

## Is uranium in organic agricultural residues a contributor for uranium soil contamination? A study case near a portuguese uranium mine

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Organic matter is a fundamental soil constituent as it can act as a plant nutrients store, adsorb and hold nutrients, usually, in a plant available form and as an agent that improve soil structure and water holding capacity, and also help to minimize soil erosion. Organic matter can also contribute as a sink for hazardous trace elements. The aim of this study was to evaluate the contribution of uranium present in organic agricultural residues (edible or non edible plant tissues) to the increase of uranium concentration in soils, located near a uranium mine (Cunha Baixa, Mangualde, Portugal), when they are used as fresh, or after composting for soil fertilization, an agricultural practice common in this region. Vegetables frequently used by the local farmers (potatoes, beans and lettuce) for own consume were harvested after grown, during field experiments, in soil plots (0.5 m x 5 m) with different uranium concentrations and irrigated with uranium contaminated and not contaminated water. Composite soil samples and the total vegetable yield (aerial tissues and roots) were collected and analysed for uranium concentration. The soils after plant growth presented average uranium concentrations ranging from 30 to 109 mg/kg. The vegetables contained the

following uranium average concentrations (lettuce: aerial and root tissues, 8–234 µg/kg and 0.8–3.3, respectively; potatoes: aerial tissues, 107–558 µg/kg, whole tubers, 13–110 µg/kg; green beans: aerial tissues, 141–199 µg/kg). The contribution of the uranium present in these vegetables to the soils were evaluated considering, by excess, that all the yield of each vegetable tissue could be returned to these soil plots (for a total soil volume of 2.5 m<sup>2</sup> x 0.2 m depth and an average density of 1.5 g/cm<sup>3</sup>) after and during agricultural practices as organic fertilizer. The amount of uranium input to the soil plots from this application was estimated as < 27 mg/kg and < 9 mg/kg from potatoes (aerial parts and tubers, respectively), < 3 mg/kg and < 4 mg/kg from lettuce (aerial and root tissues, respectively) and < 5 mg/kg from green beans (aerial tissues). These contributions (< 0.04 % of the total of uranium present in a soil mass of 0.5 m<sup>3</sup>) point out that it would not be expected a large uranium contribution from this source to the sampled soils. Therefore, the local farmers could continue to use this soil beneficial agricultural practice without the risk of significantly increasing the concentration of uranium in the agricultural soils of Cunha Baixa.

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