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LIPIDS OF MACROPHYTE MARINE ALGAE.

I. FATTY-ACID AND PHOSPHOLIPID COMPOSITION

OF *Rhodophyceae*

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In recent years ever greater attention has been devoted to the lipids and fatty acids of macrophytic marine algae. This is due to the fact that red algae contain high concentrations of polyunsaturated fatty acids, particularly eicosatetraenoic and eicosapentaenoic acids, the proportion of which may reach 73%. The phospholipid content of red algae has been studied inadequately [4].

We have now investigated the fatty acid compositions (Table 1) and phospholipid compositions (Table 2) of eight species of red algae of the Black Sea belonging to the class *Rhodophyceae*.

As GLC analysis of the fatty acids isolated from total lipid extracts of the red algae showed, the main acids characteristic for these algae are eicosatetraenoic and eicosapentaenoic. The sum of these fatty acids ranged in the various species from 27.2 to 61.2%. High concentrations were also found for the 16:0 acid (18.4 to 52.1%). In the analysis of the phospholipids of the red algae it was shown, with the aid of two-dimensional micro-TLC, that the main phospholipid was phosphatidylcholine, its amount in the various species ranging from 61.6 to 77.8% (Table 2).

An unidentified lipid was identified for all the species of red algae investigated, its amount ranging from 2.7 to 10.3% of the sum of the phospholipids.

The freshly gathered algae were comminuted, and the lipids were extracted as in [5]. The total lipids and phospholipids were determined by published methods [6, 7]. The chromatographic systems given in [8] were used for separating the phospholipids.

TABLE 1. Fatty Acid Compositions of Red Algae (weight, %, GLC)

Fatty acid	<i>Chondrodasyphylla</i>	<i>Corallina granifera</i>	<i>Gelidium latifolium</i>	<i>Laurencia coronopus</i>	<i>Polysiphonia elongata</i>	<i>Callithamnion corymbosum</i>	<i>Ceramium strictum</i>	<i>Phyllophora nervosa</i>
14:0	9.7	0.5	2.1	4.2	3.3	0.7	5.6	3.9
15:0	—	0.6	—	0.9	—	—	—	1.1
16:0	27.4	18.4	24.3	31.0	29.4	25.9	52.1	41.2
16:1	14.3	2.3	4.4	5.1	10.9	3.4	5.6	7.1
16:2	0.9	0.5	—	0.5	0.7	—	0.9	—
16:4	0.6	—	—	0.7	0.5	—	—	1.0
18:0	1.4	0.9	3.2	2.2	1.6	2.2	1.6	3.2
18:1	11.8	6.6	10.1	9.3	11.3	6.0	0.8	2.1
18:2	3.2	3.4	2.3	1.7	3.0	2.6	—	1.2
18:3	2.7	3.7	2.0	0.9	1.4	3.5	1.4	0.9
18:4	0.8	1.9	0.6	0.7	—	—	—	0.7
20:4	5.8	5.1	21.5	11.6	3.4	12.3	5.9	32.5
20:5	21.4	56.1	29.5	31.2	34.5	43.4	26.1	5.1

TABLE 2. Fatty Acid Compositions of Red Algae

Class of phospholipids	Ch. dasycyphylla	C. granifera	O. latifolium	L. coronopus	P. elongata	C. corymbosum	C. strictum	Ph. nervosa
Phosphatidylglycerol	10,4	15,1	23,9	22,1	19,5	14,5	18,3	24,8
Diphosphatidylglycerol	—	0,7	—	—	—	1,3	—	—
Phosphatidylethanolamine	2,2	1,0	0,5	1,3	7,2	1,5	0,9	5,9
Phosphatidylinositol	2,8	3,1	2,2	5,7	6,4	3,2	4,2	3,8
Phosphatidylcholine	77,8	63,8	64,5	67,6	64,2	71,6	65,4	61,6
Phosphatidic acid	—	—	—	—	1,3	—	2,1	—
Unidentified polar phospholipid	6,8	10,3	8,9	3,3	2,7	7,9	9,1	3,9
Phospholipids, % of the sum of the total lipids	18,0	17,7	19,9	9,8	16,3	14,8	21,3	15,3
Total lipids, mg/g of the dry weight of the biomass	0,9	1,1	0,7	2,1	0,7	1,2	0,6	2,6

Thus, analysis of the fatty acid and phospholipid compositions of the red algae from the Black Sea has shown that the main fatty acids are the 16:0, 20:4, and 20:5 acids. The main phospholipid is phosphatidylcholine, its amount in different species of algae ranging from 61.6 to 77.8%.

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PHENOLIC COMPOSITION OF *Artemisia laciniata*

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An investigation of *Artemisia laciniata* Willd. has shown that, in contrast to wormwoods that we have studied previously [1], which are flavonoid-containing, the main components of this species are coumarin compounds.

The epigeal part of *A. laciniata* was gathered on dry slopes in Maritime Territory, Ussuri region, village of Kuchuki, in August, 1982. The raw material was extracted successively with 96% ethanol and with 70% aqueous ethanol. As a result of the chromatographic separation of the ethanolic extract on a column of silica gel, substances (I) and (II), (VI) and (VII) were obtained while on a polyamide sorbent the aqueous ethanolic extract gave (III), (IV), and (V) and additional amounts of (VI)

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