



Uranium levels in Ebro Delta topsoils (NE Spain)

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The sources of uranium in agricultural soils can be divided into two main groups: those inherent to the parent material and those produced by anthropic inputs. The use of phosphate fertilizers, the presence of old brown coal mines and a nuclear power plant located upstream from the studied area could contribute to the increase of this radionuclide. Monitoring the uranium levels in these soils is necessary due to the importance of the delta as a rice producing area. The main objective of this work was to analyze the uranium content in the considered soils and in the rice grains harvested in those soils. Soil and rice grain samples were taken in Ebro Delta, at a rice producing area in Tarragona Province, Spain. Top soils (0-5 and 5-20 cm) were analyzed for physical and chemical properties by standard methods. Soil samples were digested by the aqua regia methods for the determination of pseudototal uranium concentration. The available fraction was extracted with EDTA 0.05M at pH 7 and rice grains were measured by digestion with a mixture of $\text{HNO}_3\text{:H}_2\text{O}$ (3:2) in hermetically closed Teflon containers and then heated in the microwave for two hours. All the extracts were determined by ICP-MS. The soils had basic pH (8.0 ± 0.2), a low salinity (ranged from 5.4 to 0.1 $\text{dS}\cdot\text{m}^{-1}$), a relatively high content of organic carbon (3.2 ± 1.8) and a loamy texture: silt ($31.9\% \pm 14.8$) and clay ($25.7\% \pm 13.5$). The average content for uranium pseudototal fraction was $0.51 \text{ mg}\cdot\text{kg}^{-1}$ (ranging from 0.25 to $0.95 \text{ mg}\cdot\text{kg}^{-1}$) and the average content for available uranium was $0.19 \text{ mg}\cdot\text{kg}^{-1}$ (ranging from 0.02 to $0.65 \text{ mg}\cdot\text{kg}^{-1}$). All values for U in rice grains were below $0.0007 \text{ mg}\cdot\text{kg}^{-1}$. The uranium content in these soils and rice were in agreement with safety levels cited in the literature. The pH, the salt content and organic matter content become the soil properties that acquire greater importance in the uranium availability.