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Atmospheric mercury uptake and desorption from olive-tree leaves

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Mercury uptake by plants, and in particular, accumulation of the element in leaves, appears as a process controlled by foliar uptake, and not by radicular uptake from the soil. In this experimental work, we have proven that mercury that has been uptake from the atmosphere is desorbed if the atmosphere is free from the toxic element.
The experiment included the acquisition of three young olive-trees from a nursery garden located away from the Almadén mercury mining district. The three samples were first grown in Almadenejos, a locality of the Almaden mercury mining district with known persistence of relatively high concentrations of atmospheric mercury; the period of exposition in Almadenejos expanded from July 8th, 2015 to June 23th, 2016. During this period, local concentrations of gaseous mercury were monitored using a TEKRAN 2537B mercury analytical device.
After this period, the trees were moved to Peñalsordo, a locality situated some 25 km to the West of Almadén and 36 km away from Almadenejos. In this site, no mercury sources have been ever described, and so, atmospheric mercury concentrations were typical background values. The period of exposure was between June 23th, 2016 and September 11th, 2016. Only one tree survived to the complete experiment.
During all the process, the plants were watered with mineral water, free of appreciable mercury contents.
Samples corresponding to the leaves of the young olive-trees were taken at regular intervals during the experiment. Total Hg contents in these leaves was measured using a LUMEX RA-915+ Atomic Absorption with Zeeman Effect spectrometer, coupled with a PYRO-915+ pyrolytical attachment.
Results confirmed the atmospheric uptake and accumulation in leaves of mercury: values in leaves variated from initial 40-50ng g-1to very variable concentrations, reaching up to 330 ng g-1 during the exposition in Almadenejos. Variability was very high during the exposition period, and Hg concentrations in the leaves correlated well with periodic variations in concentrations of atmospheric Hg, conditioned by meteorological variations, in particular wind persistence, lowering both the leaves- and the atmospheric Hg concentration values.
The desorption process resulted in a final concentration of Hg in the leaves between 20 and 15 ng g-1.
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