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Evaluation of the orally bioavailable arsenic in plants growing in an area affected by mining activities.

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Long term mining activities carried out for centuries in the Sierra Minera area (La Unión, SE Spain) have resulted in an accumulation of heavy metals in the soils, with the subsequent risk for the health and the ecosystem. The objectives of this work were to assess the possible risk posed by the orally bioavailable arsenic present in plants growing in this zone, as well as to study the suitability of these plants to be used for phytoremediation purposes.
To carry out the study 26 samples were collected from around and near the Sierra Minera zone, and the concentration of arsenic was measured both in roots and leaves. The mean content found in the roots was above that of the leaves, although the maximum concentrations were found in the latter. To assess the orally bioavailable arsenic, a simulated gastric solution was prepared according to the standard operating procedure developed by the Solubility/Bioavailability Research Consortium (SBRC). Two phases were differentiated: stomach and intestinal phase samples. To study As solubility in the gastrointestinal tract after ingestion of the plants, the method already proposed for soils was used with the aerial and green parts of the plants.
In general, the total As content was greater in the intestinal phase than in the stomach phase. However, some plants, for example, Ecballium Elaterium, Dittrichia viscosa, Sarcocornia fruticosa, Limonium angustebracteatum, Oxalis pes-caprea showed higher concentrations in the acid phase.
According to our results, species such as Sarcocornia fruticosa show a high degree of oral bioaccesibility and the same can be said for Lygeum spartum, Zygophyllum fabago and Oxalis pes-caprea. However this does not pose a real risk since the arsenic concentration found in these plants is very low. On the other hand, Dittrichia viscosa can be considered a suitable plant for phytoremediation since it transfers elements from the soil to the root but does not then transport the same in any great quantities to the green parts, which are those eaten by animals. Consequently there is no risk of these elements entering the trophic chain by this way.