

Assessment of PAHs availability in soils using chemical methods

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The total concentration of PAHs in soils may not allow a direct prediction of environmental risk, since generally only a fraction of contaminants can be leached to groundwater or be uptake by organisms. This most soluble or easily extracted fraction, is accessible for bioaccumulation or transformation by organisms, and is normally called the "available fraction". Therefore, the available fraction of contaminants is the most important for assessing their risk to the environment and human health.

Due to the overestimation of risks given by the traditional analytical methods, which consist in vigorous extractions with organic solvents, several methods to predict the available fraction have been developed. There are two main approaches of these methods: non exhaustive extractions (such as mild solvent extraction or solid phase extraction) and biomimetic methods (passive sample techniques such as solid phase microextraction or semipermeable membrane devices). These different methods assess different mechanisms, but the same endpoint. For example, the solid phase extraction using Tenax-TA as adsorbent, which is one of the most promising methods, is based on the principle that the fraction that can be desorbed to soil solution within a few hours is the most important when assessing availability.

In order to understand and validate the results of

chemical methods, it's important to correlate the predicted available fraction with bioassays results, which are the most established methods to assess the available fraction. Bioassays can be direct (accumulation in organism's tissues or biodegradation) or indirect, which are related with effects of contaminants (ecotoxicological tests).

Data found in literature about applicability of chemical methods to predict availability is dispersed and in some cases contradictory. Some authors found strong relationships between the two approaches, but in some cases chemical methods gave an underestimation or overestimation of availability. Since availability is a complex phenomenon, which depends on contaminants properties, biota behaviour (uptake, biotransformation and elimination mechanisms) and matrix properties, the prediction of contaminants accumulation remains problematic. This work intends to understand the suitability of chemical methods such as Tenax-TA to predict PAHs availability in soils, based on a literature overview and on experiments conducted in our lab.

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