

Trace element analysis of the Shrimp tissue
(MA-B-3/TM-reference material)

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ABSTRACT

Instrumental neutron activation analysis method has been applied for the determination of 22 elements in the shrimp tissue biological reference material, MA-B-3/TM.

INTRODUCTION

It is well known that the marine organisms are able to concentrate in their tissues micropollutants from the surrounding sea water and therefore it is important to determine the trace element concentration in the organism, since this content may indicate heavy metal pollution of the marine environment.

This work presents our results obtained by instrumental neutron activation analysis of lyophilised Mediterranean shrimp tissue - a biological reference material labelled MA-B-3/TM.

EXPERIMENTAL

Applying the instrumental neutron activation method the concentration of 22 elements has been determined after a short and long irradiation time in 10×10^{12} - 10×10^{13} n/cm²sec flux. A 65 cm²exp3 Ge(Li) detector, (2 keV resolution), connected to a multichannel analyzer has been used for the measurements. The MA-M-2/TM mussel tissue that has been also analysed by us 3 years ago in an intercomparison run (1) has been used as a standard.

RESULTS AND DISCUSSION.

The concentration values of the elements determined are presented in the Table 1. It must be pointed out that the concentration of the most elements in shrimp tissue are much lower than in mussel tissue. Thus the concentration ratio for the macroelements Na, Cl, Ca, Mg as well as for the trace elements Br, Mn, Sc, Co, and Au are between 4:40. The Hg and As concentration in shrimp tissue is two and six times lower than in the mussel tissue, respectively. Only the major element K and the microelements Se, Cs, Zn and Sb are approximately equally distributed in both marine samples.

TABLE 1 - Elemental content in shrimp tissue
(MA-B-3/TM - reference material)
-Error in parenthesis-

Element	Concentration (ppm)
Al	37 (3)
As	2.2 (0.3)
Au	0.0019 (0.0004)
Br	16 (1)
Ca	3840 (307)
Cl	2380 (60)
Co	0.045 (0.004)
Cs	0.34 (0.05)
Cr	0.079 (0.008)
Fe	97 (4)
Hf	0.018 (0.004)
Hg	0.00036 (0.00005)
K	10700 (427)
Mg	1130 (45)
Mn	4.0 (0.2)
Na	2200 (44)
Rb	2.0 (0.2)
Sb	0.038 (0.007)
Sc	0.005 (0.001)
Se	1.5 (0.4)
Sr	23 (2)
Zn	108 (5)

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Instrumental neutron activation analysis
of two Macrophytes from the Romanian Black Sea Beach

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ABSTRACT. The macro and microelement content of the Macrophytes *Enteromorpha linza* and *Ceramium rubrum*, sampled from the beaches of Rumanian littoral zone in October 1986, has been investigated by instrumental neutron activation analysis. Totally 33 elements have been determined. Comparing these results with those obtained in 1972, concerning the same species, the elements Na, K, Fe, Mg and Cl present a lower concentration. The elements Zn, Ce and Sc present a higher content in *C. rubrum* while a lower content was found in *E. linza*.

INTRODUCTION. It is of interest to know the content of the marine algae in macro and microelements since, as it is reported, the radionuclides when enter into the sea may follow similar pathway as their stable elements. Therefore, the study of the concentration of certain elements in the same algae species, which have been studied by us 14 years ago, would be useful for studying pollution levels, (1), (2).

EXPERIMENTAL. The algae *Enteromorpha linza* and *Ceramium rubrum*, sampled from the Rumanian Black Sea beach at Mangalia, were rinsed with distilled water, dried and then grounded into a fine powder. About 100 mg of each sample were irradiated along with an equal quantity of standards, under the same conditions, in the VVRS-2 reactor in Bucharest (flux 10×10^{12} - 13 n/cm²sec). Counting have been performed by using a 65 cc Ge(Li) detector (2 keV resolution) coupled with a pulse height analyser 4096 channels.

RESULTS AND DISCUSSION. The concentration of the 33 elements determined is given in TABLE 1. By using these we can obtain ratios of the respective elemental content in the two species. Comparing these ratios with those reported previously by us we can obtain the elemental variation of the ratios in the two investigated species, during the last 14 years.

The observed ratio "*E. linza/C. rubrum*" values for the elements determined is given below, together, with those corresponding to 1972 sampling in parenthesis: Ce:0.39 (1), Co:0.32 (1.8), V:0.45 (1.1), Rb:0.70 (0.65), Sc:0.21 (1.1). The values obtained for Sc, Ce and Zn are higher in *C. rubrum* and lower in *E. linza*. The concentration level for Na, K, Fe, Mg and Cl is decreasing in both Macrophyte species. It seems that *C. rubrum* is more resistant than *E. linza* due to its higher mineralisation.

TABLE 1. Instrumental neutron activation analysis of
some Macrophytes samples on the Black Sea
Romanian shore at Mangalia, 6 October 1986

Element	<i>Enteromorpha linza</i>	<i>Ceramium rubrum</i>
Al (ppm)	5360 ± 420	1560 ± 120
As (ppm)	1.5 ± 0.4	3.4 ± 0.6
Au (ppb)	30 ± 7	27 ± 7
Ba (ppm)	185 ± 30	406 ± 80
Br (ppm)	508 ± 10	1010 ± 20
Ca (%)	14.8 ± 1.4	16.6 ± 1.2
Ce (ppm)	7.9 ± 0.6	20 ± 1
Cl (%)	3.42 ± 0.10	3.67 ± 0.11
Co (ppm)	1.9 ± 0.1	5.9 ± 0.3
Cr (ppm)	5.8 ± 0.6	33 ± 2
Cs (ppm)	0.29 ± 0.06	1.41 ± 0.15
Eu (ppm)	0.21 ± 0.04	0.45 ± 0.06
Fe (%)	0.33 ± 0.02	0.10 ± 0.06
Hf (ppm)	0.25 ± 0.04	11.7 ± 0.09
Hg (ppm)	<0.5	<0.6
I (ppm)	50 ± 10	2.75 ± 0.27
K (%)	3.79 ± 0.38	3.23 ± 0.33
La (ppm)	2.6 ± 0.1	6.4 ± 0.2
Lu (ppm)	0.04 ± 0.01	0.10 ± 0.01
Mg (%)	5.00 ± 0.83	2.03 ± 0.38
Mn (ppm)	295 ± 15	890 ± 40
Na (%)	1.66 ± 0.02	2.03 ± 0.03
Rb (ppm)	2.4 ± 0.3	3.4 ± 0.4
Sb (ppm)	0.23 ± 0.08	0.58 ± 0.16
Sc (ppm)	0.90 ± 0.02	3.61 ± 0.05
Sm (ppm)	0.47 ± 0.02	1.03 ± 0.03
Sr (ppm)	718 ± 70	738 ± 75
Tb (ppm)	0.11 ± 0.03	0.30 ± 0.09
Th (ppm)	0.75 ± 0.08	2.8 ± 0.1
U (ppm)	0.6 ± 0.3	2.8 ± 0.8
V (ppm)	9.9 ± 1.6	22 ± 3
Yb (ppm)	0.3 ± 0.1	0.7 ± 0.1
Zn (ppm)	80 ± 3	438 ± 15

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