



## **Influence of season growth, soils and irrigation water composition on the concentration of uranium in two lettuce (*Lactuca sativa* L.) varieties. Field experiments**

M.M Abreu (1), O. Neves (2), and M. Marcelino (3)

(1) Unidade de Investigação de Química Ambiental (UIQA), Instituto Superior de Agronomia, Technical University of Lisbon (TULisbon), Lisboa, Portugal (manuelaabreu@isa.utl.pt), (2) Centro de Petrologia e Geoquímica, Instituto Superior Técnico Technical University of Lisbon (UTLisbon), Lisboa, Portugal (orquidia.neves@ist.utl.pt), (3) Instituto Superior Técnico, Technical University of Lisbon (UTLisbon), Lisboa, Portugal (marisa.marcelino@ist.utl.pt)

Former uranium mines areas are frequently the sources of environmental radionuclides problems even many years after the closure of mining operations. A concern for inhabitants from mining areas is the use of contaminated land or irrigation water for agriculture, and the potential transfer of metals from soils to vegetables, and to humans through the food chain. The main aim of this study was to compare the uranium concentration in lettuce (*Lactuca sativa* L. varieties Marady and Romana) grown in different seasons (autumn and summer) and exposed to high and low uranium concentrations both in irrigation water and agricultural soil. The content of uranium in irrigation water, soil (total and available fraction) and in lettuce leaf samples was analyzed in a certified laboratory. In the field experiments, two agricultural soils were divided into two plots (four replicates each); one of them was irrigated with uranium contaminated water (0.94 to 1.14 mg/L) and the other with uncontaminated water (< 0.02 mg/L). Irrigation with contaminated water together with highest soil uranium available concentration (10 to 13 mg/kg) had negative effects on both studied lettuce varieties, namely yield reduction (up to 53% and 87% in autumn and summer experiments, respectively) and increase of uranium leaf concentration (up to 1.4 and 7 fold in autumn and summer, respectively). Effect on lettuce yield was mainly due to the high soil salinity (1.01 to 6.31 mS/cm) as a consequence of high irrigation water electrical conductivity (up to 1.82 mS/cm) and low lettuce soil salinity tolerance (1 to 3 mS/cm). The highest lettuce uranium concentration (dry weight) observed was 2.13 and 5.37 mg/kg for Marady and Romana variety, respectively. The highest uranium lettuce concentration in Romana variety was also the effect of its growing in summer season when it was subject to greatest frequency and amount of water irrigation. The consumption by an adult of the lettuce that concentrate more uranium, represents only 16.7% of the tolerable daily limit intake set by World Health Organisation for this element (0.6 mg/kg body weight daily), suggesting that lettuce uranium intake had a low contribution and do not represent a potential health risk for Cunha Baixa's residents.