

**Universiti Teknologi MARA**

**A CASE STUDY OF RADIATION LEVEL  
AND NATURAL RADIONUCLIDE  
CONCENTRATION IN VARIOUS SOIL  
TYPES OF BACHOK DISTRICT,  
KELANTAN DARUL NAIM**

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## ABSTRACT

This research project was conducted on a 25.76-km<sup>2</sup> land area in Bachok District, Kelantan. Forty nine soil samples were taken and brought to the Malaysian Institute for Nuclear Technology Research (MINT) laboratory to be analysed for Ra-228, Ra-226, and K-40 activity concentrations. Three or more soil samples were taken from each soil series. Radiation dose at each sampling point was also measured. Radionuclide concentration measurements were carried out using shielded germanium semiconductor detector of high resolution connected to gamma spectrometer. Radiation dose measurements were carried out using radiation dose digital ratemeter detector. Coordinates of sampling points from the field were used in mapping both radiation dose contour and radionuclide concentration contour map. These were done by using block kriging method in GS+ and MapInfo Professional 6.0 computer program as the tools. Correlations between radiation doses and radionuclide activity concentrations with soil characteristics were carried out by using SAS computer program. Regression analysis was carried out by using Excel programmes. It was found that K-40, Ra-228 and Ra-226 mean activity concentrations were at 357.6, 62.9 and 46.5 Bq kg<sup>-1</sup> respectively. Soils with higher clay and silt contents had a higher activity concentration of Ra-226. Soils with a higher sand contents had a lower activity concentration of Ra-226. Soils with higher clay and silt contents had a higher activity concentration of Ra-228. Soils with a higher sand contents had a lower activity concentration of Ra-228. Potassium-40 activity concentration showed no correlation with the percentage of clay, silt and sand. The K-40 may have come from either marine sand or from the fertilizers.

## **CHAPTER 1**

### **INTRODUCTION**

In order to know the correlation between the concentration of radionuclides and soil types of Bachok District, Kelantan, a research project entitled ‘A Case Study of Radiation Level and Natural Radionuclide Concentration in Various Soil Types of Bachok District, Kelantan Darul Naim’ was carried out. This research was conducted in a selected area of Bachok District. The selected area has three soil types *i.e.* Beach Ridges Interspersed Soils (BRIS), alluvium soils and inland soils. The study was carried out in collaboration with The Malaysian Institute of Nuclear Technology (MINT).

#### **1.1 Problem Statement**

To date, there has been no study to obtain data showing radiation dose levels and radionuclide activity concentrations in Bachok District, Kelantan. The correlation between radionuclide activity concentration with the content of clay, silt and sand in soil of the study area has also not been studied.

#### **1.2 Significance of Research**

This study is important to establish a baseline levels of radiation and radioactivity in the area. The baseline can be used as a reference for future contamination of natural radionuclides in the area resulted from activities involving application or processing of