Measurement of radioactivity of $^{238}$U, $^{232}$Th, $^{40}$K and $^{137}$Cs and their transfer factor from soil to tea leaf collected from Udalia tea estate, Fatickchari in Chittagong, Bangladesh

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ABSTRACT: The measurement of radioactivity in soil of tea garden was carried out by using high purity germanium (HPGe) detector available at the Radioactivity Testing and Monitoring Laboratory of Bangladesh Atomic Energy Commission, Chittagong, Bangladesh. The activity concentrations of $^{238}$U, $^{232}$Th, $^{40}$K and $^{137}$Cs were measured collected from five locations of the garden at a depth up to 20 cm from the surface and tea leaf sample of the garden. The measurements showed that primordial radionuclides of $^{238}$U and $^{232}$Th decay chains and $^{40}$K are contained in all soil and tea leaf samples but anthropogenic $^{137}$Cs was not present in all samples. The activity concentrations of $^{238}$U, $^{232}$Th, $^{40}$K and $^{137}$Cs of the soil samples varied from $26.78\pm7.34$ to $52.49\pm8.42$ Bq.kg$^{-1}$, $35.71\pm10.71$ to $72.22\pm11.06$ Bq.kg$^{-1}$, $201\pm78.07$ to $672.45\pm80.55$ Bq.kg$^{-1}$ and $<0.4$ to $9.76\pm0.76$ Bq.kg$^{-1}$ with the average values of $38.75\pm7.75$ Bq.kg$^{-1}$, $57.43\pm10.71$ Bq.kg$^{-1}$, $383.71\pm78.58$ Bq.kg$^{-1}$ and $2.84\pm0.27$ Bq.kg$^{-1}$ respectively and measured average activity concentrations of $^{238}$U, $^{232}$Th, and $^{40}$K in the tea leaf samples was found $4.53\pm0.62$ Bq.kg$^{-1}$, $4.31\pm0.578$ Bq.kg$^{-1}$, $178.032\pm27.71$ Bq.kg$^{-1}$ and varied from $3.6\pm0.576$ to $5.66\pm0.60$ Bq.kg$^{-1}$, $2.39\pm10.08$ to $5.8\pm10.13$ Bq.kg$^{-1}$ $132.21\pm25.11$ to $257.56\pm28.78$ Bq.kg$^{-1}$ respectively. The average Transfer Factor (TF) of $^{238}$U, $^{232}$Th, and $^{40}$K was measured $0.12\pm0.08$, $0.08\pm0.05$ and $0.46\pm0.35$ respectively. Although the anthropogenic radionuclide $^{137}$Cs has not been detected in any Tea sample so the Transfer Factor (TF) of $^{137}$Cs in the study area has not been obtained.

Keywords: Transfer Factor (TF), Radionuclide, Natural, Anthropogenic, HPGe Detector, Tea Leaf, Soil.