



Activity Concentration Of Commonly Consumed Musa Species In Ado-Ekiti, Nigeria

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Abstract:

*The average concentration of radionuclides in the various Musa species obtained in Ado township of Ekiti State Nigeria with a population of 446749 were estimated from the measurement of mean specific activity using a well calibrated Sodium Iodide Thallium (NaITl) detector system. Samples were collected from Irona, Erekesan and Okesa markets being the most popular markets in Ado-Ekiti. The radionuclides observed with reliable regularity belonged to the series-decay naturally occurring radionuclides headed by ^{238}U and ^{232}Th as well as the non-series nuclide, ^{40}K . The average concentration of ^{40}K was found to be highest in *Musa sapientum* ($82.45 \pm 9.21 \text{ Bq kg}^{-1}$) while the least average concentration value was recorded in *Musa Cavendish* ($29.79 \pm 7.87 \text{ Bq kg}^{-1}$). The highest average concentration of ^{238}U was recorded in *Musa paradisiaca* ($7.03 \pm 2.46 \text{ Bq kg}^{-1}$) and the least average concentration was found in *Musa sapientum*. ($4.26 \pm 0.81 \text{ Bq kg}^{-1}$). For ^{232}Th , *Musa acuminata* was found to have the highest average concentration ($4.53 \pm 2.29 \text{ Bq kg}^{-1}$) while *Musa paradisiaca* was found with the least average concentration ($2.59 \pm 1.10 \text{ Bq kg}^{-1}$)*

1.Introduction

Banana and plantain are perennial crops that take the appearance of trees as they mature. Diverse cultivars are grown. Musa (as they are usually called) are believed to have originated in Southeast Asia but their introduction into Africa is unclear.

Throughout history Musa has provided humans with food, medicine, clothing, tools, shelter, furniture, paper, and handicrafts. It could be termed the "first fruit crop" as its cultivation originated during a time when hunting and gathering were still the principal means of acquiring food.

Musa are rich in vitamin C, B6, minerals and dietary fibre. They are also a rich energy source, with carbohydrates accounting for 22% and 32% of fruit weight for banana and plantain, respectively.

Bananas are cultivated in nearly all tropical regions of the world providing a staple starchy food for 80 million people and important source of income. Plantain resembles banana but are longer in length, have a thicker skin, and contains more starch. They are also a major staple food in Africa, Latin America, and Asia. They are usually cooked and not eaten raw unless they are very ripe. Plantains are more important in the humid lowlands of West and Central Africa. One hundred or more different varieties of plantain grow deep in the African rainforests. Banana and plantain are important staple foods in many developing countries, especially in Africa. They provide food security and income for small-scale farmers who represent the majority of producers. Only about 15% of the global banana and plantain production is involved in international trade; most production is consumed domestically. Banana starch, flour, and chips are processed banana products whose markets are yet to be fully developed.

More than 100 million tons of banana and plantain were produced worldwide in 2007 according to FAO estimates. Banana are grown in nearly 130 countries. Uganda is the largest producer of banana and plantain in sub-Saharan Africa (SSA), followed by Rwanda, Ghana, Nigeria, and Cameroon. Banana and plantain are cultivated in a wide variety of environments. Plants produce fruit year round, can produce for up to one hundred years. Africans annually consume 21 kg of banana and plantain per capita, but Ugandans consume 191 kg per year, or more than half of one kg per day. In fact, Ugandans use the same word for food as the name of the local banana dish matooke.

Four African countries have the highest per capita consumption of banana/plantain in the world, with Uganda having the highest.

Everyday man ingests and inhales radionuclides in food, water, and air. The more of the contaminated food ingested, the more the risk of man's exposure. Over 60 radionuclides can be found in nature, and they can be placed in three general categories, Primordial being in existence since the world began. Cosmogenic formed as a result of cosmic ray interactions. Artificial radionuclides enhanced or formed as a result of human actions in minor concentrations compared to natural radionuclides (Ebong and Algoa, 1992). Radionuclides are found naturally in air, water and soil. They are found in human body systems, being that man is the product of the environment.

Natural radioactivity is common in rocks and soil that make up the planet, in water and oceans and in building materials. (Akinloye and Olomo, 2002). Fruits and vegetables are very vital in human diet, the presence of natural radionuclides (^{40}K , ^{238}U and ^{232}Th) in them results in radiological implication not only in the food but also on the populace consuming these food (Aborisade et al, 2002). This study investigated the activity concentration of ^{40}K , ^{238}U and ^{232}Th in some *Musa* species popularly consumed in Ado-Ekiti, Nigeria.

2. Material And Methods

Five samples of five different types of *Musa* species were collected from three different markets (Erekesan, Okesa and Irona Market) in Ado Ekiti. A total of fifteen samples were collected, 3 samples for each of *Musa latunda*, *Musa paradisiaca*, *Musa cavendish*, *Musa sapientum* and *Musa acuminata*. The edible portion was sliced and sun dried to a constant weight (IAEA, 1989). The well dried samples were ground into powder with electrical blender and with 2mm wire mesh. Each sample was packed in 50g lot by weight and sealed in airtight plastic container. The samples were thereafter left for 28 days in order for gaseous daughters of ^{40}K , ^{238}U and ^{232}Th to reach secular equilibrium before counting was taken (UNCEAR, 1993).

Radioactivity counting was done using a lead shielded 76mm x76mm NaI detector (Model 802 series by Canberra) which was coupled to a 10 plus multi-channel analyzer (Model 1104 also by Canberra) through a preamplifier base. The detector has a resolution of about 8% at 0.662 MeV line of ^{137}Cs . Each sample was counted for 36000 seconds.

3.Results And Discussion

Sample	^{40}K	^{238}U	^{232}Th
Musa cavendish	29.37±9.60	3.90±1.35	3.41±1.30
	24.43±6.27	5.37±1.39	5.23±1.81
	35.55±7.74	9.80±2.65	3.45±1.09
Musa acuminata	43.24±5.66	4.43±1.44	5.95±2.91
	41.76±6.28	7.54±2.27	3.40±1.92
	38.65±9.21	4.18±1.32	4.30±2.04
Musa latunda	30.06±9.88	1.69±0.13	1.12±0.20
	38.58±8.97	8.58±3.73	2.40±0.42
	46.11±12.10	6.73±2.63	8.30±2.51
Musa sapientum	40.23 8.37	4.78 1.70	3.35 0.94
	23,31 11.05	4.15 0.60	0.69 0.13
	33.80 8.21	3.84 0.31	5.27 1.82
Musa paradisiaca	53.71 10.85	7.90 3.08	5.09 2.78
	48.24 7,03	6.80 2.16	1.43 0.31
	54.16 6.74	6.40 2,13	1.26 0.20

Table 1: Radionuclide concentrations (Bq kg^{-1})

Sample	^{40}K	^{238}U	^{232}Th
Musa cavendish	29.79 7.87	6.36 1.80	4.03 1.40
Musa acuminata	41.22 7.05	5.38 1.66	4.53 2.29
Musa latunda	38.25 10.3	5.67 2.18	3.94 1.04
Musa sapientum	82.45 9.21	4.26 0.81	3.10 0.96
Musa paradisiaca	52.04 8.21	7.03 2.46	2.59 1.10

Table 2: Mean concentration of Radionuclides (Bq kg^{-1})

The values and associated errors in the concentration of ^{40}K , ^{238}U and ^{232}Th measured in the samples are presented in Table 1, while the mean concentration in each of the samples are shown in Table 2. The activity concentration of ^{40}K ranged from $23.31\pm 11.05 \text{ Bq kg}^{-1}$ in Musa sapientum to $54.16\pm 6.74 \text{ Bq kg}^{-1}$ in Musa paradisiaca. The highest activity concentration of ^{238}U was found in Musa Cavendish ($9.80 \pm 2.63 \text{ Bq}$

kg⁻¹) while the least concentration was found in *Musa latunda* (1.69± 0.13 Bq kg⁻¹). The activity concentration of ²³²Th ranged from 0.69± 0.13 Bq kg⁻¹ in *Musa sapientum* to 8.3±0.25 Bq kg⁻¹ in *Musa latunda*. The activity concentration of ⁴⁰K was found to be the highest in all the samples. However, the values obtained for ⁴⁰K were very low compared to values obtained for other locally produced food stuffs in the area. Since the values obtained for ⁴⁰K were almost within the same range in all the samples, this could put the source of ⁴⁰K as being from the soil derived through the erosion of the potassium rich igneous rocks scattered all over the area of Ado-Ekiti (Akinloye and Olomo, 2002). The mean activity concentrations of ⁴⁰K and ²³⁸U were found to be high in *Musa paradisiaca* 52.04± 8.21 and 7.03± 2.46 Bq kg⁻¹ respectively, showing that this particular specie probably has an affinity for these radionuclides.

4. Conclusion

It can therefore be inferred from the results obtained in this work that the people living in Ado-Ekiti area generally receive a dose that is within acceptable dose limits of both the UNSCEAR (1988) and the ICRP (1991). However, *Musa paradisiaca* certainly has higher radionuclide concentration values compared to other sampled *Musa* species, people in this town definitely receive higher doses of radiation from *Musa paradisiaca*. This particular specie has to be given close monitoring because of relatively higher radiation level which is very close to the average acceptable limits of UNSCEAR (1988). Thus, the concentration values obtained indicate that the studied species in this area fall within low-level background radiation since values fall below the UNSCEAR and ICRP dose limits. It is expected that these data, which represent pioneering data for the study area, will serve as baseline data. These could be used to provide risk estimate resulting from external exposure of the inhabitants of the area to ionizing radiation in a further research work.

5.Reference

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