

# Analysis of Fatty Acids in Fish Oil Supplements using SCION GC-FID

AN176; SCION Instruments, V.2

## Introduction

The purpose of this study is to determine the Fatty Acid content in Fish Oil using a SCION Instruments 8500 GC with PTV injector, FID and specialist FAME column.

The analysis of Fatty Acids in Fish Oil is a critical application for the food and health industries. Accurate determination of Fatty Acids is vital for quality control and authenticity of products containing Fatty Acids/ Omegas. There has been a growing demand for the analysis of oils, fats and fat containing food products especially surrounding the edible oils market.

The SCION FAME column is specifically designed for the analysis of complex FAME patterns including the separation and identification of cis/trans isomers, specifically those of C18:1.

The SCION 456 GC was used to accurately separate, identify and quantify Fatty Acids from C4 to C24:1. With enhanced resolution, target Fatty Acids were detectable down to 0.05%.

In July 2020, The Global Organisation for EPA and DHA Omega-3 Fatty Acids (GOED) have specified the SCION 8300/8500 with PTV injector and FID detector as the recommended instrumentation for achieving optimal results for Fatty Acids in Fish Oils. Near 100% recovery has been achieved using the SCION 8300/8500 GC, which eliminates inter-laboratory variability

## Experimental

Experimental conditions for the Fatty Acid analysis can be found in Table 1.

**Table 1** Analytical method parameters

Part	Settings
Autosampler	SCION 8400 PRO
PTV Injector	250°C Split ratio 10:1
Injection Volume	2 µL
Column	SCION Select FAME 100m x 0.25mm x 0.25µm (P/N SC37301)
Carrier Gas	Hydrogen, 1.1mL/min
Oven Program	80°C (3 mins), 20°C/min to 160°C (4 mins), 0.6°C/min to 176°C (26.7 mins), 5°C/min to 233°C (11.4 mins)
Detector	FID (ceramic jet) 260°C, Air : 300 mL/min, Hydrogen : 30 mL/min, Make up (N <sub>2</sub> ): 30 mL/min
Run Time	7.5 min
Software	Compass CDS

## Results

A calibration standard containing Fatty Acids C4 to C24:1 was analysed to determine the retention time of each Fatty Acid. A Pharmaceutical Grade Fish Oil Supplement was analysed with qualitative and quantitative data analysis performed. A total of 43 Fatty Acids were detected in the sample.

Table 2 shows a summary report of Omega types detected as the associate mole percentages.

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**Table 2** Summary report of Omega composition

Summary	
<b>Fatty Acids Detected</b>	<b>43</b>
<b>Omega Type</b>	<b>Mole Percent</b>
Omega-3	26.97
Omega-6	3.63
Omega-9	16.76
<b>EPA:DHA Ratio</b>	<b>3:2</b>
<b>Fatty Acid Type</b>	<b>Mole Percent</b>
Saturated	29.78
MUFA	37.18
PUFA	31.15
Branched	0.80
Trans	1.09

Upon the recommendation of the GOED, system repeatability and reproducibility of Fatty Acids in Fish Oils was tested using eight different GC instruments in four different laboratories. A total of 56 injections were made with six different laboratory operators. A GLC-68D standard mixture at 100µg/mL was used for each test. The results are shown in Table 3.

The tests were performed on a SCION-WAX 25m x 0.25mm x 0.20µm column. The recovery requirements for the Fatty Acids is 95-105%.

**Table 3** Repeatability and reproducibility testing of GLC-68D Fatty Acid mixture

	EPA(%)	RSD(%)	DHA(%)	RSD(%)	n=
<b>Average of 3 GC's Lab 1 + Lab 2</b>	10.28	0.35	12.30	0.35	6 x 3
<b>GC 1 / Lab 3</b>	10.19	0.23	12.31	0.23	10
<b>GC 2 / Lab 3</b>	10.21	0.20	12.26	0.46	3
<b>GC 3 Rapid FAME / Lab 3</b>	10.18	0.45	12.32	0.84	9
<b>GC 1 / Lab 4</b>	10.22	0.13	12.29	0.21	10
<b>GC 2 / Lab 4</b>	10.21	0.12	12.27	0.18	6
<b>Average</b>	10.21		12.29		
<b>Std. Dev</b>	0.03		0.02		
<b>RSD %</b>	0.34		0.20		

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## Conclusions

The SCION Instrument 8300 and 8500 GC's are the recommended instruments for Fatty Acid analysis in Edible Oils, including Fish Oil supplements. Enhanced resolution for complicated samples can be achieved using the SCION Select FAME column. Excellent repeatability, reproducibility and recovery were observed through proficiency testing using SCION 8300/8500 GC's in four different laboratories and eight different systems.

## Acknowledgements

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MIDI.Inc who provided the qualitative and quantitative data.

## Ordering Information

Ordering Information for the 8300 GC	
Part	Part Number
8300-GC, with S/SL inlet and FID detector (120V)	839001701
8300-GC with S/SL inlet and FID detector (230V)	839001702
8400 PRO Autosampler for 8300 and 8500 GC	840000001
Suggested Consumables	
Part	Part Number
15% Graphite/85% Vespel Ferrule 1/16" with 0.4 mm hole pk/10	41312148
BTO Septa 9 mm, pk/50	CR298713
10 µL fixed needle syringe, 5 cm, 0.47 mm OD, 26 g conical needle	41312133
Vial, 9-425 Screw Thread, 2 mL Clear Glass 12 x 32 mm Flat Base with Label, pk/100	41311000
SCION Select FAME 100m x 0.25mm x 0.25µm (P/N SC37301)	SC37301

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