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Baseline background radiation dose and risk assessment study due to natural radionuclides in the edible biota of Domiasiat, Meghalaya

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A radiation dose and risk assessment exercise was carried out for the edible biota, Garra lamta, Brassica compestris var. dichotoma, Oryza sativa var. Shalum1 and Zea mays due to the naturally available radionuclide ^{40}K , ^{238}U and ^{232}Th in Domiasiat ecosystem of Meghalaya, India. A detailed morph-physiological study of biota and the eco-geo-physiographical study of ecosystem had been carried out prior to the dose -risk assessment. The activity in biota and the corresponding soil and water sample was measured for the 12 months by precipitation method using NaI detector. The total activity of water was 0.3447 BqL⁻¹ by the precipitation method using the 34.2% detector limit and 3000 second counting time having detection limit of 0.03 BqL⁻¹. The foremost point source dose distribution (source↔target) method and the recently developed FASSET were investigated in details. Garra lamta was modeled using the former method whilst others uses FASSET and was concluded that deviation amongst two was negligible. The obtained transfer factor (TF) was Oryza spp. ($1.00\text{E}-01$ - ^{40}K , $8.76\text{E}-05$ - ^{232}Th , and $9.11\text{E}-05$ - ^{238}U), for Brassica spp. ($5.39\text{E}-01$ - ^{40}K , $8.17\text{E}-04$ ^{232}Th and $2.96\text{E}-04$ ^{238}U) and for Zea spp. ($3.41\text{E}-01$ - ^{40}K , $5.84\text{E}-05$ - ^{232}Th and $8.87\text{E}-05$ - ^{238}U) of each radionuclide respectively. The obtained total dose was $1.58\text{E}-04$ in Oryza spp., $2.87\text{E}-04$ in Brassica spp. and $6.90\text{E}-03\mu\text{Gy h}^{-1}$ in Zea spp. and in Garra lamta $0.0199\mu\text{Gy h}^{-1}$ finally compared with IAEA and UNSCEAR dataset for the screening level dose for the fish (0.022-0.065) ,flora (0.1-1.0 mGy d⁻¹) of fresh water and forest ecosystem respectively. Zea spp. was found comparatively more susceptible for chronic radiation exposure.

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