

Estimation of Uranium in Some Edible and Commercial Plants

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ABSTRACT

The trace contents of uranium have been estimated in some edible and commercial plants by PTA method. The groups of food plants studied are cereals, pulses, underground vegetables, leafy vegetables, and fruit vegetables. The commercial plants and ingredients taken are betel leaves, tobacco leaves, areca nuts, and lime. Among the different samples studied, the average uranium content, in general, is found to vary from 0.25 to 2.67 ppm.

1. INTRODUCTION

The natural supply of radioactive uranium is incorporated as a normal trace element of plants¹⁻³. Its content in plants is found to be in ppm level and varies from one part to another even within a single plant⁴. Human beings receive this radionuclide primarily through food. The supply of uranium through food items is indeed not to be overlooked. Its content in different plant materials provide opportunity for study of possible effects of low level of radiation exposure.

2. EXPERIMENTAL PROCEDURE

The samples of different plant materials and the respective soil samples have been collected from different parts of Assam. The experimental procedure, viz sample preparation, irradiation, etching, track counting and uranium estimation, was done by the procedure published elsewhere⁵.

3. RESULTS AND DISCUSSION

3.1 Uranium Traces in Consumables

Among the different groups of plants studied, the range of uranium contents found in various groups of

consumables is shown in Table 1. From the table it is observed that average uranium content in fruit vegetables is the highest and that in cereals is the lowest.

Table 1 Uranium content in various groups of consumables

Consumable	Uranium content (ppm)	
	Min. value	Max. value
Cereals	0.19 ± 0.003*	0.30 ± 0.005
Pulses	0.16 ± 0.003	0.55 ± 0.001
Underground vegetables	0.25 ± 0.005	0.62 ± 0.01
Leafy vegetables	0.16 ± 0.003	0.55 ± 0.01
Fruit vegetables	0.37 ± 0.007	0.52 ± 0.01

* Errors indicated here are the errors of statistical counting

The uranium content of the various parts of these plants is also estimated in each case. Observation of these data has shown that in most cases the edible parts contain less uranium content than the other parts, for example, among cereals, the grains contain the least

uranium; in root vegetables, the leaves; and in leafy vegetables, the roots contain the highest trace of uranium.

3.2 Uranium Traces in Betel Leaves and its Chewable Ingredients

Uranium contents of betel leaves and its chewable ingredients in various sources collected from Assam, West Bengal and Meghalaya show variation and the results are shown in Table 2.

Table 2 Uranium content in betel leaves and its chewable ingredients

Item	Uranium content (ppm)	
	Min. value	Max. value
Betel leaves	$0.48 \pm 0.01^*$	1.87 ± 0.03
Areca nuts	0.88 ± 0.01	1.75 ± 0.03
Tobacco leaves	0.79 ± 0.01	1.35 ± 0.02
Lime	1.99 ± 0.04	3.08 ± 0.05

* Errors indicated here are the errors of statistical counting

The average uranium contents in betel leaves and its chewable ingredients collected from different locations are shown in Fig. 1. The part-wise uranium estimation of these plants shows that unlike the food items, the consumable parts have quite high (often highest) uranium content.

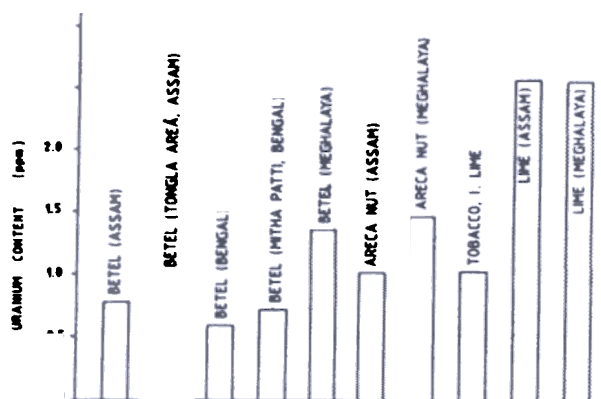


Figure 1 Average uranium content in betel leaves and its chewable ingredients.

3.3 Uranium Traces in Soil

The soil samples are collected from the habitat of each plant, and corresponding uranium estimation was

done. In the soil samples, uranium content variation is from 2.13 ± 0.03 to 3.27 ± 0.05 ppm with an average of 2.67 ppm. This is quite normal as compared to the global average value of 3.0 ppm⁶.

Reference may be made in this regard that the uranium contents of cow's milk and water are in the ppm level^{7,8}. The observation shows that human beings receive more uranium from vegetable food items than milk and water. This element is excreted in sufficient amount by natural processes⁹. Therefore, unlike other heavy trace elements, uranium may not be a cumulative poison.

Concentration of uranium in food items of North Eastern India is observed to be much higher than those reported by Chakravarti, *et al*³. Also, betel chewing habit with or without tobacco is primarily responsible for mouth and hypopharyngeal cancers. This habit which is more common in the Brahmaputra valley of Assam seems to have a strong association with esophageal cancers¹⁰. This association may be in all probability due to constant irritation to the oral mucous membrane, presence of various carcinogenic chemicals or radiation effects.

Uranium finds its way to human being through plant, meat, milk, or eggs. There are however insufficient data to provide a firm basis for evaluating the significance of such low levels of radiation in the context of biology. It is therefore desirable that such work be carried out extensively to provide a firm basis on the subject.

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