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# Use of bioassays for testing soils and/or sediments contaminated by mining activities

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Ecotoxicity tests measure the bioavailability of the contaminants and the effects of the chemically not measured toxic compounds on the members of the soil community. Therefore, ecotoxicological testing may be a useful approach for assessing the toxicity as a complement to chemical analysis. They are solid phase tests based on terrestrial methods and tests performed on water extracts using aquatic test protocols. The extent and degree of heavy metal contamination around mines may vary depending on geochemical characteristics, the mineralization of tailings, physico-chemical conditions and the processes used to extract metals.

Portman Bay was subject to mining from the time of the Roman Empire to 1991 when the activity ceased. Since 1957, the wastes from mining operations were discharged directly into the sea. These wastes mainly consisted of clay, quartz, siderite, magnetite, remains of sphalerite, pyrite and galena and residues of the chemical reagents used in floatation.

In our study two methods of environmental toxicological tests were compared and applied to sediments of the Portman Bay (SE, Spain): the standardized toxicological test based on inhibition of luminescence employing Microtox® and a phytotoxicity test, using the monocotyl *Sorghum saccharatum* (Sorgho) and the dicotyls *Lepidium sativum* (Garden cress) and *Sinapis alba* (mustard). The advantage of the bioassays is that the toxicity may be measured in different sediment compartments and interesting comparisons can be made.

Total Pb concentration in the sediments studied varied from 602 to 2517 mg/kg, with a mean value of 1206 mg/kg. The average content of Zn was 5357 mg/kg. The mean concentrations of Cd and Cu were 23 and 59 mg/kg respectively. Total As concentrations varied from 177 to 470 mg/kg, with an average value 284.3 mg/kg. Finally, the total Fe content ranged from 37% to 47%, with an average value of 40%. The sampling points, obtained by GPS, were integrated to create a database in which the coordinates were included.

A number of leachates were obtained from the solid samples and the mean heavy metal content in these solutions were 6.8 ppm for Pb, 0.1 ppm for Zn, 17 ppb for Cd, 5.6 ppb for Cu, 3.7 ppb for As and 0.6 ppm for Fe.

The bioassays results showed these solutions do not have a non-toxic effect when they were submitted to the Microtox® bioassay. On the other hand, in the Phytotoxicity® test, an influence on seed germination was observed.