BRIEF COMMUNICATIONS

PHOSPHOLIPIDS OF MARINE ALGAE

S. V. Khotimchenko

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Marine algae form a broad and economically important group of plants the lipids of which are of practical value [1]. However, information on the composition of the polar lipids of algae in limited and contradictory [2-6]. We have investigated the composition of the phospholipids (PLs) of a number of mass species of macrophytes – representatives of the red, brown, and green seaweeds.

The macrophytes were collected in June-July in Posyet Bay, Sea of Japan. The lipids were extracted as described previously [7]. The amount of PLs was determined from the phosphorus content [9], the results are given in Table 1.

The amount of PLs in the extracts and the relative amounts of their individual classes differed appreciably not only for the different sections but also for the smaller taxons. In the red algae, the predominating PL was phosphatidylcholine (PC) – 58.5-77.8% – which distinguished this section from the others. Many species contained only trace amounts of phosphatidylethanolamine (PE). A characteristic component of the red algae was an unsaponifiable PL (X_1).

In relation to their PL content, the brown algae could be separated into two groups; in the representatives of the first group the amount of PLs was of the order of 20% of the

TABLE 1. Composition of the Phospholipids of Algae, % on the

Algae	Total lipids, mg/g crude weight	PL*	PG	PX	PE	PI†	Other
Rhodophyta							
Nemalion vermiculare	2,1	18,2	12.9	77.8	Сл.	3,6	X_1—3 1; DPG† —2 6
Tichocarpus crinitus	2,3	16,0	18 7	68,7	Сл.	2,9	X_1—9.6
Ahnfeltia tobuchiensis	4 9	15 7	23,7	58,5	9,7	4,1	X_1—4.0
Mastocarpus pasilicus	2,3	14.5	7,9	74.2	1,2	3,8	X_1—11,2; PA† —1,7
Chondrus pinnulatus	2.0	24,2	13,3	72,4	Сл.	2,6	X_1—9,4; PA—2.2
Ceramium kondoi	2,25	18,1	19.4	70 5	Сл.	3 9	X_1—6,2
Laurencia nipponica	3,9	6,9	13,6	76,7	Сл.	3,9	X_1—5.9
Phaeophyta							
Scytosiphon lomentaria	8,4	24,0	22 9	42,9	20,1	8,9	X_2—5.1
Laminaria cichorioides	7,0	18,7	25,4	40,6	13,5	10.2	X_2 5,9; PA – 4.4
Undaria pinnatifida	7 9	24 5	19,6	42,1	20.8	6,6	X_2—8,5; PA –2,4
Dictyopteris divaricata	22,0	2 6	27,1	—	46,8	14 4	X_2—11.7
Sargassum pallidum	11,0	3,6	24 7	—	33,6	9,5	X_2—7 7; X_3—4 9; DPG —5,1; PA —9,5
Pelvetia wrightii	6,8	7,7	10,5	—	50,9	8,1	X_2—15,7; X_3—3,5; PA —11,3
Chlorophyta							
Ulva fenestrata	3,6	6,5	27,4	—	21,3	18.1	PS —16,8; PA —16,1
Enteromorpha linza	1,6	7,8	40,8	—	16,7	23.0	PS —12,5; PA –6.9
Bryopsis pluinosa	4.6	21 9	38,2	37,4	12,6	9.9	PS —1,9
Codium fragile	2,0	16.0	30.1	29 3	24,2	10 7	PS—5.6
Cladophora stimpsoni	5.2	14,7	52,6	29,4	4 8	6 6	PS —6 6
Chaetomorpha moniligera	2,5	6,4	33,7	24,2	4,5	19.1	PS —8.5; PA —6.5; DPG —3.5

*% on the total lipid

†PI) Phosphatidylinositol; PA) phosphatidic acid; DPG) diphosphatidylglycerol.

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weight of the lipids, and the main component was PC. The algae of the second group contained appreciably smaller amounts of PLs and no PC were detected in them, the main PL being PE. Two PLs of unknown structure with chromatographic behavior close to that of the PC were found: X_2 – characteristic for all brown algae; X_3 – characteristic for the fucoids.

The green algae could also be separated into two group. Representatives of the first group contained not PC while those of the second contained about 30% of PC. In all the green algae the main PL was phosphatidylglycerol (PG) and only in these was phosphatidylserine (PS) detected.

Previously, the literature had contained quantitative information on the PLs of only three species of algae [3, 4, 6]. Our results substantially supplement this and permit a conclusion to be drawn that there is a well-defined link between the composition of the PLs and the systematic position of the algae.

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LACTONES OF *Artemisia argyi*

M. I. Yusupov, Sh. Z. Kasymov, G. P. Sidyakin, and É. V. Boiko

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Artemisia argyi Levl. et Vaniot. – an East Asian species from the genus *Angustilobae* Poljak., section *Artemisia* [1] – is readily distinguished from other species of the genus *Artemisia*. In the USSR, *A. argyi* is widespread in Primor'e and Priamurė, growing in dry-valley meadows along ther beds and the verges of roads, and it is possible to collect many tons of the herbage of this species. *A. argyi* is used in Chinese medicine for the treatment of intestinal diseases.

To isolate the lactones, the epigeal part of *A. argyi* collected in the late budding phase in the village of Kuguki, Ussuri region (Maritime Territory) in August 1983, was extracted with chloroform (1:5). The concentrated extract was treated with 40% ethanol. The precipitate was separated off and the filtrate was extracted with chloroform. The chloroform extract was deposited on a column of silica gel (type KSK) in a ratio of 1:20 and was eluted with benzene (fractions 1-47) and with benzene–acetone in ratios of 20:1 (fractions 48-72), 10:1 (fractions 73-78), and 5:1 (fractions 90-122). The fractions collected each had a volume of 600 ml. Fractions 49-56 of the eluates were evaporated, which led to the deposition of crystals of lactone (I) with the composition $C_{15}H_{18}O_5$. mp 226-227°C (benzene–acetone), M^+ $[\alpha]D^{20}$ −25° (c 3.96; ethanol).

The IR spectrum of (I) showed an absorption band due to a hydroxy group (3515 cm^{-1}) to a γ-lactone carbonyl (1767 cm^{-1}), and to a double bond (1667 cm^{-1}).

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR, Tashkent. Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Scientific Center, Academy of Sciences of the USSR, Vladivostok.

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