

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

AN176; SCION Instruments, V.3

## 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 SCION WAX 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.

Depending on your application a variety of columns can be suitable for FAME analysis as shown in this application note using SCION WAX 25 m x 0.25 mm x 0.2 µm column. The SCION FAME 100 m x 0.25 mm x 0.2 µm 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 8500 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 2020, The Global Organisation for EPA and DHA Omega-3 Fatty Acids (GOED) specified the SCION Instruments 436-GC with PTV and FID detector as the recommended equipment for getting optimal results for analysis of fatty acids.<sup>1</sup> The 8300 GC is the next generation 436 instrument, delivering the same excellent performance. Near 100% recovery was achieved using the SCION 436-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 WAX 25 m x 0.25 mm x 0.20 µm
Carrier Gas	Hydrogen, 1.1mL/min
Oven Program	90°C (hold 2 mins), 30°C/min to 170°C, 3°C/min to 240°C hold 2 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	30 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.

## APPLICATION NOTE

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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

**Table 3** Intra-laboratory results for 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

**Table 4** Inter-laboratory results for repeatability and reproducibility testing of GLC-68D Fatty Acid mixture

	EPA(%)	DHA(%)
<b>Average of 3 GC's Lab 1 + Lab 2</b>	10.28	12.30
<b>GC 1 / Lab 3</b>	10.19	12.31
<b>GC 2 / Lab 3</b>	10.21	12.26
<b>GC 3 Rapid FAME / Lab 3</b>	10.18	12.32
<b>GC 1 / Lab 4</b>	10.22	12.29
<b>GC 2 / Lab 4</b>	10.21	12.27
<b>Average</b>	10.21	12.29
<b>Std. Dev</b>	0.03	0.02
<b>RSD %</b>	0.34	0.20

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 and 4.

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

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## Conclusions

The Global Organisation for EPA and DHA Omega-3 Fatty Acids (GOED) specified the SCION Instruments 436-GC with PTV and FID detector as the recommended equipment for getting optimal results for analysis of fatty acids. The SCION Instrument 8300 and 8500 GC's are the new generation instruments which show the same great performance for fatty acid analysis in edible oils, including fish oil supplements. Enhanced resolution for complicated samples can be achieved using the SCION WAX column. Excellent repeatability, reproducibility and recovery were observed through proficiency testing using in four different laboratories on eight different systems.

## Acknowledgements

Terje Aasoldsen, SAMSI Analytical Application Services, based in Norway, who provided the data and all of their expertise in this application field.

MIDI.Inc who provided the qualitative and quantitative data.

## References

1. Goedomega3,  
<https://goedomega3.com/storage/app/media/technical%20reports/TGD%202020%2006%2029.pdf>, (date accessed 23 April 25).

## Ordering Information

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 WAX column 25 m x 0.25 mm x 0.25 µm	SC32780
SCION FAME column 100 m x 0.25 mm x 0.25 µm	SC37301

For ordering info on the SCION 8300 and 8500 GC, which offers greater functionality with the option of up to 4 detectors (including MS), please contact your local SCION sales representative.

For more information, please contact:

E: [sales-eu@scioninstruments.com](mailto:sales-eu@scioninstruments.com)

W: [www.scioninstruments.com](http://www.scioninstruments.com)