

ESTIMATION OF RADIATION AT THENGAIPATTINAM OF KANYAKUMARI DISTRICT, TAMILNADU

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Abstract

Baseline activity concentration of the natural radioactive nuclides in soil, drinking water, vegetable and fish found at Thengaipattinam was determined. Measurements were carried out using a NaI based Gamma ray spectrometer, alpha counting system and beta counting system. Results of the gamma ray spectrometric measurements carried out for natural radioactivity levels due to ^{226}Ra , ^{232}Th and ^{40}K in soil, drinking water, vegetable and fish specimen collected from the Thengaipattinam coast of Kanyakumari district. These studies were carried out in the Health Physics unit of BARC located in the campus of Indian Rare Earths Limited, Manavalakurichi in Tamilnadu. Alpha activity was found to be higher in soil with 27546 Bq/Kg than in water 0.0065 Bq/l and 91.02 Bq/Kg, 115.72 Bq/Kg in vegetable and fish. The beta activity estimated was 94718.23 Bq/Kg, 0.032Bq/l, 220Bq/Kg and 302.15Bq/Kg in soil water, vegetable and fish respectively. Radioactive nuclides estimation reveals that ^{228}Ac concentration was higher in soil 2893Bq/Kg and potassium activity was rich in fish. ^{232}Th activity was also high in soil. The results of these studies are presented and discussed in this paper in detail.

Key words: Radioactive nuclide, Soil, Water, Vegetable.

1. INTRODUCTION

Exposure to ionizing radiation from natural sources is a continuous and unavoidable feature of life on Earth. Natural radioactive nuclides exist ubiquitously in the environment and contribute significantly to external and internal dose to the population [1]. Ilmenite rich beach sand deposits occur in the coastal stretches of Kerala, Tamilnadu, Andhrapradesh, Orissa and Maharashtra which contain monazite bearing black sands [2]. ^{232}Th and ^{238}U are reported from these regions caused mainly due to the monazite bearing black sands [3]. The major sources responsible for exposure are naturally occurring radionuclides in the earth's crust such as ^{232}Th , ^{238}U , ^{40}K which occur in minerals such as monazites and zircons. Radionuclides belonging to the uranium (^{226}Ra) and thorium series (^{228}Ra) enter the human body at a considerable smaller dose mainly by ingestion and inhalation [4]. The most important terrestrial sources of natural background radiation are ^{40}K , ^{238}U and ^{232}Th decay series. The radium of the uranium and thorium series concentrate generally at a greater level than uranium or thorium by about two orders of magnitude [5] and was generally expected to accumulate more and it will reveal the concentrations of their parent's uranium and thorium.

Radioactivity present in water is mainly due to the presence of radioactive elements in the earth's crust [6]. In the sense of lives, health and environmental pollution determination of the radioactivity concentration in water is a useful because it is used for drinking. Fish is necessary for a

balanced human diet. Since it is a naturally high background radiation area fish in Thengaipattinam coast may be subjected to direct and indirect contamination of Uranium nuclides. Radium of Uranium and Thorium series concentrate generally at a greater level than Uranium or Thorium by about two orders of magnitude [5]. Radionuclides may enter the human body at a considerable smaller dose from fish mainly by intake [6]. Reproductive stages and growing tissues are the most sensitive to radioactivity. Radioactive isotopes can be bio accumulated both in primary producers and by uptake through the food chain. The lowest dose rate at which effects of chronic radiant exposure on fertility of aquatic invertebrates and fish were demonstrated was about 0.25 in Gy/hr. In sense of lives health and environmental pollution, determination of the radioactivity concentration in fish is useful because it is used for eating. Knowledge of the concentration of radioactivity levels obtained can serve as a reference baseline value and helps to calculate the effective dose to population. Therefore an attempt is made in the present investigation to studies on the natural radioactivity content in soil, water, vegetable and fish collected from Thengaipattinam coastal region of Kanyakumari district in Tamilnadu, India.

Study Area

Study area is mainly the Thengaipattinam coastal region which is a Naturally High Background Radiation Area (NHBRA) in the Southwest coastal region of Kanyakumari district in Tamilnadu, India.

Results and Discussions

Table 1: Gross Alpha activity in the samples

No.	Sample	Gross α activity
1.	Soil	27546 Bq/Kg
2.	Water	0.0065 Bq/l
3.	Veg. (Banana)	91.02 Bq/Kg
4.	fish	115.72 Bq/Kg

Table 2: Gross Beta activity in the samples

No.	Sample	Gross β activity
1.	Soil	94718.23 Bq/Kg
2.	Water	0.032 Bq/l
3.	Veg. (Banana)	220 Bq/Kg
4.	fish	302.15 Bq/Kg

Table 3: Gross Gamma activity in the samples

No.	Sample	Gross Gamma Activity (Bq/Kg or Bq/l)			
		²²⁸ Actinium	⁴⁰ Potassium	Bismuth	²³² Thorium
1.	Soil	2896	77.51	19.71	10387.92
2.	Water	0.314	0.0029	0.031	5.08
3.	Veg. (Banana)	0.062	81.33	0.271	0.992
4.	fish	0.047	111.78	0.386	1.573

From the results obtained in the table it was evident that alpha activity was higher in soil with 27546 Bq/Kg than in water, vegetable and fish with 0.0065Bq/l, 91.02 Bq/Kg and 115.72Bq/Kg respectively. A same pattern of high beta activity was reported in soil with 94718.23 Bq/Kg while a mere 0.032 Bq/l was estimated in water and 220 Bq/Kg and 302.15 Bq/Kg in vegetable and fish respectively. Gamma activity measurements reveal that ²²⁸Ac was 2896 Bq/Kg in soil, 0.314Bq/l in water and 0.062 Bq/Kg in vegetable. The activity concentration of ⁴⁰K in fish is higher with 111.78 Bq/Kg than in soil and water with 19.71 Bq/Kg and 0.271 Bq/l respectively. The concentration of ²³²Th was reported as 10387.92 Bq/Kg in soil, 5.08 Bq/l in water, and 0.992 Bq/Kg and 1.573 Bq/Kg in vegetable and fish.

CONCLUSION

The activity concentration of radioactive nuclides reported from soil, water, vegetable and fish found at Thengaipattinam (NHBRA) of Tamilnadu in India at present is found to be within limit. Natural radioactivity forms a significant part of the total activities in the environment whereas anthropogenic activities have introduced significant amounts and usually their influence is limited to the near locality of their introduction. Understanding natural radioactivity will enable us to check or limit the toxicity and hence risk to the individual and society of such exposed.

Sources of heavy minerals in the beach sands of Thengaipattinam coast are ilmenite and monazite present in it. The concentration of heavy minerals in the beach sands is due to favourable geological conditions. Natural radioactivity content reported from these regions is mainly due to the monazite bearing black sands.

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