



Research Article

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Derived radioactivity concentration factors studied in water, sediment and fish samples collected from a pond at Puthoor, Kanyakumari district, Tamilnadu

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ABSTRACT

The area chosen for the study was Puthoor. It is highlighted as natural background radiation area. This is because of the presence of low Monazite content present in the soil samples. Radiation exposure is harmful to human life if it exceeds particular limit. The objectives of this study is to collect the fish, water and sediment samples from pond to check whether there is any radioactive element present responsible for causing radiation. Measurements were carried out using α and β counting systems. Known weight of samples was tested for their radioactive emission. Comparative studies in this area have shown that radioactive content is in the order: sediment > fish > water. From present study it was concluded that the radioactivity of pond water is within the permissible limits and the consume of this water by fish does not cause any adverse effects.

Keywords: Radioactivity, α activity, β activity, sediment, radiation.

INTRODUCTION

Radioactivity is the process whereby unstable atomic nuclei release energetic subatomic particles. It is a natural and spontaneous process by which the unstable atoms of an element emit or radiate excess energy in the form of particles or waves. Radioactivity was first discovered in 1896 by a French scientist Henry Becquerel, after which the SI unit for radiation, the Becquerel is named. In United States, human exposure to radioactivity is measured in rads, where one rad represents 0.01 joule energy absorbed per kilogram of tissue. In small doses radioactivity is a useful process. But in large doses it is extremely dangerous [1]. Exposure of cells to radiation causes chromosomal aberrations and these may be strongly linked with different cancer types [2]. The present study deals with the analysis of radioactive content of water, sediment and fish samples collected from a pond at Puthoor area.

EXPERIMENTAL SECTION

Study Area

The area profile for the investigation under this work is the Puthoor pond. This area comes under Kanyakumari District. It is a coastal district bordering Kerala state and Arabian Sea on the west and Indian Ocean on the south. This district is located between 8° 03' and 17° 05' east latitude and the total geographical area is 1671.84 sq.cm. The pond under investigation is located 2 km from Puthoor. The locals of this place use this water for washing, bathing and irrigation purposes.

Experimental Techniques

Basic component of our life support system (sand, water and air) contains measurable amount of radioactivity. The radio activities due to these components are found out by using different instruments. This work deals with the study of radioactivity of α and β counting in the water, sediment and fish samples using scintillation counter [3] and low beta counter [4].

The water samples should be collected in plastic container and sediment samples should be collected in plastic bags and taken to laboratory. The sampling period is from 02.02.2009 to 21.02.2009. A record of sample identification No, date of sampling, sample description, location and fresh weight should be noted. Size of the sample to be taken depends on what fraction or percentage of the derived maximum permissible concentration has to be detected and the detection limit of the measuring instrument for a required confidence level. Known weights of samples were analyzed. Measurements were carried out using α and β counting systems.

The gross α activity was calculated using the formula

$$\text{Gross } \alpha \text{ activity} = \frac{\text{Net counts}}{T} \times \frac{100}{\text{Efficiency of the counter}} \times \frac{1}{W} \text{ Bq}$$

Kg

The gross β activity was calculated using the formula

$$\text{Gross } \beta \text{ activity} = \frac{\text{Net counts}}{T} \times \frac{100}{\text{Efficiency of the counter}} \times \frac{1}{W} \text{ Bq}$$

Kg

RESULTS AND DISCUSSION

The radioactive content in water, sediment and fish samples were given in tables. From the results it was clear that the radioactive content of sediment sample is maximum. Its gross α activity is 1256.3Bq/Kg (Table.1) and β activity is activity is 6305.2Bq/Kg (Table.2). This is due to the presence of radioactive particles present in the sediment. The gross α activity of water sample is 0.0015Bq/l and β activity found is 0.0152Bq/l (Tables 3and 4). It has less radioactive compared to sediment and fish. For fish sample the gross α activity found is 37.0Bq/Kg (Table.5) and gross β activity is 58.1Bq/Kg (Table.6). The amount of radioactive content found in fish is very less compared to sediments. This is because as time goes on various changes have taken place during metabolism and result in direct decrease in radioactive content. The variation in the radioactive content and concentration factors depends mainly on the growth maturity of the fish.

Table. 1. Gross α activity in Sediments.

Sl. No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/kg
1	2000	15	15	37	30	1256.3
2	2000	15		23		

Table. 2. Gross β activity in Sediments

Sl. No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/kg
1	600	58	53	109	95	6305.2
2	600	47		81		

Table. 3. Gross α activity in Water.

Sl. No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/l
1	2000	15	15	19	23	0.0015
2	2000	15		27		

Table 4. Gross β activity in Water.

Sl. No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/l
1	600	58	53	92	88	0.0152
2	600	47		84		

Table 5. Gross α activity in Fish.

Sl. No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/kg
1	2000	9	9	21	19	37.0
2	2000	9		17		

Table 6. Gross β activity in Fish.

Sl.No	Period of Counting in seconds	Back ground Counts	Average Back Ground	Sample counts	Average sample Counts	Gross α activity Bq/kg
1	600	56	60	64	70	58.1
2	600	63		76		

CONCLUSION

The investigations carried out in water, sediment and fish samples leads the conclusion that the radioactive content detected in water is only in trace amounts. High radiation is observed in sediments due to the presence of monazite, an ore of Thorium present in the sediments. Various investigations undergone in cold countries like UK and Europe revealed that the cultivated pond fishes consume only little water and so the intake of radioactive content through water is very much decreased. As radiation is harmful to human life, it is advisable to take steps to reduce the radiation level. The use of certain materials may help to decrease the genotoxicity created by radiation [5]. Recently carotenoids have been used specially for decreasing the effect of radiation in many studies [6], [7]. The external radiation fields can be reduced, if the monazite content in the soil is removed by soil separation. This work enhances further extension to create awareness of radiation among the people living in Puthoor area. We live in natural radioactive world we cannot avoid radiation, but minimize the radiation

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