タコイカの胃内容物脂質に存在するワックスエステル

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Short Paper

Wax Esters in the Stomach Content Lipids of Gonatid Squid *Gonatopsis borealis*

Kenji Hayashi*

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Recently, it has been shown that three species of gonatid squids *Berryteuthis magister*,[1,2] *Gonatopsis makko*[1] and *G. borealis*[3] contained unusually high amounts of glyceryl ethers (GE) in the form of diacyl glyceryl ethers (DAGE) in the liver. However, it is not known if these compouds in squids are accumulated from dietary sources. On the other hand, it has been reported that fatty alcohols are important precursors in the biosynthesis of the alkyl chain of DAGE.[4,5] Interestingly, no fatty alcohols were detected in the liver lipids of *B. magister*[2] previously studied, but lipids of stomach contents contained a particularly high level of wax esters. Subsequently, it was found that the lipids of *G. Borealis* stomach contents contained large amounts of wax esters with trace amounts of DAGE. The present work was conducted to determine the components of fatty alcohols in connection with those of GE of *G. borealis*.

G. borealis stomach contents and livers from 19 or 25 specimens were used in this study. Extraction of tissue lipids, quantitative determination of the constituent lipids by the thin-layer chromatography (TLC)-flame ionization detector method, fractionation of fatty alcohols and GE from the unsaponifiable materials of tissue lipids by TLC, preparation of acetates of fatty alcohols and isopropylidene derivatives of GE, and the determination of the above compounds by gas-liquid chromatography, were performed as described in a previous report.[2] The components of the above compounds were identified by comparison with available known standards as well as from semilogarithmic plots of the retention times against the carbon numbers with different degrees of double bonds.

The compositions of lipid class and fatty alcohols of the stomach contents and livers of *G. borealis* are given in Table 1. Also included in Table 1 is the composition of GE of the livers. As shown in Table 1, stomach content lipids were characterized by a high level of wax esters (30.2%), comprised mainly of 16:0 and 22:1 alcohols. DAGE were also observed in the stomach content lipids only in trace quantities but in significant quantities in the liver lipids. On the other hand, fatty alcohols, consisting mainly of 22:1, 16:0, 20:1 and 24:1 alcohols, were detected only in extremely small amounts of less than 0.1% in the unsaponifiable fraction of liver lipids of this species. Therefore, it is possible that a part of GE present in *G. borealis* liver lipids was derived biosynthetically from corresponding fatty alcohols of wax esters found in foods digested by the squids. This caused the residual fatty alcohols in the liver lipid unsaponifiable fraction to have elevated amounts of 20:1, 22:1 and 24:1 alcohols. In conclusion, it is postulated that the alkyl moieties of DAGE found in unusually high concentrations in the gonatid squids are probably biosynthesized from their corresponding external and/or internal fatty alcohols and not the result of direct accumulation from dietary sources.

Table 1. Composition of lipid classes, fatty alcohols and glyceryl ethers of stomach contents and livers of *G. borealis*

	Stomach content	Liver	
Lipid content %*1	6.3	26.5	
Lipid component %*2			
WE	30.2		
DAGE	tr*3	16.3	
TG	54.1	33.0	
Unsaponifiable component %*4			
FA	87.2	0.1	
ST	8.0	57.1	
GE	1.0	39.2	
	FA*5	FA*6	GE*6
Component*7	Peak area %		
14:0	5.8	3.5	5.6
16:0	43.7	16.1	43.3
18:0	4.0	1.7	3.7
16:1	2.4	1.7	9.2
18:1	7.2	3.7	13.8
20:1	8.0	14.9	13.6
22:1	20.2	44.8	3.3
24:1	3.8	9.3	

*1 % to wet weight basis of tissue.
*2 % to total lipids.
*3 Trace.
*4 % to unsaponifiable materials.
*5 Obtained from wax esters.
*6 Obtained from unsaponifiable materials.
*7 Indicated by chain length and double bond of fatty alcohols or alkyl moiety of glyceryl ethers.
WE; Wax ester, DAGE; Diacyl glyceryl ether, TG; Triglyceride, FA; Fatty alcohol, ST; Sterol, GE; Glyceryl ether.

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* Faculty of Fisheries, Hokkaido University, Hakodate, Hokkaido 041, Japan (林 賢治: 北海道大学水産学部).