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Status of riverine soils of a Mediterranean river catchment (the Turia river, Spain) regarding potential contamination of heavy metals and pesticides

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Rivers are sink structures receiving diffuse contamination mainly from agricultural practices. Hydrological dynamics of these watercourses favour, by one hand, the transport of contaminants (dissolved, complexed or adsorbed to suspended particles) and, by the other, their accumulation in sediments. These circumstances affect at different scales the quality of soils, waters, and the entire riverine ecosystems.
In this work, 7 heavy metals and 50 pesticides were monitored in riverine soils of the Turia River catchment. From the source to the mounth, along the entiere river, 22 sampling points were selected for sampling according different lithologies, land uses, population size and the proximity to waste waters treatment plants (WWTPs). Cd, Co, Cr, Cu, Pb, Ni and Zn were analysed to determine its total and extractable contents in soils. Total content of metals was established by microwave acid digestion and the extractable fraction in soils and sediments by treatment with EDTA. Atomic Absorption Spectrometry, using graphite furnace when necessary, was used for the determination of the selected metals.
Pesticide residues were extracted from the soil samples using the QuEchERS method and determined by Liquid Chromatograph-tandem Mass Spectrometry (LC-MS/MS). Recoveries ranged from 40 to 105 %. The limits of quantification ranged from 0.1 to 5.0 ng g-1.
The higest levels of total and extractable Cd, Co, Cr and Ni were determined near the Benageber reservoir, located in the middle course of the river, where an important forest fires occurred a year ago. High levels of metals, mainly Cr and Zn, appeared headwaters in the Alfambra tributary. This deserves special mention because it was selected as a little impacted area that could serve as non-contaminated reference for the river.
From the 50 pesticides condsidered, 26 were detected, with the highest levels for acetochlor (290.00 ng g-1) and a degradation product of terbutyazine —terbuthylazine deethyl— (234.75 ng g-1). The pesticides detected with higher frequency were diazinon, chlorpyriphos, buprofezin and imazalil. An average of 9 pesticides were detected, being source and mounth those with higher incidence of these compounds with 19, 17 and 17, respectively. It is remarkable that the area of hedwaters of the river where lower contamination levels should be expected is contrarily one of the most contaminated.
The organic matter content of soils is the parameter most strongly related with all the forms of metals, mainly for Cu, Ni, Pb and Zn, and many of the pesticides and is a key factor for their availability. The textural distribution of the soils, particularly the clay content, also influences this last factor in the case of Ni. A clear trend towards enrichment in heavy metals is observed in the Turia River from the headwater to the stuary, with the exception of the possible existence of a contamination source in the headwaters.
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