

PRELIMINARY EXPERIMENTAL DATA ON THE UPTAKE OF SOME RADIONUCLIDES
BY BLACK SEA MACROPHYTES

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RESUME

On présente des données préliminaires sur les facteurs de concentration du ^{131}I , ^{134}Cs , ^{89}Sr , ^{59}Fe et ^{65}Zn déterminés en conditions expérimentales chez *Enteromorpha linza* et *Cystoseira barbata* du littoral roumain de la mer Noire.

ZUSAMMENFASSUNG

Vorläufige Ergebnisse über die Konzentrationsfaktoren für ^{131}I , ^{134}Cs , ^{89}Sr , ^{59}Fe und ^{65}Zn bei *Enteromorpha linza* und *Cystoseira barbata* von der rumänischen Schwarzmeerküste, unter experimentellen Bedingungen, sind angegeben.

Marine macroalgae are major components of most coastal shallow water ecosystems, although at present there appears to be a quantitative regression of these algae along the Romanian Black Sea shore (CELAN *et al.*, 1979). Due to their radioecological importance in monitoring schemes, between 1979-1981, concentration factors of some radionuclides for two Black Sea species *Enteromorpha linza* and *Cystoseira barbata* were determined under experimental conditions.

MATERIAL AND METHODS

Adult specimens of *Enteromorpha linza* - Chlorophyta and *Cystoseira barbata* - Phaeophyta (cleared of epibiosis: *Ceramium* sp., *Dermatolithon cystoseirae*) were collected at Jupiter (Mangalia) in August and November 1979, June - August 1980 and June and August 1981. The experiments were carried out in 7 l aquaria containing filtered sea water which was continuously aerated. Light intensity and temperature were monitored daily.

In 1979 ^{131}I in *C. barbata* was measured daily by means of a well-type 20026 counter with 4.2 - 4.6% efficiency. During 1980 ^{131}I and ^{134}Cs in *C. barbata* were measured directly (in the alga) in Marinelli geometry boxes by means of a VAS-968 sounder fitted with an NaI(Tl) scintillation crystal; counting efficiencies were 8% (^{131}I standard) and 9% (^{134}Cs standard) using an RFT counter model 22024.

^{89}Sr uptake was measured indirectly as loss from the water by means of a VAS-520 proportional counter and an RFT counter model 20026; the counting efficiency was 28% (^{90}Sr standard). In 1981 ^{59}Fe , ^{65}Zn and ^{89}Sr uptake by *E. Linza* and *C. barbata* were measured both directly in the algae and as loss from the water using a low background Nuclear Enterprises beta counter with an efficiency of 14%; samples were counted after 2,4,7, 14 and 21 days for *E. linza* and after 2,4,7,11 and 15 days for *C. barbata*.

For each radionuclide a concentration factor (CF) was computed; the CF was defined as dpm/g wet algae divided by dpm/g water.

RESULTS AND DISCUSSION

The first experimental results in 1979 showed the following increasing concentration of ^{131}I in the thallus of *C. barbata*: stipes > assimilatory branches I > assimilatory branches II. Furthermore, an enhanced metabolism for ^{131}I uptake in all components of the thallus during the less active vegetation period (August) as compared to the cold season (November) has been previously observed (BOLOGA and BALABAN, 1980).

With respect to the concentration ability for ^{131}I , ^{134}Cs and ^{89}Sr of *C. barbata*, the following relationship between the CF for these radionuclides was found: $\text{CF } ^{131}\text{I} > \text{CF } ^{134}\text{Cs} > \text{CF } ^{89}\text{Sr}$; the highest CF determined in 1980 was $^{131}\text{I} = 321$ (August), $^{134}\text{Cs} = 30$ (June) and $^{89}\text{Sr} = 9$ (June and August) (BOLOGA and BALABAN, in press).

For ^{59}Fe , ^{65}Zn and ^{89}Sr in 1981 the following maximum CF were found: *E. linza*, $^{59}\text{Fe} = 3,209$ (August), $^{65}\text{Zn} = 7,156$ (August) and $^{89}\text{Sr} = 73$ (June); *C. barbata*, $^{59}\text{Fe} = 218$ (August), $^{65}\text{Zn} = 2,446$ (August) and $^{89}\text{Sr} = 142$ (June).

Generally the highest CF were determined in *E. linza* between 2-7 days for ^{59}Fe and ^{65}Zn and between 7-14 days for ^{89}Sr . Maximum CF were found in *C. barbata* between 2-14 days for ^{59}Fe and ^{65}Zn and between 4-7 days for ^{89}Sr .

These preliminary data suggest the use of these two macrophytes as possible indicator organisms for radionuclide contamination of the Black Sea coastal marine environment, most notably *E. linza* for ^{59}Fe and ^{65}Zn and *C. barbata* for ^{131}I and ^{89}Sr .

REFERENCES:

- BOLOGA (A.S.), BALABAN (D.), 1980 - *Progress in fizica*, 2, Cluj-Napoca.
 BOLOGA (A.S.), BALABAN (D.), in press - *Cercet. mar. - Rech. mar.*, 14.
 CELAN (M.), BAVARU (A.), BOLOGA (A.S.), 1979 - *Cercet. mar. - Rech. mar.*, 12, 121-128.

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*"Preliminary experimental data on the uptake of some radionuclides
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Discussion

No comment.

