

Compositional analysis of fatty acids in food samples by THM-GC/MS

Part 2: Comparison of fatty acid composition ratios obtained by conventional and new methods

[Background] In the previous note (PYA1-170E), DHA (C_{22:6}) isomerization could be successfully suppressed when 3-(trifluoromethyl)phenyltrimethylammonium hydroxide (*m*-TFPTAH) was used as an esterification reagent in thermally assisted hydrolysis and methylation (THM)-GC/MS of algal oil under the conditions of the 30 min reaction time at room temperature. In this study, both *m*-TFPTAH and a conventional boron trifluoride (BF₃)-methanol were used as reagents, algae oil and canola oil were analyzed as food samples by THM-GC/MS, and the obtained fatty acid composition ratios were compared with each other.

[Experimental] 3 μL of a hexane solution of each oil (2 μg/μL) was put in a sample cup, followed by addition of 5 μL of a methanolic solution of *m*-TFPTAH (5 wt%). The sample cup was kept at room temperature for 30 min, followed by GC/MS analysis.

[Results] Chromatograms of algae and canola oils after esterification with *m*-TFPTAH are respectively shown in Figs. 1 and 2. Fatty acid composition ratios of both oils, obtained after esterification with *m*-TFPTAH or BF₃, are summarized in Tables 1 and 2, together with RSD value of peak areas when *m*-TFPTAH was used. For both oils, composition ratios obtained by the *m*-TFPTAH method are almost the same as those obtained by the conventional BF₃ method, reflecting the suppressed isomerization of fatty acids during the esterification with *m*-TFPTAH. In addition, the reproducibility was also found to be good. In conclusion, the analytical method described in this note enabled the determination of fatty acid composition in food samples with good reproducibility.

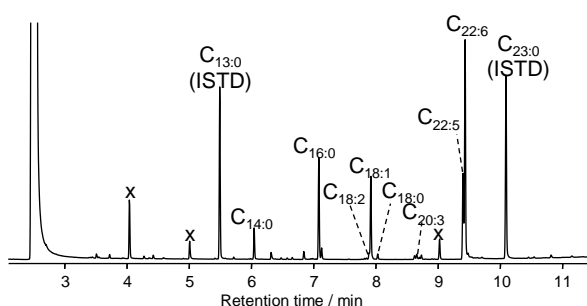


Fig. 1 Chromatogram of algae oil

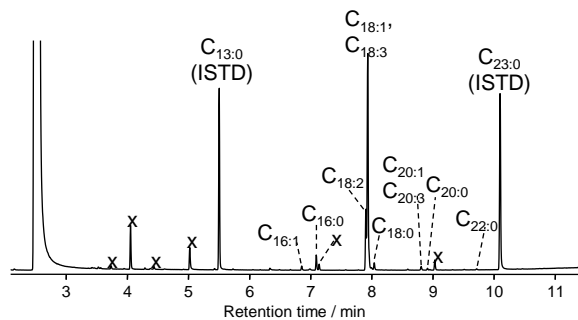


Fig. 2 Chromatogram of canola oil

Furnace temp.: 400 °C, Furnace-GC interface temp.: 280 °C, GC inj. temp.: 250 °C, Separation column: UA⁺-5 (L=15 m, i.d.=0.25 mm, df=0.25 μm), Column flow: 1.0 mL/min (He), Sample amount: 6 μg, Reagent: *m*-TFPTAH 5 wt% methanol solution 5 μL, RT reaction time: 30 min.

 Table 1 Composition ratios of fatty acids esterified either by *m*-TFPTAH or BF₃ in algae oil.

Fatty acids	<i>m</i> -TFPTAH		BF ₃
	Ave. (n=3)	RSD %	
C _{14:0}	5.59	3.95	6.58
C _{16:0}	17.96	1.61	18.67
C _{18:0}	0.94	11.58	0.92
C _{18:1 + 18:2 + 18:3}	16.72	0.88	17.30
C _{22:5 + 22:6}	58.79	0.53	56.53
Total	100.00		100.00

 Table 2 Composition ratios of fatty acids esterified either by *m*-TFPTAH or BF₃ in canola oil.

Fatty acids	<i>m</i> -TFPTAH		BF ₃
	Ave. (n=3)	RSD %	
C _{16:1}	0.68	9.47	1.03
C _{16:0}	4.48	1.42	4.74
C _{18:2}	17.56	2.08	17.61
C _{18:1+18:3}	72.65	0.30	72.00
C _{18:0}	2.42	3.06	2.26
C _{20:1+20:3}	1.27	1.96	1.40
C _{20:0}	0.58	8.20	0.68
C _{22:0}	0.36	5.57	0.28
Total	100.00		100.00

(C_{m,n}: m is the number of carbons; n is the number of unsaturated bonds)

Keywords : Oil and fat, Edible oil, Compositional analysis, fatty acid, thermally assisted hydrolysis and methylation

Products used : Multi-functional pyrolyzer, Vent-free GC/MS adapter, UA⁺-5, Eco-Cup LF

Applications : Food analysis, Lipid analysis, Quality control (QC)

Related technical notes : PYA1-170E (Part 1), PYA2-023E, PYA2-030E

Please forward your inquiries via our web page or send us a fax message.

R&D and manufactured by :
Frontier Laboratories Ltd.

Phone: (81)24-935-5100 Fax: (81)24-935-5102
www.frontier-lab.com