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Ecotoxicological risk assessment of the Guadiamar Green Corridor soils 20 years after the Aznalcóllar mining accident

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The present study evaluates the potential toxicity of the soils of the Guadiamar Green Corridor (GGC) (Seville, SW Spain) affected by the Aznalcóllar mine spill, one of the most important mining accidents in Europe in recent decades. Twenty years after the accident, soils affected by residual contamination are still present in the area, for which their potential toxicity was assessed by carrying out bioassays with lettuce (*Latuca sativa* L.), earthworms (*Eisenia andrei*) and determining the microbial activity by measuring the basal respiration and the microbial metabolic quotient (qCO₂) of these soils at surface level (0-10 cm). A total of 84 soil samples were taken along the GGC, which were divided into four types (SS1-SS4) according to their physicochemical properties. Soils SS1 and SS2 showed a higher environmental toxicity risk, with a reduction in root elongation of lettuce seeds of 57% and 34% compared to the control, as well as a higher metabolic quotient (23.9 and 18.1 ng C_{CO₂} μg C_{microb}⁻¹ h⁻¹), significantly higher than those measured in SS3 and SS4.

The potential risk to humans of these soils through ingestion, inhalation, and skin exposure routes for the main potentially toxic elements (PTEs) present in the GGC (Pb, and As) was also evaluated based on EPA empirical models, in which the total exposure through each of the three routes was considered. The results obtained indicate that there is no potential risk for human health throughout the GGC considering the exposure for both adults and children, although there are areas of the corridor where the Guideline values for both Pb and As are exceeded. This, together with the potential toxicity of the soils to the ecosystem shown by the bioassays, indicate the need to monitor over time the human and environmental risks in the area to guarantee the safety and enjoyment of this natural area.