ARPHA Conference Abstracts 6: e108043
doi: 10.3897/aca.6.e108043

Conference Abstract

Soil Salinization May Trigger Mercury Mobilisation from Contaminated Soils and Sediment

Marco Contin‡, Stefano Tomat‡, Elisa Pellegrini‡, Maria De Nobili‡, Mara Mauri§, Milena Horvat|

‡ Department of Agricultural, Food, Environmental and Animal Sciences, University of Udine, Udine, Italy
§ Regione FVG - Servizio disciplina gestione rifiuti e siti inquinati, Trieste, Italy
| Department of Environmental Sciences, Jožef Stefan Institute, Ljubljana, Slovenia

Corresponding author: Marco Contin (marco.contin@uniud.it)

Received: 15 Jun 2023 | Published: 13 Oct 2023

Citation: Contin M, Tomat S, Pellegrini E, De Nobili M, Mauri M, Horvat M (2023) Soil Salinization May Trigger Mercury Mobilisation from Contaminated Soils and Sediment. ARPHA Conference Abstracts 6: e108043. https://doi.org/10.3897/aca.6.e108043

Abstract

Mercury (Hg) contamination of soils is a concerning issue worldwide due to its high toxicity and risk to human health. Source of contamination, chemical form and environmental conditions affect its mobility and hence bioavailability. Contaminated coastal soils, could potentially become hotspots of Hg re-mobilisation, because of simultaneous flooding and salinization caused by sea level rise as a consequence of climate change.

The aim of our work was to assess changes in Hg solubility in soils and sediments, with different type of Hg contamination, after exposure to salt and flood stresses.

A soil contaminated by mining activity (mainly cinnabar-Hg) and a sediment heavily contaminated by a chlor-alkali plant (mainly elemental Hg) were collected from North-East Italy. Mercury speciation was performed either by Thermal Desorption (TD) or by a Sequential Extraction Procedure (SEP) to quantify operationally defined binding forms (soluble, exchangeable, bound to Mn or Fe oxides, bound to organic matter, non-cinnabar and cinnabar Hg forms).

A bench top simulation with 0 to 32.8 g l-1 salt solution was carried out in microcosms filled with contaminated soil or sediment, to characterize flood effects on Hg mobility. Soils were kept submerged for different inundation periods (1, 7 and 30 days). After the flooding

treatment, a rain event was simulated using artificial rain water. Solubilised Hg of each flood and each leaching treatment was measured by ICP-MS.

Thermal desorption showed the presence of two main forms of Hg: organic bound Hg and HgS. The cinnabar-Hg peak was largely prevalent in the mine-contaminated soil, whereas the organic-bound-Hg peak was prevalent in the chlor-alkali contaminated sediment. This difference was confirmed by the liquid SEP speciation.

Hg mobility increased with increasing salinity and flooding time. The effect of salt concentration was more pronounced for longer flooding periods. After 1 day of inundation, the amount of solubilised Hg was negligible, but after 7 days flooding Hg levels in the highest saline solution reached up to 0.9 and 9.3 µg Hg L^{-1} in the soil and in the sediment simulations, respectively. The mobility of Hg increased substantially after 30 days, and was about 22 times in the soil (19.8 µg Hg L^{-1}) and 10 times in the sediment (89.8 µg Hg L^{-1}) compared to the background level.

Our results show a potential risk of Hg re-mobilization from contaminated coastal soils and sediments as consequence of sea level rise and their consequent salinization.

Keywords

Soil pollution, soil flooding, sea level rise, solubility, bioavailability

Presenting author

Marco Contin

Presented at

Oral presentation

Part 2. Impacts from Anthropogenic Activities - Theme: Agriculture or Climate change.

Acknowledgements

We acknowledge the Regione FVG - Servizio disciplina gestione rifiuti e siti inquinati for financial support.

Hosting institution

Department of Agricultural, Food, Environmental and Animal Sciences, University of Udine (I)

Conflicts of interest

The authors have declared that no competing interests exist.