

LIPIDS OF SOFT CORAL *Sinularia* SPECIES

A. B. Imbs,¹ H. V. Luu,² and L. Q. Pham²

UDC 547.915

Lipids represent up to 25% of the dry biomass of soft coral [1], are the structural basis of biological membranes, and determine the energy balance of coral [2]. Reports of the composition of lipids from soft coral are incomplete and contradictory [3]. Lipids from soft coral of the genus *Sinularia* have not been reported. The goal of our investigation was to determine the composition of the total lipids, the composition of their fatty acids (FA), and the composition of the alkyl groups of monoalkyldiacylglycerides (MADAG) and hydrocarbons from soft coral of *Sinularia* spp.

Colonies of *Sinularia* spp. were collected in Nyachang Bay of the South China Sea. Total lipids were isolated by the literature method [4], methyl esters of fatty acids (MEFA) from total lipids, by the previous method [5]. The composition of MEFA was analyzed by GC on a Shimadzu GC-17A using a capillary quartz column (30 m × 0.25 mm) with Supelcowax 10, vaporizer and detector (FID) temperature 240°C, column temperature 205°C, and He carrier gas. FA were identified by GC—MS as MEFA or FA pyrrolidides, which were prepared from MEFA by the literature method [6]. GC—MS was performed in a Shimadzu GCMS-QP5050A GC—MS with a capillary column and HP-5MS (30 m × 0.25 mm) at 70 eV ionization energy with He carrier gas (MS database NIST 02). MEFA were analyzed under the conditions described above for Supelcowax 10. FA pyrrolidides and the hydrocarbon fraction were analyzed with programmed temperature from 100 to 300°C (5°C/min) and then 30 min at 300°C with vaporizer and detector temperature 300°C. The composition of alkyl groups of MADAG was analyzed by GC—MS as isopropylidene derivatives of monoalkylglycerides produced by alkaline hydrolysis of the corresponding MADAG.

TLC was performed on Merck Kieselgel 60 G silica-gel plates. Total lipids were separated by one-dimensional TLC using C₆H₆:Et₂O:CH₃COOH (70:30:1) with subsequent detection and densitometry as described before [7]. Neutral and polar lipids were obtained by column chromatography as before [8]. Polar lipids were separated by two-dimensional TLC using CHCl₃:CH₃OH:C₆H₆:NH₄OH (28%) (65:30:10:6) and CHCl₃:CH₃OH:CH₃COOH:CH₃COCH₃:C₆H₆:H₂O (70:30:4:5:10:1). Phospholipids were determined quantitatively by the Vaskovsky method [9].

Lipids from soft coral of *Sinularia* spp. consisted of hydrocarbons (25.7%), MADAG (25.2%), triacylglycerides (TAG, 17.2%), polar lipids (13.6%), sterols (10.0%), and free FA (5.8%). The main components of polar lipids were phosphatidylglycerine (30.7%), ceramidaminoethylphosphonate (30.6%), phosphatidylcholine (14.6%), phosphatidylserine (14.5%), and lysophosphatidylcholine (9.5%). The hydrocarbons included 1-ethenyl-1-methyl-2,4-di(methylethynyl)cyclohexane (5.6%), 7,11-dimethyl-3-methylen-1,6,10-dodecatriene (7.0%), 2-isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,7-octahydronaphthalene (41.5%), 1,8a-dimethyl-7-(1-methylethynyl)-1,2,3,5,6,7,8,8a-octahydronaphthalene (10.2%), 4a-methyl-1-methylen-7-(1-methylethynyl)-decahydronaphthalene (8.0%), C₂₀H₃₂ (13.6%), and tetradecylpalmitate (7.0%). MADAG contained mainly saturated unbranched alkyl groups C₁₆ (22.8%), C₁₈ (77.0%), and C₂₀ (0.2%). Table 1 gives the compositions of FA from total, polar, and neutral lipids in addition to TAG and MADAG. The main FA of total lipids were 16:0, 16:2n-7, 18:0, 18:1n-9, 18:2n-6, and 20:4n-6. TAG and MADAG contained the majority of saturated FA. Polar lipids were enriched in polyunsaturated acids (18:4n-3, 20:4n-6, 20:5n-3, docosa- and tetrapolyenic components). TAG and MADAG differed greatly in content of linoleic (18:2n-6) and arachidonic (20:4n-6) acids.

Sinularia spp. are typical species of tropical soft coral. The composition of hydrocarbons and alkyl groups of MADAG were analyzed and the FA compositions of the main lipid classes were compared for the first time for soft coral.

1) A. V. Zhirmunskii Institute of Marine Biology, Far-East Division, Russian Academy of Sciences, ul. Pal'chevskogo, 17, Vladivostok, 690041, Russian Federation, fax +7(4232) 31 09 00, e-mail: andreyimbs@hotmail.com; 2) Institute of the Chemistry of Natural Compounds, VANT, Hanoi, Viet Nam. Translated from *Khimiya Prirodykh Soedinenii*, No. 5, pp. 502-503, September-October, 2007. Original article submitted August 6, 2007.

TABLE 1. Fatty-Acid Composition of Lipids from Soft Coral Species *Sinularia*, % of Total

Fatty acids	Lipids			Triacylglycerides	Monoalkyldiacylglycerides
	total	neutral	polar		
14:0	2.3	1.9	2.4	1.3	1.6
16:0	47.0	38.3	24.3	47.4	42.8
16:1n-9	0.4	0.5	0.3	0.5	0.6
16:1n-7	3.0	3.8	2.1	2.6	3.0
16:2n-7	5.2	7.6	3.3	6.3	6.6
16:3n-6	1.7	2.0	6.3	1.0	1.3
16:4n-3	0.6	0.4	2.3	-	0.7
18:0	10.7	8.2	7.2	10.2	12.5
18:1n-9	4.8	5.9	3.8	7.3	4.1
18:1n-7	0.8	0.9	0.8	0.9	0.9
18:2n-9	0.6	0.8	-	0.6	0.9
18:2n-7	2.8	4.2	0.7	2.0	4.1
18:2n-6	4.0	6.2	1.9	11.5	0.9
18:3n-6	1.3	2.1	-	0.9	2.7
18:3n-3	0.5	0.8	0.6	0.9	0.4
18:4n-3	1.4	1.4	14.1	0.8	1.2
20:0	0.9	0.6	0.3	0.7	1.0
20:3n-6	0.3	0.4	0.2	-	0.7
20:4n-6	4.2	5.2	9.0	0.8	6.3
20:4n-3	0.8	1.3	0.2	0.5	1.8
20:5n-3	0.5	0.5	3.9	0.4	0.8
22:0	0.7	0.4	0.2	0.5	0.8
22:4n-6	0.1	-	0.6	-	-
22:6n-3	1.0	1.5	2.3	1.3	1.2
24:5n-6	1.7	2.0	9.5	0.1	0.2
24:6n-3	0.7	1.0	1.0	0.1	0.1

REFERENCES

1. H. Yamashiro, H. Oku, H. Higa, I. Chinen, and K. Sakai, *Comp. Biochem. Physiol. Part B: Biochem. Mol. Biol.*, **122**, 397 (1999).
2. D. P. Spencer, *Mar. Biol.*, **108**, 137 (1991).
3. A. B. Imbs, H. V. Luu, and L. Q. Pham, *Biol. Morya*, **33**, 70 (2007).
4. E. G. Bligh and W. J. Dyer, *Can. J. Biochem. Physiol.*, **37**, 911 (1959).
5. J. P. Carreau and J. P. Dubacq, *J. Chromatogr.*, **151**, 384 (1979).
6. B. A. Andersson, *Prog. Chem. Fats Other Lipids*, **16**, 279 (1978).
7. A. B. Imbs, O. A. Demina, and D. A. Demidkova, *Lipids*, **41**, 721 (2006).
8. G. Rouser, G. Kritchevsky, and A. Yamamoto, *Lipid Chromatographic Analysis*, Dekker, New York (1976), Vol. 3, pp. 713-776.
9. V. E. Vaskovsky, E. Y. Kostetsky, and I. M. Vasendin, *J. Chromatogr.*, **114**, 129 (1975).