

URANIUM CONCENTRATION ON AGRICULTURAL SOILS NEAR CUNHA BAIXA MINE (PORTUGAL CENTRE-NORTH) AFTER A SEASONAL PERIOD OF IRRIGATION

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As in many European countries, Portugal had a legacy of former uranium mining sites surrounded or located near villages where the agriculture and livestock pastures frequently take places. This is the case of Cunha Baixa, one of the most important mines exploited (1970-1993) in the center-north of Portugal. Preliminary assessments of the impact resulting from the mining operations reported that in the surrounding mine area, surface and groundwater quality was affected throughout the mine site. As the Cunha Baixa inhabitants grow their own crops, vegetables and fruits and use shallow water pumped from wells for irrigation, it is an important issue to know the effect of this practice on soils and plants. This investigation presents and compares the results of uranium (total and soil available fractions) in a field experiment carried out in the dry season in two uranium enriched agricultural soils (U total: 21 to 60 mg/kg and 95 to 156 mg/kg in soils A and B, respectively) before and after a long period of irrigation (6 months). During this period, in different soil plots were cultivated beans (*Phaseolus vulgaris* L.) and potatoes (*Solanum tuberosum* L.) and following lettuces (*Lactuca sativa* L.) and beans. Local agricultural practices were followed and the crops were watered, according to irrigation needs, with two different water qualities: low and high total dissolved uranium concentration (< 20 mg U/L and 940 to 1040 mg U/L, respectively). At the end of the field experiments in soil plots A and B cultivated with beans and after with lettuce the total uranium content did not change significantly. Otherwise, in soil plots cultivated with potato and after with beans total uranium content increased 2 to 3 fold. These behavior was observed whatever dissolved uranium content in irrigation water. In general, the uranium available soil fractions were small and did not show appreciable differences when compared to the beginning of the experiments. The cultivated plant species in these soils shown to be able to uptake and retain uranium in the edible tissues, particularly in lettuce leaves (204-282 mg U/kg fresh weight). The results of this work highlight the needs to understand the uranium transfer in the soil-water-plant agricultural system. This knowledge is crucial as it concerns with both the chemical and the radiotoxic effects on the health of human inhabitants of former uranium mine sites by inhalation of soil particles and intake of uranium enriched food.

Keywords: uranium, agricultural soils, irrigation water