



JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FATS AND OILS

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PROPOSED DRAFT STANDARD FOR FISH OILS

REPLIES TO CL 2015/05-FO Part B, Point 4

CANADA

General Comments:

1. Request for additional information on the fatty acid profiles of anchovy and krill oils:

Canada recognizes the importance of having a robust standard for fish oil which takes into consideration data from various sources to reflect variations due to species, climate, geographical location, etc. and, at the same time, provide a means to safeguard against fraudulent practices. In support of this principle, Canada is pleased to submit analytical data on krill oil, contained in a document attached to this submission, for consideration in the setting of quality parameters for krill oil in the Draft Codex Standard for Fish Oils. This includes analytical data on fatty acid composition and other quality parameters of krill oil. Information has been submitted by a Canadian industry stakeholder based on analytical test results of 119 batches from commercial trade between 2010 and 2016. Additional information on krill species, geographic location as well as the harvest season is also included.

2. Comments on the request for proposals for alternative texts in Section 7.3 "Other Labelling Requirements"

With respect to the two options in square brackets that are presented in the draft standard for declaring vitamin nutrients in fish oils and fish liver oils, Canada supports retaining the second option for mandatory labelling of vitamin A and D in fish liver oil, naturally present or restored, where this is required by country of retail sale. Canada also supports using the term "may" when providing the content of EPA/DHA for fish oils covered by this standard.

~~[For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D shall be given.~~

Or

For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D, naturally present or restored, shall be given if required by country of retail sale.]

The content of EPA and DHA ~~shall~~ may] be given for all fish oils covered by this Standard.

(See Appendix for the Analytical Data on Krill Oil)

EUROPEAN UNION

Proposals for alternative texts of Section 7.3 "Other labelling requirements":

The EU supports that the content of vitamin A and D **shall** be given on the labelling of fish liver oil food supplements.

The EU believes that the names of the categories of nutrients or substances that characterise the product are important and essential information for consumers. Consumers often buy these supplements solely for their vitamin and minerals' content. Therefore, the amount of the nutrients or substances with a nutritional or physiological effect present in the product shall be declared. Both the presence and the amount of vitamins A and D in fish liver oil supplements should be labelled.

The EU also supports that the content of EPA and DHA **shall** be given on the labelling of fish liver oil food supplements for the same reasons as for vitamins A and D.

JAPAN

7.3 Other labelling requirement

Proposed text:

For fish liver oils (Section 2.3 and 2.4) **except shark liver oils** the content in vitamin A and vitamin D shall be given.

The content of EPA and DHA ~~{shall/may}~~ be given for all fish oils covered by this Standard **except shark liver oils**.

Rationale:

It is not necessary to give content in vitamin A, vitamin E, EPA and DHA for shark liver oils because shark liver oils generally do not contain these substances. If it is indicated as "0", it will give a negative image of the product and mislead consumers.

NORWAY

(i) General Comments

We support the document and the joint effort to develop a common standard on this subject.

(ii) Specific Comments

SECTION 2.1.3 KRILL OIL

Please see the additional information on krill oil attached (**see appendix**). In the attachment, the first sheet gives the fatty acid composition of 16 new batches of krill oil from 2015/2016. The second sheet gives the quality parameters in these 16 batches. In the third sheet we have listed max/min values for the 16 batches, the draft Codex values for krill oil, the United States Pharmacopeia – National Formulary (USP-NF) values for comparison, and our proposal for revised Codex values, with a rationale. The changes we propose are marked with bold numbers in sheet number three in the attachment.

SECTION 5 CONTAMINANTS

We would like to emphasize that we consider it important that CCCF, as soon as the fish oil standard is finalized, consider whether it is appropriate that the ML for arsenic in fish oils apply to total arsenic or to only inorganic arsenic. The inorganic arsenic is considered far more toxic than the organic arsenic, and it is the organic arsenic which is mainly found in seafood.

SECTION 7.3 OTHER LABELLING REQUIREMENTS

~~{For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D shall be given.~~

~~or~~

~~For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D, naturally present or restored, shall be given if required by country of retail sale.~~

The content of EPA and DHA ~~{shall/may}~~ be given for all fish oils covered by this Standard.

Rationale: Cod liver oil is the most traditional fish oil that has been on the market for more than hundred years and the natural content of vitamins is the main characteristic for liver oils distinguishing them from other fish oils.

In addition, Norway do prefer that the content of EPA and DHA shall be given.

SECTION 8.3 DETERMINATION OF ARSENIC

According to AOAC 952.13 (Silver Diethyldithiocarbamate Method); AOAC 942.17 (Molybdenum Blue); AOAC 986.15 (Spectroscopy/Atomic Absorption Spectroscopy); **CEN-EN 16802:2016**.

Rationale: Because inorganic arsenic is the most toxic arsenic compound, and because inorganic arsenic usually constitutes a small share of the total amount of arsenic in sea food, it is important that we have good methods to measure inorganic arsenic. We would propose adding the method CEN-EN 16802:2016 to the list of methods for determination of arsenic. This is a new and updated method suitable for this purpose.

SECTION 8.10 DETERMINATION OF PHOSPHOLIPIDS

Norway would like to inform the CCFO of the progress for the validation of the USP-NF method for the determination of phospholipids. The work is ongoing, and this method may be included in the forthcoming 7th edition of AOCS methods due for release in May 2017.

Norway would like to ask CCFO to refer to this method in section 8.10 in the fish oil standard, as soon as the method is adapted by AOCS.

(See Appendix for the Analytical Data and Proposal on Krill Oil)

PERU

GENERAL COMMENTS

In response to the request from CCFO, Perú submits information on the profile of fatty acids present in the oil from Peruvian anchovy (anchoveta). The ranges submitted are based on information from official sources on the results of analyses of fish oil from catches of the Peruvian species *Engraulis ringens* between the years 2013 to 2015 in several areas of the Peruvian coast.

It is important for the draft CODEX Standard for Fish Oils to include the minimum sum of EPA + DHA (both omega 3) and the contents of linoleic acid (omega 6), that characterize and identify each species and that can contribute to guaranteeing the authenticity of the fish oil, as well as its declaration on the product label.

It is necessary to take into account and debate the fact that it is important to adequately distinguish oil from wild fish species compared with oil from farmed fish. To ignore this, could affect the health benefits inherent in fish oil due to the relationship between the content of omega 3 and omega 6.

Information regarding the fatty acid profile in Peruvian anchovy (anchoveta) *Engraulis ringens*, determined by gas liquid chromatography from authentic samples (expressed as a percentage of total fatty acids)

Fatty acids	Peruvian Anchovy (Anchoveta) (<i>Engraulis ringens</i>)
C14:0 miristic acid	2.7 – 9.0
C15:0 pentadecanoic acid	N.D.
C16:0 palmitic acid	13.0-22.0
C16:1 (n-7) palmitoleic acid	4.0 – 11.0
C17:0 heptadecanoic acid	N.D.
C18:0 stearic acid	1.5 – 6.0
C18:1 (n-7) vaccenic acid	1.7 – 3.7
C18:1 (n-9) oleic acid	5.3 - 17.0
C18:2 (n-6) linoleic acid	0.7 – 2.3
C18:3 (n-3) linolenic acid	0.1 – 2.0
C18:3 (n-6) γ-linolenic acid	N. D.
C18:4 (n-3) stearidonic acid	IN-5.0
C20:0 araquidic acid	IN – 1.0
C20:1 (n-9) eicosenoic acid	IN-3.0
C20:1 (n-11) eicosenoic acid	N.D.
C20:4 (n-6) araquidonic acid	IN – 2.5
C20:4 (n-3) eicosatetraenoic acid	0.4 – 1.4
C20:5 (n-3) eicosapentaenoic acid	5.0-26.0
C21:5 (n-3) heneicosapentaenoic acid	IN – 1.1
C22:1 (n-9) erucic acid	IN – 0.5
C22:1 (n-11) cetoleic acid	IN- 5.6

C22:5 (n-3) docosapentaenoic acid	1.0 – 3.1
C22:6 (n-3) docosahexaenoic acid	5.2 – 26.5
SUM OF EPA + DHA	Min. 27

IN = Non detectable, defined as $\leq 0,05$ %

N.D. = not available

N.A. = not applicable

Source: Organismo Nacional de Sanidad Pesquera del Perú (SANIPES)

Method used: AOCS Ce-1b-89 Fatty Acid Composition of Marine Oils by GLC

Number of samples: 1141

REPUBLIC OF KOREA

- In relation to 3.2.2 the Acid value of krill oil

According to the EFSA's Journal 2009 "[scientific opinion on Safety of 'Lipid extract from *Euphausia superba*' as a novel food ingredient](#)", it says "Edible oils are normally characterized by low contents of free fatty acids, expressed by the acid value (typical specification for fish oil: 0-5 mg KOH/g). The acid value given for NKO™ is much higher (25.7-32.4 mg KOH/g) owing to the inherent content of free fatty acids. Therefore, this parameter is less appropriate as stability indicator."

Our opinion is the same as above, and here is the link of EFSA's scientific opinion

http://www.bfr.bund.de/cm/343/efsa_opinion_on_the_safety_of_lipid_extract_from_euphausia_superba.pdf

In addition, the Korean company (BIOLSYSTEMS CO., LTD), which manufactures krill oil and also suggested to us to change the range of acid value of krill oil, is now testing the acid value from 10 major krill oil products imported and produced domestically. The results may come out by the end of next week. We are going to share with you and would like to discuss on this matter after reviewing the data.

Regarding fatty acid composition of krill oil, we attached below ([see Appendix](#)). We considered that the attached data analyzed by the company is the only thing to consider among those materials you mentioned in the list.

Global Organization for EPA and DHA Omega-3s (GOED)

The Global Organization for EPA and DHA Omega-3s (GOED) is an association of processors, refiners, manufacturers, distributors, marketers, retailers and supporters of products containing eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) omega-3 fatty acids. GOED's membership represents a broad range of businesses, from small entrepreneurs to multinational food companies. The Organization's objectives are to educate consumers about the health benefits of EPA/DHA and to collaborate with government groups, the healthcare community and the industry on issues related to omega-3s, while setting high standards for our business sector. As such, our members have a profound interest in ensuring that valuable information regarding EPA and DHA is communicated to consumers in a meaningful and timely way.

In response to CL 2015/23-FO (July 2015), on 30 September 2016, GOED provided comments at Step 6 on the Proposed Draft Standard for Fish Oils. While preparing comments related to Section 7.3 "Other Labelling Requirements", GOED realized it had a couple of additional comments at Step 6, so those comments are included below, along with comments related to Section 7.3. As always, thank you for the opportunity to provide comments. GOED looks forward to a productive discussion on this topic at the upcoming CCFO meeting.

2.6 Concentrated fish oils ethyl esters

GOED recommends the addition of 2.7 Concentrated fish oil re-esterified triglycerides in order to differentiate from 2.6 Concentrated fish oil ethyl esters. For 2015, the volume, growth and value for EEs and rTGs were as follows:

- EEs (2015)
 - Volume: 12,152 metric tons (What is total volume?)
 - Growth: about 4.5% per year
 - Value: 368 million US\$

- rTGs (2015)
 - Volume: 4640 metric tons (What is total volume?)
 - Growth: about 16.0% per year
 - Value: 701 million US\$

7.3 Other labelling requirements

~~[For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D shall be given.~~

or

For fish liver oils (Sections 2.3 and 2.4) the content in vitamin A and vitamin D, naturally present or restored, shall be given ~~if required by country of retail sale.~~

GOED recommends vitamins A and D be labelled with the units of micrograms RE and micrograms, respectively.

The content of EPA and DHA [shall/may] be given for all fish oils covered by this Standard.

In addition, GOED recommends that concentrated fish oils state the chemical form (e.g. ethyl ester, TG).

ANALYTICAL DATA

CANADA

28th November 2016

Canada is pleased to submit the following fatty acid analytical data on krill oil from a Canadian industry member.

Data includes test results from 119 lots from 2010-2016

Additional information on krill species, geographic location, harvest season and method of analysis are provided below.

		Year:	2010												
		Lot:	1	2	3	4	5	6	7	8	9	10	11	12	13
Parameter		Units													
Fatty acid profile	C14:0	% total fatty acids	11.17	12.75	11.40	11.24	10.97	10.98	10.83	10.65	10.39	10.46	10.59	10.05	9.77
	C16:0		22.04	22.50	22.22	22.01	22.36	22.47	22.36	22.59	22.32	22.11	21.96	21.32	20.95
	C16:1 n-7cis		7.04	6.82	6.86	6.28	5.88	5.92	5.79	6.02	5.93	6.08	5.91	5.37	4.75
	C18:1 n-9		12.05	11.93	12.11	12.12	12.02	12.22	12.25	12.53	12.35	12.13	12.11	9.73	9.63
	C18:1 n-7		7.17	7.69	7.17	7.09	7.14	7.07	7.03	7.02	6.98	6.99	7.06	6.88	6.89
	C18:2 n-6		1.71	1.83	1.73	1.87	1.94	1.90	1.90	1.82	1.85	1.87	1.83	1.57	1.55
	C18:3 n-3		1.12	0.87	1.13	1.13	1.19	1.19	1.23	1.14	1.21	1.23	1.20	1.49	1.73
	C18:4 n-3		3.66	3.09	3.80	3.63	3.57	3.68	3.76	3.60	3.72	3.81	3.81	5.16	5.78
	C20:1 n-9		0.74	0.81	0.75	0.82	0.79	0.80	0.77	0.75	0.74	0.73	0.76	0.66	0.65
	C20:5 n-3 EPA		18.27	17.65	18.13	18.20	18.15	18.01	18.22	18.07	18.38	18.45	18.67	20.45	20.53
	C22:1 n-9		0.07	0.05	0.06	0.10	0.09	0.09	0.09	0.10	0.11	0.11	0.09	0.05	0.06
	C22:5 n-3 DPA		0.41	0.40	0.39	0.43	0.43	0.42	0.42	0.40	0.41	0.41	0.56	0.42	0.45
	C22:6 n-3 DHA		9.61	8.79	9.39	9.78	10.07	9.82	10.07	10.15	10.48	10.48	10.28	12.06	12.73
Other compositional parameters	Total lipids as FA	g/100g oil	73.8	74.5	73.5	72.5	70.2	72.1	71.7	71.7	71.3	70.8	72.2	74.2	74.3
	Omega-3	g/100g oil	25.6	23.8	25.4	24.4	23.9	24.2	24.4	24	24.4	24.2	24.8	30	30.4
	Omega-6	g/100g oil	1.5	1.6	1.5	1.6	1.6	1.6	1.6	1.5	1.6	1.6	1.5	1.4	1.4
	Omega-9	g/100g oil	8.9	9.1	8.9	8.9	8.6	9	8.9	9.1	8.9	8.7	8.9	7.5	7.2
	Saturated FA	g/100g oil	25.3	27.2	25.4	25.8	25.1	25.9	25.5	25.6	25.2	18.4	25.5	24	24.4
	Monounsaturated FA	g/100g oil	20.3	20.9	20.1	19.6	18.7	19.4	19.2	19.5	19.2	19.1	19.3	17.5	16.8
	Polyunsaturated FA	g/100g oil	28.2	26.5	28	27.0	26.5	26.9	27.7	26.6	27	26.8	27.4	32.7	33
	Carotenoids	mg/100g oil	76.5	66.9	72	68.1	76.6	74.2	84.8	87.6	90.6	81.8	88.1	81	62.1
	Astaxanthin (esterified)	mg/100g oil	135.6	116	128.1	124.2	138.9	155.7	154	147.8	164.2	148	159.4	141.3	108.2
Total phospholipids	g/100g oil	41.7	43.8	39	38.7	41.7	40.7	40.6	39.5	39.4	39.5	40.3	45.3	43.8	
Stability indexes	Peroxide value	mEq peroxide/kg	0	0.2	0	0.0	0.0	0	0	0	0	0	0	0	
	p-Anisidine value	-	1.1	2.5	1.1	1.3	1.2	2	1.8	1.8	2	1.6	1.2	0.9	1.2
	Acid value	mg KOH/g oil	20.5	7.2	19.1	15.5	13.6	13.2	15.9	15.7	17.2	15.9	17	26.3	21.2
	Saponification value	mg KOH/g oil	178.6	182.3	178.6	178.4	182.0	173.8	176.5	182	174.3	171	172.5	173.6	175.2

		Year:	2011				2012									
		Lot:	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Parameter		Units														
Fatty acid profile	C14:0	% total fatty acids	9.81	9.95	9.77	8.70	9.51	9.46	9.34	9.11	9.45	9.77	9.56	9.50	9.17	9.38
	C16:0		20.79	21.60	21.88	20.66	21.30	20.73	20.98	21.69	21.49	21.47	20.89	20.89	21.23	20.79
	C16:1 n-7cis		5.26	5.98	5.93	4.95	6.08	6.29	6.14	6.21	6.08	6.08	6.25	6.18	5.47	5.55
	C18:1 n-9		9.84	10.21	10.39	9.93	10.81	10.97	10.51	10.89	10.47	10.63	10.59	10.43	9.36	9.62
	C18:1 n-7		6.83	6.90	7.09	6.79	7.65	8.05	7.73	7.85	7.81	7.78	7.89	7.78	6.90	7.16
	C18:2 n-6		1.54	1.56	1.56	1.61	2.12	2.17	2.18	2.14	2.20	2.17	2.11	2.09	1.98	2.08
	C18:3 n-3		1.58	1.12	1.17	1.39	0.99	1.03	1.03	1.03	1.01	1.03	0.94	1.00	1.27	1.19
	C18:4 n-3		5.50	4.22	4.18	4.47	2.60	2.56	2.60	2.58	2.56	2.67	2.47	2.65	4.32	3.74
	C20:1 n-9		0.67	0.75	0.73	0.72	0.56	0.64	0.59	0.58	0.56	0.57	0.52	0.53	0.46	0.54
	C20:5 n-3 EPA		20.62	20.70	20.41	21.99	20.75	20.98	21.66	20.54	21.94	21.10	21.54	21.63	21.73	21.72
	C22:1 n-9		0.05	0.08	0.05	0.07	0.05	0.07	0.06	0.07	0.06	0.05	0.05	0.05	0.06	0.07
	C22:5 n-3 DPA		0.43	0.40	0.40	0.47	0.51	0.43	0.46	0.47	0.44	0.44	0.43	0.42	0.49	0.50
C22:6 n-3 DHA	12.44	11.74	11.84	13.04	11.77	11.73	12.29	11.58	12.51	11.90	12.60	12.75	12.82	12.99		
Other compositional parameters	Total lipids as FA	g/100g oil	72.8	75.8	72.5	72.1	72.3	71.5	70.8	72.1	69.7	72.7	72.8	71	69.9	72.9
	Omega-3	g/100g oil	29.1	29.1	27.7	29.7	26.5	26.9	26.6	26.6	27	27	26.7	26.6	27.7	28.3
	Omega-6	g/100g oil	1.4	1.4	1.4	1.5	1.8	1.9	1.7	1.7	1.7	1.8	1.7	1.7	1.5	1.7
	Omega-9	g/100g oil	7.3	8	7.7	7.2	7.9	7.8	7.5	7.8	7.4	7.8	7.9	7.6	6.9	7.2
	Saturated FA	g/100g oil	23.9	25.2	24.2	23	24.3	23.2	23.3	24	22.1	24	24.1	23.1	23	24.1
	Monounsaturated FA	g/100g oil	17.2	18.8	18.1	16.7	18.6	18.4	18.1	18.6	17.8	18.7	19.1	18.5	16.5	17.6
	Polyunsaturated FA	g/100g oil	31.6	31.8	30.2	32.4	29.4	29.9	29.4	29.5	29.8	29.9	29.6	29.4	30.4	31.2
	Carotenoids	mg/100g oil	62.2	62.1	72.6	85.8	69.9	74	67.6	71	71.3	71.2	74.9	68.1	69.9	66.9
	Astaxanthin (esterified)	mg/100g oil	106.4	108.5	127.3	151	121	128	120	126	125	126	129.9	120	120	117
Total phospholipids	g/100g oil	42.1	42.3	43.5	46.3	45.6	46	47.2	45.5	48.6	46.3	46.7	46.5	46.9	45	
Stability indexes	Peroxide value	mEq peroxide/kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	p-Anisidine value	-	0.7	1.2	1.2	0.6	0.8	0	0.6	0.6	0.9	1	1.3	1.2	1.2	1.4
	Acid value	mg KOH/g oil	24.1	26	26.3	29.6	29.8	29.7	31.3	29.9	30.2	29.8	29.8	30.1	30.9	32.2
	Saponification value	mg KOH/g oil	178.4	178.5	172.2	166	173	173	175	175	177	175	177	177	178	172

		Year:	2012													
		Lot:	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Parameter	Units															
	Fatty acid profile	C14:0	% total fatty acids	9.62	9.58	9.56	9.66	9.50	9.39	10.71	9.45	9.33	9.92	10.23	9.06	8.94
C16:0		% total fatty acids	20.57	20.85	20.48	20.25	20.00	20.60	21.90	20.97	20.84	21.15	21.27	20.54	20.18	20.92
C16:1 n-7cis		% total fatty acids	5.49	5.77	5.90	5.74	5.78	5.70	6.25	5.46	5.70	6.26	6.08	6.07	5.81	5.95
C18:1 n-9		% total fatty acids	9.72	9.83	9.63	9.53	9.66	9.49	10.25	9.59	9.74	10.35	10.40	10.19	9.86	9.85
C18:1 n-7		% total fatty acids	7.18	7.22	6.91	6.88	6.88	6.90	7.09	6.94	7.08	7.04	6.93	7.35	6.97	6.66
C18:2 n-6		% total fatty acids	2.13	2.08	2.09	2.08	2.14	2.10	1.99	2.08	2.09	1.87	1.92	1.99	1.96	1.89
C18:3 n-3		% total fatty acids	1.17	1.07	1.23	1.26	1.26	1.35	1.16	1.20	1.15	1.07	1.12	1.08	1.19	1.21
C18:4 n-3		% total fatty acids	3.57	3.44	3.95	4.13	4.09	4.09	4.07	3.92	3.77	3.55	3.63	3.02	3.39	3.81
C20:1 n-9		% total fatty acids	0.56	0.54	0.57	0.57	0.62	0.56	0.54	0.51	0.52	0.61	0.62	0.60	0.61	0.61
C20:5 n-3 EPA		% total fatty acids	21.73	21.86	21.51	21.70	21.63	21.49	20.08	21.54	21.74	21.72	21.08	22.28	22.82	22.39
C22:1 n-9		% total fatty acids	0.07	0.07	0.09	0.09	0.08	0.08	0.08	0.07	0.08	0.09	0.08	0.07	0.08	0.12
C22:5 n-3 DPA		% total fatty acids	0.52	0.46	0.52	0.53	0.54	0.51	0.44	0.51	0.46	0.46	0.49	0.47	0.50	0.50
C22:6 n-3 DHA	% total fatty acids	12.77	12.89	12.48	12.60	12.68	12.67	11.09	12.80	12.94	11.44	11.30	12.74	12.74	11.40	
Other compositional parameters	Total lipids as FA	g/100g oil	72	71.9	71.1	72.2	70	69.5	72.4	70.4	70.8	70.8	71	71.4	69.8	70.1
	Omega-3	g/100g oil	28	28.2	28	28.6	28	27.8	26	27.9	27.9	27.1	26.5	27.7	28.1	27.3
	Omega-6	g/100g oil	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.7	1.7	1.6	1.6	1.6	1.6	1.6
	Omega-9	g/100g oil	7.2	7.2	7	7	7	6.8	7.5	6.9	7.1	7.5	7.5	7.4	7.1	7.1
	Saturated FA	g/100g oil	23.7	23.2	23	23.5	22.2	22.3	25.6	23.2	23.1	23.3	24	22.9	21.9	23.2
	Monounsaturated FA	g/100g oil	17.3	17.5	17	17.1	16.8	16.4	18.1	16.4	17	17.8	17.7	17.9	16.9	16.9
	Polyunsaturated FA	g/100g oil	31	31.2	31	31.6	30.9	30.7	28.7	30.7	30.8	29.8	29.2	30.6	30.9	30
	Carotenoids	mg/100g oil	66.5	69.3	71.4	67.7	70.8	67.1	58	73.6	76	55.2	52.7	72.2	68.3	56.7
	Astaxanthin (esterified)	mg/100g oil	117	121	125	119	125	117	101	130	133	104	94.4	127	120	100
Total phospholipids	g/100g oil	44.1	43.1	44.4	47.9	46.8	45	40.7	42.1	42.2	41.4	41.9	44.3	43.2	42.6	
Stability indexes	Peroxide value	mEq peroxide/kg	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0
	p-Anisidine value	-	0.7	0.7	0.7	0.4	1	0.5	0.9	1.4	0.7	1	0.5	0.2	1.1	0.7
	Acid value	mg KOH/g oil	32.3	33.2	32.9	34.3	35.1	33.7	26.9	34.8	35.5	34.7	33.7	36.3	36.2	35.2
	Saponification value	mg KOH/g oil	171	171	174	173	169	172	173	164	169	172	174	169	168	171

		Year:	2012													
		Lot:	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Fatty acid profile	Parameter	Units														
		C14:0	% total fatty acids	8.81	8.69	8.76	9.33	8.48	8.18	8.53	8.34	8.22	7.99	7.23	8.03	7.65
	C16:0	20.39		20.04	19.63	20.44	19.57	20.21	20.51	19.91	19.66	19.80	19.43	19.64	19.39	19.86
	C16:1 n-7cis	5.81		5.76	5.80	5.81	5.10	4.45	4.79	4.98	4.46	4.14	3.93	4.88	4.46	4.79
	C18:1 n-9	10.11		9.71	9.74	9.79	9.67	9.60	9.84	9.74	9.53	9.40	8.64	9.45	9.30	9.93
	C18:1 n-7	7.35		6.74	6.55	6.62	6.55	6.59	6.51	6.39	6.35	6.27	6.26	6.46	6.26	6.37
	C18:2 n-6	2.06		1.97	1.91	2.00	1.83	1.69	1.71	1.73	1.62	1.51	1.61	1.59	1.56	1.93
	C18:3 n-3	1.28		1.10	1.19	1.21	1.15	1.10	1.13	1.15	1.15	1.12	1.16	1.12	1.16	1.32
	C18:4 n-3	3.55		3.67	3.72	3.77	3.83	3.98	3.95	3.99	4.16	4.30	4.28	4.11	4.34	5.20
	C20:1 n-9	0.62		0.51	0.57	0.57	0.59	0.55	0.66	0.64	0.64	0.64	0.57	0.63	0.55	0.60
	C20:5 n-3 EPA	21.62		23.71	23.80	22.48	24.68	25.55	24.46	24.94	25.93	27.14	27.58	26.78	27.22	22.78
	C22:1 n-9	0.06		0.09	0.10	0.12	0.06	0.05	0.05	0.05	0.04	0.03	0.03	0.04	0.05	0.05
	C22:5 n-3 DPA	0.46		0.49	0.54	0.52	0.53	0.49	0.49	0.51	0.52	0.50	0.54	0.57	0.52	0.48
	C22:6 n-3 DHA	13.21		13.12	12.77	12.39	13.10	13.05	12.54	12.67	12.67	12.16	13.97	11.78	12.65	12.61
Other compositional parameters	Total lipids as FA	g/100g oil	70.8	71	71.5	73.6	74.6	71.6	69.7	73.8	71.6	72.8	70.40	69.50	70.60	74.00
	Omega-3	g/100g oil	28.2	30.3	29.5	29.1	31.6	30.8	29.4	31.6	31.6	32.5	30.9	31.4	32.1	30.9
	Omega-6	g/100g oil	1.7	1.5	1.6	1.7	1.6	1.4	1.4	1.5	1.4	1.3	1.3	1.3	1.3	1.7
	Omega-9	g/100g oil	7.3	6.9	7	7.2	7.3	6.9	7	7.3	6.9	6.9	6.9	6.7	6.8	7.4
	Saturated FA	g/100g oil	22.3	21.5	22.2	24	23	22.1	22	22.7	21.7	22	21.7	20.3	20.7	23.4
	Monounsaturated FA	g/100g oil	17.4	16.4	16.9	17.5	17.1	16	15.8	16.7	15.7	15.7	15.3	15.3	15.2	16.7
	Polyunsaturated FA	g/100g oil	31.1	33.1	32.4	32.1	34.5	33.5	31.9	34.4	34.3	35.1	33.4	34	34.7	33.9
	Carotenoids	mg/100g oil	80.1	72.4	73.1	63.1	68.4	64.7	70.1	67.3	64	65.3	58.6	61	70	69.8
	Astaxanthin (esterified)	mg/100g oil	142	126	127	112	123.5	114	123	118	112	115	104	106	122	126
Total phospholipids	g/100g oil	46.4	43.5	43.9	44	42.6	42.9	42.3	42.4	43.8	42.9	43	42.6	42.3	42	
Stability indexes	Peroxide value	mEq peroxide/kg	0	0	0	0	0	0.1	0	0	0.1	0.1	0.3	0.4	0.4	0.3
	p-Anisidine value	-	0.9	1.5	1.3	0.7	1.3	1.5	1.3	1	0.9	0.7	1.5	1.3	1.4	1
	Acid value	mg KOH/g oil	31.9	38.3	41.4	35.7	35.4	35.7	35.4	-	-	-	-	-	-	29.9
	Saponification value	mg KOH/g oil	167	169	169	170	167	168	168	168	169	167	169	161	167	170

		Year:	2014														
		Lot:	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
		Parameter	Units														
Fatty acid profile	C14:0	% total fatty acids	7.99	8.84	10.0 8	10.3 1	9.50	8.43	9.01	9.68	9.21	9.02	9.61	10.1 4	9.78	10.1 4	10.0 3
	C16:0		19.8 2	20.7 2	21.4 8	22.0 4	20.4 4	20.7 5	21.2 9	21.4 3	20.9 7	21.0 2	20.5 0	21.0 1	21.6 0	21.8 8	21.5 1
	C16:1 n-7cis		4.10	4.42	5.31	4.93	5.00	4.27	4.57	4.69	4.81	4.70	4.74	4.92	4.81	5.17	5.34
	C18:1 n-9		8.65	9.01	10.0 2	9.78	9.63	8.66	9.53	9.41	9.62	9.43	9.20	9.22	9.26	9.72	9.99
	C18:1 n-7		6.49	6.56	6.63	6.50	6.67	6.42	7.01	6.71	6.70	6.80	6.50	6.44	6.69	6.69	6.68
	C18:2 n-6		1.66	1.66	1.75	1.69	1.77	1.65	1.71	1.70	1.71	1.64	1.70	1.70	1.69	1.73	1.74
	C18:3 n-3		2.30	2.24	1.91	1.83	2.03	1.94	1.85	1.94	2.02	2.11	2.12	2.10	2.19	2.11	2.07
	C18:4 n-3		6.13	6.08	5.48	5.49	5.66	5.59	5.57	5.51	5.81	5.93	5.77	5.63	6.09	5.89	5.82
	C20:1 n-9		0.45	0.49	0.54	0.51	0.53	0.43	0.48	0.46	0.46	0.49	0.49	0.50	0.51	0.49	0.46
	C20:5 n-3 EPA		22.9 8	21.8 5	19.9 0	19.9 6	21.5 3	22.1 8	21.5 0	21.0 8	21.5 8	21.2 6	21.4 0	20.8 2	21.2 8	20.1 0	20.2 2
	C22:1 n-9		0.05	0.06	0.09	0.00	0.00	0.00	0.00	0.14	0.00	0.08	0.00	0.00	0.00	0.00	0.00
	C22:5 n-3 DPA		0.50	0.47	0.49	0.46	0.47	0.45	0.45	0.46	0.47	0.43	0.47	0.49	0.47	0.46	0.49
C22:6 n-3 DHA	14.2 8	13.0 7	11.7 0	12.4 7	12.6 6	15.5 4	12.9 8	13.0 5	12.7 2	12.5 4	12.9 0	12.5 1	11.7 5	11.3 3	11.7 1		
Other compositiona l parameters	Total lipids as FA	g/100g oil	62.7 0	61.0 0	66.9 0	63.5 0	61.6 0	64.1 0	64.3 0	66.5 0	67.7 0	69.1 0	71.0 0	68.8 0	73.0 0	73.6 0	73.9 0
	Omega-3	g/100g oil	30.3	28	27.2	27.4	27.2	26.8	27.9	28.8	30	29.2	29.8	28.4	31.6	30.6	30.8
	Omega-6	g/100g oil	1.4	1.3	1.5	1.3	1.2	1.3	1.3	1.3	1.5	1.5	1.4	1.4	1.4	1.4	1.4
	Omega-9	g/100g oil	5.6	5.8	7	6.4	6.1	6.3	6.2	6.5	6.7	9.1	6.7	6.5	7.1	7.4	7.6
	Saturated FA	g/100g oil	18.2	18.6	22.6	20.9	19.3	21.3	20.7	21.7	21.1	20.9	24.1	23.7	24.1	25.1	24.7
	Monounsaturated FA	g/100g oil	12.8	13	15.7	13.9	13.8	14.6	14.3	14.8	15	17.4	15.6	15.1	16	16.8	17.1
	Polyunsaturated FA	g/100g oil	31.7	29.4	28.7	28.8	28.5	28.2	29.3	30.1	31.6	30.9	31.3	29.9	33	31.9	32.1
	Carotenoids	mg/100g oil	55.8	46.4	53.3	47.8	47.6	44.2	44.9	47.4	45.3	45.8	50.1	45.7	46.3	50.8	58.7
	Astaxanthin (esterified)	mg/100g oil	101	82.2	93.2	83.7	84.8	78.8	79.3	83.9	81.3	82.4	90.3	82.2	83.4	90.1	103
Total phospholipids	g/100g oil	41.3	39.9	41.4	39.5	40.2	42.2	43.4	43.6	40	41.4	48	40.8	41	41	40.7	
Stability indexes	Peroxide value	mEq peroxide/kg	0.3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,5	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3
	p-Anisidine value	-	1	0.6	<0,6	0.9	1.8	0.9	0.6	1.3	0.8	0.4	0.5	0.2	1.3	1.2	2
	Acid value	mg KOH/g oil	32.7	29.4	27.1	31.4	29.5	-	27.8	27.7	29.4	30	29.4	-	29.6	29.7	31.6
	Saponification value	mg KOH/g oil	169	169	178	176	174	173	172	166	172	171	172	168	168	172	180

Year:		2015															
Lot:		71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Parameter	Units																
C14:0	% total fatty acids	9.68	9.16	9.86	9.33	8.93	8.72	9.80	9.00	8.93	9.31	8.65	9.24	10.47	9.11	8.70	8.79
C16:0		21.62	21.54	21.63	21.58	21.43	20.64	21.11	20.74	19.92	19.92	19.12	19.71	20.12	20.08	19.39	19.47
C16:1 n-7cis		5.17	5.07	5.32	4.83	4.83	4.76	5.52	4.77	5.07	4.89	4.67	4.82	5.32	4.87	4.08	4.46
C18:1 n-9		9.84	9.48	9.80	9.19	9.18	8.97	10.01	9.01	9.40	9.38	9.20	9.35	10.11	9.41	8.81	9.27
C18:1 n-7		6.85	6.88	6.73	6.78	6.78	6.83	6.82	6.91	6.60	6.41	6.36	6.39	6.54	6.56	6.61	6.62
C18:2 n-6		1.68	1.72	1.71	1.72	1.75	1.71	1.73	1.65	1.72	1.75	1.71	1.71	1.75	1.79	1.82	1.77
C18:3 n-3		1.86	1.91	1.75	1.99	1.88	1.92	1.75	1.93	1.90	2.14	2.16	2.13	2.10	2.14	2.69	2.35
C18:4 n-3		5.40	5.42	5.17	5.79	5.38	5.56	5.33	5.66	5.67	5.89	5.95	5.97	5.98	5.94	7.06	6.46
C20:1 n-9		0.53	0.48	0.51	0.45	0.48	0.42	0.46	0.41	0.46	0.52	0.49	0.53	0.56	0.52	0.58	0.61
C20:5 n-3 EPA		20.37	21.51	20.33	21.45	21.90	22.41	20.96	21.89	22.56	22.02	22.55	22.17	19.84	21.83	21.40	21.54
C22:1 n-9		0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.08	0.00	0.08	0.00	0.14	0.09
C22:5 n-3 DPA		0.49	0.43	0.42	0.45	0.39	0.43	0.38	0.43	0.46	0.49	0.51	0.48	0.46	0.50	0.63	0.48
C22:6 n-3 DHA		12.24	12.84	12.24	12.80	13.42	13.64	12.63	13.33	13.72	13.25	13.69	13.47	12.01	13.03	13.00	13.53
Total lipids as FA		g/100g oil	62.60	70.50	70.80	70.80	68.90	61.60	64.80	64.50	62.90	66.10	67.00	65.10	70.90	66.30	69.10
Omega-3	g/100g oil	26.3	30.5	28.8	30	29.1	27.9	28	29	28.4	30.3	30.5	29.1	29.9	27.3	32.4	32.9
Omega-6	g/100g oil	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.4	1.4	1.4	1.5	1.5	1.7	1.6
Omega-9	g/100g oil	6.4	6.9	7.3	8.9	8.7	5.7	6.7	5.9	6.1	6.4	6.4	6.3	7.5	6.8	6.5	6.9
Saturated FA	g/100g oil	20.5	23.1	24.2	22.2	21.6	19.1	20.6	20.2	19.4	20	20.5	20.3	23.1	21.8	20.6	21.8
Monounsaturated FA	g/100g oil	14.4	15.7	16.5	17.3	17	13.2	15	14	14	14.4	14.6	14.3	16.5	15.5	14.4	15.7
Polyunsaturated FA	g/100g oil	27.8	31.8	30.1	31.3	30.4	29.3	29.2	30.4	29.6	31.7	32	30.5	31.4	29	34.2	34.6
Carotenoids	mg/100g oil	48.6	52.5	56.4	52.6	52.8	45.6	44	47.2	48.2	38.6	40	40.1	49.4	45.1	42.8	51.8
Astaxanthin (esterified)	mg/100g oil	87	93.3	-	94.3	96.3	79.8	78.6	82.5	85.8	69.9	70.7	70.9	89.8	80.6	76.5	93.3
Total phospholipids	g/100g oil	41	40.5	40.4	40.9	41.5	43.7	40	41.3	42.2	39.9	39.5	39.8	36.6	41.5	40.4	38.9
Peroxide value	mEq peroxide/kg	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3
p-Anisidine value	-	0.5	1.3	<0,6	0.4	3.2	<0,6	<0,6	<0,6	0.8	<0,6	<0,6	<0,6	<0,6	<0,6	1.7	1.1
Acid value	mg KOH/g oil	30.3	33.2	-	33.4	-	-	-	-	-	-	-	-	33.7	-	33.5	35.9
Saponification value	mg KOH/g oil	172	171	175	163	163	166	164	165	175	173	172	172	177	169	169	166

Parameter	Year:	2015															
		Lot:	87	88	89	90	91	92	93	94	95	97	98	99	100	96	101
	Units																
C14:0	% total fatty acids	8.98	9.00	9.01	9.24	8.99	9.55	9.97	9.04	9.40	9.17	9.10	9.38	8.84	8.90	9.09	8.65
C16:0		19.89	20.62	19.28	20.40	19.95	20.86	21.04	20.19	20.16	20.29	19.54	20.37	19.62	19.79	20.51	20.08
C16:1 n-7cis		4.52	4.87	4.68	4.85	4.53	4.75	4.95	4.78	4.95	5.14	4.83	4.89	4.70	4.71	4.98	4.62
C18:1 n-9		9.24	9.60	9.54	9.47	9.03	9.77	9.96	9.87	9.83	9.63	9.07	9.22	9.49	9.56	9.26	9.15
C18:1 n-7		6.56	6.78	6.57	6.68	6.48	6.61	6.70	6.69	6.63	6.87	6.72	6.60	6.73	6.66	6.82	6.86
C18:2 n-6		1.74	1.76	1.82	1.74	1.72	1.71	1.73	1.77	1.78	1.83	1.74	1.75	1.75	1.75	1.67	1.68
C18:3 n-3		2.25	2.03	2.43	2.01	2.03	1.98	1.95	1.96	2.36	2.29	2.03	1.95	2.12	1.99	2.05	1.99
C18:4 n-3		6.19	5.78	6.67	5.82	5.73	5.62	5.68	5.64	6.30	6.39	5.94	5.71	6.00	5.81	6.34	6.07
C20:1 n-9		0.45	0.53	0.51	0.51	0.47	0.51	0.52	0.62	0.53	0.00	0.43	0.44	0.47	0.53	0.41	0.41
C20:5 n-3 EPA		21.71	21.90	22.10	21.65	22.44	20.97	20.49	21.24	21.25	22.84	23.54	21.61	22.05	22.24	21.89	22.46
C22:1 n-9		0.04	0.00	0.00	0.07	0.08	0.08	0.06	0.08	0.00	0.00	0.00	0.15	0.19	0.20	0.00	0.00
C22:5 n-3 DPA		0.51	0.40	0.48	0.49	0.47	0.45	0.46	0.50	0.49	0.48	0.53	0.52	0.48	0.52	0.41	0.42
C22:6 n-3 DHA		13.38	13.43	13.60	12.71	13.60	12.60	12.12	12.92	12.60	13.49	13.88	12.82	12.90	12.92	12.66	13.43
Total lipids as FA		g/100g oil	71.00	65.30	64.30	68.25	66.29	64.98	68.29	71.37	67.08	64.73	63.37	69.53	68.29	65.76	64.98
Omega-3	g/100g oil	32	29.6	30.4	30.94	30.85	28.47	29.53	30.16	30.69	30.93	30.71	31.12	31.06	29.88	30.68	30.92
Omega-6	g/100g oil	1.6	1.1	1.2	1.44	1.38	1.37	1.46	1.49	1.28	1.29	1.11	1.59	1.61	1.43	1.37	1.37
Omega-9	g/100g oil	6.9	6.4	6.3	6.67	6.17	6.54	7.04	7.37	6.74	5.99	5.88	6.81	6.82	6.69	6.01	5.9
Saturated FA	g/100g oil	21.9	20.2	18.8	20.71	19.88	20.5	21.74	23.19	20.28	19.03	18.16	21.33	20.47	19.71	18.9	18.39
Monounsaturated FA	g/100g oil	15.4	14.3	13.8	15	14.04	14.49	15.44	16.42	14.83	13.47	13.39	15.35	15.04	14.62	13.92	13.56
Polyunsaturated FA	g/100g oil	33.7	30.8	31.7	32.53	32.37	29.99	31.11	31.77	31.97	32.23	31.82	32.85	32.77	31.43	32.15	32.37
Carotenoids	mg/100g oil	47.5	43.6	46.7	42.52	41.13	46.23	46.39	45.52	47.01	42.87	42.74	42.35	43.41	42.89	45.24	46.32
Astaxanthin (esterified)	mg/100g oil	-	79.2	84.8	77.4	74.7	84.5	83.18	83.38	83.19	75.58	75.4	75.42	76.86	77.43	79.84	81.27
Total phospholipids	g/100g oil	41.8	39.9	35.8	39.27	43.63	42.42	37.35	36.97	36.47	38.03	39.98	42.27	41.31	39.71	41	40.51
Peroxide value	mEq peroxide/kg	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	1.4	<0,3	<0,3	<0,3
p-Anisidine value	-	2.1	1.2	0.7	<0,6	0.82	1.06	1.57	1.21	2.34	<0,6	<0,6	0.9	<0,6	1.19	1.29	0.97
Acid value	mg KOH/g oil	34.2	33.7	38	-	33.01	30.41	-	31.46	35.22	35.03	39.94	36.99	36.14	36.12	34.86	36.96
Saponification value	mg KOH/g oil	169	169	170	170.7	172.4	169	173.8	171.6	165.9	181.2	180.2	176.5	177.7	177.2	172.6	172.1

Parameter	Year: Lot:	2016																
		103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
	Units																	
C14:0	% total fatty acids	8.75	9.62	8.59	9.18	9.18	9.27	8.62	9.24	8.93	9.05	9.87	9.13	9.63	10.1 2	9.33	9.45	8.72
C16:0		19.6 2	19.9 6	19.8 8	20.1 6	19.9 2	19.6 9	19.8 0	19.8 5	19.2 7	20.0 3	20.5 7	19.7 5	20.1 3	21.0 7	19.3 7	19.7 9	18.5 8
C16:1 n-7cis		5.13	5.25	5.09	5.13	5.22	5.08	4.82	5.02	4.73	4.98	5.05	4.97	4.97	5.14	4.87	5.01	4.83
C18:1 n-9		9.59	9.94	9.22	9.52	9.51	9.41	8.89	9.19	9.00	9.13	9.57	9.12	9.44	9.22	9.33	9.42	9.13
C18:1 n-7		6.70	6.62	6.64	6.65	6.61	6.58	6.54	6.68	6.47	6.53	6.94	6.54	6.66	6.66	6.49	6.64	6.53
C18:2 n-6		1.82	1.78	1.74	1.80	1.81	1.78	1.80	1.72	1.67	1.70	1.71	1.68	1.70	1.68	1.69	1.71	1.65
C18:3 n-3		2.03	2.15	2.03	2.20	1.99	2.21	2.18	2.06	2.05	2.06	2.10	1.94	2.14	2.13	2.20	2.19	2.25
C18:4 n-3		5.70	6.11	5.82	6.10	5.71	6.04	6.11	5.96	5.97	5.86	6.07	5.80	6.22	6.10	6.58	6.36	6.82
C20:1 n-9		0.52	0.52	0.44	0.48	0.51	0.50	0.41	0.45	0.43	0.45	0.44	0.40	0.40	0.39	0.39	0.41	0.43
C20:5 n-3 EPA		21.8 8	20.6 6	22.6 9	21.3 3	21.9 0	21.6 1	22.7 5	22.4 3	23.4 0	22.4 8	21.0 2	23.3 3	21.9 0	21.3 2	22.8 0	22.1 8	23.3 7
C22:1 n-9		0.00	0.07	0.06	0.08	0.07	0.10	0.06	0.07	0.06	0.08	0.05	0.05	0.04	0.05	0.06	0.00	0.07
C22:5 n-3 DPA		0.47	0.47	0.45	0.46	0.51	0.50	0.51	0.43	0.46	0.48	0.41	0.44	0.42	0.43	0.44	0.42	0.44
C22:6 n-3 DHA		12.9 9	12.3 4	13.1 3	12.2 0	12.6 3	12.6 2	13.1 9	12.9 3	13.5 5	12.9 5	12.1 8	13.0 7	12.6 3	12.0 9	12.8 7	12.7 6	13.3 6
Total lipids as FA		g/100g oil	67.7 8	68.7 7	66.3 8	72.4 6	67.2 9	62.4 6	65.7 6	66.3 5	63.5 9	64.9 0	66.1 3	66.4 5	65.5 8	75.4 0	70.6 3	67.6 4
Omega-3	g/100g oil	30.5 1	30.5 9	31.1 4	31.6 2	30.5 6	28.6 8	31.3 9	31.2 2	31.3 1	31.2 7	30.6	32.4 8	30.7	34.3 7	34.0 2	32.0 7	34.9 3
Omega-6	g/100g oil	1.51	1.53	1.44	1.63	1.49	1.46	1.45	1.33	1.35	1.41	1.4	1.38	1.34	1.59	1.48	1.44	1.42
Omega-9	g/100g oil	6.73	7.17	6.29	9.51	6.65	6.09	6.07	6.28	5.98	6.14	6.42	6.18	6.26	7.05	6.69	6.48	6.31
Saturated FA	g/100g oil	20.5 4	20.8 5	19.2 7	21.0 1	20.2 1	18.5 7	18.9	19.3 3	17.4 7	18.3 2	19.5 9	18.5 4	19.4 2	23.1 5	20.1 5	19.5 7	17.6
Monounsaturated FA	g/100g oil	15.1 2	15.6 7	14.4 3	18.0 8	14.9 4	13.7	13.9 1	14.3 4	13.3 8	13.8 1	14.4 8	14.0 4	14.1 3	16.2 2	14.9 9	14.5 6	14.2 2
Polyunsaturated FA	g/100g oil	32.1 2	32.2 4	32.6 8	33.3 7	32.1 5	30.2	32.9 5	32.6 8	32.7 4	32.7 7	32.0 6	33.8 6	32.0 4	36.0 3	35.5	33.5 1	36.4 7
Carotenoids	mg/100g oil	45.9 5	46.7 6	42.8 4	45.8 4	44.5 6	47.2 1	44.4 5	45.3 2	44.8 8	44.8 7	45.4 3	42.6 1	44.5 7	43.1 4	40.4 8	40.0 5	43.8 3
Astaxanthin (esterified)	mg/100g oil	83.6 5	85	75.3	82.3 6	80.2 2	86.0 9	80.1 1	80.0 4	79.3 6	77.9 7	80.8 1	73.0 1	78.9	75.4	70.3 1	69.7 1	74.0 2
Total phospholipids	g/100g oil	39.2 4	36.3 5	43.9 4	38.7	41.8 3	38.7 5	40.4 3	39.3 8	39.9 2	40.6 6	36.0 2	39.5 4	35.9	38.1 7	37.9 2	36.3 7	36.8 8
Peroxide value	mEq peroxide/kg	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3
p-Anisidine value	-	1.22	1.15	0.95	1.34	0.91	< 0,6	1.55	0.9	1.2	1.64	<0,6	1.49	0.81	0.9	0.94	1.81	1.34
Acid value	mg KOH/g oil	36.3 1	38.5 6	37.8 1	36.7 9	37.3	37.4	37.1 9	40.3	38.9	38.4	38.9	39.6	37.3	37.5	41.4	38.2	42.5
Saponification value	mg KOH/g oil	172. 5	173. 5	173. 2	175. 7	173	174. 4	173. 2	173. 1	172. 3	176. 3	173. 6	173. 5	174. 3	171. 9	172. 6	170. 6	172. 5

		Year:	Overall			
		Lot:	Min	Max	Average	Std. dev.
Parameter		Units				
Fatty acid profile	C14:0	% total fatty acids	7.23	12.75	9.40	0.80
	C16:0		18.58	22.59	20.65	0.88
	C16:1 n-7cis		3.93	7.04	5.25	0.63
	C18:1 n-9		8.64	12.53	9.85	0.87
	C18:1 n-7		6.26	8.05	6.82	0.37
	C18:2 n-6		1.51	2.20	1.80	0.17
	C18:3 n-3		0.87	2.69	1.66	0.48
	C18:4 n-3		2.47	7.06	4.92	1.20
	C20:1 n-9		0.00	0.82	0.54	0.11
	C20:5 n-3 EPA		17.65	27.58	21.69	1.82
	C22:1 n-9		0.00	0.20	0.06	0.04
	C22:5 n-3 DPA		0.38	0.63	0.47	0.04
	C22:6 n-3 DHA		8.79	15.54	12.47	1.05
	Other compositional parameters		Total lipids as FA	g/100g oil	61.00	75.80
Omega-3		g/100g oil	23.80	34.93	29.09	2.35
Omega-6		g/100g oil	1.10	1.90	1.48	0.17
Omega-9		g/100g oil	5.60	9.51	7.10	0.88
Saturated FA		g/100g oil	17.47	27.20	21.94	2.20
Monounsaturated FA		g/100g oil	12.80	20.90	16.15	1.87
Polyunsaturated FA		g/100g oil	26.50	36.47	31.16	2.14
Carotenoids		mg/100g oil	38.60	90.60	57.33	13.65
Astaxanthin (esterified)		mg/100g oil	69.71	164.20	101.92	24.38
Total phospholipids		g/100g oil	35.80	48.60	41.64	2.83
Stability indexes	Peroxide value	mEq peroxide/kg	0.00	1.40	0.07	0.21
	p-Anisidine value	-	0.00	3.20	1.12	0.50
	Acid value	mg KOH/g oil	7.20	42.50	31.50	7.01
	Saponification value	mg KOH/g oil	161.00	182.30	172.20	4.26

NORWAY

Krill Oil

Fatty Acids

Fatty acids (Area %)	Draft Codex values	G037/001/A15	G138/002/A15	G243/001/A15	G307/001/A15	G334/001/A15	G009/001/A16	G036/001/A16	G036/004/A16
C14:0	6,4-13,0	10.6	10.6	9.6	9.7	9.8	7.7	6.5	7.1
C15:0	NA								
C16:0	17,0-24,6	20.4	21.1	21.7	20.6	20.3	18	18.7	18.6
C16:1, n-7	2,1-8,9	5.5	7.9	4.2	4.7	5.4	3.7	3.3	3.4
C17:0	NA								
C18:0	NA								
C18:1, n-7	8,4-21,7	6.1	6.4	6.5	6.1	6.1	5.5	5.9	6.1
C18:1, n-9	NA								
C18:2 n-6	0,7-2,1	1.6	1.3	1.5	1.6	1.5	1.4	1.5	1.6
C18:3, n-3	0,1-4,7	2.1	0.5	1.9	2.7	2	2.5	2.3	2.5
C18:3, n-6	NA								
C18:4, n-3	1,0-8,1	5.6	2.5	5.4	6	4.9	5.4	5.1	5.7
C20:0	NA								
C20:1, n-9	NA								
C20:1, n-11	NA								
C20:4, n-6	NA								
C20:4, n-3	NA								
C20:5, n-3	14,3-24,3	16.4	18.1	19.6	16.6	15.8	17.1	23.6	21.8
C21:5 n-3	NA								
C22:1, n-9	NA								
C22:1, n-11	NA								
C22:5, n-3	0-0,07	0.4	0.4	0.4	0.4	0.3	0.4	0.6	0.5
C22:6, n-3	7,2-25,7	8.2	7.3	10.7	9.4	8.2	9.9	13.6	13.1

Fatty acids (Area %)	G036/006/A16	G046/001/A16	G047/001/A16	G049/002/A16	G106/001/A16	G106/002/A16	G106/003/A16	G243/002/A16	min	max
C14:0	8.5	5.3	5.1	5.2	6.50	6.60	6.50	6.60	5.1	10.6
C15:0										
C16:0	20	18.4	18.2	18.4	20.20	20.30	20.20	20.30	18	21.7
C16:1, n-7	3.7	2.6	2.6	2.6	4.60	4.60	4.50	3.40	2.6	7.9
C17:0										
C18:0										
C18:1, n-7	6.7	5.8	5.8	5.8	5.9	5.8	5.8	5.7	5.5	6.7
C18:1, n-9										
C18:2 n-6	1.8	1.5	1.5	1.5	1.7	1.6	1.6	1.4	1.3	1.8
C18:3, n-3	2.8	2.5	2.6	2.5	1.2	1.2	1.2	2.3	0.5	2.8
C18:3, n-6										
C18:4, n-3	6.7	5.1	5.3	5.1	2.9	2.8	2.8	4.3	2.5	6.7
C20:0										
C20:1, n-9										
C20:1, n-11										
C20:4, n-6										
C20:4, n-3										
C20:5, n-3	21.1	26	26.2	26.5	26.8	26.6	27.1	23.5	15.8	27.1
C21:5 n-3										
C22:1, n-9										
C22:1, n-11										
C22:5, n-3	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.3	0.6
C22:6, n-3	12.9	15.2	15.5	15.6	13.4	13.7	13.8	12.8	7.3	15.6

Quality Parameter

	G037/001/A15	G138/002/A15	G243/001/A15	G307/001/A15	G334/001/A15	G60/001/A16	G82/001/A16	G167/008/A16	G036/001/A16	G036/004/A16	G036/006/A16	G046/001/A16	G047/001/A16	G049/002/A16	G106/001/A16	G106/002/A16
Acid value (mg KOH/g)	11.3	12	11.68	13.79	12.39	11.64	13.7	13	19.97	18.5	15.43	18.38	19.3	17.99	n.d	n.d
Peroxide value (mEq/kg)	<2,0	<2,0	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10	<0,10
Phospholipids (g/100g)	45.5	n.d	44.5	40.1	41.1	45.3	44.6	45	50.4	45.6	40.8	56.4	56.6	57	58.2	58

Proposal

Fatty acids (Area %)	Draft Codex values	Current USP-NF (United States Pharmacopeia - National Formulary)	max/min value analyzed	Proposal for revised Codex values	Comments
C14:0	6,4-13,0	6,4-13,0	5,1-10,6	5,0 -13,0	The Draft Codex corresponds to USP-NF, but we have analyzed some batches below the lower limit and would like to decrease it to 5,0
C15:0	NA	NA	NA	NA	
C16:0	17,0-24,6	17,0-24,6	18,0-21,7	17,0-24,6	Ok
C16:1, n-7	2,1-8,9	2,5-9,0	2,6-7,9	2,5-9,0	We suggest to update the limit in the Draft Codex standard according to the current USP-NF
C17:0	NA			NA	
C18:0	NA			NA	
C18:1, n-7	8,4-21,7	4,7-8,0	5,5-6,7	4,7-8,0	We suggest to update the limit in the Draft Codex standard according to the current USP-NF
C18:1, n-9	NA	7,0-14,5		NA	
C18:2 n-6	0,7-2,1	0-3,0	1,3-1,8	0-3,0	We suggest to update the limit in the Draft Codex standard according to the current USP-NF
C18:3, n-3	0,1-4,7		0,5-2,8	0,1-4,7	Ok
C18:3, n-6	NA			NA	
C18:4, n-3	1,0-8,1		2,5-6,7	1,0-8,1	OK
C20:0	NA			NA	
C20:1, n-9	NA	0,0-2,0		NA	
C20:1, n-11	NA			NA	
C20:4, n-6	NA			NA	
C20:4, n-3	NA			NA	
C20:5, n-3	14,3-24,3	14,0-24,3	15,8-27,1	14,3- 28,0	The Draft Codex standard corresponds to USP-NF, but we have analyzed some batches above the upper limit and would like to increase it to 28,0
C21:5 n-3	NA			NA	
C22:1, n-9	NA	0,0-1,5		NA	
C22:1, n-11	NA			NA	
C22:5, n-3	0-0,7	0-0,7	0,3-0,6	0-0,7	
C22:6, n-3	7,2-25,7	7,1-15,7	7,3-15,6	7,1-15,7	We suggest to update the limit in the Draft Codex standard according to the current USP-NF

REPUBLIC OF KOREA

Comparison of fatty acid composition of krill oil by manufacturer

No	Compound	LIAOYU	Fully	BKO	USP Krill Oil	Enymotec	Neptuen	USP STANDARD*
1	Butyric acid C4:0	-	-	-	-	-	-	
2	Caproic acid C6:0	-	-	-	-	-	-	
3	Caprylic acid C8:0	-	-	-	-	-	-	
4	Capric acid C10:0	-	-	-	-	-	-	
5	Undecanoic acid C11:0	-	-	-	-	-	-	
6	Lauric acid C12:0	0.2	0.1	0.2	0.2	0.2	0.2	
7	Tridecanoic acid C13:0	0.1	0.0	0.1	0.0	0.0	0.1	
8	Myristic acid C14:0	8.2	5.6	9.6	7.9	8.7	9.8	
9	Myristoleic acid C14:1	0.1	0.1	0.2	0.1	0.2	0.1	
10	Pentadecanoic acid C15:0	0.4	0.3	0.3	0.3	0.3	0.4	
11	cis-10-Heptadecenoic acid C15:1	0.0	0.0	0.1	0.0	0.0	0.1	
12	Palmitic acid C16:0	19.0	16.8	21.2	18.8	19.5	19.0	2.5-6.9
13	Palmitoleic acid C16:1	5.5	4.6	5.2	4.5	4.0	6.0	
14	Heptadecanoic acid C17:0	0.9	0.7	1.4	1.1	1.3	2.3	
15	cis-10-Heptadecenoic acid C17:1	0.2	0.3	0.2	0.2	0.3	0.3	
16	Stearic acid C18:0	1.4	1.9	1.0	1.0	0.9	1.1	
17	Elaidic acid C18:1n9t	0.1	0.1	0.1	0.1	0.1	0.1	
18	Oleic acid C18:1n9c	8.7	10.0	9.8	8.9	8.8	10.2	7.0-14.5
19	cis-vaccenic acid C18:1	5.4	4.8	6.3	6.0	6.1	6.4	4.7-7.0
20	Linolelaidic acid C18:2n6t	0.2	0.2	0.2	0.1	0.2	0.2	
21	Linoleic acid C18:2n6c	1.5	2.2	1.6	1.4	1.8	1.6	1.4-3.0
22	γ-Linolenic acid C18:3n6	0.2	0.3	0.2	0.2	0.2	0.2	
23	α-Linolenic acid C18:3n3	1.3	1.7	1.4	1.2	2.1	1.3	0.5-3.5
24	Stearidonic acid C18:4n3	3.6	3.5	3.9	4.1	5.2	3.1	1.8-7.2
25	Arachidic acid C20:0	0.2	0.1	0.1	0.1	0.1	0.1	
26	cis-11-Eicosenoic acid C20:1	0.8	0.7	0.6	0.6	0.5	0.6	0.1-1.2
27	cis-11,14-Eicosadienoic acid C20:2	0.2	0.2	0.1	0.1	0.1	0.1	
28	Heneicosanoic acid C21:0	-	-	-	-	-	-	
29	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.1	0.1	0.1	0.1	0.1	0.1	
30	Methyl cis-5,8,11,14-eicosatetraenoic acid C20:4n6	0.6	0.8	0.4	0.5	0.3	0.4	
31	cis-11,14,17-Eicosatrienoic acid C20:3n3	0.2	0.2	0.2	0.2	0.3	0.2	
32	cis-5,8,11,14,17-Eicosapentaenoic acid C20:5n3	18.3	19.1	17.0	20.3	18.6	16.3	14.0-22.1
33	Behenic acid C22:0	0.1	0.1	0.1	0.1	0.2	0.1	
34	Erucic acid C22:1n9	0.5	0.3	0.7	0.6	0.5	0.5	0.0-0.9
35	cis-13,16-Docosadienoic acid C22:2	-	-	-	-	-	-	
36	Tricosanoic acid C23:0	0.6	0.6	0.5	0.6	0.6	0.4	
37	Lignoceric acid (C24:0)	-	-	-	-	-	-	
38	Docosapentaenoic acid C22:5n3	0.8	1.1	0.4	0.4	0.4	0.4	0.0-0.7

39	cis-4,7,10,13,16,19-Docosahexaenoic acid C22:6n3	11.1	13.5	9.3	12.2	10.2	9.6	7.5~13.2
40	Nervonic acid C24:1	0.2	0.2	0.2	0.1	0.1	0.1	

Test method : USP38 chemical tests - Fats and fixed oils - "fatty acid composition"

Analytical condition

Mode: GC (Gas Chromatography)

Detector : Flame Ionization

Column : 0.25-mm(ID)x 30-m x 0.25 um film, DB-23 (Agilent technologies)

Temperatures

- Injection port : 250°C

- Detector : 270 °C

- Column oven temperature program(split injection)

Carrier gas : Helium

Flow rate : 0.85mL/min

Split flowrate : 50:1

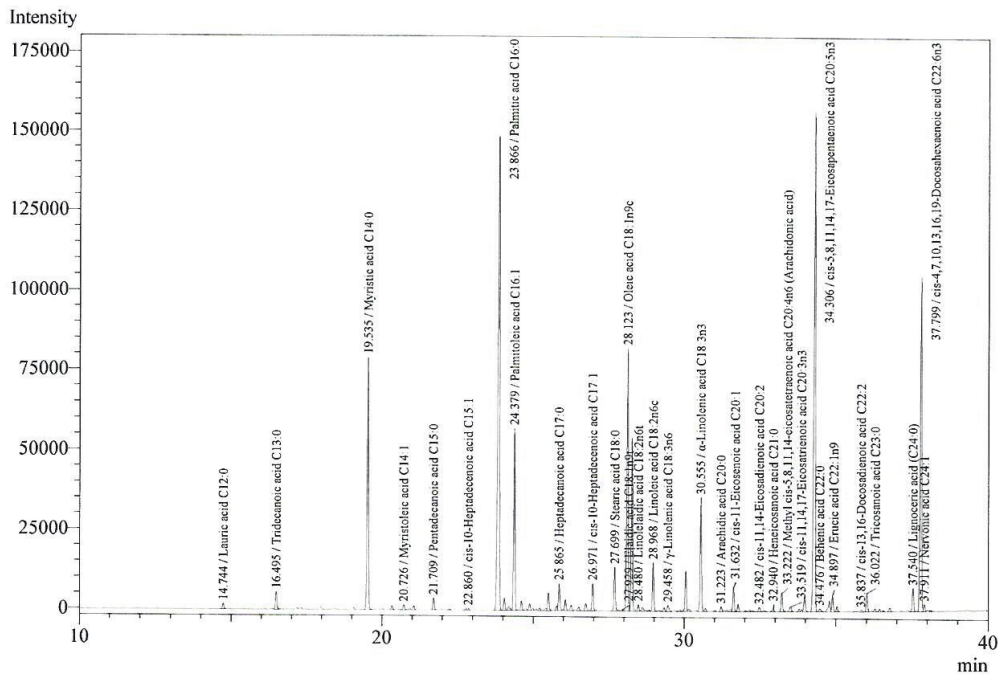
Injection size : 1 µL

Initial Temp. (°C)	Hold Time at 200°C (min)	Temp. Ramp (°C/ min)	Final Temp. (°C)	Hold Time at Final Temp. (min)
100	5	4	240	10

Result : Result = 100 x (A/B)

Analysis Date & Time : 2016-07-02 오전 1:58:39
 User Name : Admin
 Vial# : 1
 Sample Name : LIAOYU
 Sample ID : LIAOYU
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\LIAOYU.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm



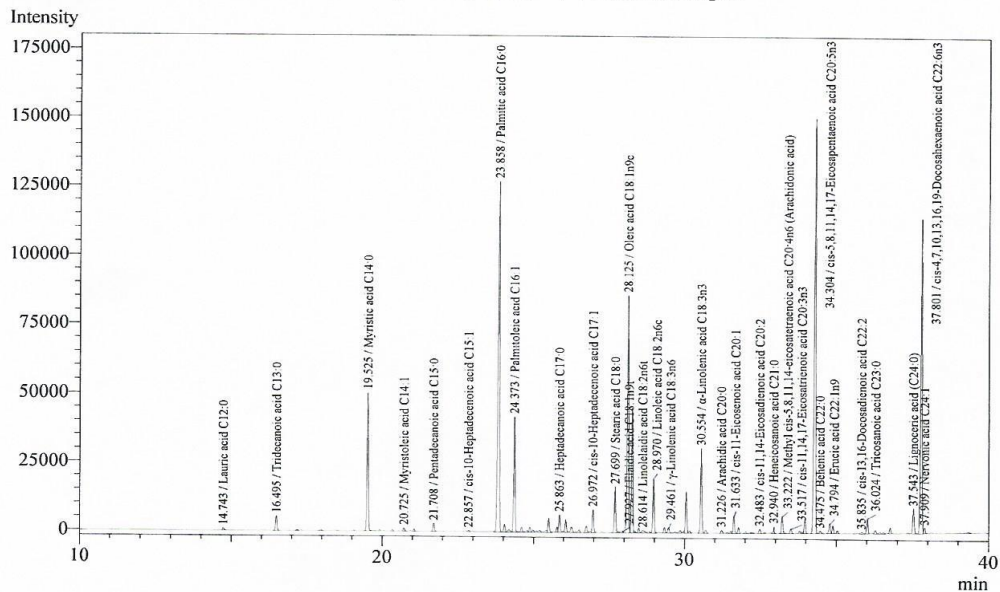
Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.744	5542	1777	0.000	ppm
7	Tridecanoic acid C13:0	16.495	18271	5464	0.000	ppm
8	Myristic acid C14:0	19.535	256595	78595	0.000	ppm
9	Myristoleic acid C14:1	20.726	5106	1546	0.000	ppm
10	Pentadecanoic acid C15:0	21.709	11113	3760	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.860	1601	520	0.000	ppm
12	Palmitic acid C16:0	23.866	594064	148226	0.000	ppm
13	Palmitoleic acid C16:1	24.379	172264	56666	0.000	ppm
14	Heptadecanoic acid C17:0	25.865	26737	8466	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.971	26704	8543	0.000	ppm
16	Stearic acid C18:0	27.699	44428	13658	0.000	ppm
17	Elaidic acid C18:1n9t	27.929	2605	540	0.000	ppm
18	Oleic acid C18:1n9c	28.123	273141	82024	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.480	6204	2071	0.000	ppm
20	Linoleic acid C18:2n6c	28.968	47179	15203	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.458	7160	1903	0.000	ppm
22	α-Linolenic acid C18:3n3	30.555	113282	35680	0.000	ppm
23	Arachidic acid C20:0	31.223	5258	1561	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.632	24107	7707	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.482	4963	1320	0.000	ppm
26	Heneicosanoic acid C21:0	32.940	3211	828	0.000	ppm

ID#	Name	Ret.Time	Area	Height	Conc.	Units
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.222	19575	5936	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.519	7040	1706	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C2	34.306	572062	156026	0.000	ppm
31	Behenic acid C22:0	34.476	4106	916	0.000	ppm
32	Erucic acid C22:1n9	34.897	16799	5385	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.837	2349	485	0.000	ppm
34	Tricosanoic acid C23:0	36.022	18346	5898	0.000	ppm
35	Lignoceric acid (C24:0)	37.540	24197	7165	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.799	347301	104361	0.000	ppm
37	Nervonic acid C24:1	37.911	6930	2182	0.000	ppm

Analysis Date & Time : 2016-07-02 오전 2:54:39
 User Name : Admin
 Vial# : 1
 Sample Name : Fully
 Sample ID : Fully
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\Fully.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm



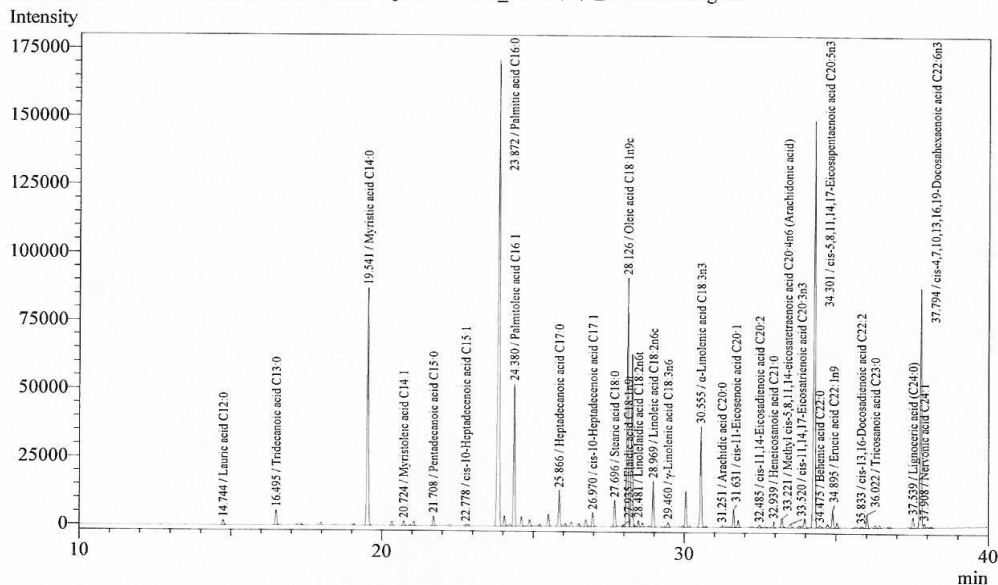
Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.743	2685	868	0.000	ppm
7	Tridecanoic acid C13:0	16.495	18022	5317	0.000	ppm
8	Myristic acid C14:0	19.525	158316	50152	0.000	ppm
9	Myristoleic acid C14:1	20.725	3633	1203	0.000	ppm
10	Pentadecanoic acid C15:0	21.708	8856	2920	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.857	1240	424	0.000	ppm
12	Palmitic acid C16:0	23.858	475529	126661	0.000	ppm
13	Palmitoleic acid C16:1	24.373	129268	41997	0.000	ppm
14	Heptadecanoic acid C17:0	25.863	19970	6335	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.972	27104	8304	0.000	ppm
16	Stearic acid C18:0	27.699	53121	16661	0.000	ppm
17	Elaidic acid C18:1n9t	27.927	3193	597	0.000	ppm
18	Oleic acid C18:1n9c	28.125	283026	85833	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.614	5699	949	0.000	ppm
20	Linoleic acid C18:2n6c	28.970	62301	19919	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.461	7423	1935	0.000	ppm
22	α-Linolenic acid C18:3n3	30.554	97493	30854	0.000	ppm
23	Arachidic acid C20:0	31.226	4232	1193	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.633	20736	6439	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.483	5672	1488	0.000	ppm
26	Heneicosanoic acid C21:0	32.940	3469	898	0.000	ppm

ID#	Name	Ret.Time	Area	Height	Conc.	Units
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.222	21890	6368	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.517	6667	1800	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C	34.304	540722	149835	0.000	ppm
31	Behenic acid C22:0	34.475	4028	894	0.000	ppm
32	Erucic acid C22:1n9	34.794	12849	3701	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.835	2598	510	0.000	ppm
34	Tricosanoic acid C23:0	36.024	17632	5593	0.000	ppm
35	Lignoceric acid (C24:0)	37.543	30691	8910	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.801	381319	113498	0.000	ppm
37	Nervonic acid C24:1	37.909	6086	1935	0.000	ppm

Analysis Date & Time : 2016-07-02 오전 3:50:41
 User Name : Admin
 Vial# : 1
 Sample Name : BKO
 Sample ID : BKO
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\F\BKO.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\F\160702.gcm



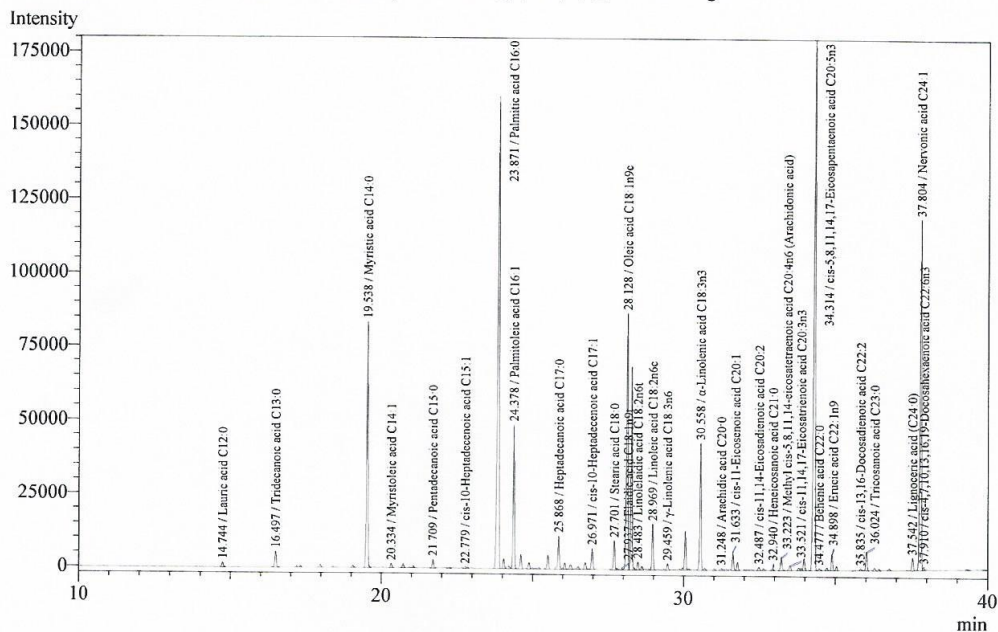
Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.744	5429	1750	0.000	ppm
7	Tridecanoic acid C13:0	16.495	18345	5521	0.000	ppm
8	Myristic acid C14:0	19.541	295511	86687	0.000	ppm
9	Myristoleic acid C14:1	20.724	5258	1690	0.000	ppm
10	Pentadecanoic acid C15:0	21.708	10682	3591	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.778	1847	547	0.000	ppm
12	Palmitic acid C16:0	23.872	651335	170169	0.000	ppm
13	Palmitoleic acid C16:1	24.380	159646	51814	0.000	ppm
14	Heptadecanoic acid C17:0	25.866	42451	13242	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.970	17418	5261	0.000	ppm
16	Stearic acid C18:0	27.696	31375	9758	0.000	ppm
17	Elaidic acid C18:1n9t	27.935	2498	534	0.000	ppm
18	Oleic acid C18:1n9c	28.126	300564	90829	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.481	7481	2430	0.000	ppm
20	Linoleic acid C18:2n6c	28.969	50660	16959	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.460	6358	1794	0.000	ppm
22	α-Linolenic acid C18:3n3	30.555	118898	37026	0.000	ppm
23	Arachidic acid C20:0	31.251	3520	817	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.631	19634	6684	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.485	3762	948	0.000	ppm
26	Heneicosanoic acid C21:0	32.939	2545	621	0.000	ppm
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm

ID#	Name	Ret.Time	Area	Height	Conc.	Units
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.221	11740	3479	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.520	7099	1593	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C2	34.301	522225	147981	0.000	ppm
31	Behenic acid C22:0	34.475	3831	879	0.000	ppm
32	Erucic acid C22:1n9	34.895	19979	6548	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.833	2579	500	0.000	ppm
34	Tricosanoic acid C23:0	36.022	15787	4992	0.000	ppm
35	Lignoceric acid (C24:0)	37.539	13011	3819	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.794	284298	87524	0.000	ppm
37	Nervonic acid C24:1	37.908	4632	1476	0.000	ppm

Analysis Date & Time : 2016-07-02 오전 4:46:44
 User Name : Admin
 Vial# : 1
 Sample Name : USO
 Sample ID : USO
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\USP Krill Oil.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm



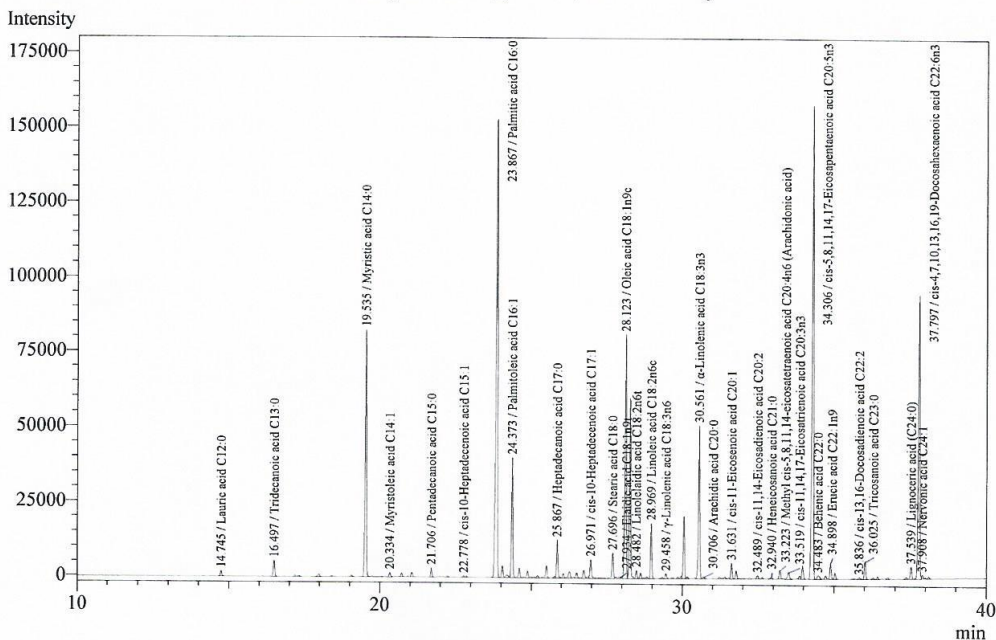
Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.744	5224	1675	0.000	ppm
7	Tridecanoic acid C13:0	16.497	18551	5479	0.000	ppm
8	Myristic acid C14:0	19.538	264821	83467	0.000	ppm
9	Myristoleic acid C14:1	20.334	4759	1531	0.000	ppm
10	Pentadecanoic acid C15:0	21.709	9042	2967	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.779	1796	543	0.000	ppm
12	Palmitic acid C16:0	23.871	631075	159576	0.000	ppm
13	Palmitoleic acid C16:1	24.378	149809	48802	0.000	ppm
14	Heptadecanoic acid C17:0	25.868	37939	11354	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.971	23847	7258	0.000	ppm
16	Stearic acid C18:0	27.701	32132	9888	0.000	ppm
17	Elaidic acid C18:1n9t	27.937	3065	636	0.000	ppm
18	Oleic acid C18:1n9c	28.128	297182	86762	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.483	8617	2763	0.000	ppm
20	Linoleic acid C18:2n6c	28.969	47545	15634	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.459	7004	2104	0.000	ppm
22	α-Linolenic acid C18:3n3	30.558	135685	42949	0.000	ppm
23	Arachidic acid C20:0	31.248	2836	656	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.633	20428	6693	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.487	3843	990	0.000	ppm
26	Heneicosanoic acid C21:0	32.940	2130	608	0.000	ppm

ID#	Name	Ret.Time	Area	Height	Conc.	Units
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.223	15409	4537	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.521	7090	1809	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C2	34.314	678834	179658	0.000	ppm
31	Behenic acid C22:0	34.477	3429	754	0.000	ppm
32	Erucic acid C22:1n9	34.898	18892	5853	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.835	3100	652	0.000	ppm
34	Tricosanoic acid C23:0	36.024	20275	6486	0.000	ppm
35	Lignoceric acid (C24:0)	37.542	13990	4201	0.000	ppm
36	Nervonic acid C24:1	37.804	407802	118556	0.000	ppm
37	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.910	3442	1120	0.000	ppm

Analysis Date & Time : 2016-07-02 오전 5:42:47
 User Name : Admin
 Vial# : 1
 Sample Name : ENZ
 Sample ID : ENZ
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\Enzymotec.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm



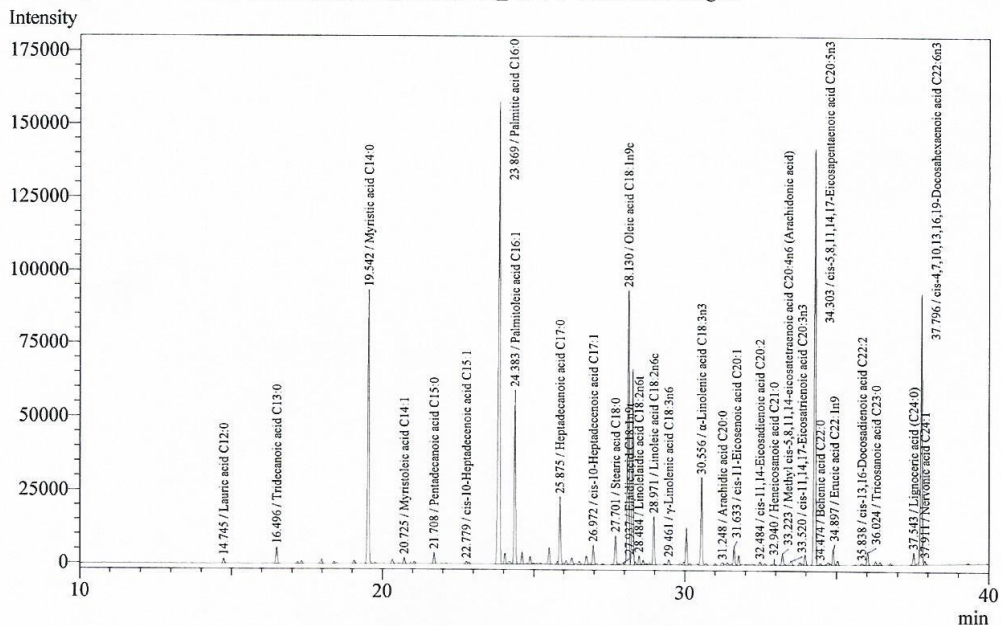
Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.745	5402	1789	0.000	ppm
7	Tridecanoic acid C13:0	16.497	18289	5348	0.000	ppm
8	Myristic acid C14:0	19.535	264336	81807	0.000	ppm
9	Myristoleic acid C14:1	20.334	4774	1509	0.000	ppm
10	Pentadecanoic acid C15:0	21.706	9418	3049	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.778	1571	478	0.000	ppm
12	Palmitic acid C16:0	23.867	591255	152334	0.000	ppm
13	Palmitoleic acid C16:1	24.373	121178	40044	0.000	ppm
14	Heptadecanoic acid C17:0	25.867	38697	12635	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.971	21573	6208	0.000	ppm
16	Stearic acid C18:0	27.696	27769	8497	0.000	ppm
17	Elaidic acid C18:1n9t	27.934	2595	550	0.000	ppm
18	Oleic acid C18:1n9c	28.123	266584	80848	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.482	7946	2686	0.000	ppm
20	Linoleic acid C18:2n6c	28.969	56113	18435	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.458	5517	1572	0.000	ppm
22	α-Linolenic acid C18:3n3	30.561	156747	50890	0.000	ppm
23	Arachidic acid C20:0	30.706	2644	778	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.631	16276	5268	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.489	4090	1113	0.000	ppm
26	Heneicosanoic acid C21:0	32.940	2118	618	0.000	ppm

ID#	Name	Ret.Time	Area	Height	Conc.	Units
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.223	10412	3033	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.519	9400	2412	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C2	34.306	565224	157098	0.000	ppm
31	Behenic acid C22:0	34.483	6385	1147	0.000	ppm
32	Erucic acid C22:1n9	34.898	16692	5557	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.836	2457	481	0.000	ppm
34	Tricosanoic acid C23:0	36.025	18796	5934	0.000	ppm
35	Lignoceric acid (C24:0)	37.539	13520	3916	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.797	308662	93837	0.000	ppm
37	Nervonic acid C24:1	37.908	4090	1243	0.000	ppm

Analysis Date & Time : 2016-07-02 오전 6:38:45
 User Name : Admin
 Vial# : 1
 Sample Name : Neptune
 Sample ID : Neptune
 Sample Type : Unknown
 Injection Volume : 1.00
 ISTD Amount :

Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\Neptune.gcd
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm



Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	0.000	0	0	0.000	ppm
2	Caproic acid C6:0	0.000	0	0	0.000	ppm
3	Caprylic acid C8:0	0.000	0	0	0.000	ppm
4	Capric acid C10:0	0.000	0	0	0.000	ppm
5	Undecanoic acid C11:0	0.000	0	0	0.000	ppm
6	Lauric acid C12:0	14.745	4921	1615	0.000	ppm
7	Tridecanoic acid C13:0	16.496	19052	5584	0.000	ppm
8	Myristic acid C14:0	19.542	308367	93115	0.000	ppm
9	Myristoleic acid C14:1	20.725	6672	2175	0.000	ppm
10	Pentadecanoic acid C15:0	21.708	12137	3943	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.779	2798	846	0.000	ppm
12	Palmitic acid C16:0	23.869	601204	157401	0.000	ppm
13	Palmitoleic acid C16:1	24.383	188488	59013	0.000	ppm
14	Heptadecanoic acid C17:0	25.875	71516	23111	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.972	22420	6712	0.000	ppm
16	Stearic acid C18:0	27.701	33276	9997	0.000	ppm
17	Elaidic acid C18:1n9t	27.937	3593	715	0.000	ppm
18	Oleic acid C18:1n9c	28.130	322964	93296	0.000	ppm
19	Linolelaidic acid C18:2n6t	28.484	9339	3069	0.000	ppm
20	Linoleic acid C18:2n6c	28.971	51865	16520	0.000	ppm
21	γ-Linolenic acid C18:3n6	29.461	5582	1587	0.000	ppm
22	α-Linolenic acid C18:3n3	30.556	98484	29844	0.000	ppm
23	Arachidic acid C20:0	31.248	3661	832	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.633	19799	6528	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.484	3888	1054	0.000	ppm
26	Heneicosanoic acid C21:0	32.940	2229	555	0.000	ppm

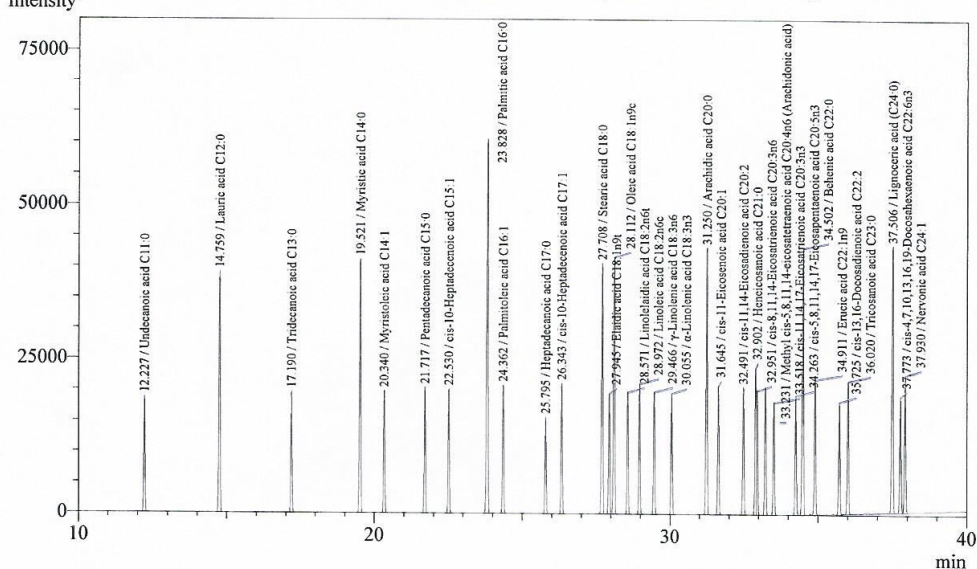
ID#	Name	Ret.Time	Area	Height	Conc.	Units
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	0.000	0	0	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.223	13799	4088	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.520	6882	1547	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C20:5n3	34.303	513480	141674	0.000	ppm
31	Behenic acid C22:0	34.474	2055	568	0.000	ppm
32	Erucic acid C22:1n9	34.897	16576	5414	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.838	2505	462	0.000	ppm
34	Tricosanoic acid C23:0	36.024	14024	4456	0.000	ppm
35	Lignoceric acid (C24:0)	37.543	13284	4102	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid C22:6n7	37.796	301821	91363	0.000	ppm
37	Nervonic acid C24:1	37.911	3615	1178	0.000	ppm

C:\GCsolution\Data\Project1\160701_차차카네카사부-FA\STD 37.gcd

Analysis Date & Time : 2016-07-02 오전 8:30:44
 User Name : Admin
 Vial# : 1
 Sample Name : STD 37
 Sample ID : STD 37
 Sample Type : Unknown
 Injection Volume : 1.00
 Multi Injection# : 1
 Dilution Factor : 1
 ISTD Amount :
 Sample Amount : 1
 Level# : 1
 Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\STD 37.gcd
 Original Data Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\STD 37.gcd
 Baseline Data Name :
 Method Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160702.gcm
 Report Name : C:\GCsolution\System\DEFAULT.gcr
 Batch Name : C:\GCsolution\Data\Project1\160701_제조회사별\FA\160701.gcb

Sample Information

Chromatogram STD 37 C:\GCsolution\Data\Project1\160701_제조회사별\FA\STD 37.gcd - Channel 1



Quantitative Results - Channel 1

ID#	Name	Ret.Time	Area	Height	Conc.	Units
1	Butyric acid C4:0	2.520	80957	42906	0.000	ppm
2	Caproic acid C6:0	3.257	99253	49895	0.000	ppm
3	Caprylic acid C8:0	5.393	112558	42295	0.000	ppm
4	Capric acid C10:0	9.700	117885	38518	0.000	ppm
5	Undecanoic acid C11:0	12.227	58582	19084	0.000	ppm
6	Lauric acid C12:0	14.759	122268	39399	0.000	ppm
7	Tridecanoic acid C13:0	17.190	59638	19939	0.000	ppm
8	Myristic acid C14:0	19.521	125479	41157	0.000	ppm
9	Myristoleic acid C14:1	20.340	60573	20092	0.000	ppm
10	Pentadecanoic acid C15:0	21.717	62249	20639	0.000	ppm
11	cis-10-Heptadecenoic acid C15:1	22.530	61914	20403	0.000	ppm
12	Palmitic acid C16:0	23.828	195402	60479	0.000	ppm
13	Palmitoleic acid C16:1	24.362	63255	20987	0.000	ppm
14	Heptadecanoic acid C17:0	25.795	48435	15895	0.000	ppm
15	cis-10-Heptadecenoic acid C17:1	26.343	63753	21302	0.000	ppm
16	Stearic acid C18:0	27.708	131676	40792	0.000	ppm
17	Elaidic acid C18:1n9t	27.945	63128	19804	0.000	ppm
18	Oleic acid C18:1n9c	28.112	131460	41847	0.000	ppm
19	Linoleic acid C18:2n6t	28.571	60359	19999	0.000	ppm

C:\GCsolution\Data\Project1\160701_アヲカネクサ部-FA\STD 37.gcd

ID#	Name	Ret.Time	Area	Height	Conc.	Units
20	Linoleic acid C18:2n6c	28.972	63599	21331	0.000	ppm
21	γ -Linolenic acid C18:3n6	29.466	62672	19981	0.000	ppm
22	α -Linolenic acid C18:3n3	30.055	62874	19794	0.000	ppm
23	Arachidic acid C20:0	31.250	133773	43342	0.000	ppm
24	cis-11-Eicosenoic acid C20:1	31.645	64800	20891	0.000	ppm
25	cis-11,14-Eicosadienoic acid C20:2	32.491	63988	20670	0.000	ppm
26	Heneicosanoic acid C21:0	32.902	76219	23850	0.000	ppm
27	cis-8,11,14-Eicosatrienoic acid C20:3n6	32.951	51085	20191	0.000	ppm
28	Methyl cis-5,8,11,14-eicosatetraenoic acid	33.231	63077	20619	0.000	ppm
29	cis-11,14,17-Eicosatrienoic acid C20:3n3	33.518	53951	18178	0.000	ppm
30	cis-5,8,11,14,17-Eicosapentaenoic acid C20:5n3	34.263	59338	19291	0.000	ppm
31	Behenic acid C22:0	34.502	134011	43075	0.000	ppm
32	Erucic acid C22:1n9	34.911	65615	21755	0.000	ppm
33	cis-13,16-Docosadienoic acid C22:2	35.725	56079	18197	0.000	ppm
34	Tricosanoic acid C23:0	36.020	66562	21510	0.000	ppm
35	Lignoceric acid (C24:0)	37.506	135257	42971	0.000	ppm
36	cis-4,7,10,13,16,19-Docosahexaenoic acid	37.773	58289	18762	0.000	ppm
37	Nervonic acid C24:1	37.930	65893	22180	0.000	ppm