, providing stability to soil through the development of extensive root systems, and hastening successional development.

A field experiment was carried out in Santa Antonieta tailing pond, located in Cartagena-La Unión mining district (SE Spain) in order to know the reasons why important differences in the percentage of plant cover were observed in the studied areas two years after the end of assisted phytostabilization.

The main objectives of this research were to: a) determine the vegetation cover and biodiversity of the four plots selected; b) evaluate which soil physicochemical properties influence significantly the growth and development of plant species and c) identify in which soil fractions are mostly retained Pb and Zn.

The results of this study showed that the highest percentage of vegetation cover was registered in the plot 1 (85%), while the lowest percentage was observed in Plot 3 where no plant grew as in the control plot. The most influential physicochemical properties on the growth and development of the plant species that grew on the plots were: pH, electrical conductivity, inorganic carbon and bioavailable phosphorus. With regard to sequential extraction, Pb and Zn were in a very high percentage in the residual fraction. The highest concentration of bioavailable metal was observed with Zn in plot 3, around 15%, probably due to its acidity (pH value of 3.2) and this may be the cause of this plot is devoid of vegetation.

For future research in the study area, a new sampling of plant species that continue growing on plots would need to be carried out to determine if metals continue to accumulate in the rhizosphere or are accumulating at the aerial part of the plant, and avoid possible environmental risks.