Uranium in foodstuff samples from two regions in Bulgaria with relatively higher local levels of radioactive background

Radoslava Lazarova, Ivanka Yordanova, Donka Staneva

„N. Poushkarov" Institute of Soil Science, Agrotechnologies and Plant Protection, BG – 1080 Sofia, Bulgaria

Introduction

The amount of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K in soils depends on the type of rocks from which they originate and the processes of soil formation. Analysis of radionuclide content of soil, plants, water and knowledge of radionuclides behaviour in soil–plant system provides an important part of the data basis for dose estimation.The assessment of activity concentration of natural radionuclides is of particular importance as the principles of long-term environmental and human protection have to take into account the natural background.

Human activities can cause accumulation of radioactive elements this way modifying the natural concentrations. Examples for this are former uranium mining areas.

In this connection it was of interest to study uranium content in certain foodstuffs to answer the strong public interest in the topic due to concentrations higher than the reference value of 0.03 mg/l measured in waters from two regions in Bulgaria – Haskovo and Plovdiv.

2. Materials and methods

Testing Laboratory of Radioecology and Radioisotopic Research at ISSAPP "N. Pushkarov " has been accredited by EA "BAS" under BDS EN ISO/IEC 17025:2006 for determining radionuclides in water, food, foodstuffs and soil since 2002.

The method developed and validated in the Laboratory for determining activity concentration of uranium izotopes is presented on Fig.1

In the present study samples of dried alfalfa, carrots, potatoes, tomato concentrate, milk and minced meat from the regions of Plovdiv and Haskovo were analyzed and it was assumed, that two- and trivalent elements of the matrix typical for soils are absent or are in negligible quantities and the method can be reduced to the procedure presented on Fig. 2.

The chemical yield was between 30-60%. Since the alpha spectra obtained were of relatively good quality and it was possible to separate clearly the isotopes of uranium, the results obtained were considered sufficiently reliable.

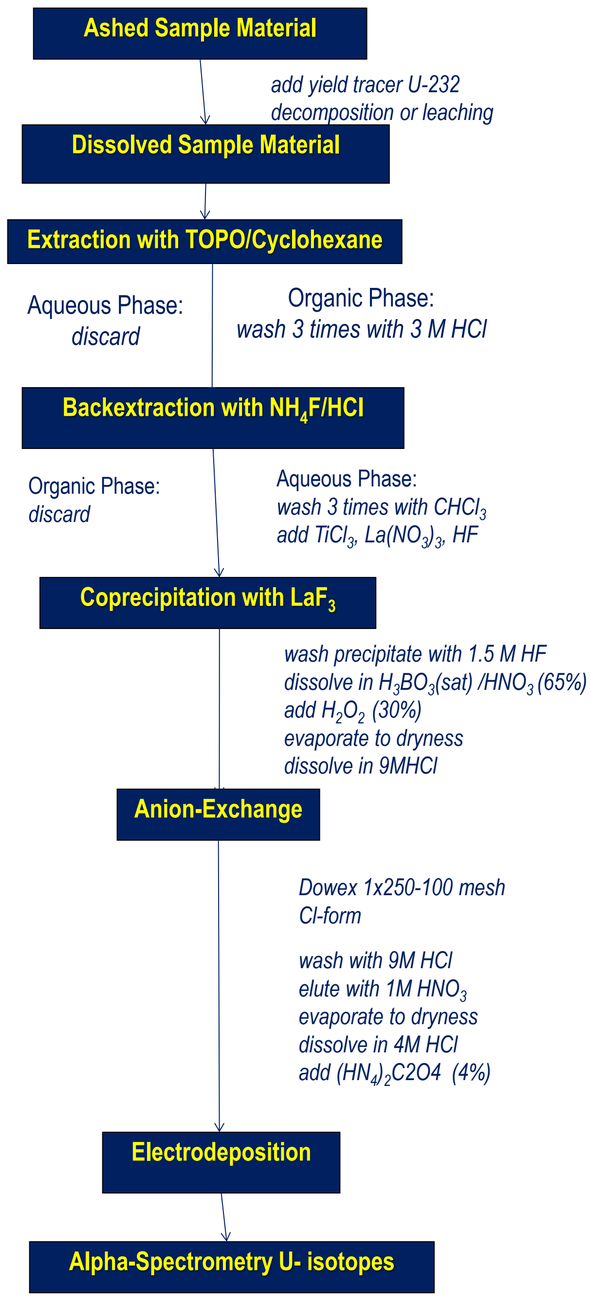

Fig. 1. Principle scheme of the method used in the Laboratory for uranium isotopes determination

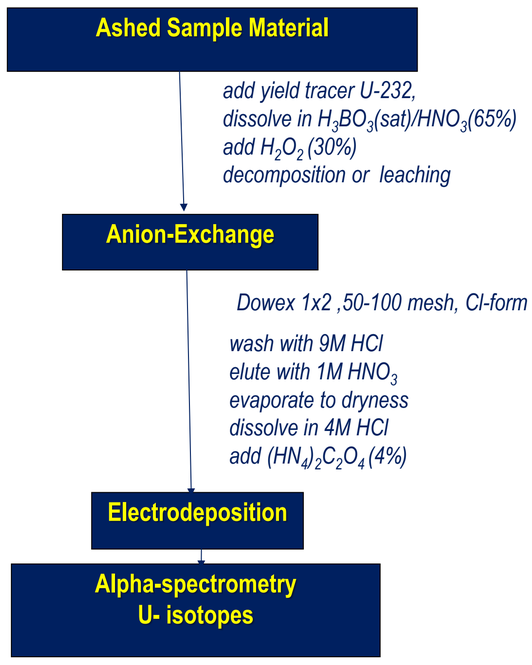

Fig. 2 Scheme of the analytical procedure used for uranium isotopes determination in the present study

Results and Discussion

Results of analyzes of uranium content in the foodstuffs from the regions of Plovdiv and Haskovo are presented in Table 1.

From the results obtained, it can be seen that the uranium concentration in all tested foodstuffs is much lower than the reference values for natural uranium in drinking water provided for in Ordinance 9 (0.03 mg /l). Relatively high natural uranium is observed in alfalfa, which is mainly used as animal feed.

Sample	U-234	U-235	U-238	U	U
	Bq.kg^{-1}	Bq.kg^{-1}	Bq.kg^{-1}	Bq.kg^{-1}	mg/kg
From the region of Plovdiv					
Minced meat	0,020	0,005	0,020	0,045±0,005	0,0018±0,0002
Carrots	0,020	0,005	0,016	0,041±0,004	0,0016±0,0002
Potatoes	0,042	0,005	0,036	0,083±0,008	0,0033±0,0003
Fresh milk	0,010	0,005	0,010	0,025±0,003	0,0010±0,0001
Tomato concentrate	0,020	0,005	0,020	0,045±0,005	0,0018±0,0002
Alfalfa	0,520	0,020	0,440	0,980±0,098	0,0392±0,0039
From the region of Haskovo					
Minced meat	0,050	0,005	0,050	0,105±0,011	0,0042±0,0004
Fresh milk	0,035	0,002	0,035	0,072±0,007	0,0029±0,0003
Alfalfa	1,000	0,020	0,760	1,780±0,178	0,0712±0,0071
Carrots	0,004	0,001	0,004	0,009±0,001	0,0004±0,00004
Potatoes sample 1	0,020	0,005	0,020	0,045±0,005	0,0018±0,0002
Potatoes sample 2	0,050	0,005	0,040	0,095±0,010	0,0038±0,0004

CONCLUSIONS

As a result of the present study, the following conclusions could be drawn:

The reduced procedure for uranium isotopes analyzes could be used as a faster screening method for measuring natural uranium in foodstuffs.

The results obtained show that relatively higher uranium concentrations found in drinking water from the studied regions of Plovdiv and Haskovo did not result in increased concentration of this element in the studied foodstuffs.