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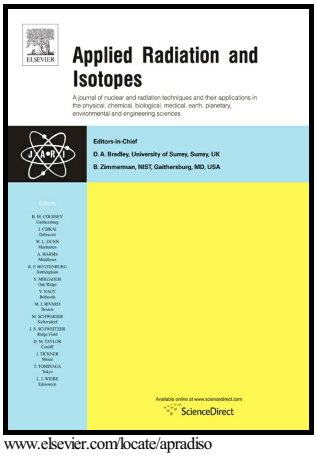

www.elsevier.com/locate/apradiso

PII: S0969-8043(17)30038-6
DOI: http://dx.doi.org/10.1016/j.apradiso.2017.07.059
Reference: ARI8011

To appear in: *Applied Radiation and Isotopes*

Received date: 13 January 2017
Revised date: 24 June 2017
Accepted date: 31 July 2017

Cite this article as: E. Gören, Ş. Turhan, A. Kurnaz, A.M.K. Garad, C. Duran F.A. Uğur and Z. Yeğingil, Environmental evaluation of natural radioactivity ir soil near a lignite-burning power plant in Turkey, *Applied Radiation an Isotopes,* http://dx.doi.org/10.1016/j.apradiso.2017.07.059

Environmental evaluation of natural radioactivity in soil near a lignite-burning power plant in Turkey

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Abstract

Natural radionuclides are released into the environment together with fly ash from the coal-burning power plant and cause an increase in the natural radioactivity in environmental samples. The study concerns to the evaluation the influence of Kangal lignite-burning power plant (LBPP) with a power of 457 MWe, which has been in operation since 1989, on natural radionuclide a concentration in surface soil samples around it. Activity concentrations of natural radionuclides (^{226}Ra, ^{232}Th, ^{40}K and ^{222}Rn) in the soil samples, and emanation coefficient (EC) and mass (ER_M) and surface (ER_S) exhalation rate of radon were determined by using a gamma-ray spectrometer with an HPGe detector. The average values of ^{226}Ra, ^{232}Th, ^{40}K and ^{222}Rn, EC, ER_M and ER_S were found as 37±5, 17±3, 222±30 Bq kg^{-1} and 9±1 kBq m^{-3}, 12%, 12.1 µBq kg^{-1} s^{-1} and 7.1 mBq m^{-2} s^{-1}, respectively. Absorbed gamma dose rate in outdoor air and the corresponding effective dose rate from external exposure and excess lifetime cancer risk were estimated to evaluate radiological hazards for human population. The results revealed that the Kangal LBPP has caused a small increment in ^{226}Ra concentration in the studied area. No influence was observed for ^{232}Th and ^{40}K.

Keywords: Soil; Coal-fired power plant; Environmental radioactivity; Emanation coefficient; Radon mass exhalation rate; Radon surface exhalation rate; Effective dose

1. Introduction

Coal plays an important role in the generation of electricity in Turkey because it is an essential domestic source (Turhan et al., 2010). In Turkey, as of the end of 2016, the