



Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Assessing toxicity of metal contaminated soil from glassworks sites with a battery of biotests



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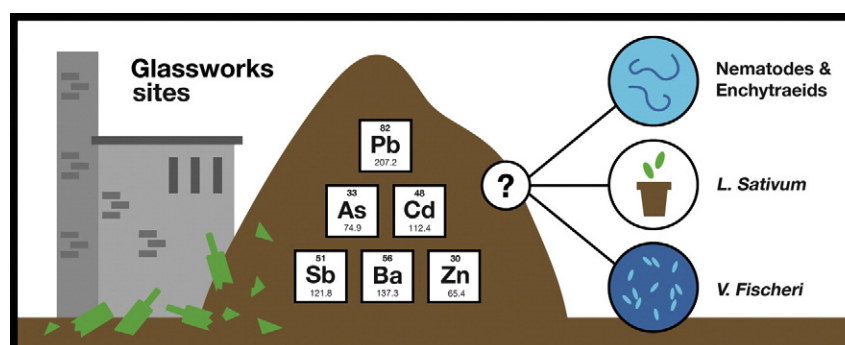
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HIGHLIGHTS

- The toxicological properties of metal contaminated glassworks soils was addressed.
- The soils and landfills at glassworks sites contain high concentrations of several toxic metals.
- A battery of biotests was used to assess toxicity of glassworks soil environments.
- Toxicity of the glassworks soils was not detected by *ex situ* tests (phytotoxicity; the BioTox™).
- A decrease in enchytraeid abundance and biomass was observed implying *in situ* toxicity.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 27 April 2017

Received in revised form 28 July 2017

Accepted 12 August 2017

Available online 26 September 2017

Editor: Henner Hollert

Keywords:

Metal contamination

Glassworks sites

Enchytraeids

Biotests

Bioavailability

ABSTRACT

The present study addresses toxicological properties of metal contaminated soils, using glassworks sites in south-eastern Sweden as study objects. Soil from five selected glassworks sites as well as from nearby reference areas were analysed for total and water-soluble metal concentrations and general geochemical parameters. A battery of biotests was then applied to assess the toxicity of the glassworks soil environments: a test of phytotoxicity with garden cress (*Lepidium sativum*); the BioTox™ test for toxicity to bacteria using *Vibrio fischeri*; and analyses of abundancies and biomass of nematodes and enchytraeids. The glassworks- and reference areas were comparable with respect to pH and the content of organic matter and nutrients (C, N, P), but total metal concentrations (Pb, As, Ba, Cd and Zn) were significantly higher at the former sites. Higher metal concentrations in the water-soluble fraction were also observed, even though these concentrations were low compared to the total ones. Nevertheless, toxicity of the glassworks soils was not detected by the two *ex situ* tests; inhibition of light emission by *V. fischeri* could not be seen, nor was an effect seen on the growth of *L. sativum*. A decrease in enchytraeid and nematode abundance and biomass was, however, observed for the landfill soils as compared to reference soils, implying *in situ* toxicity to soil-inhabiting organisms. The confirmation of *in situ* bioavailability and negative effects motivates additional studies of the risk posed to humans of the glassworks villages.

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1. Introduction

There are many sites that have been contaminated by metals released from past industrial activities, and metal contamination

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