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Radioactivity Levels in Marine Algae from the Black Sea and Marmara Sea

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The accident at Tchernobyl nuclear power station on 26 April 1986 has been the subject of radionuclide contamination surveys in algae (Guven et al., 1990), fish, (Topcuoglu et al., 1988) and sediments (Buesseler et al., 1987) of the Black Sea. In this work the algae were collected from the Turkish coasts of the Black Sea in 1989 and Marmara Sea during 1981-1989 and their gamma isotopic analysis was made using γ-ray spectrometry (Canberra, S 85). The gross beta radioactivities of the samples were also measured with a gas-flow proportional counter.

Table 1

Algae	Location	date	Bq/g^{-1}, dry weight		
			^{134}Cs	^{137}Cs	^{40}K
Chaetamorpha linum	Şile	(1)	nd	0.010±0.006	1.476±0.216
C. linum	Sinop	(1)	nd	0.011±0.005	2.525±0.268
Ulva rigida	Şile	(1)	<0.005	0.011±0.006	0.749±0.210
U. rigida	Amasra	(2)	nd	0.006±0.003	0.541±0.228
U. rigida	Arakli	(2)	nd	0.007±0.004	0.537±0.230
U. lactuca	Sinop	(1)	nd	0.005	1.021±0.622
Cystoseira barbata	İğneada	(1)	<0.005	0.015±0.009	0.901±0.175
C. barbata	Beşikdüzü	(2)	<0.005	0.015±0.009	0.340±0.203
C. barbata	Çayeli	(2)	nd	0.015±0.007	0.430±0.126
C. barbata	Sarp	(2)	nd	0.007±0.003	1.579±1.379
Ceramium rubrum	Şile	(1)	nd	0.006±0.004	0.817±0.209
C. rubrum	Sinop	(1)	nd	0.012±0.007	0.906±0.301
Phyllophora nervosa	Şile	(1)	nd	0.009±0.005	0.597±0.149

Collection date: (1) Jun. 1989, (2) Jul. 1989, Counting date: Aug.-Dec.1989, Feb. 1990

The ^{137}Cs levels found in the algae samples collected from regions of the Black Sea in 1989 are given in Table 1. As can be seen, ^{137}Cs was detected in some of the samples but ^{134}Cs was only detected in Ulva rigida and Cystoseira barbata.

Table 2

Algae	Location	date	Radionuclide concentration Bq/g^{-1}, dry weight			
			^{106}Ru	^{134}Cs	^{137}Cs	^{40}K
Ulva lactuca	(1)	a) 25.9.1987 b) 1.4.1988	<0.010	<0.005	0.011±0.003	0.620±0.077
Corallina granifera	(2)	a) 10.10.1987 b) 17.10.1988	<0.010	nd	nd	0.110±0.038

Collection sites: (1) Çanakkale, (2) Gelibolu, a) Collection date, b) Counting date, nd: not detected.

Radioactivity in the algae collected from the region of the Marmara Sea is shown in Table 2. Of the algae collected from Canakkale in 1987, ^{134}Cs and ^{137}Cs activities were detected in Ulva lactuca. ^{137}Cs alone was detected in Cystoseira barbata, Padina pavonia and Ceramium rubrum collected in 1989. ^{137}Cs was also found in Codium fragile collected from Canakkale in 1983 and 1987, but not in 1989. ^{106}Ru activity was detected at the <0.010 level in U. lactuca and Corallina granifera. Total β-activities were found to be between 0.163-1.392 Bq/g.

In our earlier study of radionuclides in the algae of the Black Sea, it was found that contamination due to Tchernobyl was present and it gradually diminished until 1988 (Guven et al., 1990). Comparison of the results from the earlier work with those of the present study showed that radionuclide contamination of the algae diminished over time. The highest contamination appeared at Igneada, Inebolu-Sinop and Sarp on the coasts of the Black Sea.

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