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## Absorption dose distribution pattern and radiological risk assessment in sediments of Miankaleh international wetland, north of Iran

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### Abstract

In this study, the specific activity of natural and artificial radioactive elements was measured for 50 sediment samples collected from throughout Miankaleh wetland in northern Iran on the southeastern side of the Caspian Sea using a High-Purity Germanium detector. Also, radiological parameters and hazard indicators due to environmental gamma radiation caused by these nuclei were calculated and a distribution map of Radium equivalent activity and absorbed Dose for the whole Miankaleh wetland was drawn using GIS software. The mean specific activity of  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ ,  $^{40}\text{K}$  and  $^{137}\text{Cs}$  respectively were  $16.06 \pm 1.65$ ,  $21.19 \pm 1.46$ ,  $312.37 \pm 8.17$  and  $4.81 \pm 0.27 \text{ Bqkg}^{-1}$  that for natural radioactive nuclei are less than the global average. The highest concentration of  $^{226}\text{Ra}$  is related to the sediments of the estuary of the Galouga River. The results show rapid deposition of  $^{232}\text{Th}$  immediately after entering the lagoon. The highest concentrations of  $^{40}\text{K}$  and  $^{137}\text{Cs}$  were observed in the mouth of the Gaz River and the calm part in the central area of the wetland, respectively. The mean values of  $Ra_{\text{eq}}$  and  $D$  respectively were  $70.42 \pm 4.37 \text{ Bqkg}^{-1}$  and  $32.73 \text{ nGyh}^{-1}$ , which are less than the global average. The distribution map of  $Ra_{\text{eq}}$  and  $D$  shows the high amount of these two parameters in the sediments of the southern and eastern parts of the wetland, which is due to the entry of radionuclides by the water flow of rivers of this wetland basin. In general, the amount of radioactivity expressed in terms of radium equivalent in the wetland is higher near the mouth of rivers with higher water flow. The average value for  $AEDE_{\text{out}}$ ,  $ELCR$ ,  $AGDE$ ,  $I_y$  and  $H_{\text{ex}}$  in this wetland is less than the allowable value and, in general, the results of this study show that the amount of radiation due to the radionuclides in Miankaleh wetland does not pose radiological hazards to the health of the inhabitants of this area.

**Keywords:** Miankaleh international wetland, environmental radiation, dose distribution pattern, radiological map

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