Hg uptake by crop plants grown on contaminated soil from a petrochemical plant. Effects of combined treatments of plant hormone and thioligand

[a]Barbafieri M, [a]Cassina L, [a]Tassi E, [a]Pedron F, [a]Petruzzelli G, [b]Ambrosini P

Industrial activities pose severe risk and impact on the environment and on human health. Moreover, industrial processes in a petrochemical plant are well known for their high production of waste with high content of contaminants (organics and inorganics). Among them, mercury is of great concern to the environment and is highly toxic, causing severe damage to the human central nervous system.

Mercury contaminated soil was used to investigate the phytoextraction efficiency of crop plants treated with a phytohormone (cytokinine, foliar treatment), and with ammonium tiosulphate (TS, soil application). Brassica juncea and Helianthus annuus plants were grown in a soil, from a petrochemical plant, contaminated with 16.4 ± 1.1 mg kg-1 total Hg. Plant biomass, evapotranspration, Hg uptake and distribution following treatments were compared. Results indicate the plant hormone, cytokinine (CK) foliar treatment, increased evapotranspiration rate in both tested plants. The Hg uptake and translocation in both tested plants increased with simultaneous addition of CK and TS treatments. B. juncea was the most effective in Hg uptake. Application of CK to plants grown in TS-treated soil lead to an increase in Hg concentration of 232% in shoots and 39% in roots with respect to control. While H. annuus gave a better response in plant biomass production, the application of CK to plants grown in TS-treated soil lead to an increase in Hg concentration of 248% in shoots and 185% in roots with respect to control plants. The effectiveness of the treatments was confirmed by the calculation of Hg phytoextraction and evaluation of labile-Hg residue in the soil after the plant growing. Plants grown with CK and TS in one growing cycle significantly affected labile-Hg pools in soil (soluble/NH4Cl exchangeable) characterized by sequential extraction, but did not significantly reduce the total metals in the soil. Results support the use of plant growth regulators in assisted phytoextraction process for Hg.

[a] *Istituto per lo Studio degli Ecosistemi, ISE CNR Pisa (Italy) (meri.barbafieri@ise.cnr.it)*
[b] *Saipem/RISAMB, Italy.*