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September 18, 2017

Dr. Paulette Gaynor
Office of Food Additive Safety (HFS-200)
Center for Food Safety and Applied Nutrition
Food and Drug Administration
5001 Campus Drive
College Park, MD 20740

Subject: GRAS Notice for Docosahexaenoic Acid (DHA)-Rich Oil for Food Applications

Dear Dr. Gaynor:

On behalf of Linyi Youkang Biology Co., Ltd., we are submitting a GRAS notification for Docosahexaenoic Acid (DHA)-Rich Oil for general food applications. The attached document contains the specific information that addresses the safe human food uses (infant formulas) for the notified substance. We believe that this determination and notification are in compliance with Pursuant to 21 C.F.R. Part 170, subpart E.

We enclose an original copy of this notification for your review. Please feel free to contact me if additional information or clarification is needed as you proceed with the review. We would appreciate your kind attention to this matter.

Sincerely,

(b) (6)

9/18/17

Susan Cho, Ph.D.
Susanscho1@yahoo.com
Agent for Linyi Youkang Biology Co., Ltd.

enclosure

DETERMINATION OF THE GENERALLY RECOGNIZED AS SAFE (GRAS) STATUS OF DOCOSAHEXAENOIC ACID-RICH OIL AS A FOOD INGREDIENT FOR GENERAL FOOD APPLICATIONS

Prepared for Linyi Youkang Biology Co., Ltd

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GENERALLY RECOGNIZED AS SAFE (GRAS) STATUS OF DHA-RICH OIL AS A FOOD INGREDIENT FOR GENERAL FOOD APPLICATION

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GENERALLY RECOGNIZED AS SAFE (GRAS) STATUS OF DHA-RICH OIL AS A FOOD INGREDIENT FOR GENERAL FOOD APPLICATION

PART 1. EXECUTIVE SUMMARY OF THE EXPERT PANEL REPORT

Linyi Youkang Biology Co., Ltd (hereinafter referred to as 'Linyi Youkang Biology') GRAS) claims that the use of docosahexaenoic acid (DHA)-rich oil products in foods, as described in Parts 2 through 7 of this Generally Recognized as Safe (GRAS) dossier, is not subject to premarket approval requirements of the FD&C Act based on its conclusion that the substance is GRAS under the conditions of its intended use.

food categories currently listed in 21 CFR 184.1472(a)(3) (Tables 1-1 and 1-2). These are the same food categories found in the GRAS notifications for fish oil concentrate (GRN 105), GRN 137 (algal oil derived from *Schizochytrium* sp.), and GRN 319 (algal oil derived from *Ulkenia sp.*) for which the FDA did not raise any questions as to safety when intended uses included the food categories identified for menhaden oil.

The population expected to consume the substance consists of members of the general population who consume at least one of the products described above. Linyi Youkang Biology does not intend to add ARA to any meat and/or poultry products that come under USDA jurisdiction. Therefore, 21 CFR 170.270 does not apply.

Table 1-1. Maximum Intended Use Levels of DHA-Rich Oil from *Schizochytrium sp.*[1]

Food category	Maximum use levels, %	
	Menhaden oil	Current notice
Baked goods and baking mixes (1)	5.0	1.11
Cereals (4)	4.0	0.89
Cheese products (5)	5.0	1.11
Chewing gum (6)	3.0	0.67
Condiments (8)	5.0	1.11
Confections and frostings (9)	5.0	1.11
Dairy products analog (10)	5.0	1.11
Fats and oils (12) (not including infant formula)	12.0	2.67
Frozen dairy products (20)	5.0	1.11
Gelatins and puddings (22)	1.0	0.22
Gravies and sauces (24)	5.0	1.11
Hard candy (25)	10.0	2.22
Jams and jellies (28)	7.5	1.67
Milk products (31)	5.0	1.11

Nonalcoholic beverages (3)	0.5	0.11
Nut products (32)	5.0	1.11
Pastas (23)	2.0	0.44
Plant protein products (33)	5.0	1.11
Processed fruit juices (35)	1.0	0.22
Processed vegetable juices (36)	1.0	0.22
Snack foods (37)	5.0	1.11
Soft candy (38)	4.0	0.89
Soup mixes (40)	3.0	0.67
Sugar substitutes (42)	10.0	2.22
Sweet sauces, toppings, and syrups (43)	5.0	1.11
White granulated sugar (41)	4.0	0.89
Egg products (11)	5.0	1.11
Fish products (13)	5.0	1.11
Meat products (29)	5.0	1.11
Poultry products (34)	3.0	0.67

[1]The food categories correspond to those listed in 21 CFR 170.3(n). The number in parenthesis following each food category is the paragraph listing of that food category in 21 CFR 170.3(n).
Intended use has been adopted from GRNs 105, 137, and 319.

Table 1-2. Maximum Intended Use Levels of DHA-Rich Oil Powder from *Schizochytrium sp.*[1]

Food Category	Maximum use levels, %	
	Menhaden oil	Current notice
Baked goods and baking mixes (1)	5.0	6.25
Cereals (4)	4.0	5.0
Cheese products (5)	5.0	6.25
Chewing gum (6)	3.0	3.75
Condiments (8)	5.0	6.25
Confections and frostings (9)	5.0	6.25
Dairy products analogs (10)	5.0	6.25
Fats and oils (12) (not including infant formula)	12.0	15.0
Frozen dairy products (20)	5.0	6.25
Gelatins and puddings (22)	1.0	1.25
Gravies and sauces (24)	5.0	6.25
Hard candy (25)	10.0	12.5
Jams and jellies (28)	7.5	9.4
Milk products (31)	5.0	6.25
Nonalcoholic beverages (3)	0.5	0.62
Nut products (32)	5.0	6.25
Pastas (23)	2.0	2.5
Plant protein products (33)	5.0	6.25
Processed fruit juices (35)	1.0	1.25
Processed vegetable juices (36)	1.0	1.25

Snack foods (37)	5.0	6.25
Soft candy (38)	4.0	5.0
Soup mixes (40)	3.0	3.75
Sugar substitutes (42)	10.0	12.5
Sweet sauces, toppings, and syrups (43)	5.0	6.25
White granulated sugar (41)	4.0	5.0
Egg products (11)	5.0	6.25
Fish products (13)	5.0	6.25
Meat products (29)	5.0	6.25
Poultry products (34)	3.0	3.75

[1]The food categories correspond to those listed in 21 CFR 170.3(n). The number in parenthesis following each food category is the paragraph listing of that food category in 21 CFR 170.3(n).
Intended use has been adopted from in 21 CFR 184.1472(a)(3).

Several sources of DHA or DHA-rich oil have been evaluated by the FDA and other global regulatory agencies over the past 20 years for proposed incorporation of DHA in foods for human consumption. Relevant U.S. GRAS notifications include GRN 137 (FDA, 2008). All the GRAS notices provided information/clinical study data that supported the safety of the proposed DHA ingredients for use in human foods. In all the studies summarized in these notifications, there were no significant adverse effects/events or tolerance issues attributable to DHA. In addition, due to the compositional similarity and DHA content of fish and marine algal-derived oils to Youkang's DHA-rich oils, the available scientific literature on the safety of these oils supports the safety of DHA-rich oil derived from *Schizochytrium* sp. Because this safety evaluation was based on generally available and widely accepted data and information, it satisfies the so-called "common knowledge" element of a GRAS determination.

In addition, the intended uses of DHA have been determined to be safe though scientific procedures as set forth in 21 CFR 170.3(b), thus satisfying the so-called "technical" element of the GRAS determination. The specifications of the proposed GRAS substance, Linyi Youkang Biology's DHA-rich oil products, are almost identical to those that have received FDA no question letters.

This GRAS determination for DHA is based on scientific procedures. Numerous human and animal studies examined the health benefits of DHA-rich oils. There are no reports of safety concerns in any of the studies as long as the consumption level does not exceed 1.5 g/person/day. Linyi Youkang Biology utilizes a HACCP-controlled manufacturing process and rigorously tests its final production batches to verify adherence to quality control specifications. The literature indicates that DHA-rich oil offers consumers health benefits without serious adverse effects.

The information and data provided by Linyi Youkang Biology in this report and supplemented by the publicly available literature/toxicity data on DHA and DHA-rich algal oil provide a sufficient basis for an assessment of the safety of DHA-rich oil from *Schizochytrium* sp. for the proposed use as an ingredient in food when prepared according to appropriate specifications and used according to cGMP.

Therefore, not only is the Linyi Youkang Biology's proposed use of DHA-rich oil products safe within the terms of the Federal Food, Drug, and Cosmetic Act (meeting the standard of reasonable certainty of no harm), but because of this consensus among experts, it is also GRAS.

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Susan Cho, Ph.D. Date
NutraSource, Inc., Clarksville, MD 21029

_____ _____

Joanne Slavin, Ph.D. Date
Professor, University of Minnesota, St. Paul, MN 55108

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George C. Fahey, Jr, Ph.D. Date
Professor Emeritus, University of Illinois, Urbana, IL 61801

PART 2. IDENTITY, MANUFACTURING, SPECIFICATIONS, AND TECHNICAL EFFECTS OF DHA

2.A.1. Identity of the Notified Substance

2.A.1.1. Common Name

Docosahexaenoic acid-rich oil, DHA-rich oil, docosahexaenoic acid-rich algal oil, DHA-rich algal oil, DHA algal oil, DHA-oil

2.A.1.2. Chemical Names

Its systematic name is *all-cis*-docosa-4,7,10,13,16,19-hexa-enoic acid, and its shorthand name is 22:6(n-3).

2.A.1.3. Chemical Abstract Service (CAS) Registry Number

6217-54-5

2.A. 1.4. Empirical Formula

Molecular formula, $C_{22}H_{32}O_2$

2.A.1.5. Molecular weight

328.488

2.A.1.6. Structural Formula

Figure 1 shows the structure of DHA.

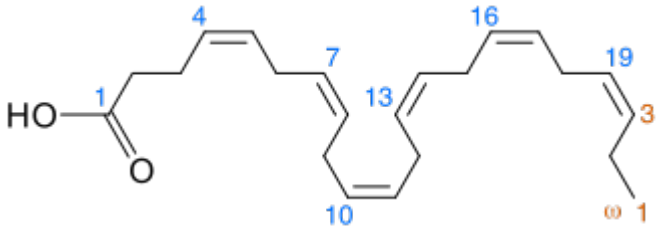


Figure 1. Structure of DHA.

2.A.1.7. Physical Properties

Density, 0.943 g/cm^3

2.A.1.8. Background

Docosahexaenoic acid (DHA) is an omega-3 fatty acid (FA) that is a primary structural component of the human brain, retina, and other tissues. It can be synthesized from alpha-linolenic acid or obtained directly from maternal milk, algal oil, or fish oil. Fatty acids can be desaturated endogenously up to the Δ9 position due to lack of certain enzymes in humans (Kremmyda et al., 2011). For this reason, linoleic (18:2n-6) and α-linolenic (18:3n-3) acids must be obtained from the diet and are termed essential FA. Further elongation and desaturation of these FAs to produce long-chain polyunsaturated fatty acids (PUFA) is possible, but not very

efficient in humans. Examples of PUFA include arachidonic acids (ARA; 20:4n-6), eicosapentaenoic (EPA; 20:5n-3), and DHA (22:6n-3). Thus, these FA may be conditionally essential depending on essential FA availability.

Linyi Youkang Biology's DHA-rich oil is derived from the heterotrophic fermentation of the marine alga, *Schizochytrium* sp. DHA's structure is a carboxylic acid with a 22-carbon chain (docosa is Greek for 22 and hexa is Greek for six) *cis*-double bonds; the first double bond is located at the third carbon from the omega end (methyl terminus). Thus, it is classified as an omega-3 fatty acid.

2.A.2. Potential Toxicants in the Source of the Notified Substance

Potential toxicants have not been identified in DHA-rich oil ingredients. High-performance liquid chromatography (HPLC) reveals that Linyi Youkang Biology's DHA-rich oil is > 45.0% pure. No pesticide residues (organochlorine and organophosphorus) and shellfish poisons have been detected in Linyi Youkang Biology's DHA-rich oil ingredients (Tables 2 to 4 and Appendix). In addition, no significant amounts of dioxins and furans, polychlorinated biphenyls **(**PCBs), polycyclic aromatic hydrocarbons (PAHs), or solvent residues have been detected in Linyi Youkang Biology's DHA-rich oil ingredients (oil or powder form; Tables 5 to 9 and Appendix). The Certificate of Analysis (COA) for DHA-rich oil ingredients is presented in Appendix.

Pesticides and shellfish toxins

Three non-consecutive lots of DHA-rich algal oil ingredients (oil and powder forms) were screened for organochlorine pesticides, organophosphate pesticides, and shellfish toxins, domoic acid (Tables 2 to 4 and Appendix). None of these pesticides were found at levels above the detection limit in the sample analyzed (DHA-rich oil and DHA powder).

Dioxins, furans, PCBs, and PAHs

The analysis of 3 non-consecutive lots of DHA-rich algal oil and powder samples found that concentrations of PCDDs (dioxins), furans, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) were at levels below or close to the detection limits (Tables 5 to 8 for DHA-rich oil; Appendix).

Residual solvents

As shown in Table 9 and Appendix, residual solvents were not detected in DHA-rich oil ingredients.

Table 2. A List of Organochlorine Pesticides Screened for DHA-Rich Oil Ingredients

Pesticide (detection limit, ppm)	Pesticide (detection limit, ppm)	Pesticide (detection limit, ppm)
Aclonifen (0.01)	Acrinathrin (0.02)	Aldrin (0.005)
Benfluralin (0.005)	Bifenox (0.02)	Binapacryl (0.02)
Bifenthrin (0.02)	Bromocyclen (0.02)	Bromoxynil-octanoate (0.01)
Butralin (0.02)	Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)
Chlordane, trans- (0.005)	Chlorfenapyr (0.005)	Chlorfenprop-methyl (0.01)
Chlorfenson (0.01)	Chloroneb (0.05)	Chlorothalonil (0.01)
Chlorthal-dimethyl (0.005)	Cyfluthrin (0.02)	Cyhalothrin, lamda- (0.02)
Cypermethrin (0.02)	Cyphenothrin (0.02)	DDD, o,p- (0.005)
DDD, p,p'- (0.005)	DDE, o,p- (0.005)	DDE, p,p'- (0.005)
DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.02)
Diallate (0.05)	Dichlobenil (0.01)	Dichlone (0.02)
Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.4)	Dichlorobenzophenone, p,p- (0.04)
Dicofol, o,p- (0.04)	Dicofol, p,p- (0.04)	Dieldrin (0.005)
Dienochlor (0.02)	Dinitramine (0.01)	Dinobuton (0.02)
Endosulfan, alpha- (0.005)	Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)
Endrin (0.01)	Endrin ketone (0.01)	Esfenvalerate (0.02)
Ethalfluralin (0.01)	Etridiazole (0.01)	Fenfluthrin (0.02)
Fenpropathrin (0.02)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers)
Fenvalerate (RS-/SR-Isomers) (0.01)	Flubenzimine (0.01)	Fluchloralin (0.01)
Flucythrinate (0.02)	Flumetralin (0.01)	Fluorodifen (0.02)
Fluoroimide (0.02)	Genite (0.01)	Halfenprox (0.02)
HCH, alpha- (0.005)	HCH, beta- (0.01)	HCH, delta- (0.005)
HCH, epsilon- (0.005)	Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)
Heptachlor epoxide, cis- (0.005)	Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)
Ioxynil-octanoate (0.005)	Isobenzan (0.005)	Isodrin (0.005)
Isopropalin (0.01)	Methoxychlor (0.01)	Mirex (0.005)
Nitrapyrin (0.01)	Nitrofen (0.01)	Octachlorstyrene (0.01)
Oxyfluorfen (0.01)	Pendimethalin (0.01)	Pentachloranisole (0.01)
Pentachloroaniline (0.005)	Pentachlorothioanisolte (0.005)	Permethrin (0.02)
Plifenate (0.005)	Polychloroterpene (Camphechlor) (0.2)	Profluralin (0.005)
Propanil (0.02)	Quintozene (0.005)	S 421 (0.005)
Tau-Fluvalinate (0.02)	Tecnazene (0.005)	Tefluthrin (0.02)
Tetradifon (0.01)	Tetrasul (0.01)	Tralomethrin (0.02)
Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)

Table 3. A list of Organophosphorus Pesticides Screened for DHA-Rich Oil Ingredients

Pesticide (detection limit, ppm)	Pesticide (detection limit, ppm)	Pesticide (detection limit, ppm)
Acephate (0.02)	Amidithion (0.02)	Azamethiophos (0.04)
Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Carbophenothion (0.02)
Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)
Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)
Chlorthiophos (0.02)	Coumaphos (0.05)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)
Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.05)	Dialifos (0.05)
Diazinon (0.02)	Dicapthon (0.01)	Dichlofenthion (0.02)
Dichlorvos (0.01)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethoate/Omethoate (sum) ()	Dimethylvinphos (002)
Dioxabenzofos (0.02)	Dioxathion (0.02)	Disulfoton (0.02)
Disulfoton-sulfon (0.02)	Disulfoton-sulfoxide (0.04)	Ditalimfos (0.02)
Edifenphos (0.05)	EPN (0.05)	Ethion (0.01)
Ethoprophos (0.02)	Etrimfos (0.02)	Famophos (0.05)
Fenamiphos (0.02)	Fenamiphos (sum) ()	Fenamiphos-sulfone (0.02)
Fenamiphos-sulfoxide (0.02)	Fenchlorphos (0.02)	Fenchlorphos-oxon-sulfone (0.1)
Fenitrothion (0.01)	Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)
Fensulfonthion-oxon-sulfoxide (0.02)	Fensulfothion-sulfone (0.02)	Fenthion (0.01)
Fenthion-oxon (0.02)	Fenthion-oxon-sulfone (0.05)	Fenthion-oxon-sulfoxide (0.02)
Fention-sulfone (0.05)	Fenthion-sulfoxide (0.02)	Fonofos (0.02)
Formothion (0.02)	Fosthiazate (0.02)	Fosthietan (0.02)
Heptenophos (0.02)	Iodofenphos (0.02)	Iprobenfos (0.02)
Isazophos (0.02)	Isocarbofos (0.02)	Isofenphos (0.02)
Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)
Malaoxon (0.02)	Malathion (0.02)	Mecarbam (0.02)
Mephosfolan (0.02)	Merphos (0.02)	Methacriphos (0.02)
Methamidophos (0.02)	Methidathion (0.02)	Mevinphos (0.02)
Monocrotophos (0.01)	Morphothion (0.05)	Naled (0.02)
N-Desethyl-pirimiphos-methyl (0.02)	Omethoate (0.02)	Oxydemeton-methyl (0.05)
Paraoxon-ethyl (0.02)	Paraoxon-methyl (0.02)	Parathion (0.02)
Parathion-methyl (0.02)	Parathion-methyl/Paraoxon-methyl (sum) ()	Phenkapton (0.02)

Phenthoate (0.02)	Phorate (0.02)	Phorate (sum) ()
Phorate-sulfone (0.02)	Phorate-sulfoxide (0.02)	Phosalone (0.04)
Phosfolan (0.02)	Phosmet (0.05)	Phosphamidon (0.02)
Piperophos (0.02)	Pirimiphos-ethyl (0.02)	Pirimiphos-methyl (0.02)
Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)
Prothiofos (0.02)	Prothoate (0.02)	Pyraclofos (0.05)
Pyrazophos (0.05)	Pyridaphenthion (0.02)	Pyrimitate (0.02)
Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	Tebupirimfos (0.02)	TEPP (0.02)
Terbufos (0.02)	Terbufos (sum) ()	Terbufos-sulfone (0.01)
Tetrachlorvinphos (0.02)	Thiometon (0.02)	Thionazin (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.01)
Tribufos (0.04)	Trichlorfon (0.05)	Vamidothion (0.04)

Table 4. Analytical Results for Amnesic Shellfish Poison

Amnesic Shellfish Poison, Domoic Acid, ug/g	Lot:	Lot:	Lot:
Detection limit	< 3.0	< 3.0	< 3.0
Results	Not Detected	Not Detected	Not Detected

Table 5. List of Dioxins and Furans Tested for DHA-Rich Oil

Dioxins and Furans, pg/g	Lot:	Lot:	Lot:
1,2,3,4,6,7,8-HeptaCDD	< 0.132	< 0.260	< 0.132
1,2,3,4,6,7,8-HeptaCDF	< 0.0927	< 0.182	< 0.0921
1,2,3,4,7,8,9-HeptaCDF	< 0.0646	< 0.127	< 0.0641
1,2,3,4,7,8-HexaCDD	< 0.0629	< 0.123	< 0.0625
1,2,3,4,7,8-HexaCDF	< 0.0977	< 0.192	< 0.0970
1,2,3,6,7,8-HexaCDD	< 0.0861	< 0.169	< 0.0855
1,2,3,6,7,8-HexaCDF	< 0.094	< 0.175	< 0.0888
1,2,3,7,8,9-HexaCDD	< 0.0811	< 0.159	< 0.0806
1,2,3,7,8,9-HexaCDF	< 0.0662	< 0.130	< 0.0658
1,2,3,7,8-PentaCDD	< 0.0414	< 0.0812	< 0.0411
1,2,3,7,8-PentaCDF	< 0.0596	< 0.117	< 0.0592
2,3,4,6,7,8-HexaCDF	< 0.0811	< 0.159	< 0.0806
2,3,4,7,8-PentaCDF	< 0.0927	< 0.182	< 0.0921
2,3,7,8-TetraCDD	< 0.0315	< 0.0617	< 0.0313
2,3,7,8-TetraCDF	< 0.0861	< 0.169	< 0.0855
OctaCDD	< 0.960	< 1.88	< 0.954
OctaCDF	< 0.199	< 0.390	< 0.197
WHO (2005)-PCDD/F TEQ (lower-bound)	Not Detected	Not Detected	Not Detected
WHO (2005)-PCDD/F TEQ	0.171	0.335	0.170

(upper-bound)			

Table 6. A List of PCBs Tested for DHA-Rich Oil

Polychlorinated Biphenyls	Lot: (b) (6)	Lot: (b) (6)	Lot: (b) (6)
PCB 101, ng/g	< 0.166	< 0.325	< 0.164
PCB 105, pg/g	< 6.46	< 12.7	< 6041
PCB 114, pg/g	< 0.877	< 1.72	< 0.872
PCB 118, pg/g	< 23.2	< 45.5	< 23.0
PCB 123, pg/g	< 0.662	< 1.30	< 0.658
PCB 126, pg/g	< 0.414	< 0.812	< 0.411
PCB 138, ng/g	< 0.166	< 0.325	< 0.164
PCB 153, ng/g	< 0.166	< 0.325	< 0.164
PCB 156, pg/g	< 3.64	< 7.14	< 3.62
PCB 157, pg/g	< 0.679	< 1.33	< 0.674
PCB 167, pg/g	< 1.82	< 3.57	< 1.81
PCB 169, pg/g	< 1.99	< 3.90	< 1.97
PCB 180, ng/g	< 0.166	< 0.325	< 0.164
PCB 189, pg/g	< 0.662	< 1.30	< 0.658
PCB 28, ng/g	< 0.166	< 0.325	< 0.164
PCB 52, ng/g	< 0.166	< 0.325	< 0.164
PCB 77, pg/g	< 16.6	< 32.5	< 16.4
PCB 81, pg/g	< 0.447	< 0.877	< 0.444
Total 6 ndl- PCB (lower-bound), ng/g	Not Detected	Not Detected	Not Detected
Total 6 ndl- PCB (upper-bound), ng/g	0.993	1.95	0.987
WHO (2005)-PCB TEQ (lower-bound), pg/g	Not Detected	Not Detected	Not Detected
WHO (2005)-PCB TEQ (upper-bound), pg/g	0.104	0.204	0.103

Table 7. Summary of TEQ-Totals WHO-PCDD/F and PCB

TEQ-Totals WHO-PCDD/F and PCB	Lot: (b) (6)	Lot: (b) (6)	Lot: (b) (6)
WHO (2005)-PCDD/F+PCB TEQ (lower-bound), pg/g	Not Detected	Not Detected	Not Detected
WHO (2005)-PCDD/F+PCB TEQ (upper-bound), pg/g	0.275	0.539	0.273

Table 8. A List of PAHs Tested for DHA-Rich Oil

PAH 4, ug/kg	Lot:	Lot:	Lot:	Detection Limit
Benzo(a)anthracene	0.7	0.6	0.7	0.5
Benzo(a)pyrene	0.6	0.6	0.6	0.5
Benzo(b)fluoranthene	1.4	1.3	1.4	0.5
Chrysene	0.8	0.8	0.8	0.5
Sum PAH 4	3.5	3.3	3.5	2.0

Table 9. A List of Solvent Residues Tested for DHA-Rich Oil

Solvent Residues, mg/kg	Lot:	Lot:	Lot:	Detection Limit
1,1,1,2-Tetrachloroethane	< 0.01	< 0.01	< 0.01	0.01
1,1,1-Trichloroethane	< 0.01	< 0.01	< 0.01	0.01
1,1,2-Tricholorethane	< 0.01	< 0.01	< 0.01	0.01
1,1-Dichloroethane	< 0.05	< 0.05	< 0.05	0.05
1,2-Dichloroethane	< 0.05	< 0.05	< 0.05	0.05
2-Butanon (Methylethylketon)	< 1	< 1	< 1	1
2-Methylpentane	< 1	< 1	< 1	1
3-Methylpentane	< 1	< 1	< 1	1
Benzene	0.073	0.065	0.069	0.01
Bromodichloromethane	< 0.05	< 0.05	< 0.05	0.05
Chloroform (trichloromethane)	< 0.01	< 0.01	< 0.01	0.01
cis-Dichloroethane	< 0.05	< 0.05	< 0.05	0.05
Dibromochloromethane	< 0.05	< 0.05	< 0.05	0.05
Dichloromethane	< 0.05	< 0.05	< 0.05	0.05
Ethyl acetate	< 1	< 1	< 1	1
Ethylbenzene	< 0.01	< 0.01	< 0.01	0.01
m-/-p-Xylene	< 0.01	< 0.01	< 0.01	0.01
Methylcyclopentane	< 1	< 1	< 1	1
n-Heptane	< 1	< 1	< 1	1
n-Hexane	< 1	< 1	< 1	1
n-Pentane	< 1	< 1	< 1	1
Styrene	< 0.01	< 0.01	< 0.01	0.01
Sum 3 chlorinated solvents	Inapplicable	Inapplicable	Inapplicable	-
Technical Hexane (calculated)	Inapplicable	Inapplicable	Inapplicable	-
Tetrachloroethane	< 0.01	< 0.01	< 0.01	0.01
Tetrachloromethane	< 0.01	< 0.01	< 0.01	0.01
Toluene	< 0.01	< 0.01	< 0.01	0.01
trans-Dichloroethane	< 0.05	< 0.05	< 0.05	0.05
Tribromomethane	< 0.05	< 0.05	< 0.05	0.05

Trichloroethene	< 0.01	< 0.01	< 0.01	0.01
Xylene (ortho-)	< 0.01	< 0.01	< 0.01	0.01

2.A.3. Particle Size

DHA-rich oil – Not applicable.

DHA-rich oil powder – NLT 90% passing a 60 mesh screen.

2.B. Method of Manufacture

Culture

Pre-culture flasks are shaken and inoculated with one vial of *Schizochytrium* sp. Linyi Youkang Biology maintains the cultural purity, sterility, and integrity of the microalgae, *Schizochytrium* sp. Samples of the pure strain, and samples of shake flask culture, pre-culture, and main culture are checked for the detection of microbial contamination (Petri dishes with nutrient agar). The culture is transferred to the first seed fermentor (pre-cultures). This culture is subsequently transferred to additional seed fermenters until the volume is sufficient for inoculation of the main fermentor.

Fermentation

The production medium used in the manufacturing process for DHA oil is mostly based on Glucose, corn steep liquor, yeast powder, potassium sulfate, and malic acid. In addition, sodium hydroxide (NaOH) and citric acid monohydrate are used as pH adjusting agents prior to sterilization and during fermentation. All components of the culture medium meet food grade specifications or are of adequate purity for food fermentation processes.

Enzymolysis, Extraction, and Purification

After the fermentation process, sodium hydroxide is used to adjust pH to 9-10 and then alkaline protease (source: *Bacillus licheniformis;* 200,000 IU/g; lead content<0.03 ppm) is added for the hydrolysis of protein for 1-6 hours. Then, DHA-rich oil layer is separated from fermentation biomass by disc centrifuge, followed by a series of purification steps including water degumming, acid degumming (citric acid monohydrate) and alkali (sodium hydroxide) refining, water washing, low temperature separation for further purification of DHA-rich oil, decolorization (activated clay treatment), and deodorization (steam generator process at 0.2 MPa, 160-190 C). No organic solvents are used to extract DHA-rich oil from the fermentation biomass.

Stabilization and Packaging of DHA-Rich oil

Natural vitamin E (0.1%) is added to purified DHA-rich oil before being packaged

Production of DHA-Rich Oil Powder

Sodium ascorbate, lecithin, ascorbyl palmitate, lactose, and starch sodium octenyl succinate (less than 2%; 21 CFR Sec. 172.892) are added to DHA-rich oil as excipients and mixed. The mixture is spray-dried to produce DHA-rich oil powder.

Linyi Youkang Biology uses a Hazard Analysis and Critical Control Points (HACCP)-controlled manufacturing process and rigorously tests its final production batches to verify adherence to quality control specifications.

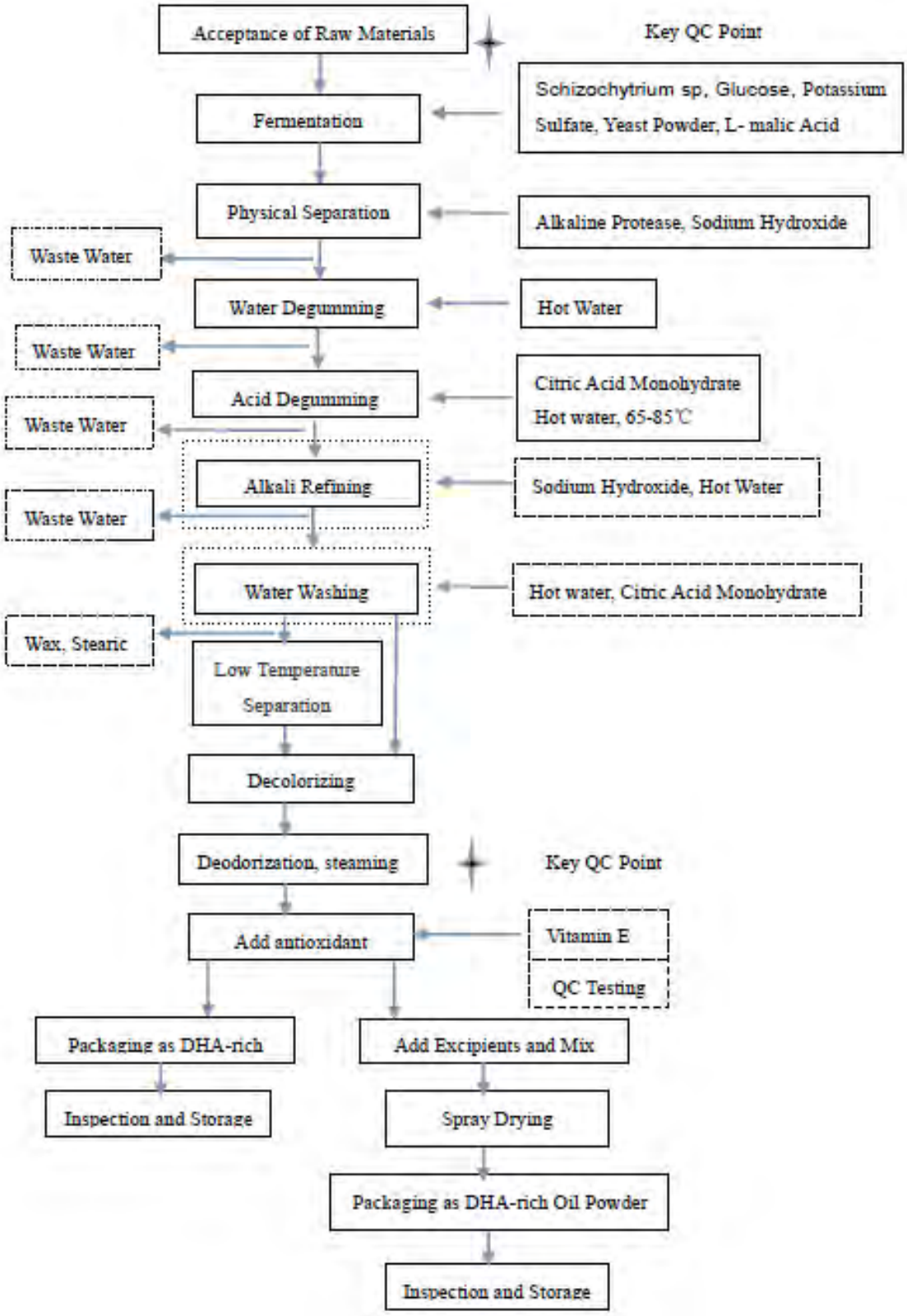
Table 10. Raw Materials Used in Fermentation

Ingredient	CAS number	Regulatory status
Yeast powder	8013-01-2	21CFR 172.896
Corn syrup powder (corn steep liquor)	66071-94-1	21CFR 184.1033
Glucose	50-99-7	21 CFR 168.121
Potassium sulfate	7778-80-5	21CFR 184.1643
Malic acid	97-67-6	21CFR 184.1069
Citric acid monohydrate	5959-29-1	21CFR 184.1033
Magnesium sulfate heptahydrate	10034-99-8	21CFR 184.1443
Ammonium sulfate	7783-20-2	21CFR 184.1143
Dipotassium hydrogen phosphate	7758-11-4	21CFR 182.6245
Calcium chloride	10043-52-4	21CFR 184.1193
Copper sulfate	7758-98-7	21CFR 184.1261
Zinc sulfate	7733-02-0	21CFR 182.8997
Cobalt chloride	7646-79-9	21CFR582.80
Manganese chloride	7773-01-5	21CFR 184.1446
Nickel sulfate	10101-97-0	Nickel-184.1537
Vitamin B12	68-19-9	21CFR 184.1945
Biotin	58-85-5	21CFR 182.8159
Thiamine hydrochloride	67-03-8	21CFR 184.1875

Table 11. Processing Aids

Processing aids	CAS number	Regulatory status
Tocopherols	1406-66-2	21CFR 184.1890
Activated clay (Bentonite)	1302-78-9	21CFR 184.1155
Silicon dioxide	14808-60-7	21CFR 172.480
Excipients for Powder Form		
Sodium ascorbate	134-03-2	21CFR 182.3731
Lecithin	8002-43-5	21CFR 184.1400
Ascorbyl palmitate	137-66-6	21CFR 182.3149
Lactose	9004-34-6	21CFR 168.122
Starch sodium octenyl succinate	66829-29-6	21 CFR 172.892

Figure 2. Manufacturing Flow Diagram of DHA-rich Oil Ingredients



Characterization of the Source Organism

The principle of production method (via algal production) is similar to those described by other companies whose production methods for DHA-rich oils received a no objections letter from the FDA (GRN 137- FDA, 2004; GRN 553-FDA, 2015; GRN 677-FDA, 2017).

DHA-rich algal oil is derived from the heterotrophic fermentation of the marine alga, *Schizochytrium* sp. *Schizochytrium* sp. is a member of the Chromista kingdom (Table 12). There are no reports of this organism producing toxic chemicals or being pathogenic. Consumption by man of thraustochytrids, especially those of the genus *Schizochytrium*, is primarily through consumption of mussels and clams. Indirect consumption, through the marine food chain (fish and shellfish), is more widespread. Analysis of the finished products confirmed the absence of common shellfish toxins. *Schizochytrium* sp. microorganisms are widespread and are commonly found in marine environments throughout the world. There have never been any reports of toxic compounds produced by these microorganisms.

Table 12. Taxonomic Classification of *Schizochytrium* sp.

Class	Scientific Classification
Kingdom	Chromista
Subkingdom	Chromobiota
Phylum	Labyrinthulomycota
Class	Labyrinthulomycetes
Order	Thraustochytriales
Family	Thraustochytriaceae
Genus	*Schizochytrium*

From http://sn2000.taxonomy.nl/Main/Classification/123817.htm

2.C. Specifications and Composition

Tables 13-1 and 13-2 show specifications and certificate of analysis (COA) for DHA-rich oil. Tables 14-1 and 14-2 present specifications and COA for DHA-rich oil powder. Powder form is diluted in DHA content since it is diluted with excipients. Three non-consecutive lots of DHA-rich oil and powder samples were analyzed for DHA, acid value, peroxide value, free fatty acids, trans fatty acids, heavy metals, and microbiology to ensure that Linyi Youkang Biology's DHA-rich oil products meet the specifications and are free from contaminations. DHA-rich oil is a free flowing, yellow oil, predominantly triglycerides (TG, >95%; details are shown in Appendix).

Tables 15 and 16 show FA profiles of Linyi Youkang Biology's DHA-rich oil in comparison with those described in GRN 137. The DHA content was higher in the current notice than GRN 137 (current notice vs. GRN 137= >45% vs. 32-45%). Other fatty acid profiles are similar to each other. Table 17 presents FA profile of Linyi Youkang Biology's DHA-rich oil powder. Table 18 presents other nutrients present in DHA-rich oil. There are negligible amounts of other nutrients such as carbohydrates and protein.

Table 13-1. Specifications of DHA-Rich Oil

Parameter	Specifications		Method of Analysis for the Current Notice
	Current notice	GRN137	
DHA, %	>45	32 - 45	AOCS Ce 1b-89
Acid value, mg KOH/g	< 0.5	<0.5	DCF C-V 2
Free fatty acid, as % oleic acid	< 0.1	NA	
Trans fatty acids, %	<1.0	<2.0	AOCS2a-94
Unsaponifiable matter, %	<3.0	<4.5	ISO 18609
Peroxide value, meq/kg	<5.0	<5.0	AOCS Cd 8b-90:2003
Moisture (direct drying method), g/100 g	<0.1	<0.1	ISO 662:1998
Docosapentaenoic acid (DPA, n-6), %	NA	10-20	AOAC 996.06
Residual hexane, ppm	<5.0	<10	Eurofin internal method: HS-GC-MS
Copper (Cu), mg/kg	<0.1	<0.1	BS EN ISO 17294-2 2004 mod.
Iron (Fe), mg/kg	<0.5	<0.5	
Lead (Pb), mg/kg	< 0.2	<0.2	
Arsenic (As), mg/kg	< 0.2	<0.5	
Cadmium (Cd), mg/kg	< 0.1		
Mercury (Hg), mg/kg	< 0.04	<0.2	BS EN 13806:2002
Coliforms, cfu/ml	< 1	NA	ISO 4832:2006
Molds, cfu/ml	< 1	NA	ISO 21527:2008
Yeast, cfu/ml	< 1	NA	
Salmonella, /25 g	Not Detected	NA	ISO 6579:2002

AOAC = Association of Official Analytical Chemists; AOCS = American Oil Chemist's Society; cfu = colony forming units

Table 13-2. Summary of Analytical Values for DHA-Rich Oil*

Parameter	Analytical values supporting specifications		
	DHY2017 040401	DHY2017 041201	DHY2017 042001
DHA, %	50.66	50.43	50.43
Acid value, mg KOH/g	0.14	< 0.2	< 0.2
Free fatty acid, as % oleic acid	< 0.1	< 0.1	< 0.1
Trans fatty acids, %	0.25	0.08	0.09
Unsaponifiable matter, %	1.0	1.0	1.0
Peroxide value, meq/kg	0.85 (retest value)	0.57 (retest value)	0.51 (retest value)
Moisture, g/100 g	<0.1	<0.1	<0.1
Residual hexane, mg/kg	<1	<1	<1
Copper (Cu), mg/kg	<0.1	<0.1	<0.1
Iron (Fe), mg/kg	0.19	<0.1	<0.1
Lead (Pb), mg/kg	< 0.05	< 0.05	< 0.05

Arsenic (As), mg/kg	< 0.1	< 0.1	< 0.1
Cadmium (Cd), mg/kg	< 0.01	< 0.01	< 0.01
Mercury (Hg), mg/kg	< 0.005	< 0.005	< 0.005
Coliforms, cfu/ml	< 1	< 1	< 1
Molds, cfu/ml	< 1	< 1	< 1
Yeast, cfu/ml	< 1	< 1	< 1
Salmonella, /25 g	Not Detected	Not Detected	Not Detected

*Samples were taken from 3 non-consecutive batches.

Table 14-1. Specifications of DHA-Rich Oil Powder

Parameter	Specifications	Method Analysis
DHA, %	>8.0	AOCS Ce 1b-89
Acid value, mg KOH/g	< 0.5	DCF C-V 2
Free fatty acids, as % oleic acid	<0.1	DCF C-V 2
Peroxide value, meq/kg	<5.0	AOCS Cd 8b-90:2003
Mercury (Hg), mg/kg	< 0.01	BS EN 13806:2002
Lead (Pd), mg/kg	< 0.05	BS EN ISO 17294-2 2004 mod.
Arsenic (As), mg/kg	< 0.1	BS EN ISO 17294-2 2004 mod.
Cadmium (Cd), mg/kg	< 0.01	BS EN ISO 17294-2 2004 mod.
Moisture and volatile matter content, g/100 g	<5.0	ISO 662:1998
Ash, g/100 g	<2.0	AOAC 941.12
Coliforms, cfu/g	< 10	ISO 4832:2006
Molds, cfu/g	< 10	ISO 21527:2008
Yeast, cfu/g	< 10	ISO 21527:2008
Salmonella, /25 g	Not Detected	ISO 6579:2002
Aerobic plate count, cfu/g	< 10	ISO 4833-1:2013

AOAC = Association of Official Analytical Chemists; AOCS = American Oil Chemist's Society; BS EN=British standards in English; cfu = colony forming units; ISO= International Organization for Standardization; meq = milliequivalents.

Table 14-2. Analytical Values for DHA-Rich Oil Powder*

	Analytical values		
Parameter	2017020901	2017021501	2017022401
DHA, %	8.98	8.91	8.80
Acid value, mg KOH/g	< 0.2	<0.2	<0.2
Free fatty acids, as % oleic acid	<0.1	<0.1	<0.1
Peroxide value, meq/kg	1.78	< 0.05	0.66
Mercury (Hg), mg/kg	< 0.005	< 0.005	< 0.005
Lead (Pd), mg/kg	< 0.05	< 0.05	< 0.05
Arsenic (As), mg/kg	< 0.1	< 0.1	< 0.1
Cadmium (Cd), mg/kg	< 0.01	< 0.01	< 0.01

Mercury (Hg), mg/kg	< 0.005	< 0.005	< 0.005
Moisture and volatile matter content, g/100 g	2.38	2.44	2.42
Ash, g/100 g	1.58	1.60	1.55
Coliforms, cfu/g	< 10	< 10	< 10
Molds, cfu/g	< 10	< 10	< 10
Yeast, cfu/g	< 10	< 10	< 10
Salmonella, /25 g	Not Detected	Not Detected	Not Detected
Aerobic plate count, cfu/g	< 10	< 10	< 10

*Samples were taken from 3 non-consecutive batches. AOAC = Association of Official Analytical Chemists; AOCS = American Oil Chemist's Society; BS EN=British standards in English; cfu = colony forming units; ISO= International Organization for Standardization; meq = milliequivalents.

Table 15. Fatty Acid Profile of Linyi Youkang Biology's DHA-Rich Oil

Fatty Acid Profile, g/100 g	Lot: DHY 2017040401	Lot: DHY 2017041201	Lot: DHY 2017042001	Mean
C 6:0 (Caproic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 8:0 (Caprylic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 10:0 (Capric acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 12:0 (Lauric acid)	0.10	0.10	0.10	0.10
C 14:0 (Myristic acid)	0.82	0.82	0.82	0.82
C 14:1 (Myristoleic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 15:0 (Pentadecanoic acid)	0.06	0.06	0.06	0.06
C 15:1 (Pentadecenoic acid)	0.07	0.07	0.07	0.07
C 16:0 (Palmitic acid)	20.86	21.05	20.97	20.96
C 16:1 (Palmitoleic acid)	0.51	0.50	0.50	0.51
C 17:0 (Margaric acid)	0.08	0.08	0.08	0.08
C 17:1 (Heptadecenoic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 18:0 (Stearic acid)	1.29	1.31	1.30	1.30
C 18:1 (Oleic acid)	0.28	0.27	0.27	0.27
C 18:1n7 (Vaccenic acid)	0.51	0.51	0.51	0.51
C 18:2n6 (Linoleic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 18:3n3 (alpha-Linolenic acid)	0.14	0.14	0.14	0.14
C 18:3n6 (gamma-Linolenic acid)	0.09	0.09	0.09	0.09
C 20:0 (Arachidic acid)	0.29	0.29	0.29	0.29
C 20:1 (Eicosenoic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 20:2n6 (Eicosodienoic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 20:3n3 (Eicosatrienoic acid)	1.35	1.34	1.34	1.34
C 20:3n6 (homo-gamma-Linolenic acid)	0.21	0.21	0.21	0.21
C 20:4n6 (Arachidonic acid)	0.15	0.13	0.14	0.15
C 20:5n3 (Eicosapentaenoic acid)	0.70	0.70	0.69	0.70
C 21:0 (Heneicosanoic acid)	0.031	0.029	0.059	0.04
C 22:0 (Behenic acid)	0.15	0.15	0.15	0.15

C 22:1n9 (Erucic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 22:2n6 (Docosadienoic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 22:6n3 (Docosahexaenoic acid)	50.66	50.43	50.43	50.66
C 22-5n3 (Docosapentaenoic acid)	0.10	0.11	0.11	0.11
C 22-5n6 (Docosapentaenoic acid)	10.37	10.30	10.33	10.33
C 23:0 (Tricosanoic acid)	< 0.02	< 0.02	< 0.02	< 0.02
C 24:0 (Lignoceric acid)	0.14	0.16	0.15	0.15
C 24:1 (Nervonic acid)	0.40	0.42	0.40	0.41
Monounsaturated fat	1.76	1.78	1.76	1.76
Omega-3 fatty acids	54.02	53.79	53.80	53.87
Omega-6 fatty acids	10.88	10.80	10.84	10.84
Polyunsaturated fat	64.90	64.60	64.65	64.73
Saturated fat	23.84	24.06	23.99	23.96
Total fat	90.52	90.43	90.40	90.45

Based on AOAC 996.06.

Table 16. Comparison of Fatty Acid Profiles of DHA-Rich Oils*

	Current notice	GRN 137
DHA specifications, %	>45	32 - 45
Actual content, %	50.66	35 2.46
Fatty Acid Profile, g/100g		
C 6:0 (Caproic acid)	< 0.02	
C 8:0 (Caprylic acid)	< 0.02	
C 10:0 (Capric acid)	< 0.02	
C 12:0 (Lauric acid)	0.10	0.04
C 14:0 (Myristic acid)	0.82	10.11
C 14:1 (Myristoleic acid)	< 0.02	
C 15:0 (Pentadecanoic acid)	0.06	
C 15:1 (Pentadecenoic acid)	0.07	
C 16:0 (Palmitic acid)	20.96	23.68
C 16:1 (Palmitoleic acid)	0.51	1.76
C 17:0 (Margaric acid or Heptadecanoic acid)	0.08	
C 18:0 (Stearic acid)	1.30	0.45
C 18:1 (Oleic acid)	0.27	NA
C 18:1n7 (Vaccenic acid)	0.51	Trace-1.36
C 18:2n6 (Linoleic acid)	< 0.02	
C 18:3n3 (alpha-Linolenic acid)	0.14	
C 18:3n6 (gamma-Linolenic acid)	0.09	
C 20:0 (Arachidic acid)	0.29	
C 20:1 (Eicosenoic acid)	< 0.02	
C 20:2n6 (Eicosodienoic acid)	< 0.02	
C 20:3n3 (Eicosatrienoic acid)	1.34	
C 20:3n6 (homo-gamma-Linolenic acid)	0.21	
C 20:4n6 (Arachidonic acid)	0.15	0.94

C 20:5n3 (Eicosapentaenoic acid; EPA)	0.70	2.63
C 21:0 (Heneicosanoic acid)	0.04	
C 22:0 (Behenic acid)	0.15	
C 22:1n9 (Erucic acid)	< 0.02	
C 22:2n6 (Docosadienoic acid)	< 0.02	
C 22:6n3 (Docosahexaenoic acid)	50.66	
C 22-5n3 (Docosapentaenoic acid)	0.11	
C 22-5n6 (Docosapentaenoic acid)	10.33	13.5
C 23:0 (Tricosanoic acid)	< 0.02	
C 24:0 (Lignoceric acid)	0.15	
C 24:1 (Nervonic acid)	0.41	
Monounsaturated fat	1.76	
Polyunsaturated fat	64.73	
Saturated fat	23.96	
Total fat	90.45	

*DHA-rich oils were derived from *Schizochytrium* sp. for general food applications.

Table 17. Fatty Acid Profiles of Linyi Youkang Biology's DHA-Rich Oil Powder

Fatty Acid Profile, g/100g	Lot: (b) (6)	Lot: (b) (6)	Lot: (b) (6)	Mean
C 6:0 (Caproic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 8:0 (Caprylic acid)	0.047	0.044	0.040	0.02
C 10:0 (Capric acid)	0.039	0.034	0.038	0.02
C 12:0 (Lauric acid)	< 0.020	< 0.020	< 0.020	0.02
C 14:0 (Myristic acid)	0.134	0.133	0.131	0.133
C 14:1 (Myristoleic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 15:0 (Pentadecanoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 15:1 (Pentadecenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 16:0 (Palmitic acid)	8.407	8.407	8.243	8.352
C 16:1 (Palmitoleic acid)	0.077	0.075	0.074	0.075
C 17:0 (Margaric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 17:1 (Heptadecenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 18:0 (Stearic acid)	0.273	0.272	0.266	0.270
C 18:1 (Oleic acid)	0.041	0.040	0.040	0.040
C 18:1n7 (Vaccenic acid)	0.067	0.066	0.065	0.066
C 18:2n6 (Linoleic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 18:3n3 (alpha-Linolenic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 18:3n6 (gamma-Linolenic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 20:0 (Arachidic acid)	0.053	0.054	0.052	0.053
C 20:1 (Eicosenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 20:2n6 (Eicosodienoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 20:3n3 (Eicosatrienoic acid)	0.204	0.200	0.198	0.200
C 20:3n6 (homo-gamma-Linolenic acid)	0.037	0.036	0.036	0.030

C 20:4n6 (Aracihdonic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 20:5n3 (Eicosapentaenoic acid)	0.096	0.095	0.096	0.096
C 21:0 (Heneicosanoic acid)	0.027	< 0.020	< 0.020	< 0.020
C 22:0 (Behenic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 22:1n9 (Erucic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 22:2n6 (Docosadienoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 22:6n3 (Docosahexaenoic acid)	8.983	8.912	8.805	8.900
C 22-5n3 (Docosapentaenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 22-5n6 (Docosapentaenoic acid)	1.972	1.959	1.936	1.956
C 23:0 (Tricosanoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 24:0 (Lignoceric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 24:1 (Nervonic acid)	0.055	0.062	0.059	0.058
Total fat	20.73	20.61	20.28	20.54

Based on AOAC 996.06.

Table 18. Other Nutrients in Linyi Youkang Biology's DHA-Rich Oil

	Lot: (b) (6) (b) (6)	Lot: (b) (6) (b) (6)	Lot: (b) (6) (b) (6)	Mean
Protein, g/100 g	< 0.1 (k=6.25)	< 0.1 (k=6.25)	< 0.1 (k=6.25)	<0.1
Dietary fiber, g/100 g	< 0.5	< 0.5	< 0.5	<0.5
Total fat, g/100 g	99.1	99.6	99.9	99.5
Energy				
Energy kcal (calculated), kcal/100 g	896	898	900	898
Energy kJ (calculated), kJ/100 g	3682	3692	3698	3691
Carbohydrates, g/100 g				
Carbohydrates (available)	0.90	0.40	0.10	0.46
Total carbohydrates	0.90	0.40	0.10	0.46
Sugar Profile, g/100 g				
Fructose	< 0.1	< 0.1	< 0.1	< 0.1
Galactose	< 0.1	< 0.1	< 0.1	< 0.1
Glucose	< 0.1	< 0.1	< 0.1	< 0.1
Lactose	< 0.1	< 0.1	< 0.1	< 0.1
Maltose	< 0.1	< 0.1	< 0.1	< 0.1
Monosaccharides and disaccharides	< 0.1	< 0.1	< 0.1	< 0.1
Sucrose	< 0.1	< 0.1	< 0.1	< 0.1
Sterols, mg/100 g				596

2.D. Intended Technical Effects

DHA-rich oil ingredients will be used as a nutritional ingredient in general foods.

PART 3. EXPOSURE ESTIMATES

3.A. Intended Use

DHA-rich oil will be added to the same food categories as those currently listed in 21 CFR 184.1472(a)(3) (menhaden oil) at maximum use levels that are 22.22% percent of those specified in that regulation. We derived the 22.22% value based on the following factors:

1) Whereas menhaden oil is considered GRAS at a level providing no more than 3 grams of DHA and EPA per day, the use levels in each food category are decreased by 50% so that total daily consumption of DHA from the DHA-rich oil will be no more than 1.5 grams per day.
2) The levels of use are based on the quantity of DHA-rich oil that can be added to each product. An additional adjustment is needed because the DHA-rich oil has a different concentration of DHA than that found in menhaden oil. DHA-rich oil contains approximately 45 wt% compared to about 20% combined EPA and DHA in menhaden oil. An additional adjustment of 44.44% (20/45) is needed to accommodate the different concentrations of DHA in the two oils.
3) The 22.22% adjustment is calculated by multiplying the 50% adjustment that is needed in accordance with the first bullet point above by the 44.4% adjustment that is needed in accordance with the second bullet point above. ((0.50) x (0.444) x 100 = 22.22 %).

DHA-rich oil powder will be added to the same food categories as those currently listed in 21 CFR 184.1472(a)(3) (menhaden oil) at maximum use levels that are 125% of those specified in that regulation. We derived the 125% value because of the following factors:

1) Total daily consumption of DHA from the DHA-rich oil will be no more than 1.5 g per day as explained above.
2) An additional adjustment is needed because the DHA-rich oil powder contains approximately 8% compared to about 20% combined EPA and DHA in menhaden oil. An additional adjustment of 250% (20/8) is needed to accommodate the different concentrations of DHA in the two oil products.
3) The 125% adjustment is calculated by multiplying the 50% adjustment that is needed in accordance with the first bullet point above by the 250% adjustment that is needed in accordance with the second bullet point above, ((0.50) x (2.50) x 100 = 125%).

These are the same food categories found in the GRAS notification for fish oil concentrate (GRN 000105) and DHA-algal oils (*Schizochytrium* sp.: GRN 137- FDA, 2004a; *Ulkenia* sp.: GRN 319- FDA, 2010) for which the agency did not raise any objections to the company's conclusion that its fish oil concentrate and DHA-algal oils derived from *Schizochytrium* sp. and *Ulkenia* sp. would be considered GRAS when used in the food categories identified for menhaden oil.

3.B. Exposure Estimates

The proposed use levels of the DHA-rich oil ingredients are expected to result in a maximum dietary exposure of less than 1.5 g of DHA per day. In the GRN 137, estimates exposure at the intended use levels is 1.4 g/person/day from the current intended use levels (which was indicated as future use levels at that time). Because DHA-rich oil is intended to be

used as an alternative to menhaden oil, there will be no increase in exposure to EPA and DHA from the intended use described in Tables 1-1 and 1-2.

DHA-rich oil ingredient is intended to be the sole source of DHA in any given food category. It would be possible, however, to blend DHA-rich oil with other sources of DHA and/or EPA. FDA has determined in its review of other sources of DHA and/or EPA that these oils may be used at a level providing up to 3.0 g of DHA and/or EPA per day. In the event that a manufacturer blends DHA-rich oil with another oil that is a source of DHA and/or EPA, such blending would be appropriate provided that (1) the DHA-rich oil is used at a level consistent with Tables 1-1 and 1-2 and its use would not result in more than 1.5 g of DHA/person/day and (2) the other oil source of DHA and/or EPA is used at a level that would not result in a cumulative exposure of DHA and EPA of greater than 3.0 g/person/day.

3.C. Food Sources of DHA

Human milk provides small quantities of DHA and ARA, usually less than 1% of total fatty acids (Brenna et al., 2007). Fish oil and egg yolks also are known to be excellent sources of DHA.

Summary of Consumption Data

DHA-rich oil will be added to the same food categories as those currently listed in 21 CFR 184.1472(a)(3) (menhaden oil) at maximum use levels. The proposed use levels of the DHA-rich oil ingredients are expected to result in a maximum dietary exposure of less than 1.5 g of DHA per day. To ensure the safe use of the substance, either DHA-rich oil or powder are intended to be the sole source of DHA in any given food category. In addition, the no-observed-adverse-effect-level (NOAEL) value of 5,000 mg/kg bw/day found in a subchronic toxicity study in rats (details are found in Part 6.B.3) further supports the safe intake of DHA at maximum exposure levels of 1.5 g/day.

PART 4. SELF-LIMITING USE LEVELS

The use of DHA-rich oil will be based on the maximum use levels of menhaden oil in specific food categories established by FDA for menhaden oils such that total intake of DHA plus EPA does not exceed 3.0 g/person/day. The use limitations of EPA and DHA were based on the content of EPA and DHA in menhaden oil, which is approximately 20%. Therefore, while DHA-rich oil and powder contain a DHA content of 45-51% and 8-9%, respectively, and no significant EPA level, it can reasonably be concluded that approximately 22% and 125% as much menhaden oil as DHA-rich oil or DHA-rich oil powder, respectively, will have to be consumed for the same intake of w-3 fatty acids.

PART 5. HISTORY OF CONSUMPTION

EXPERIENCE BASED ON COMMON USE IN FOODS BEFORE 1958

The statutory basis for the conclusion of GRAS status of algal DHA-rich oil in this document is not based on common use in food before 1958. The GRAS determination is based on scientific procedures. As described above, DHA is a naturally occurring food component. It is reasonable to conclude that it was present in food prior to 1958.

PART 6. BASIS FOR GRAS DETERMINATION

6.A. Current Regulatory Status.

Due to the compositional similarity and DHA content of fish and algal-derived oils to Youkang's DHA-rich oils, the available scientific literature on the safety of these oils supports the safety of DHA-rich oil derived from *Schizochytrium* sp.

In 1989, the FDA affirmed the GRAS status of partially hydrogenated menhaden oil (with an iodine number 185) and fully hydrogenated menhaden oil for use in foods with certain limitations (U.S. FDA, 1989). Subsequently, in 1997, the FDA affirmed the GRAS status of menhaden oil and partially hydrogenated menhaden oil (with an iodine number S110), provided that under the conditions of intended use in foods, the total EPA + DHA daily intake does not exceed 3 g/person/day (U.S. FDA, 1997). In 2005, FDA issued a final rule on menhaden oil reallocating the use levels and categories of use within the GRAS affirmation, but ensuring daily intakes of EPA and DHA do not exceed 3 g/person/day (U.S. FDA, 2005).

Thus, in 21 CFR 184.1472(a)(3), menhaden oil is considered GRAS at a level providing no more than 3 g of combined DHA and EPA per person per day. Subsequently, GRAS notices on fish oils as sources of DHA and EPA (GRN 105- FDA, 2002; GRN 138 - FDA, 2004b; GRN 193 - FDA, 2006; GRN 371 – FDA, 2011a) have received no question by FDA. In addition, algal DHA derived from *Schizochytrium* sp. (GRN 137 - FDA, 2004a) received a GRAS notice status with U.S. FDA to result in a maximum dietary exposure of less than 1.5 g of DHA per day (Table 19). Algal DHA from *Ulkenia* sp. (GRN 319 - FDA, 2010) also has established a GRAS notice status with U.S. FDA for general food applications.

Table 19. Regulatory Approvals for Use of Algal DHA-Rich Oils in Foods

Item	Year Approved	Submission
GRN 137	2004	Algal DHA (>35%) derived from *Schizochytrium* sp. with intended uses as a direct food ingredient in the same categories as considered GRAS for menhaden oil (U.S. FDA, 2004a).
GRN 319	2010	Algal DHA derived from *Ulkenia* sp. with intended uses as a direct food ingredient in the same categories as considered GRAS for menhaden oil (U.S. FDA, 2010).

6.B. Review of Safety Data

As the DHA-rich oil in this GRAS notice has similar specifications compared to the DHA-rich oil in the previous FDA GRAS notices, GRNs 137, 553, and 677 (Table 13-1), it is recognized that the information and data in GRN 137 are pertinent to the safety of the DHA-rich oil in this GRAS notice. Although GRNs 553 and 677 were related to infant formula applications, the safety and metabolism studies reviewed in these GRAS notices can be used for safety evaluation of DHA-rich oil derived from *Schizochytrium* sp. Based on a comparison of the specifications for these products, it is concluded that they are essentially similar.

Therefore, this notice incorporates by reference the safety and metabolism studies discussed in the previous GRAS notices (GRNs 137, 553, and 677), and will not discuss previously reviewed references in detail. Additionally, this notice discusses additional children and adult human studies published since the FDA's last review in 2010 (January 2010 and July 2017). Due to abundance of literature on DHA or DHA-rich oils, our review has focused on the studies of DHA-rich oils derived from *Schizochytrium* sp. The subject of the present GRAS notice is DHA-rich oil derived from *Schizochytrium* sp. (both oil and powder forms).

6.B.1. Metabolic Fate of DHA (adopted from Kremmyda et al., 2011; Kroes et al., 2003; Martin et al., 1993)

DHA is mainly found in the form of triglycerides (TGs), although they also occur in phospholipids in breast milk (Martin et al., 1993). In general, dietary TGs undergo enzymatic hydrolysis in the upper intestine to free fatty acids (FFA) and 2-monoglycerides. These products are then integrated into bile acid micelles for diffusion into the interior of the intestinal epithelial cells for subsequent incorporation into new or reconstituted TGs (Kroes et al., 2003). These reconstructed TGs enter the lymph in the form of chylomicrons for transport to the blood, which allows distribution and incorporation into plasma lipids, erythrocyte membranes, platelets, and adipose tissue. The chylomicron-contained TGs are hydrolyzed by lipoprotein lipase during passage through the capillaries of adipose tissue and the liver to release FFA to the tissues for metabolism or for cellular uptake, with subsequent re-esterification into TGs and phospholipids for storage as energy or as structural components of cell membranes. The metabolism of FAs occurs in the mitochondria following their transport across the mitochondrial membrane in the form of acylcarnitine. Fatty acids are metabolized predominantly via beta-oxidation, a process that involves a shortening of the FA carbon chain and the production of acetic acid and acetyl CoA, which combines with oxaloacetic acid and enters the citric acid cycle for energy production. The degree of transport of FAs across the mitochondrial membrane is contingent upon the length of the carbon chain; FAs of 20 carbons or more are transported into the mitochondria to a lesser degree than shorter chain FAs. Therefore, long chain FAs, such as DHA, may not undergo mitochondrial beta-oxidation to the same extent (Kroes et al., 2003). Instead they are preferentially channeled into the phospholipid pool where they are rapidly incorporated into the cell membranes of the developing brain and retina.

Fatty acids can be desaturated endogenously up to the Δ9 position due to lack of certain enzymes in humans (Kremmyda et al., 2011). For this reason, linoleic (18:2n-6) and linolenic (18:3n-3) acids must be obtained from the diet and are termed essential FA. Further elongation and desaturation of these FAs to produce long-chain PUFA is possible, but not very efficient in humans. Examples of long-chain PUFA include ARA (20:4n-6), eicosapentaenoic (EPA; 20:5n-3), and DHA (22:6n-3). Thus, these FAs may be conditionally essential depending on essential FA availability. Genetic variation in human desaturase genes affects FA metabolism, plasma lipid profiles, and risk of disease development.

6.B.2. Studies on Mutagenicity and Genotoxicity of DHA Derived from *Schizochytrium* sp.

Table 20 summarizes the results of mutagenicity and genotoxicity studies on DHA derived from *Schizochytrium* sp. Due to the abundance of papers, this mutagenicity and genotoxicity review limits the studies on the DHA derived only from *Schizochytrium sp*., instead of covering DHA from various sources. In a study by Lewis et al. (2016), the safety of DHA-rich oil from *Schizochytrium* sp. was confirmed by testing for gene mutations and genotoxicity. The results of all mutagenicity and genotoxicity tests were negative.

Bacterial reverse mutation assays for DHA-rich oil (Lewis et al., 2016)

None of the revertant colonies exceeded three times the mean of the solvent control in the presence or absence of metabolic activation when treated with DHA-rich oil (41.37% DHA). There was no dose-related increase over the range tested for any of the five tester strains used. Based on these results, DHA-rich oil was found to be not mutagenic.

In vitro chromosomal aberration tests using human blood peripheral lymphocyte with DHA-rich oil (Lewis et al., 2016)

In Phase I, the cultures were treated for 4 h with DHA-rich oil and the mean number of percent aberrant cells was determined in the presence and in the absence of metabolic activation for concentrations of 0, 1.25, 2.5, and 5.0 mg/mL DHA-rich oil and positive controls, respectively. For Phase II, test item treatment concentrations were 0, 1.25, 2.5, and 5.0 mg DHA-rich oil/mL culture in presence and in absence of metabolic activation. The duration of exposure was 24 h. The mean percentage of aberrant cells was determined in the absence and presence of metabolic activation. Treatment with 600 mg/mL ethyl methanesulfonate in the absence of metabolic activation, and 30 mg/mL cyclophosphamide in the presence of metabolic activation resulted in a significant increase in percent aberrant cells. The analysis did not reveal any statistically significant results for DHA-rich oil. Under these experimental conditions, DHA-rich oil did not induce chromosomal aberration and was not genotoxic in the presence and absence of metabolic activation.

Mammalian erythrocyte micronucleus tests for DHA-rich oil (Lewis et al., 2016)

Wistar rats treated with DHA-rich oil at all doses exhibited mean frequency of polychromatic erythrocytes (%PCE) to normochromatic erythrocytes and individual frequencies of micronucleated polychromatic erythrocytes that were similar to the values for the vehicle control group, thus indicating no evidence of test article related to bone marrow toxicity.

GRN 553 and 677 reported that bacterial reverse mutation assays (Hammond et al., 2002; Fedorova et al., 2011a; 2011b; Schmitt et al., 2012a), chromosome aberration assays (Hammond et al., 2002; Fedorova et al., 2011a; 2011b; Schmitt et al, 2012a), *in vivo* micronucleus tests in mice and rats (Hammond et al., 2002; Fedorova et al., 2011a; 2011b; Schmitt et al, 2012a), and *in vitro* CHO AS52/XPRT gene mutation assay (Hammond et al., 2002) did not show any mutagenicity or genotoxicity of DHA-rich algal oil and DHA-rich microalgae (DRM). Individual studies are summarized in Table 19.

Table 20. Genotoxicity Studies Showing No Mutagenicity or Genotoxicity

Test concentrations	Test system	Substance	Reference
Recently published studies			
62, 185, 556, 1,667, 2,500, 3,750, and 5,000 ug/plate, plate incorporation and preincubation ± S9	*S. typhimurium* TA98, TA100, TA1535, TA1537, *E. coli* WP2 uvrA	DHA-rich oil (41.4% DHA)	Lewis et al., 2016
Phase I: Concentration of 0, 1.25, 2.5, and 5.0 mg/mL (4 h); Phase II: 0, 1.25, 2.5, and 5.0 mg/mL culture (24 h) ± S9	Human blood peripheral lymphocytes	DHA-rich oil (41.4% DHA)	Lewis et al., 2016
1000, 2500, and 5000 mg/kg bw/day	Polychromatic erythrocytes in bone marrow of treated rats	DHA-rich oil (41.4% DHA)	Lewis et al., 2016
Studies reviewed in GRN 677 and 553			
2,000-5,000 ug/plate	*S. typhimurium* TA 98, TA 100, TA 1535, TA 1537, and *E. coli* WP2 *uvrA;* w/ and w/o S9 activation	DHA-rich oil (37-45% DHA)	Fedorova-Dahms et al. 2011a, 2011b
5-500 ug/plate	*S. typhimurium* TA 98, TA 100, TA 102, TA 1535, TA 1537 w/ and w/o S9 activation	DRM	Hammond et al. 2002
500-5,000 ug/plate	*S. typhimurium* TA 100 and *E. coli* WP2 w/ and w/o S9 activation	DHA-rich oil	Schmitt et al. 2012a
0.13 and 0.25 ug/ml	Human peripheral blood lymphocytes	DHA-rich microalgae	Hammond et al. 2002
13.6, 19.4, 27.7. 39.5, 56.5, 80.7, 115, 165, 235, 336, 480, 686, 980, 1400, and 200 ug/ml	Human peripheral blood lymphocytes	DHA-rich oil	Schmitt et al., 2012a
NA	Human lymphocytes, 4 or 24 h, w/ and w/o metabolic activation	DHA-rich oil (37-45% DHA)	Fedorova-Dahms et al., 2011a, 2011b
2,000 mg/kg	Murine PCE in peripheral blood		
500, 1,000, and 2,000 mg/kg	Murine PCE in bone marrow	DHA-rich microalgae	Hammond et al., 2002
500, 1,000, 1,500, and 2,000 mg/kg	Rat PCE in bone marrow	DHA-rich oil	Schmitt et al., 2012a
10-5,000 ug/ml, and different S9 concentrations (0, 1, 5, and 10%)	CHO AS52/XPRT gene mutation assay	DHA-rich microalgae	Hammond et al., 2002

PCE=polychromatic erythrocytes

Overall, studies consistently show that all preparations of DHA-rich oil are not mutagenic or genotoxic.

6.B.3. Animal Toxicity Studies of DHA Derived from *Schizochytrium* sp.

The results of various animal toxicity studies are summarized in Table 21. Due to the abundance of papers reporting no adverse effects of DHA in animals, this animal toxicity review has focused on the studies of DHA-rich oil derived from *Schizochytrium* sp., instead of DHA from various sources.

Acute Toxicity Study of Linyi Youkang's DHA-Rich Oil

Gao (2017) evaluated acute toxicity of DHA-rich oil in rats. DHA-rich oil (50.5% DHA) was administered to 10 young rats (5 males and 5 females) by oral gavage at the dosage of 0 or 15.2 g/kg body weight (bw). Animals were observed for 14 days to monitor changes in body weight, clinical signs, as well as food consumption. At the end of the study, all surviving animals were sacrificed and major organs were examined. No animal died during the 14-day observation period and no clinical signs of abnormality were observed at the dose of 15.2 g/kg bw. Furthermore, no significant differences in mean body weight, food consumption, and organ weights were found among the test group and control groups (water control and sunflower oil vehicle control). No treatment-related abnormalities were observed in macroscopic examinations. The author found that the mean lethal dose (LD_{50}) of DHA-rich oil was far above 15.2 g/kg bw.

Studies of Other ARA-Rich Oil from *Schizochytrium* sp.

In a study by Lewis et al. (2016), the safety of DHA-rich oil from *Schizochytrium* sp. was evaluated by conducting 28-day and 90-day dietary studies in Wistar rats. The 28-day and 90-day studies involved dietary exposure to 1,000, 2,500, and 5,000 mg/kg bw/day of the DHA-rich oils and two control diets: water and corn oil (vehicle control). There were no treatment-related effects of DHA-rich oils on clinical observations, body weight, food consumption, behavior, hematology, clinical chemistry, coagulation, urinalysis parameters, or necropsy findings. Increases in cholesterol and TG levels were considered related to a high oil diet and non-adverse. In a series of toxicity studies (acute toxicity, 28-day subacute toxicity and 90 day subchronic toxicity), the NOAEL for the DHA-rich oils from *Schizochytrium* sp. was determined to be 5,000 mg/kg bw/day, the highest dose tested. The DHA oil contained 41.4% DHA.

A recent study by Falk et al. (2017) investigated the reproductive and developmental toxicity of dietary exposure to DHA-rich oil (41.4% DHA) from *Schizochytrium* sp. In a developmental toxicity study, pregnant Wistar rats were untreated (control) or administered corn oil (vehicle control), 1,000, 2,500, or 5,000 mg/kg bw/day of DHA-rich oil via gavage from gestation days 6 through 20. In the reproductive toxicity study, male and female Wistar rats were administered vehicle control (corn oil), or 1,000, 2,500, or 5,000 mg/kg bw/day of DHA-rich oil via gavage throughout the mating period, pregnancy, and the nursing and lactation period. Differences in the number of fetuses, fetal skeletal malformations, and external and visceral anomalies in the developmental study and mortality, clinical signs, fertility indices, physical observations, gross necropsy findings, and gestation period length in the reproductive toxicity study were not dose-related or significantly different from control groups, and were not considered to be treatment-related. The NOAEL was determined to be 5,000 mg/kg bw/day for

maternal toxicity and embryo/fetal development and for paternal or maternal treatment-related reproductive toxicity for the DHA-rich oil administered by gavage.

In addition, GRN 553 and 677 reported that the NOAELs for DHA-rich algal oil were found to be 3,250 -7,464 mg/kg bw/day (or 1,300- 2,985 mg DHA/kg bw/day) in rats from subchronic toxicity or developmental toxicity studies (Fedorova-Dahms et al., 2011a; 2011b; Schmitt et al., 2012a; 2012b). For DHA-rich microalgae (DRM), the NOAELs were estimated to be 3,162-4,000 mg/kg bw/day from asubchronic toxicity study in pigs (Abril et al., 2003; Hammond et al., 2001a), 20,000 -22,000 mg/kg bw/day (or 1,800 mg DHA/kg bw/day) from a single generation reproduction or developmental toxicity studies in rats (Hammond et al., 2001b, 2001c), and 1,800 mg/kg bw/day from a developmental toxicity in rabbits (Hammond et al., 2001b). Individual studies are summarized in Table 21.

Conclusion:
Based on the studies summarized above, for purposes of safety evaluation, a NOAEL of 5,000 mg/kg bw/day was chosen for DHA-rich oils (or 2,000 mg/kg bw/day for DHA) in rats.

Table 21. Animal Toxicity Studies of DHA-Rich Oil or DHA-Rich Microalgae

Dose	Study Design (Route of administration)	Duration	Species	Material Studied	Primary Observations	NOAEL (mg/kg bw/d)	Reference
Linyi Youkang Biology's DHA-rich oil							
15.2 g/kg bw/d	Oral gavage	Single dose	Rat	DHA-rich oil	Clinical signs of abnormality	LD50>>>15,200 mg/kg bw	Gao, 2017
Studied published since FDA's review in 2016-2017							
1,000, 2,500, or 5,000 mg/kg bw/d	Subchronic toxicity (oral gavage)	90 d	Rat	DHA-rich oil (41.4% DHA) from *Schizo-chytrium sp.*	No treatment-related adverse effects	5,000 mg/kg bw/d	Lewis et al., 2016
	Developmental toxicity (oral gavage)	Gestat-ion days 6 to 20	Rat	DHA-rich oil (41.4% DHA) from *Schizo-chytrium sp.*	No treatment-related adverse effects	5,000	Falk et al., 2017
150, 1000, and 2,000 mg/kg bw/d	Chronic toxicity (oral gavage)	9 mo	Beagle dog	DHA ethyl ester (90% DHA) made from DHA oil from *C. cohnii*	No treatment-related adverse effects	2,000	Dahm et al., 2016
Studies reviewed in previous GRAS notices							
5000 mg/kg/d	Acute oral toxicity (gavage)	14 d	Rat	DHA-rich oil (42% DHA; from *Schizo-chytrium sp.*)	No treatment-related adverse effects	LD_{50}>5,000	Schmitt et al., 2012a
1, 2.5, or 5% in diet	Acute oral toxicity (diet)	14 d	Rat		No treatment-related adverse effects	M, 3,258; F, 3,542	
1, 2.5, or 5% in diet	Subchronic toxicity (diet)	90 d	Rat		No treatment-related adverse effects	M, 3,305; F, 3,679	
0.5, 1.5, or 5% in diet	Subchronic toxicity (diet)	90 d	Rat	DHA-rich oil (37% DHA; from *Schizo-*	Reduced food consumption in all treatment and fish oil control groups;	3,246	Fedorova-Dahms et al., 2011a

				chytrium sp.)	attributed to high fat content rather than treatment.		
0.5, 1.5, or 5% in diet	Developmental toxicity of mothers (diet)	15 d	Rat	DHA-rich oil (40-45% DHA; from *Schizochytr-ium sp.*)	No treatment-related adverse effects	4,260	Fedorova-Dahms et al., 2011b
0.5, 1.5, or 5% in diet	Subchronic toxicity of F1 (diet)	90 d	Rat		No treatment-related adverse effects	4,260	Fedorova-Dahms et al., 2011b
400-2,000	Developmental toxicity (gavage)	20 d	Rat	DHA-rich oil (42% DHA; from *Schizochytri-um sp.*)	No treatment-related adverse effects	2,000	Schmitt et al., 2012b
1, 2.5, or 5% in diet	Subchronic and reproductive toxicity of first generation (diet)	75-90 d	Rat		No treatment-related adverse effects	M during premating, 3,421; M after mating, 2,339; F during mating, 3,558; F during gestation, 3,117; F during lactation, 7,464	
1, 2.5, or 5% in diet	Developmental and subchronic toxicity of second generation (diet)	106-111 d	Rat		No treatment-related adverse effects in the 5% group males; Higher food consumption and BW in the 5% group females	M, 3,526; F, 2,069	
1.17, 3.39, or 5.75 kg DRM per pig over 42 d; 2.68 kg DRM over 120 d	Subchronic toxicity (diet)	42-120 d	Pig	DHA-rich microalgae	No treatment-related adverse effects (598, 261, 756, and 1,281 g DHA per pig during expt. period)	DRM, 1,368; DHA, ~305	Abril et al., 2003

400, 1,500, or 4,000	Subchronic toxicity (diet)	13 wk	Rat	DHA-rich microalgae (*Schizochytrium sp.*)	No treatment-related adverse effects	4,000	Hammond et al., 2001a
0.6, 6.0, or 30% DRM in diet	Developmental safety (diet)	15 d	Rat	DHA-rich microalgae (*Schizochytrium sp.*)	No treatment-related adverse effects	22,000	Hammond et al., 2001b
180, 600, or 1,800 mg/kg/d	Developmental toxicity (gavage)	30 d	Rabbit		High-dose (1,800) DHA oil and fish oil groups: F0-reduced food consumption and BW	Maternal, 600; Develop: 1,800	Hammond et al., 2001b
0.6, 6.0, or 30% DRM in diet	Single-generation reproduction toxicity (Diet)	13 wk	Rat	DHA-rich microalgae (*Schizochytrium sp.*)	No treatment-related adverse effects	DHA-rich microalgae: M, 17,847; F, 21,000; DHA: M, 1500; F, 1800	Hammond et al., 2001c

M=males; F=females;

6.B.4. Human Clinical Studies of DHA

The FDA previously reviewed the safety of fish oil containing the two omega-3 fatty acids, EPA and DHA, in the 1997 final rule affirming menhaden oil as GRAS (FDA, 1997). The FDA raised concerns about the consumption of high levels of EPA and DHA, which may increase bleeding time, increase levels of low-density lipoprotein (LDL) cholesterol, and have an effect on glycemic control in subjects with type 2 diabetes (menhaden oil final rule; 62 FR 30751; June 5, 1997). Based on this review, the FDA concluded that a combined intake of EPA and DHA of up to 3 g/person/day would not result in any adverse health effects. In 2005, FDA issued a final rule on menhaden oil reallocating the use levels and categories of use within the GRAS affirmation, but ensuring daily intakes of EPA and DHA do not exceed 3 g/person/day (U.S. FDA, 2005). Since DHA represents approximately one half of combined DHA plus EPA, it is reasonable to consider that acceptable daily intake (ADI) of DHA is 1.5 g/person/day.

A key concept in evaluating the safety of a substance is related to substantial equivalence. The 1996 joint consultation by the Food and Agriculture Organization (FAO) and World Health Organization (WHO) recommended that, "if a new food or food component is found to be substantially equivalent to an existing food or food component, it can be treated in the same manner with respect to safety (i.e., the food or food component can be concluded to be as safe as the conventional food or food component)" (Joint FAO/WHO, 1996). Numerous GRAS notices have considered that DHA derived from algal oil is equivalent to that of fish oil. Thus, the GRAS panel convened by Linyi Youkang Biology also has considered that the FDA's 1997 final rule on menhaden oil is applicable to DHA-rich oils derived from *Schizochytrium* sp.

We have evaluated recent scientific literature published between January 2010 and July 2017 to determine if there is any new information pertaining to the FDA's safety concerns that would contradict what was concluded and recommended by FDA in the 1997 review of DHA and EPA intake from fish oil. Due to the abundance of papers on the topic, we have limited the discussion to algal DHA-rich oil derived from *Schizochytrium* sp.

All of the studies of algal DHA-rich oil derived from *Schizochytrium* sp. reported no adverse events or adverse effects on measured outcomes (Table 22 to 24). Studies reporting no adverse effects are as follows:

In adults,
2.4 g/day for 14 weeks (Maki et al., 2014);
1.6 g/day for 16 weeks (Singhal et al., 2013):
1.14 g/day for 8 weeks (Busquets-Cortes et al., 2016);
1.14-1.16 g/day for 8 weeks (Capo et al., 2014; 2015a; 2015b; 2016a; 2016b).

In children,
250 -500 mg/day for 24 months (Nobili et al., 2013a; 2013b),
200 -250 mg/day for 6 months (Pacifico et al., 2015; Voigt et al., 2014) and
600 mg/day for 6 months (Montgomery et al., 2014).

In pregnant women,

300-800 mg/day during gestation periods (Chase et al., 2015; Escamilla-Nunez et al., 2014; Harris et al., 2015; Mulder et al., 2014; Ramakrishnan et al., 2015; Scholt et al., 2015).

The exceptions were the studies using high doses of DHA from *Crypthecodinium cohnii*: in studies by Hughbanks-Wheaton et al. (2014) and Hoffman et al. (2014; 2015) employing 0.6-3.6 g DHA/person/day (or 30 mg DHA/kg bw/day) for 4 years, transient adverse events were noted. However, those adverse events were not considered severe (e.g., gastrointestinal irritability, blood chemistry alterations). In addition, DHA and placebo groups had comparable adverse events. No severe adverse events requiring hospitalization were reported in the 4-year trial.

In general, many recent studies published since 2014 tend to employ algal DHA from *Schizochytrium* sp. source, narrowing our focus on studies after 2014 when algal source was not specified. Thus, we have not reviewed the study by VanLint and Ried (2012) on unspecified algal DHA since it was published in 2012. On the other hand, the studies of unspecified algal DHA-rich oil manufactured by Martek (Escamilla-Nunez et al., 2014; Mulder et al., 2014; Ramakrishnan et al., 2015; Scholt et al., 2015) were included in our review since they were published in the period of 2014 – 2015.

Overall, the review of recent human clinical trials is consistent with the conclusions of the previous GRAS notice (GRN 137) that intake of DHA is safe as long as the daily intake does not exceed 1.5 g/person/day.

Table 22. Adult Human Studies of DHA from *Schizochytrium* sp.

Objective	Subject	Dose	Duration	Measured outcomes	Reference
To investigate the role of DHA in the primary prevention of CVD and to test the hypothesis that DHA supplementation improves endothelial function and risk factors for CVD.	328 healthy volunteers; aged 18-37 y	2 groups:1) 1.6 g DHA/d with 2.4 g/d carrier oil; or 2) 4.0 g/d olive oil control (both given in eight 500-mg capsules/day)	16 wk	Some safety parameters such as anthropometry/ plasma biochemistry, lipid profile and fatty acid; flow-mediated endothelium-dependent vasodilation of the brachial artery; brachial artery vasomotor function; brachial artery distensibility carotid artery distensibility; carotid artery intima–media thickness; pulse wave velocity;	Singhal et al., 2013
To investigate the effect of training and DHA supplementation on the mitochondria dynamics and antioxidant status in peripheral blood mononuclear cells (PBMCs) from sportsmen.	16 male professional and federated football players (Real Mallorca B)	1.14 g/d DHA DHA-S	8 wk	DHA content in erythrocyte membranes; antioxidant enzyme; mitochondrial protein levels of PBMCs (uncoupling protein- [UCP-] 2, UCP-3, Mn-superoxide dismutase, and cytochrome c oxidase); anti-mitochondrial transcription factor; reactive oxygen species production	Busquets-Cortes et al., 2016
To investigate the effect of DHA diet on the plasma cytokine levels and on the PBMCs cells cytokine production after a training season or an acute bout of exercise.	15 male soccer players	1.14 g added DHA in almond-based isotonic beverage (0.6% of olive oil plus 0.2% of DHA-S; or 0.8% olive oil).	8 wk	Lipid composition of erythrocytes; circulating cytokine profile; peripheral mononuclear cell counts; plasma levels of growth factors	Capo et al., 2014
To determine the effects of a DHA diet on the pro-oxidant and	15 male football players	1.14-1.16 g added DHA in a drink containing	8 wk	Carbonyl and nitrotyrosine index; malondialdehyde levels; catalase and glutathione peroxidase activity; protein	Capo et al., 2015a; 2015b;

antioxidant status of PBMCs, oxidative and inflammatory neutrophil response to phorbol myristate acetate, plasma eicosanoids levels and PBMCs eicosanoids production, and cytokine production during football training and after acute exercise.		0.6 % refined olive oil and 0.2 % DHA-S; or 0.8% olive oil.		levels of UCP2 and UCP3; inducible nitric oxide synthase; nitrotyrosine index; decreased the levels of nitrate; mitochondrial reactive oxygen species production; inflammatory gene expression, an inflammatory response to phorbol myristate acetate, plasma eicosanoids levels and PBMCs eicosanoids production	2016a; 2016b
To examine a new, microalgal DHA- and EPA-containing oil that lowers triacylglycerols in adults with mild-to-moderate hypertriglyceridemia.	93 healthy adults with hypertriglyce-ridemia (triacylglycer-ols, 150-499 mg/dL)	4 of 1g capsules/d with meals containing: 1. DHA-O; 2.4 g/d DHA and EPA in a 2.7:1 ratio) 2. Fish oil (2.0 g/day DHA and EPA in a 0.7:1 ratio), or 3. Corn oil/soy oil control	14 wk	Blood lipid profiles	Maki et al., 2014

CVD=cardiovascular disease; D=days; mo=months; PBMCs = Peripheral blood mononuclear cells; UCP=uncoupling proteins; wk=weeks

Table 23. Children Studies of Algal DHA from *Schizochytrium* sp.

Objective	Subject	Daily Dose	Duration	Measured outcomes	Reference
To test whether dietary DHA supplementation can decrease liver fat content and to test whether the I148M variant of Patatin-like phospholipase domain-containing protein-3 (PNPLA3) is associated with the response to DHA in children with NAFLD.	60 children with NAFLD, 6-16 yr (20 children per group)	3 groups: 1)-2) DHA 250 or 500 mg/d; or 3) 500 mg/d placebo oil.	24 mo	The change in liver fat content; changes in fasting TG, alanine transaminase (ALT), HOMA and BMI; the changes in liver fat, TG, and ALT; liver steatosis; and effect of the I148M PNPLA3 genotype on the response to DHA	Nobili et al., 2013a; 2013b
To determine whether DHA supplementation improves the behavior of children with autism.	48 children with autism; 3-10 yr	200 mg/d	6 mo	Total plasma DHA levels; and core symptoms of autism	Voigt et al., 2014

ALT=alanine transaminase; BMI=body mass index; HOMA=Homeostatic Model Assessment of Insulin Resistance; NAFLD=non-alcoholic fatty liver disease; TG=triglycerides

Table 24. Human Studies of DHA during Pregnancy

Objective	Subject	Dose	Duration	Results	Reference
To investigate the effect of DHA supplementation on stimulated inflammatory cytokine production in white blood cells (WBC) from infants with a high genetic risk for type 1 diabetes	A. 41 mother and infant pairs with first-degree relative with T1D and to have HLA DR3 and/or DR4; B. 57 infants	Mothers - 800 mg/d DHA or corn/soy oil until delivery, and continued on this same dose after delivery if breast-feeding. Formula-fed infants – 3.4 or 10.2 mg DHA/oz. At 12 mo, all infants received 400 mg/d DHA or corn/soy oil until 36 mo. DHASCO-5 oil from *Schizochytrium* sp.	Test 1. Last trimester of pregnancy until birth Formula fed until 5 mo of age; Follow up - up to 36 mo	Infant WBC stimulated inflammatory cytokine Production (IL-1β, TNFα, or IL-12p40); the inflammatory marker, high-sensitivity C-reactive protein (hsCRP); biochemical islet autoantibodies; maternal and infants levels of RBC DHA and infants levels of RBC DPA	Chase et al., 2015
To compare DHA supplementation to nutrition education to increase DHA consumption from fish and DHA fortified foods.	564 pregnant women, aged 18-40 yr; 505 women and infant pairs	3 groups: 1) -2) 300 or 600 mg DHA from *Schizochytrium* sp.; or 3) olive oil placebo	16-20 wk of gestation through delivery	The rate of early preterm birth; Gestational length; RBC DHA at delivery; birth weight, birth length, or head circumference	Harris et al., 2015
To test hypothesis that prenatal consumption of omega-3 fatty acids can act as an adjuvant in the development of the immune system and affect the inflammatory response of neonates.	1,094 pregnant women; aged 18-35 y, 869 mother-child pairs	400 mg/d of algal DHA (Algal source, Martek, NA; maybe from *Schizochytrium* sp.)	18-22 wk of gestation through delivery; infant follow-up until 18 mo of age	Respiratory symptoms in infants until 18 mo of age	Escamilla-Nunez et al., 2014
To evaluate the effects	730 offspring of	400 mg/d of DHA or	The latter half	Child development-	Ramakrish-

of prenatal DHA supplementation on offspring development at 18 months of age.	women who participated in a trial of DHA supplementation	placebo. (Algal source, Martek, NA; maybe from *Schizochytrium* sp.)	of pregnancy until delivery; follow up of infants at 18 mo of age.	psychomotor developmental index, mental developmental index and behavior rating scale	nan et al., 2015
To determine two FADS single nucleotide polymorphisms (SNPs) in a cohort of pregnant women and examine the relationship of SNPs to DHA and ARA status.	205 pregnant women	600 mg/d DHA or corn/soy oil placebo (Algal source, Martek, NA; maybe from *Schizochytrium* sp.)	Last 2 trimesters of pregnancy (~26 wk)	RBC phospholipid DHA and ARA; and genotyping	Scholt et al., 2015
To determine whether fetal DHA insufficiency occurs and constrains central nervous system development in term gestation infants.	270 term gestation single birth healthy infants born to women	400 mg/d DHA or placebo (Algal source, Martek, NA; maybe from *Schizochytrium* sp.)	16 wk gestation to delivery; follow up of infants until 18 mo of age	Maternal RBC phosphatidylethanolamine; Child development-language, cognitive and motor skill development	Mulder et al., 2014

DPA= docosapentaenoic acid**;** IL=interleukin; RBC=red blood cell; TNFα =tumor necrosis factor alpha; WBC=white blood cell

6.B.5. Potential Adverse Effects

As mentioned in Section 6.B.4, the FDA raised concerns about the consumption of high levels of EPA and DHA, which may increase bleeding time, increase levels of low-density lipoprotein (LDL) cholesterol, and have an effect on glycemic control in subjects with type 2 diabetes (menhaden oil final rule; 62 FR 30751; June 5, 1997). In affirming the GRAS status of menhaden oil, FDA concluded that the use of menhaden oil as a direct food ingredient is GRAS, provided that the combined daily intake of EPA and DHA from consumption of menhaden oil does not exceed 3 g/person/day. To assure that the combined exposure to EPA and DHA would not exceed 3 g/person/day, FDA established maximum levels of use of menhaden oil that would be permitted in specified food categories (21 CFR 184.1472(a)(3)). No studies on type-2 diabetics have reported increased glucose levels in plasma when higher amounts (4.5 to 6.9 g/person/day) of omega-3 fatty acids were ingested (Bucher et al., 2002; Buckley et al., 2004).

It is noteworthy that the Institute of Medicine (IOM, 2005) has not established any Tolerable Upper Intake Levels (UL) for DHA and EPA while establishing Dietary Reference Intakes for Americans. The IOM states that "While there is evidence to suggest that high intakes of n-3 polyunsaturated fatty acids, particularly EPA and DHA, may impair immune response and result in excessively prolonged bleeding times, it is not possible to establish a UL. Studies on immune function were done *in vitro* and it is difficult, if not impossible, to know how well these artificial conditions simulate human immune cell response *in vivo.* Data on EPA and DHA intakes and bleeding times are mixed and dose-response effect was not observed."

Overall, our review of human clinical trials supports the ADI of 1.5 g/person/day for DHA.

6.C. Safety Determination

Numerous human and animal studies have reported health benefits of DHA or DHA-rich oils with no major adverse effects. There is broad-based and widely disseminated knowledge concerning the chemistry of DHA. This GRAS determination is based on the data and information generally available and consented opinion about the safety of DHA. The literature indicates that DHA-rich oil offers consumers health benefits without serious adverse effects.

The following safety evaluations fully consider the composition, intake, nutritional, microbiological, and toxicological properties of DHA-rich oil as well as appropriate corroborative data.

1. Linyi Youkang Biology's DHA-rich oil ingredients (both oil and powder forms) are manufactured under cGMP using common food industry materials and processes.

2. Analytical data from multiple lots indicate that DHA-rich oil ingredients reliably comply with established specifications and meets all applicable purity standards. Potential toxicants have not been identified in DHA. HPLC analysis reveals that Linyi Youkang Biology's DHA-rich oil is > 45.0% pure. No pesticide residues (organochlorine and organophosphorus) and shellfish poisons have been detected in Linyi Youkang Biology's DHA-rich oil ingredients. In addition, no significant

amounts of dioxins and furans, PCBs, PAHs, or solvent residues have been detected from Linyi Youkang Biology's DHA-rich oil ingredients (oil or powder form).

3. Based on the final rule on menhaden oil described in 21 CFR 184.1472(a)(3), ADI for DHA has been established as 1.5 g/person/day. In addition, algal DHA derived from *Schizochytrium* sp. (GRN 137) received a GRAS notice status with U.S. FDA to result in a maximum dietary exposure of less than 1.5 g of DHA per day. Subsequently, algal DHA from *Ulkenia* sp. (GRN 319- FDA, 2010) also has established a GRAS notice status with U.S. FDA for general food applications.

4. As the DHA-rich oil in this GRAS notice has similar specifications compared to the DHA-rich oil in the previous FDA GRAS notices (GRNs 137, 553 and 677), it is concluded that Linyi Youkang Biology's DHA-rich oil is substantially equivalent to those described in GRN 137. Thus, it is recognized that the information and data in GRN notices are pertinent to the safety of the DHA-rich oil in this GRAS notice. As noted above, the FDA did not question the safety of DHA-rich oil for the specified food uses in response to GRAS notifications on DHA-rich oil derived from *Schizochytrium* sp. (GRN 137). In addition, FDA did not question the safety of DHA-rich oils oil derived from *Schizochytrium* sp. for infant formula applications (GRN 553 and 677).

5. Linyi Youkang Biology's DHA-rich oil or powder will be added to the same food categories as those currently listed in 21 CFR 184.1472(a)(3) (menhaden oil) at maximum use levels of 22.22% or 125%, respectively, of those specified in that regulation.

6. It is assumed that Linyi Youkang Biology's DHA-rich oil ingredients derived from *Schizochytrium* sp. will replace currently marketed DHA or other DHA sources. Thus, cumulative exposures are not expected to change.

7. In the previous GRAS notices to the FDA, the safety of DHA-rich oils has been established in toxicological studies in animals, mutagenicity studies, and is further supported by clinical studies in human. The NOAEL was determined to be 5,000 mg/kg bw/day in a subchronic toxicity study in rats. After applying a safety margin of 100, it can be concluded that doses up to 50 mg/kg bw/day or 3,000 mg DHA-rich oil/person/day would be safe in adults weighing 60 kg.

8. Furthermore, historical consumption of DHA supports the safety of DHA as long as the consumption level does not exceed 1.5 g/person/day. Additional studies published subsequent to the FDA GRAS notices continue to support safety of DHA as a food ingredient.

6.D. Conclusions and General Recognition of the Safety of DHA-rich oil

Several sources of DHA or DHA-rich oil have been evaluated by the FDA and other global regulatory agencies over the past 15 years for proposed incorporation of DHA in foods for human consumption. Relevant U.S. GRAS notifications include GRN 137 (FDA, 2004a). All the GRAS notices provided information/clinical study data that supported the safety of the proposed DHA ingredients for use in human foods. In all the studies summarized in these notifications, there were no significant adverse effects/events or tolerance issues attributable to DHA or DHA-rich oils. In addition, due to the compositional similarity and DHA content of fish and marine algal-derived oils to Linyi Youkang Biology's DHA-rich oil, the available scientific literature on the safety of these oils supports the safety of Linyi Youkang Biology's DHA-rich oil derived from *Schizochytrium* sp. Because this safety evaluation was based on generally available and widely accepted data and information, it satisfies the so-called "common knowledge" element of a GRAS determination.

In addition, the intended uses of DHA have been determined to be safe though scientific procedures as set forth in 21 CFR 170.3(b), thus satisfying the so-called "technical" element of the GRAS determination. The specifications of the proposed GRAS substance, Linyi Youkang Biology's DHA-rich oil ingredients, are almost identical to those that have received FDA no question letters.

This GRAS determination for DHA is based on scientific procedures. Numerous human and animal studies examined the health benefits of DHA-rich oils. There are no reports of safety concerns in any of the studies as long as the consumption level does not exceed 1.5 g DHA/person/day. Linyi Youkang Biology utilizes a HACCP-controlled manufacturing process and rigorously tests its final production batches to verify adherence to quality control specifications. The literature indicates that DHA-rich oil offers consumers health benefits without serious adverse effects.

The information and data provided by Linyi Youkang Biology in this report and supplemented by the publicly available literature or toxicity data on DHA and DHA-rich algal oil provide a sufficient basis for an assessment of the safety of DHA-rich oil from *Schizochytrium* sp. for the proposed use as an ingredient in food when prepared according to appropriate specifications and used according to cGMP.

Therefore, not only is the Linyi Youkang Biology's proposed use of DHA-rich oil ingredients safe within the terms of the Federal Food, Drug, and Cosmetic Act (meeting the standard of reasonable certainty of no harm), but because of this consensus among experts, it is also GRAS.

6.E. Discussion of Information Inconsistent with GRAS Determination

We are not aware of information that would be inconsistent with a finding that the proposed use of DHA-rich oil ingredients, meeting appropriate specifications and used according to cGMP, is GRAS.

PART 7. REFERENCES

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7.B. Reference that Is Not Generally Available

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Analytical Report

Sample Code	128-2017-00005022	Report date	28-Jun-2017
Certificate No.	AR-17-VV-005522-01		

Linyi Youkang Biology Co., Ltd.

Racheal GAO

Lianbang Road,

Economical and Technical Development Area,

Linyi City, ShanDong Province

Our reference:	128-2017-00005022/ AR-17-VV-005522-01
Client Sample Code:	2017020701
Sample described as:	ARACHIDONIC ACID Powder
Sample Packaging:	Sealed aluminum foil bag
Sample reception date:	02-Jun-2017
Analysis starting date:	02-Jun-2017
Analysis ending date:	28-Jun-2017
Arrival Temperature (°C)	-0.6
Sample Weight	2kg

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Method: Internal method, LC-MS/MS				
	Patulin	<20	µg/kg	20	
☆ A7297	Vitamin E (tocopherol profile) Method: EN 12822:2014				
	alpha-Tocopherol (vitamin E)	23.8	mg/100 g	0.08	
	beta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	delta-Tocopherol (vitamin E)	2.87	mg/100 g	0.5	
	gamma-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	Sum of tocopherols	26.7	mg/100 g		
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	1,2,3,4,6,7,8-HeptaCDD	< 0.218	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.153	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.106	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.104	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.161	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.142	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.147	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.134	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.109	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0681	pg/g		
	1,2,3,7,8-PentaCDF	< 0.0981	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.134	pg/g		
	2,3,4,7,8-PentaCDF	< 0.153	pg/g		
	2,3,7,8-TetraCDD	< 0.0518	pg/g		
	2,3,7,8-TetraCDF	< 0.142	pg/g		
	OctaCDD	< 1.58	pg/g		
	OctaCDF	< 0.327	pg/g		
	WHO(2005)-PCDD/F TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F TEQ (upper-bound)	0.281	pg/g		
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				

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	Results	Unit	LOQ	LOD
☆ GFL07 polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
PCB 101	< 0.272	ng/g		
PCB 105	< 10.6	pg/g		
PCB 114	< 1.44	pg/g		
PCB 118	< 38.2	pg/g		
PCB 123	< 1.09	pg/g		
PCB 126	< 0.681	pg/g		
PCB 138	< 0.272	ng/g		
PCB 153	< 0.272	ng/g		
PCB 156	< 5.99	pg/g		
PCB 157	< 1.12	pg/g		
PCB 167	< 3.00	pg/g		
PCB 169	< 3.27	pg/g		
PCB 180	< 0.272	ng/g		
PCB 189	< 1.09	pg/g		
PCB 28	< 0.272	ng/g		
PCB 52	< 0.272	ng/g		
PCB 77	< 27.2	pg/g		
PCB 81	< 0.736	pg/g		
Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g		
Total 6 ndl-PCB (upper-bound)	1.63	ng/g		
WHO(2005)-PCB TEQ (lower-bound)	Not Detected	pg/g		
WHO(2005)-PCB TEQ (upper-bound)	0.171	pg/g		
☆ GFTE1 TEQ-Totals WHO-PCDD/F and PCB Method: Internal method, Calculation				
WHO(2005)-PCDD/F+PCB TEQ (lower-bound)	Not Detected	pg/g		
WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	0.452	pg/g		
☆ J1054 Sulphur (S) Method: DIN EN ISO 11885, mod.				
Sulphur total (S)	200	mg/kg	2	
☆ J1056 Silicon (Si) Method: DIN EN ISO 11885, mod.				
Silicon (Si)	8.0	mg/kg	2	
☆ JCSRA Solvent residues (big scope) Method: Internal method, HS-GC-MS				
1,1,1,2-Tetrachloroethane	<0.01	mg/kg	0.01	
1,1,1-Trichloroethane	<0.01	mg/kg	0.01	
1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
1,1-Dichloroethane	<0.05	mg/kg	0.05	
1,2-Dichloroethane	<0.05	mg/kg	0.05	
2-Butanon (Methylethylketon)	<1	mg/kg	1	
2-Methylpentane	<1	mg/kg	1	
3-Methylpentane	<1	mg/kg	1	
Benzene	<0.01	mg/kg	0.01	
Bromodichloromethane	<0.05	mg/kg	0.05	
Chloroform (trichloromethane)	<0.01	mg/kg	0.01	
cis-Dichloroethene	<0.05	mg/kg	0.05	
Dibromochloromethane	<0.05	mg/kg	0.05	
Dichloromethane	<0.05	mg/kg	0.05	
Ethyl Acetate	<1	mg/kg	1	
Ethylbenzene	<0.01	mg/kg	0.01	
m-/-p-Xylene	<0.01	mg/kg	0.01	
Methylcyclopentane	<1	mg/kg	1	
n-Heptane	<1	mg/kg	1	
n-Hexane	<1	mg/kg	1	
n-Pentane	<1	mg/kg	1	

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		Results	Unit	LOQ	LOD
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	Styrene	<0.01	mg/kg	0.01	
	Sum 3 chlorinated solvents	Inapplicable	mg/kg		
	Technical Hexane (calculated)	Inapplicable	mg/kg		
	Tetrachloroethene	<0.01	mg/kg	0.01	
	Tetrachloromethane	<0.01	mg/kg	0.01	
	Toluene	<0.01	mg/kg	0.01	
	trans-Dichloroethene	<0.05	mg/kg	0.05	
	Tribromomethane	<0.05	mg/kg	0.05	
	Trichloroethene	<0.01	mg/kg	0.01	
	Xylene (ortho-)	<0.01	mg/kg	0.01	
☆ JJ04T	Phthalate + DEHA Method: Internal method, GC-MS				
	Acetyltributylcitrat (ATBC)	<1	mg/kg	1	
	Benzyl butyl phthalate (BBP)	<1	mg/kg	1	
	Dibutyl phthalate (DBP)	<0.3	mg/kg		0.3
	Diethyl hexyl phthalate (DEHP)	<1	mg/kg	1	
	Diethyl phthalate (DEP)	<1	mg/kg	1	
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1	
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg		0.3
	Diisodecylphthalate (DIDP)	<5	mg/kg	5	
	Diisononylphthalate (DINP)	<5	mg/kg	5	
	Dimethyl phthalate (DMP)	<1	mg/kg	1	
	DINCH	<5	mg/kg	5	
	Dioctyl phthalate (D-n-OP)	<1	mg/kg	1	
	Triisobutyl phosphate	<1	mg/kg	1	
☆ JJ088	Fumonisine B1, B2, B3 (maize and products derived from maize) Method: Internal Method, LC-MS/MS				
	Fumonisin B1 (FB1)	<20	µg/kg	20	
	Fumonisin B2 (FB2)	<20	µg/kg	20	
	Fumonisin B3 (FB3)	<20	µg/kg	20	
	Fumonisin sum (B1+B2)	<40	µg/kg	40	
	Fumonisin sum (B1+B2+B3)	<60	µg/kg		
☆ JJ0EW	Aflatoxin B1, B2, G1, G2 (spices, special matrix) Method: internal method based on EN 14123				
	Aflatoxin B1	<1	µg/kg	1	
	Aflatoxin B2	<1	µg/kg	1	
	Aflatoxin G1	<1	µg/kg	1	
	Aflatoxin G2	<1	µg/kg	1	
	Sum of all positive Aflatoxins	<4	µg/kg		
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Deoxynivalenol (Vomitoxin)	<20	µg/kg	20	
	HT-2 Toxin	<10	µg/kg	10	
	sum T-2 HT-2 toxin	<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	
	Zearalenone (ZON)	<10	µg/kg	10	
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				
	Ochratoxin A (OTA)	<2	µg/kg	2	
☆ JJW2Z	Sterigmatocystin Method: Internal method, LC-MS/MS				
	Sterigmatocystin	<10	µg/kg	10	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS) Method: Internal method, GC-MS				
	Acenaphthene	<1.0	µg/kg	1	
	Acenaphthylene	<2.0	µg/kg	2	
	Anthracene	<2.0	µg/kg	2	
	Benzo(a)anthracene	<0.50	µg/kg	0.5	
	Benzo(a)pyrene	<0.50	µg/kg	0.5	
	Benzo-(b)-Fluoranthene	<0.50	µg/kg	0.5	

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	Results	Unit	LOQ	LOD
☆ QA049 Polynuclear Aromatic Hydrocarbons (GC-MS)	Method: Internal method, GC-MS			
Benzo(ghi)perylene	<2.0	μg/kg	2	
Benzo(k)fluoranthene	<3.0	μg/kg	3	
Chrysene	<0.50	μg/kg	0.5	
Dibenzo(a,h)anthracene	<3.0	μg/kg	3	
Fluoranthene	<1.0	μg/kg	1	
Fluorene	<2.0	μg/kg	2	
Indeno(1,2,3-cd)pyrene	<2.0	μg/kg	2	
Naphthalene	<20	μg/kg	20	
Phenanthrene	<2.0	μg/kg	2	
Pyrene	<1.0	μg/kg	1	
☆ QA156 Fatty Acid Profile Method: AOAC 996.06				
C 6:0 (Caproic acid)	<0.020	g/100 g	0.02	
C 8:0 (Caprylic acid)	<0.020	g/100 g	0.02	
C 10:0 (Capric acid)	<0.020	g/100 g	0.02	
C 12:0 (Lauric acid)	<0.020	g/100 g	0.02	
C 14:0 (Myristic acid)	0.090	g/100 g	0.02	
C 14:1 (Myristoleic acid)	<0.020	g/100 g	0.02	
C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02	
C 15:1 (Pentadecenoic acid)	<0.020	g/100 g	0.02	
C 16:0 (Palmitic acid)	1.631	g/100 g	0.02	
C 16:1 (Palmitoleic acid)	0.035	g/100 g	0.02	
C 17:0 (Margaric acid)	0.058	g/100 g	0.02	
C 17:1 (Heptadecenoic acid)	<0.020	g/100 g	0.02	
C 18:0 (Stearic acid)	1.469	g/100 g	0.02	
C 18:1 (Oleic acid)	1.548	g/100 g	0.02	
C 18:1n7 (Vaccenic acid)	0.069	g/100 g	0.02	
C 18:2n6 (Linoleic acid)	2.519	g/100 g	0.02	
C 18:3n3 (alpha-Linolenic Acid)	<0.020	g/100 g	0.02	
C 18:3n6 (gamma-Linolenic Acid)	0.550	g/100 g	0.02	
C 20:0 (Arachidic acid)	0.192	g/100 g	0.02	
C 20:1 (Eicosenoic acid)	0.065	g/100 g	0.02	
C 20:2n6 (Eicosodienoic acid)	0.103	g/100 g	0.02	
C 20:3n3 (Eicosatrienoic acid)	0.050	g/100 g	0.02	
C 20:3n6 (homo-gamma-Linolenic acid)	1.016	g/100 g	0.02	
C 20:4n6 (Aracihdonic Acid)	11.372	g/100 g	0.02	
C 20:5n3 (Eicosapentaenoic acid)	0.032	g/100 g	0.02	
C 21:0 (Heneicosanoic acid)	<0.020	g/100 g	0.02	
C 22:0 (Behenic acid)	0.801	g/100 g	0.02	
C 22:1n9 (Erucic acid)	<0.020	g/100 g	0.02	
C 22:2n6 (Docosadienoic acid)	<0.020	g/100 g	0.02	
C 22:6n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02	
C 22-5n3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
C 22-5n6 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
C 23:0 (Tricosanoic acid)	<0.020	g/100 g	0.02	
C 24:0 (Lignoceric acid)	3.270	g/100 g	0.02	
C 24:1 (Nervonic acid)	0.093	g/100 g	0.02	
Monounsaturated Fat	1.810	g/100 g	0.02	
Omega-3 fatty acids	0.080	g/100 g	0.02	
Omega-6 fatty acids	15.560	g/100 g	0.02	
Polyunsaturated Fat	15.645	g/100 g	0.02	
Saturated Fat	7.515	g/100 g	0.02	

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	Total Fat	25.00	g/100 g	0.02	
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89				
	C 20:4n6 (Arachidonic acid)	109.1	mg/g	0.1	
☆ QA934	Trans Fatty Acids, relative area% (GC-FID) Method: AOCS 2a-94				
	Total Trans Fatty Acids	0.93	%	0.05	
☆ SP421	Organochlorine Pesticides, Pyrethroides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SP424	Organophosphorus Pesticides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SU007	Mercury (AAS) Method: BS EN 13806:2002				
	Mercury (Hg)	<0.005	mg/kg	0.005	
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Manganese (Mn)	0.41	mg/kg	0.1	
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Nickel (Ni)	<0.1	mg/kg	0.1	
☆ SU05D	Lead (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Lead (Pb)	<0.05	mg/kg	0.05	
☆ SU05E	Arsenic (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1	
☆ SU05F	Chromium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	Cadmium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	Iron (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Iron (Fe)	1.28	mg/kg	0.1	
☆ SU05J	Copper (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Copper (Cu)	0.57	mg/kg	0.1	
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Phosphorus (P)	1970	mg/kg	5	
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003				
	Peroxide value	<0.05	meq/kg	0.05	
☆ SU21J	Moisture and Volatile matter Method: ISO 662:1998				
	moisture and volatile matter content	2.14	g/100 g	0.01	
⚬ SU9QW	Butane residual Method: Internal method, Internal Method GC-MS				
	Butane	Not Detected	mg/kg	1	
⚬ SUA4Q	Test of Veterinary Drug and toxin Residues Method: Internal Method, LC-MS				
	24-Methyl Cholesta-5,(25)27-dien-3β-ol	2.5	mg/100 g	0.1	
	24-Methyl Cholesta-5,24(25)-dien-3β-ol	18.9	mg/100 g	0.1	
	24-Methyl Cholesterol	16.6	mg/100 g	10	
	31-Norlanosterol	3.6	mg/100 g	0.1	
	4α-Methyl Zymosterol	9.7	mg/100 g	0.1	
	Beta-sitosterol	9.7	mg/100 g	0.1	
	Brassicasterol	19.8	mg/100 g	0.1	
	Desmosterol	11.7	mg/100 g	0.1	
	Lanosterol	5.6	mg/100 g	0.1	
	Total unknown sterols	62.7	mg/100 g	0.1	
	Zymosterol	4.7	mg/100 g	0.1	
VV00B	Coliforms Method: ISO 4832:2006				
	Coliforms	<10	cfu/g		
VV00D	Yeasts and moulds Method: ISO 21527:2008				

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			Results	Unit	LOQ	LOD
VV00D	Yeasts and moulds	Method: ISO 21527:2008				
	Moulds		<10	cfu/g		
	Yeast		<10	cfu/g		
VV00P	Aerobic plate count	Method: ISO 4833-1:2013				
	Aerobic plate count		<10	cfu/g		

List of screened and not detected molecules (* = limit of quantification)

SP421 Organochlorine Pesticides, Pyrethroides (LOQ* mg/kg)

2.3.4.6-Tetrachloranisol (0.005)	Aclonifen (0.01)	Acrinathrin (0.05)	Aldrin (0.005)	Aldrin/ Dieldrin (Sum) ()	Benfluralin (0.005)
Benzoylprop-ethyl (0.01)	Bifenox (0.02)	Binapacryl (0.02)	Bifenthrin (0.05)	Bromocyclen (0.01)	Bromoxynil-octanoate (0.01)
Butralin (0.02)	Chlordane (total) ()	Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)	Chlordane, trans- (0.005)	Chlorfenapyr (0.01)
Chlorfenprop-methyl (0.02)	Chlorfenson (0.01)	Chloroneb (0.02)	Chlorothalonil (0.01)	Chlorthal-dimethyl (0.005)	Cyfluthrin (0.05)
Cyhalothrin, lambda- (0.05)	Cypermethrin (0.05)	Cyphenothrin (0.05)	DDD, o,p- (0.005)	DDD, p,p'- (0.005)	DDE, o,p- (0.005)
DDE, p,p'- (0.005)	DDT (total) ()	DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.05)	Dibromobenzophenone, p,p- (0.02)
Dichlobenil (0.01)	Dichlone (0.02)	Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	Dicofol (sum) ()
Dicofol, o,p- (0.02)	Dicofol, p,p- (0.02)	Dieldrin (0.005)	Dienochlor (0.01)	Dinitramine (0.01)	Dinobuton (0.02)
Endosulfan (total) ()	Endosulfan, alpha- (0.005)	Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)	Endrin (0.005)	Endrin ketone (0.01)
Ethalfluralin (0.01)	Etridiazole (0.01)	Fenfluthrin (0.05)	Fenpropathrin (0.05)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers) (0.05)
Fenvalerate (RS-/SR-isomers) (0.05)	Flubenzimine (0.01)	Fluchloralin (0.01)	Flucythrinate (0.05)	Flumetralin (0.01)	Fluorodifen (0.01)
Fluoroimide (0.02)	Genite (0.01)	Halfenprox (0.05)	HCH isomers (without lindane) ()	HCH, alpha- (0.005)	HCH, beta- (0.005)
HCH, delta- (0.005)	HCH, epsilon- (0.005)	Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)
Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)	loxynil-octanoate (0.01)	Isobenzan (0.005)	Isodrin (0.005)	Isopropalin (0.01)
Methoxychlor (0.01)	Mirex (0.005)	Nitrapyrin (0.01)	Nitrofen (0.01)	Nonachlor, trans- (0.005)	Octachlorstyrene (0.005)
Oxyfluorfen (0.01)	Pendimethalin (0.01)	Pentachloranisole (0.005)	Pentachloroaniline (0.005)	Pentachlorobenzene (0.01)	Pentachlorothioanisole (0.005)
Permethrin (0.05)	Plifenate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Profluralin (0.005)	Quintozene (0.005)	Quintozene (sum) ()
S 421 (0.01)	tau-Fluvalinate (0.05)	Tecnazene (0.005)	Tefluthrin (0.05)	Tetradifon (0.01)	Tetrasul (0.01)
Tralomethrin (0.05)	Transfluthrin (0.05)	Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)	

SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Acephate (0.02)	Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)	Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)	Chlorthiophos (0.02)	Coumaphos (0.1)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)	Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.1)	Dialifos (0.02)
Diazinon (0.02)	Dicapthon (0.02)	Dichlofenthion (0.02)	Dichlorvos (0.02)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethylvinphos (0.02)	Dioxabenzofos (0.02)	Dioxathion (0.05)	Disulfoton (0.05)	Disulfoton-sulfon (0.05)
Disulfoton-sulfoxide (0.05)	Ditalimfos (0.02)	Edifenphos (0.05)	Ethion (0.02)	Ethoprophos (0.02)	Etrimfos (0.02)
Fenamiphos (0.02)	Fenamiphos-sulfone (0.05)	Fenamiphos-sulfoxide (0.05)	Fenchlorphos (0.02)	Fenchlorphos oxon (0.05)	Fenitrothion (0.02)
Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)	Fensulfothion-oxon-sulfoxide (0.05)	Fensulfothion-sulfone (0.05)	Fenthion (0.02)	Fenthion-oxon-sulfone (0.05)
Fenthion-oxon-sulfoxide (0.05)	Fenthion-sulfone (0.05)	Fenthion-sulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosthietan (0.02)	Heptenophos (0.02)	Iodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
Isofenphos (0.02)	Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)	Malaoxon (0.02)	Malathion (0.02)
Mecarbam (0.02)	Mephosfolan (0.02)	Merphos (0.05)	Methacrifos (0.02)	Methamidophos (0.02)	Methidathion (0.02)
Mevinphos (0.02)	Monocrotophos (0.02)	Morphothion (0.05)	Omethoate (0.02)	Oxydemeton-methyl (0.1)	Paraoxon-ethyl (0.02)
Paraoxon-methyl (0.02)	Parathion (0.02)	Parathion-methyl (0.02)	Phenkapton (0.05)	Phenthoate (0.02)	Phorate (0.02)
Phorate-sulfone (0.05)	Phorate-sulfoxide (0.05)	Phosalone (0.05)	Phosmet (0.05)	Phosphamidon (0.02)	Pirimiphos-ethyl (0.02)
Pirimiphos-methyl (0.02)	Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)	Prothiofos (0.02)	Prothoate (0.02)
Pyraclofos (0.05)	Pyrazophos (0.05)	Pyridaphenthion (0.02)	Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	TEPP (0.02)	Terbufos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.02)	Trichlorfon (0.1)	Vamidothion (0.05)	

SIGNATURE

(b) (6)

Kevin Fu
Authorized Signatory

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EXPLANATORY NOTE

≥ Greater than or equal to

< Less than

≤ Less than or equal to

☆ means the test is subcontracted within Eurofins group

⊕ means the test is subcontracted outside Eurofins group

N/A means Not applicable

For and on behalf of Eurofins Technology Service (Qingdao) Co., Ltd.

END OF REPORT

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Analytical Report

Sample Code	128-2017-00005023	Report date	28-Jun-2017
Certificate No.	AR-17-VV-005523-01		

Linyi Youkang Biology Co., Ltd.
Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00005023/ AR-17-VV-005523-01
Client Sample Code:	2017030101
Sample described as:	ARACHIDONIC ACID Powder
Sample Packaging:	Sealed aluminum foil bag
Sample reception date:	02-Jun-2017
Analysis starting date:	02-Jun-2017
Analysis ending date:	28-Jun-2017
Arrival Temperature (°C)	-0.6
Sample Weight	2kg

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Method: Internal method, LC-MS/MS				
	Patulin	<20	µg/kg	20	
☆ A7297	Vitamin E (tocopherol profile) Method: EN 12822:2014				
	alpha-Tocopherol (vitamin E)	22.4	mg/100 g	0.08	
	beta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	delta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	gamma-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	Sum of tocopherols	22.4	mg/100 g		
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	1,2,3,4,6,7,8-HeptaCDD	< 0.234	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.164	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.114	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.111	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.173	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.152	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.158	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.143	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.117	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0731	pg/g		
	1,2,3,7,8-PentaCDF	< 0.105	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.143	pg/g		
	2,3,4,7,8-PentaCDF	< 0.164	pg/g		
	2,3,7,8-TetraCDD	< 0.0556	pg/g		
	2,3,7,8-TetraCDF	< 0.152	pg/g		
	OctaCDD	< 1.70	pg/g		
	OctaCDF	< 0.351	pg/g		
	WHO(2005)-PCDD/F TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F TEQ (upper-bound)	0.302	pg/g		
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				

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		Results	Unit	LOQ	LOD
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	PCB 101	< 0.292	ng/g		
	PCB 105	< 11.4	pg/g		
	PCB 114	< 1.55	pg/g		
	PCB 118	< 40.9	pg/g		
	PCB 123	< 1.17	pg/g		
	PCB 126	< 0.731	pg/g		
	PCB 138	< 0.292	ng/g		
	PCB 153	< 0.292	ng/g		
	PCB 156	< 6.43	pg/g		
	PCB 157	< 1.20	pg/g		
	PCB 167	< 3.22	pg/g		
	PCB 169	< 3.51	pg/g		
	PCB 180	< 0.292	ng/g		
	PCB 189	< 1.17	pg/g		
	PCB 28	< 0.292	ng/g		
	PCB 52	< 0.292	ng/g		
	PCB 77	< 29.2	pg/g		
	PCB 81	< 0.789	pg/g		
	Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g		
	Total 6 ndl-PCB (upper-bound)	1.75	ng/g		
	WHO(2005)-PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCB TEQ (upper-bound)	0.184	pg/g		
☆ GFTE1	TEQ-Totals WHO-PCDD/F and PCB Method: Internal method, Calculation				
	WHO(2005)-PCDD/F+PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	0.485	pg/g		
☆ J1054	Sulphur (S) Method: DIN EN ISO 11885, mod.				
	Sulphur total (S)	16	mg/kg	2	
☆ J1056	Silicon (Si) Method: DIN EN ISO 11885, mod.				
	Silicon (Si)	6.0	mg/kg	2	
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	1,1,1,2-Tetrachloroethane	<0.01	mg/kg	0.01	
	1,1,1-Trichloroethane	<0.01	mg/kg	0.01	
	1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
	1,1-Dichloroethane	<0.05	mg/kg	0.05	
	1,2-Dichloroethane	<0.05	mg/kg	0.05	
	2-Butanon (Methylethylketon)	<1	mg/kg	1	
	2-Methylpentane	<1	mg/kg	1	
	3-Methylpentane	<1	mg/kg	1	
	Benzene	<0.01	mg/kg	0.01	
	Bromodichloromethane	<0.05	mg/kg	0.05	
	Chloroform (trichloromethane)	<0.01	mg/kg	0.01	
	cis-Dichloroethene	<0.05	mg/kg	0.05	
	Dibromochloromethane	<0.05	mg/kg	0.05	
	Dichloromethane	<0.05	mg/kg	0.05	
	Ethyl Acetate	<1	mg/kg	1	
	Ethylbenzene	<0.01	mg/kg	0.01	
	m-/-p-Xylene	<0.01	mg/kg	0.01	
	Methylcyclopentane	<1	mg/kg	1	
	n-Heptane	<1	mg/kg	1	
	n-Hexane	<1	mg/kg	1	
	n-Pentane	<1	mg/kg	1	

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		Results	Unit	LOQ	LOD
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	Styrene	<0.01	mg/kg	0.01	
	Sum 3 chlorinated solvents	Inapplicable	mg/kg		
	Technical Hexane (calculated)	Inapplicable	mg/kg		
	Tetrachloroethene	<0.01	mg/kg	0.01	
	Tetrachloromethane	<0.01	mg/kg	0.01	
	Toluene	<0.01	mg/kg	0.01	
	trans-Dichloroethene	<0.05	mg/kg	0.05	
	Tribromomethane	<0.05	mg/kg	0.05	
	Trichloroethene	<0.01	mg/kg	0.01	
	Xylene (ortho-)	<0.01	mg/kg	0.01	
☆ JJ04T	Phthalate + DEHA Method: Internal method, GC-MS				
	Acetyltributylcitrat (ATBC)	<1	mg/kg	1	
	Benzyl butyl phthalate (BBP)	<1	mg/kg	1	
	Dibutyl phthalate (DBP)	<0.3	mg/kg		0.3
	Diethyl hexyl phthalate (DEHP)	<1	mg/kg	1	
	Diethyl phthalate (DEP)	<1	mg/kg	1	
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1	
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg		0.3
	Diisodecylphthalate (DIDP)	<5	mg/kg	5	
	Diisononylphthalate (DINP)	<5	mg/kg	5	
	Dimethyl phthalate (DMP)	<1	mg/kg	1	
	DINCH	<5	mg/kg	5	
	Dioctyl phthalate (D-n-OP)	<1	mg/kg	1	
	Triisobutyl phosphate	<1	mg/kg	1	
☆ JJ088	Fumonisine B1, B2, B3 (maize and products derived from maize) Method: Internal Method, LC-MS/MS				
	Fumonisin B1 (FB1)	<20	µg/kg	20	
	Fumonisin B2 (FB2)	<20	µg/kg	20	
	Fumonisin B3 (FB3)	<20	µg/kg	20	
	Fumonisin sum (B1+B2)	<40	µg/kg	40	
	Fumonisin sum (B1+B2+B3)	<60	µg/kg		
☆ JJ0EW	Aflatoxin B1, B2, G1, G2 (spices, special matrix) Method: internal method based on EN 14123				
	Aflatoxin B1	<1	µg/kg	1	
	Aflatoxin B2	<1	µg/kg	1	
	Aflatoxin G1	<1	µg/kg	1	
	Aflatoxin G2	<1	µg/kg	1	
	Sum of all positive Aflatoxins	<4	µg/kg		
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Deoxynivalenol (Vomitoxin)	<20	µg/kg	20	
	HT-2 Toxin	<10	µg/kg	10	
	sum T-2 HT-2 toxin	<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	
	Zearalenone (ZON)	<10	µg/kg	10	
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				
	Ochratoxin A (OTA)	<2	µg/kg	2	
☆ JJW2Z	Sterigmatocystin Method: Internal method, LC-MS/MS				
	Sterigmatocystin	<10	µg/kg	10	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS) Method: Internal method, GC-MS				
	Acenaphthene	<1.0	µg/kg	1	
	Acenaphthylene	<2.0	µg/kg	2	
	Anthracene	<2.0	µg/kg	2	
	Benzo(a)anthracene	<0.50	µg/kg	0.5	
	Benzo(a)pyrene	<0.50	µg/kg	0.5	
	Benzo-(b)-Fluoranthene	<0.50	µg/kg	0.5	

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		Results	Unit	LOQ	LOD
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS)	Method: Internal method, GC-MS			
	Benzo(ghi)perylene	<2.0	µg/kg	2	
	Benzo(k)fluoranthene	<3.0	µg/kg	3	
	Chrysene	<0.50	µg/kg	0.5	
	Dibenzo(a,h)anthracene	<3.0	µg/kg	3	
	Fluoranthene	<1.0	µg/kg	1	
	Fluorene	<2.0	µg/kg	2	
	Indeno(1,2,3-cd)pyrene	<2.0	µg/kg	2	
	Naphthalene	<20	µg/kg	20	
	Phenanthrene	<2.0	µg/kg	2	
	Pyrene	<1.0	µg/kg	1	
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 6:0 (Caproic acid)	<0.020	g/100 g	0.02	
	C 8:0 (Caprylic acid)	<0.020	g/100 g	0.02	
	C 10:0 (Capric acid)	<0.020	g/100 g	0.02	
	C 12:0 (Lauric acid)	<0.020	g/100 g	0.02	
	C 14:0 (Myristic acid)	0.110	g/100 g	0.02	
	C 14:1 (Myristoleic acid)	<0.020	g/100 g	0.02	
	C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02	
	C 15:1 (Pentadecenoic acid)	<0.020	g/100 g	0.02	
	C 16:0 (Palmitic acid)	1.775	g/100 g	0.02	
	C 16:1 (Palmitoleic acid)	0.033	g/100 g	0.02	
	C 17:0 (Margaric acid)	0.065	g/100 g	0.02	
	C 17:1 (Heptadecenoic acid)	<0.020	g/100 g	0.02	
	C 18:0 (Stearic acid)	1.539	g/100 g	0.02	
	C 18:1 (Oleic acid)	1.434	g/100 g	0.02	
	C 18:1n7 (Vaccenic acid)	0.064	g/100 g	0.02	
	C 18:2n6 (Linoleic acid)	1.674	g/100 g	0.02	
	C 18:3n3 (alpha-Linolenic Acid)	<0.020	g/100 g	0.02	
	C 18:3n6 (gamma-Linolenic Acid)	0.621	g/100 g	0.02	
	C 20:0 (Arachidic acid)	0.206	g/100 g	0.02	
	C 20:1 (Eicosenoic acid)	0.084	g/100 g	0.02	
	C 20:2n6 (Eicosodienoic acid)	0.112	g/100 g	0.02	
	C 20:3n3 (Eicosatrienoic acid)	0.054	g/100 g	0.02	
	C 20:3n6 (homo-gamma-Linolenic acid)	1.105	g/100 g	0.02	
	C 20:4n6 (Aracihdonic Acid)	11.282	g/100 g	0.02	
	C 20:5n3 (Eicosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 21:0 (Heneicosanoic acid)	<0.020	g/100 g	0.02	
	C 22:0 (Behenic acid)	0.833	g/100 g	0.02	
	C 22:1n9 (Erucic acid)	<0.020	g/100 g	0.02	
	C 22:2n6 (Docosadienoic acid)	<0.020	g/100 g	0.02	
	C 22:6n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n6 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 23:0 (Tricosanoic acid)	<0.020	g/100 g	0.02	
	C 24:0 (Lignoceric acid)	3.086	g/100 g	0.02	
	C 24:1 (Nervonic acid)	0.085	g/100 g	0.02	
	Monounsaturated Fat	1.700	g/100 g	0.02	
	Omega-3 fatty acids	0.050	g/100 g	0.02	
	Omega-6 fatty acids	14.795	g/100 g	0.02	
	Polyunsaturated Fat	14.850	g/100 g	0.02	
	Saturated Fat	7.615	g/100 g	0.02	

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	Total Fat	24.22	g/100 g	0.02	
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89				
	C 20:4n6 (Arachidonic acid)	108.2	mg/g	0.1	
☆ QA934	Trans Fatty Acids, relative area% (GC-FID) Method: AOCS 2a-94				
	Total Trans Fatty Acids	1.35	%	0.05	
☆ SP421	Organochlorine Pesticides, Pyrethroides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SP424	Organophosphorus Pesticides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SU007	Mercury (AAS) Method: BS EN 13806:2002				
	Mercury (Hg)	<0.005	mg/kg	0.005	
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Manganese (Mn)	0.33	mg/kg	0.1	
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Nickel (Ni)	<0.1	mg/kg	0.1	
☆ SU05D	Lead (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Lead (Pb)	<0.05	mg/kg	0.05	
☆ SU05E	Arsenic (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1	
☆ SU05F	Chromium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	Cadmium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	Iron (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Iron (Fe)	0.96	mg/kg	0.1	
☆ SU05J	Copper (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Copper (Cu)	0.60	mg/kg	0.1	
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Phosphorus (P)	1960	mg/kg	5	
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003				
	Peroxide value	<0.05	meq/kg	0.05	
☆ SU21J	Moisture and Volatile matter Method: ISO 662:1998				
	moisture and volatile matter content	2.28	g/100 g	0.01	
• SU9QW	Butane residual Method: Internal method, Internal Method GC-MS				
	Butane	Not Detected	mg/kg	1	
• SUA4Q	Test of Veterinary Drug and toxin Residues Method: Internal Method, LC-MS				
	24-Methyl Cholesta-5,(25)27-dien-3β-ol	3.1	mg/100 g	0.1	
	24-Methyl Cholesta-5,24(25)-dien-3β-ol	14.3	mg/100 g	0.1	
	24-Methyl Cholesterol	15.2	mg/100 g	10	
	31-Norlanosterol	6.8	mg/100 g	0.1	
	4α-Methyl Zymosterol	7.7	mg/100 g	0.1	
	Beta-sitosterol	8.5	mg/100 g	0.1	
	Brassicasterol	12.8	mg/100 g	0.1	
	Desmosterol	14.7	mg/100 g	0.1	
	Lanosterol	4.2	mg/100 g	0.1	
	Total unknown sterols	59.5	mg/100 g	0.1	
	Zymosterol	5.9	mg/100 g	0.1	
VV00B	Coliforms Method: ISO 4832:2006				
	Coliforms	<10	cfu/g		
VV00D	Yeasts and moulds Method: ISO 21527:2008				

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		Results	Unit	LOQ	LOD
VV00D	Yeasts and moulds Method: ISO 21527:2008				
	Moulds	<10	cfu/g		
	Yeast	<10	cfu/g		
VV00P	Aerobic plate count Method: ISO 4833-1:2013				
	Aerobic plate count	<10	cfu/g		

List of screened and not detected molecules (* = limit of quantification)

SP421 Organochlorine Pesticides, Pyrethroides (LOQ* mg/kg)

2.3.4.6-Tetrachloranisol (0.005)	Aclonifen (0.01)	Acrinathrin (0.05)	Aldrin (0.005)	Aldrin/ Dieldrin (Sum) ()	Benfluralin (0.005)
Benzoylprop-ethyl (0.01)	Bifenox (0.02)	Binapacryl (0.02)	Bifenthrin (0.05)	Bromocyclen (0.01)	Bromoxynil-octanoate (0.01)
Butralin (0.02)	Chlordane (total) ()	Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)	Chlordane, trans- (0.005)	Chlorfenapyr (0.01)
Chlorfenprop-methyl (0.02)	Chlorfenson (0.01)	Chloroneb (0.02)	Chlorothalonil (0.01)	Chlorthal-dimethyl (0.005)	Cyfluthrin (0.05)
Cyhalothrin, lambda- (0.05)	Cypermethrin (0.05)	Cyphenothrin (0.05)	DDD, o,p- (0.005)	DDD, p,p'- (0.005)	DDE, o,p- (0.005)
DDE, p,p'- (0.005)	DDT (total) ()	DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.05)	Dibromobenzophenone, p,p- (0.02)
Dichlobenil (0.01)	Dichlone (0.02)	Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	Dicofol (sum) ()
Dicofol, o,p- (0.02)	Dicofol, p,p- (0.02)	Dieldrin (0.005)	Dienochlor (0.01)	Dinitramine (0.01)	Dinobuton (0.02)
Endosulfan (total) ()	Endosulfan, alpha- (0.005)	Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)	Endrin (0.005)	Endrin ketone (0.01)
Ethalfluralin (0.01)	Etridiazole (0.01)	Fenfluthrin (0.05)	Fenpropathrin (0.05)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers) (0.05)
Fenvalerate (RS-/SR-Isomers) (0.05)	Flubenzimine (0.01)	Fluchloralin (0.01)	Flucythrinate (0.05)	Flumetralin (0.01)	Fluorodifen (0.01)
Fluoroimide (0.02)	Genite (0.01)	Halfenprox (0.05)	HCH isomers (without lindane) ()	HCH, alpha- (0.005)	HCH, beta- (0.005)
HCH, delta- (0.005)	HCH, epsilon- (0.005)	Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)
Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)	Ioxynil-octanoate (0.01)	Isobenzan (0.005)	Isodrin (0.005)	Isopropalin (0.01)
Methoxychlor (0.01)	Mirex (0.005)	Nitrapyrin (0.01)	Nitrofen (0.01)	Nonachlor, trans- (0.005)	Octachlorstyrene (0.005)
Oxyfluorfen (0.01)	Pendimethalin (0.01)	Pentachloranisole (0.005)	Pentachloroaniline (0.005)	Pentachlorobenzene (0.01)	Pentachlorothioanisole (0.005)
Permethrin (0.05)	Plifenate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Profluralin (0.005)	Quintozene (0.005)	Quintozene (sum) ()
S 421 (0.01)	tau-Fluvalinate (0.05)	Tecnazene (0.005)	Tefluthrin (0.05)	Tetradifon (0.01)	Tetrasul (0.01)
Tralomethrin (0.05)	Transfluthrin (0.05)	Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)	

SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Acephate (0.02)	Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)	Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)	Chlorthiophos (0.02)	Coumaphos (0.1)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)	Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.1)	Dialifos (0.02)
Diazinon (0.02)	Dicapthon (0.02)	Dichlofenthion (0.02)	Dichlorvos (0.02)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethylvinphos (0.02)	Dioxabenzofos (0.02)	Dioxathion (0.05)	Disulfoton (0.05)	Disulfoton-sulfon (0.05)
Disulfoton-sulfoxide (0.05)	Ditalimfos (0.02)	Edifenphos (0.05)	Ethion (0.02)	Ethoprophos (0.02)	Etrimfos (0.02)
Fenamiphos (0.02)	Fenamiphos-sulfone (0.05)	Fenamiphos-sulfoxide (0.05)	Fenchlorphos (0.02)	Fenchlorphos oxon (0.05)	Fenitrothion (0.02)
Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)	Fensulfothion-oxon-sulfoxide (0.05)	Fensulfothion-sulfone (0.05)	Fenthion (0.02)	Fenthion-oxon-sulfone (0.05)
Fenthion-oxon-sulfoxide (0.05)	Fenthion-sulfone (0.05)	Fenthion-sulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosthietan (0.02)	Heptenophos (0.02)	Iodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
Isofenphos (0.02)	Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)	Malaoxon (0.02)	Malathion (0.02)
Mecarbam (0.02)	Mephosfolan (0.02)	Merphos (0.05)	Methacrifos (0.02)	Methamidophos (0.02)	Methidathion (0.02)
Mevinphos (0.02)	Monocrotophos (0.02)	Morphothion (0.05)	Omethoate (0.02)	Oxydemeton-methyl (0.1)	Paraoxon-ethyl (0.02)
Paraoxon-methyl (0.02)	Parathion (0.02)	Parathion-methyl (0.02)	Phenkapton (0.05)	Phenthoate (0.02)	Phorate (0.02)
Phorate-sulfone (0.05)	Phorate-sulfoxide (0.05)	Phosalone (0.05)	Phosmet (0.05)	Phosphamidon (0.02)	Pirimiphos-ethyl (0.02)
Pirimiphos-methyl (0.02)	Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)	Prothiofos (0.02)	Prothoate (0.02)
Pyraclofos (0.05)	Pyrazophos (0.05)	Pyridaphenthion (0.02)	Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	TEPP (0.02)	Terbufos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.02)	Trichlorfon (0.1)	Vamidothion (0.05)	

SIGNATURE

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EXPLANATORY NOTE

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Analytical Report

Sample Code	128-2017-00008163	Report date	18-Aug-2017
Certificate No.	AR-17-VV-007754-01		

Linyi Youkang Biology Co., Ltd.

Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00008163/ AR-17-VV-007754-01
Client Sample Code:	2017011001 2017020701 2017030101
Sample described as:	ARACHIDONIC ACID POWDER
Sample Packaging:	Sealed metal bottle
Sample reception date:	07-Aug-2017
Analysis starting date:	07-Aug-2017
Analysis ending date:	18-Aug-2017
Arrival Temperature (°C)	5
Sample Weight	50g

	Results	Unit	LOQ	LOD
☆ FL023 Plant sterols and plant stanols (not enriched)	Method: NMKL 198:2014			
24-Methylenecycloartanol	<1	mg/100 g	1	
Brassicasterol	22	mg/100 g	1	
Campesterol	5	mg/100 g	1	
Cholesterol	2	mg/100 g	1	
Citrostadienol	1	mg/100 g	1	
Cycloartenol	<1	mg/100 g	1	
Delta-5,24-stigmastadienol	1	mg/100 g	1	
delta-7-Avenasterol	<1	mg/100 g	1	
Delta-7-stigmastenol	<1	mg/100 g	1	
Sitostanol+ delta-5-avenasterol	2	mg/100 g	1	
Sitosterol	12	mg/100 g	1	
Stigmasterol	1	mg/100 g	1	
Total plant sterols + plant stanols	162	mg/100 g	1	
Unidentified sterols	119	mg/100 g	1	

COMMENT

Due to the sample matrix the results are reported without accrediation. This sample seems to contain unusual phytosterols and, therefore, the peak identifications have to be treated only tentative.

Cholesterol is not included in the sum of plant sterols and plant stanols.

The analysis of 24-Methylene-Cholesterol does not belong to our normal scope, but the component has been tentatively identified based on ISO 12228 standard method eluting just in front of Campesterol in the chromatogram.

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Analytical Report

Sample Code	128-2017-00003832	Report date	27-May-2017
Certificate No.	AR-17-VV-004039-04		

This report is translated from report AR-17-VV-004039-03

Linyi Youkang Biology Co., Ltd.

Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00003832/ AR-17-VV-004039-04
Client Sample Code:	A2017030201
Sample described as:	ARACHIDONIC ACID OIL
Sample Packaging:	Sealed aluminum foil bag
Sample reception date:	27-Apr-2017
Analysis starting date:	27-Apr-2017
Analysis ending date:	27-May-2017

Arrival Temperature (°C) 20.1 Sample Weight 220g

		Results	Unit	LOQ	LOD
☆ JJ0HV	Free fatty acids (FFA) Method: DGF C-V 2				
	Acid value (mg KOH/g)	<0.2	mg KOH/g	0.2	
	Free fatty acids (calculated as lauric acid)	<0.1	%	0.1	
	Free fatty acids (calculated as oleic acid)	<0.1	%	0.1	
	Free fatty acids (calculated as palmitic acid)	<0.1	%	0.1	
☆ JK07G	Unsaponifiable matter Method: ISO 18609				
	Unsaponifiable matter	0.7	%	0.1	
☆ QA117	Anisidine Value (ISO Method) Method: ISO 6885				
	Anisidine Value	3.5		1	
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89				
	C 20:4n6 (Arachidonic Acid)	421.8	mg/g	0.1	
☆ QD04J	Lovibond Color - Lovibond Scale Method: AOCS Cc 13j-97, Cc 13e-92				
	Lovibond Color - Lovibond Scale	1.1R,11.0Y,0.0B, 0.5N			
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003				
	Peroxide value	2.05	meq/kg	0.05	

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Analytical Report

Sample Code	128-2017-00005024	Report date	27-Jun-2017
Certificate No.	AR-17-VV-005478-01		

Linyi Youkang Biology Co., Ltd.

Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00005024/ AR-17-VV-005478-01
Client Sample Code:	A2017030201
Sample described as:	ARACHIDONIC ACID OIL
Sample Packaging:	Sealed metal bottle
Sample reception date:	02-Jun-2017
Analysis starting date:	02-Jun-2017
Analysis ending date:	27-Jun-2017
Arrival Temperature (°C)	-16.6
Sample Weight	3kg

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Method: Internal method, LC-MS/MS				
	Patulin	<20	µg/kg	20	
☆ AS403	Haloxyfop Method: Internal method, GC-MS				
	Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003	
☆ DJPFG	Vitamin E profile in Margarine, Butter, Fats & Oils. Tocopherole profile Method: EN 12822:2014				
	alpha-Tocopherol (vitamin E)	96.2	mg/100 g	0.5	
	beta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	delta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	gamma-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	sum tocopherols	96.2	mg/100 g		
☆ DJTTG	Tocotrienols in fats and olis Method: ISO 9936:2006				
	alpha-Tocotrienol	0.370	mg/100 g	0.08	
	beta-Tocotrienol	<0.5	mg/100 g	0.5	
	delta-Tocotrienol	<0.5	mg/100 g	0.5	
	gamma-Tocotrienol	<0.5	mg/100 g	0.5	
	Tocotrienols Total	0.370	mg/100 g		
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	1,2,3,4,6,7,8-HeptaCDD	< 0.133	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.0933	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.0650	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.0633	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.0983	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.0867	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.0900	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.0817	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.0667	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0417	pg/g		
	1,2,3,7,8-PentaCDF	< 0.0600	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.0817	pg/g		
	2,3,4,7,8-PentaCDF	< 0.0933	pg/g		
	2,3,7,8-TetraCDD	< 0.0317	pg/g		

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		Results	Unit	LOQ	LOD
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	2,3,7,8-TetraCDF	< 0.0867	pg/g		
	OctaCDD	< 0.967	pg/g		
	OctaCDF	< 0.200	pg/g		
	WHO(2005)-PCDD/F TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F TEQ (upper-bound)	0.172	pg/g		
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	PCB 101	< 0.167	ng/g		
	PCB 105	< 6.50	pg/g		
	PCB 114	< 0.883	pg/g		
	PCB 118	< 23.3	pg/g		
	PCB 123	< 0.667	pg/g		
	PCB 126	< 0.417	pg/g		
	PCB 138	< 0.167	ng/g		
	PCB 153	< 0.167	ng/g		
	PCB 156	< 3.67	pg/g		
	PCB 157	< 0.683	pg/g		
	PCB 167	< 1.83	pg/g		
	PCB 169	< 2.00	pg/g		
	PCB 180	< 0.167	ng/g		
	PCB 189	< 0.667	pg/g		
	PCB 28	< 0.167	ng/g		
	PCB 52	< 0.167	ng/g		
	PCB 77	< 16.7	pg/g		
	PCB 81	< 0.450	pg/g		
	Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g		
	Total 6 ndl-PCB (upper-bound)	1.0	ng/g		
	WHO(2005)-PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCB TEQ (upper-bound)	0.105	pg/g		
☆ GFTE1	TEQ-Totals WHO-PCDD/F and PCB Method: Internal method, Calculation				
	WHO(2005)-PCDD/F+PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	0.277	pg/g		
☆ J1054	Sulphur (S) Method: DIN EN ISO 11885, mod.				
	Sulphur total (S)	2.0	mg/kg	2	
☆ J1056	Silicon (Si) Method: DIN EN ISO 11885, mod.				
	Silicon (Si)	130	mg/kg	2	
☆ J5003	Aflatoxin M1 (milk products) Method: Internal method, IAC-LC-FLD				
	Aflatoxin M1	<0.01	µg/kg	0.01	
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	1,1,1,2-Tetrachloroethane	<0.01	mg/kg	0.01	
	1,1,1-Trichloroethane	<0.01	mg/kg	0.01	
	1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
	1,1-Dichloroethane	<0.05	mg/kg	0.05	
	1,2-Dichloroethane	<0.05	mg/kg	0.05	
	2-Butanon (Methylethylketon)	<1	mg/kg	1	
	2-Methylpentane	<1	mg/kg	1	
	3-Methylpentane	<1	mg/kg	1	
	Benzene	<0.01	mg/kg	0.01	
	Bromodichloromethane	<0.05	mg/kg	0.05	
	Chloroform (trichloromethane)	<0.01	mg/kg	0.01	

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		Results	Unit	LOQ	LOD
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	cis-Dichloroethene	<0.05	mg/kg	0.05	
	Dibromochloromethane	<0.05	mg/kg	0.05	
	Dichloromethane	<0.05	mg/kg	0.05	
	Ethyl Acetate	<1	mg/kg	1	
	Ethylbenzene	<0.01	mg/kg	0.01	
	m-/-p-Xylene	<0.01	mg/kg	0.01	
	Methylcyclopentane	<1	mg/kg	1	
	n-Heptane	<1	mg/kg	1	
	n-Hexane	<1	mg/kg	1	
	n-Pentane	<1	mg/kg	1	
	Styrene	<0.01	mg/kg	0.01	
	Sum 3 chlorinated solvents	Inapplicable	mg/kg		
	Technical Hexane (calculated)	Inapplicable	mg/kg		
	Tetrachloroethene	<0.01	mg/kg	0.01	
	Tetrachloromethane	<0.01	mg/kg	0.01	
	Toluene	<0.01	mg/kg	0.01	
	trans-Dichloroethene	<0.05	mg/kg	0.05	
	Tribromomethane	<0.05	mg/kg	0.05	
	Trichloroethene	<0.01	mg/kg	0.01	
	Xylene (ortho-)	<0.01	mg/kg	0.01	
☆ JJ04T	Phthalate + DEHA Method: Internal method, GC-MS				
	Acetyltributylcitrat (ATBC)	<1	mg/kg	1	
	Benzyl butyl phthalate (BBP)	<1	mg/kg	1	
	Dibutyl phthalate (DBP)	<0.3	mg/kg		0.3
	Diethyl hexyl phthalate (DEHP)	<1	mg/kg	1	
	Diethyl phthalate (DEP)	<1	mg/kg	1	
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1	
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg		0.3
	Diisodecylphthalate (DIDP)	<5	mg/kg	5	
	Diisononylphthalate (DINP)	<5	mg/kg	5	
	Dimethyl phthalate (DMP)	<1	mg/kg	1	
	DINCH	<5	mg/kg	5	
	Dioctyl phthalate (D-n-OP)	<1	mg/kg	1	
	Triisobutyl phosphate	<1	mg/kg	1	
☆ JJ088	Fumonisine B1, B2, B3 (maize and products derived from maize) Method: Internal Method, LC-MS/MS				
	Fumonisin B1 (FB1)	<20	µg/kg	20	
	Fumonisin B2 (FB2)	<20	µg/kg	20	
	Fumonisin B3 (FB3)	<20	µg/kg	20	
	Fumonisin sum (B1+B2)	<40	µg/kg	40	
	Fumonisin sum (B1+B2+B3)	<60	µg/kg		
☆ JJ0EW	Aflatoxin B1, B2, G1, G2 (spices, special matrix) Method: internal method based on EN 14123				
	Aflatoxin B1	<1	µg/kg	1	
	Aflatoxin B2	<1	µg/kg	1	
	Aflatoxin G1	<1	µg/kg	1	
	Aflatoxin G2	<1	µg/kg	1	
	Sum of all positive Aflatoxins	<4	µg/kg		
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Deoxynivalenol (Vomitoxin)	<20	µg/kg	20	
	HT-2 Toxin	<10	µg/kg	10	
	sum T-2 HT-2 toxin	<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	
	Zearalenone (ZON)	<10	µg/kg	10	
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				

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		Results	Unit	LOQ	LOD
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				
	Ochratoxin A (OTA)	<2	µg/kg	2	
☆ JJW2Z	Sterigmatocystin Method: Internal method, LC-MS/MS				
	Sterigmatocystin	<10	µg/kg	10	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS) Method: Internal method, GC-MS				
	Acenaphthene	<1.0	µg/kg	1	
	Acenaphthylene	<2.0	µg/kg	2	
	Anthracene	<2.0	µg/kg	2	
	Benzo(a)anthracene	<0.50	µg/kg	0.5	
	Benzo(a)pyrene	<0.50	µg/kg	0.5	
	Benzo-(b)-Fluoranthene	<0.50	µg/kg	0.5	
	Benzo(ghi)perylene	<2.0	µg/kg	2	
	Benzo(k)fluoranthene	<3.0	µg/kg	3	
	Chrysene	<0.50	µg/kg	0.5	
	Dibenzo(a,h)anthracene	<3.0	µg/kg	3	
	Fluoranthene	<1.0	µg/kg	1	
	Fluorene	<2.0	µg/kg	2	
	Indeno(1,2,3-cd)pyrene	<2.0	µg/kg	2	
	Naphthalene	<20	µg/kg	20	
	Phenanthrene	<2.0	µg/kg	2	
	Pyrene	<1.0	µg/kg	1	
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 6:0 (Caproic acid)	<0.020	g/100 g	0.02	
	C 8:0 (Caprylic acid)	<0.020	g/100 g	0.02	
	C 10:0 (Capric acid)	<0.020	g/100 g	0.02	
	C 12:0 (Lauric acid)	<0.020	g/100 g	0.02	
	C 14:0 (Myristic acid)	0.386	g/100 g	0.02	
	C 14:1 (Myristoleic acid)	<0.020	g/100 g	0.02	
	C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02	
	C 15:1 (Pentadecenoic acid)	<0.020	g/100 g	0.02	
	C 16:0 (Palmitic acid)	7.257	g/100 g	0.02	
	C 16:1 (Palmitoleic acid)	0.121	g/100 g	0.02	
	C 17:0 (Margaric acid)	0.243	g/100 g	0.02	
	C 17:1 (Heptadecenoic acid)	0.098	g/100 g	0.02	
	C 18:0 (Stearic acid)	6.721	g/100 g	0.02	
	C 18:1 (Oleic acid)	5.916	g/100 g	0.02	
	C 18:1n7 (Vaccenic acid)	0.295	g/100 g	0.02	
	C 18:2n6 (Linoleic acid)	6.009	g/100 g	0.02	
	C 18:3n3 (alpha-Linolenic Acid)	0.073	g/100 g	0.02	
	C 18:3n6 (gamma-Linolenic Acid)	2.450	g/100 g	0.02	
	C 20:0 (Arachidic acid)	0.873	g/100 g	0.02	
	C 20:1 (Eicosenoic acid)	0.430	g/100 g	0.02	
	C 20:2n6 (Eicosodienoic acid)	0.421	g/100 g	0.02	
	C 20:3n3 (Eicosatrienoic acid)	0.229	g/100 g	0.02	
	C 20:3n6 (homo-gamma-Linolenic acid)	4.781	g/100 g	0.02	
	C 20:4n6 (Aracihdonic Acid)	43.914	g/100 g	0.02	
	C 20:5n3 (Eicosapentaenoic acid)	0.100	g/100 g	0.02	
	C 21:0 (Heneicosanoic acid)	0.063	g/100 g	0.02	
	C 22:0 (Behenic acid)	3.415	g/100 g	0.02	
	C 22:1n9 (Erucic acid)	0.114	g/100 g	0.02	
	C 22:2n6 (Docosadienoic acid)	<0.020	g/100 g	0.02	
	C 22:6n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 22-5n6 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 23:0 (Tricosanoic acid)	<0.020	g/100 g	0.02	
	C 24:0 (Lignoceric acid)	11.381	g/100 g	0.02	
	C 24:1 (Nervonic acid)	0.372	g/100 g	0.02	
	Monounsaturated Fat	7.425	g/100 g	0.02	
	Omega-3 fatty acids	0.400	g/100 g	0.02	
	Omega-6 fatty acids	57.575	g/100 g	0.02	
	Polyunsaturated Fat	57.975	g/100 g	0.02	
	Saturated Fat	30.340	g/100 g	0.02	
	Total Fat	95.75	g/100 g	0.02	
☆ QA307	Glyceride Profile Method: AOCS Cd 11c-93				
	Diglycerides	4.59	%	1	
	Glycerol	<1.00	%	1	
	Monoglycerides	1.14	%	1	
	Triglycerides	93.28	%	1	
☆ QA934	Trans Fatty Acids, relative area% (GC-FID) Method: AOCS 2a-94				
	Total Trans Fatty Acids	0.24	%	0.05	
☆ QD106	Iodine Value Method: AOCS Cd 1d-92				
	Iodine value	183.5			
☆ S1102	Dithiocarbamates Method: EN 12396-3:2000				
	Dithiocarbamates (as CS2)	< 0.1	mg/kg	0.1	
☆ SF7DN	Fipronil Method: Internal method, GC-MS				
	Fipronil	<0.04	mg/kg	0.04	
☆ SF7K0	Fipronil, desulfinyl- Method: Internal method, GC-MS				
	Fipronil, desulfinyl-	<0.04	mg/kg	0.04	
☆ SP421	Organochlorine Pesticides, Pyrethroides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SP424	Organophosphorus Pesticides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SPGZ5	Organotin Pesticides Method: Internal method, GC-MS				
	Cyhexatin/Azocyclotin (Sum)	Inapplicable	mg/kg		
☆ SU007	Mercury (AAS) Method: BS EN 13806:2002				
	Mercury (Hg)	<0.005	mg/kg	0.005	
☆ SU04N	Sodium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Sodium (Na)	<1	mg/100 g	1	
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Manganese (Mn)	<0.1	mg/kg	0.1	
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Nickel (Ni)	<0.1	mg/kg	0.1	
☆ SU05D	Lead (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Lead (Pb)	<0.05	mg/kg	0.05	
☆ SU05E	Arsenic (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1	
☆ SU05F	Chromium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	Cadmium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	Iron (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Iron (Fe)	<0.1	mg/kg	0.1	
☆ SU05J	Copper (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Copper (Cu)	0.80	mg/kg	0.1	
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				

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		Results	Unit	LOQ	LOD
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Phosphorus (P)	**41.6**	mg/kg	5	
☆ SU20L	Protein Method: AOAC 984.13				
	Protein	**<0.1 (k=6.25)**	g/100 g	0.1	
☆ SU20Q	Dietary fiber Method: AOAC 991.43				
	Dietary fiber	**<0.5**	g/100 g	0.5	
☆ SU20U	Total fat Method: AOAC 963.15				
	Total fat	**99.9**	g/100 g	0.1	
☆ SU20Y	Moisture (Direct drying method) Method: AOAC 935.29				
	Moisture	**0.12**	g/100 g	0.01	
☆ SU21B	Energy				
	Energy kcal (calculated)	**899**	kcal/100 g		
	Energy kJ (calculated)	**3696**	kJ/100 g		
☆ SU21C	Carbohydrates				
	Carbohydrates (available)	**<0.1**	g/100 g	0.1	
	Total carbohydrates	**<0.1**	g/100 g	0.1	
☆ SU21J	Moisture and Volatile matter Method: ISO 662:1998				
	moisture and volatile matter content	**0.03**	g/100 g	0.01	
☆ SU21L	Sugar Profile Method: AOAC 995.13, modified				
	Fructose	**<0.1**	g/100 g	0.1	
	Galactose	**<0.1**	g/100 g	0.1	
	Glucose	**<0.1**	g/100 g	0.1	
	Lactose	**<0.1**	g/100 g	0.1	
	Maltose	**<0.1**	g/100 g	0.1	
	Monosaccharides and Disaccharides	**<0.1**	g/100 g	0.1	
	Sucrose	**<0.1**	g/100 g	0.1	
☆ SU227	Ash Method: AOAC 941.12				
	Ash	**<0.1**	g/100 g	0.01	
• SU9QW	Butane residual Method: Internal method, Internal Method GC-MS				
	Butane	**Not Detected**	mg/kg	1	
VV00B	Coliforms Method: ISO 4832:2006				
	Coliforms	**<1**	cfu/ml		
VV00D	Yeasts and moulds Method: ISO 21527:2008				
	Moulds	**<1**	cfu/ml		
	Yeast	**<1**	cfu/ml		
VV00E	Salmonella Method: ISO 6579:2002				
	Salmonella	**Not Detected**	/25 g		
VV00G	Bacillus cereus Method: ISO 7932:2004				
	Bacillus cereus	**<1**	cfu/ml		
VV00P	Aerobic plate count Method: ISO 4833-1:2013				
	Aerobic plate count	**<1**	cfu/ml		
VV00V	Enterobacter sakazakii Method: ISO/TS 22964:2006				
	Cronobacter spp	**Not Detected**	/25 g		
VV0A2	Listeria monocytogenes Method: ISO 11290-1:1996/Amd.1:2004				
	Listeria monocytogenes	**Not Detected**	/25 g		
VV0A3	Coagulase-positive staphylococci Method: ISO 6888-1:1999/AMD 1:2003				
	Coagulase-positive staphylococci	**<1**	cfu/ml		
VV0A4	Escherichia coli Method: ISO 16649-2:2001				
	Escherichia coli	**<1**	cfu/ml		

List of screened and not detected molecules (* = limit of quantification)

SP421 **Organochlorine Pesticides, Pyrethroides** (LOQ* mg/kg)

2.3.4.6-Tetrachloranisol (0.005)	Aclonifen (0.01)	Acrinathrin (0.05)	Aldrin (0.005)	Aldrin/ Dieldrin (Sum) ()	Benfluralin (0.005)
Benzoylprop-ethyl (0.01)	Bifenox (0.02)	Binapacryl (0.02)	Bifenthrin (0.05)	Bromocyclen (0.01)	Bromoxynil-octanoate (0.01)
Butralin (0.02)	Chlordane (total) ()	Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)	Chlordane, trans- (0.005)	Chlorfenapyr (0.01)
Chlorfenprop-methyl (0.02)	Chlorfenson (0.01)	Chloroneb (0.02)	Chlorothalonil (0.01)	Chlorthal-dimethyl (0.005)	Cyfluthrin (0.05)
Cyhalothrin, lambda- (0.05)	Cypermethrin (0.05)	Cyphenothrin (0.05)	DDD, o,p- (0.005)	DDD, p,p'- (0.005)	DDE, o,p- (0.005)

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SP421 Organochlorine Pesticides, Pyrethroides (LOQ* mg/kg)

DDE, p,p'- (0.005)	DDT (total) ()	DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.05)	Dibromobenzophenone, p,p- (0.02)
Dichlobenil (0.01)	Dichlone (0.02)	Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	Dicofol (sum) ()
Dicofol, o,p- (0.02)	Dicofol, p,p- (0.02)	Dieldrin (0.005)	Dienochlor (0.01)	Dinitramine (0.01)	Dinobuton (0.02)
Endosulfan (total) ()	Endosulfan, alpha- (0.005)	Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)	Endrin (0.005)	Endrin ketone (0.01)
Ethalfluralin (0.01)	Etridiazole (0.01)	Fenfluthrin (0.05)	Fenpropathrin (0.05)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers) (0.05)
Fenvalerate (RS-/SR-Isomers) (0.05)	Flubenzimine (0.01)	Fluchloralin (0.01)	Flucythrinate (0.05)	Flumetralin (0.01)	Fluorodifen (0.01)
Fluoroimide (0.02)	Genite (0.01)	Halfenprox (0.05)	HCH isomers (without lindane) ()	HCH, alpha- (0.005)	HCH, beta- (0.005)
HCH, delta- (0.005)	HCH, epsilon- (0.005)	Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)
Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)	Ioxynil-octanoate (0.01)	Isobenzan (0.005)	Isodrin (0.005)	Isopropalin (0.01)
Methoxychlor (0.01)	Mirex (0.005)	Nitrapyrin (0.01)	Nitrofen (0.01)	Nonachlor, trans- (0.005)	Octachlorstyrene (0.005)
Oxyfluorfen (0.01)	Pendimethalin (0.01)	Pentachloranisole (0.005)	Pentachloroaniline (0.005)	Pentachlorobenzene (0.01)	Pentachlorothioanisole (0.005)
Permethrin (0.05)	Plifenate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Profluralin (0.005)	Quintozene (0.005)	Quintozene (sum) ()
S 421 (0.01)	tau-Fluvalinate (0.05)	Tecnazene (0.005)	Tefluthrin (0.05)	Tetradifon (0.01)	Tetrasul (0.01)
Tralomethrin (0.05)	Transfluthrin (0.05)	Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)	

SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Acephate (0.02)	Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)	Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)	Chlorthiophos (0.02)	Coumaphos (0.1)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)	Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.1)	Dialifos (0.02)
Diazinon (0.02)	Dicapthon (0.02)	Dichlofenthion (0.02)	Dichlorvos (0.02)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethylvinphos (0.02)	Dioxabenzofos (0.02)	Dioxathion (0.05)	Disulfoton (0.05)	Disulfoton-sulfon (0.05)
Disulfoton-sulfoxide (0.05)	Ditalimfos (0.02)	Edifenphos (0.05)	Ethion (0.02)	Ethoprophos (0.02)	Etrimfos (0.02)
Fenamiphos (0.02)	Fenamiphos-sulfone (0.05)	Fenamiphos-sulfoxide (0.05)	Fenchlorphos (0.02)	Fenchlorphos oxon (0.05)	Fenitrothion (0.02)
Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)	Fensulfothion-oxon-sulfoxide (0.05)	Fensulfothion-sulfone (0.05)	Fenthion (0.02)	Fenthion-oxon-sulfone (0.05)
Fenthion-oxon-sulfoxide (0.05)	Fenthion-sulfone (0.05)	Fenthion-sulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosthietan (0.02)	Heptenophos (0.02)	Iodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
Isofenphos (0.02)	Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)	Malaoxon (0.02)	Malathion (0.02)
Mecarbam (0.02)	Mephosfolan (0.02)	Merphos (0.05)	Methacrifos (0.02)	Methamidophos (0.02)	Methidathion (0.02)
Mevinphos (0.02)	Monocrotophos (0.02)	Morpholthion (0.05)	Omethoate (0.02)	Oxydemeton-methyl (0.1)	Paraoxon-ethyl (0.02)
Paraoxon-methyl (0.02)	Parathion (0.02)	Parathion-methyl (0.02)	Phenkapton (0.05)	Phenthoate (0.02)	Phorate (0.02)
Phorate-sulfone (0.05)	Phorate-sulfoxide (0.05)	Phosalone (0.05)	Phosmet (0.05)	Phosphamidon (0.02)	Pirimiphos-ethyl (0.02)
Pirimiphos-methyl (0.02)	Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)	Prothiofos (0.02)	Prothoate (0.02)
Pyraclofos (0.05)	Pyrazophos (0.05)	Pyridaphenthion (0.02)	Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	TEPP (0.02)	Terbufos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.02)	Trichlorfon (0.1)	Vamidothion (0.05)	

SIGNATURE

(b) (6)

Kevin Fu
Authorized Signatory

EXPLANATORY NOTE

≥ Greater than or equal to
< Less than
≤ Less than or equal to
N/A means Not applicable

☆ means the test is subcontracted within Eurofins group
* means the test is subcontracted outside Eurofins group

For and on behalf of Eurofins Technology Service (Qingdao) Co., Ltd.

END OF REPORT

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Analytical Report

Sample Code	128-2017-00005025	Report date	27-Jun-2017
Certificate No.	AR-17-VV-005479-01		

Linyi Youkang Biology Co., Ltd.
Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00005025/ AR-17-VV-005479-01
Client Sample Code:	A2017031001
Sample described as:	ARACHIDONIC ACID OIL
Sample Packaging:	Sealed metal bottle
Sample reception date:	02-Jun-2017
Analysis starting date:	02-Jun-2017
Analysis ending date:	27-Jun-2017
Arrival Temperature (°C)	-16.6
Sample Weight	3kg

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Method: Internal method, LC-MS/MS				
	Patulin	<20	µg/kg	20	
☆ AS403	Haloxyfop Method: Internal method, GC-MS				
	Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003	
☆ DJPFG	Vitamin E profile in Margarine, Butter, Fats & Oils. Tocopherole profile Method: EN 12822:2014				
	alpha-Tocopherol (vitamin E)	97.1	mg/100 g	0.5	
	beta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	delta-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	gamma-Tocopherol (vitamin E)	<0.5	mg/100 g	0.5	
	sum tocopherols	97.1	mg/100 g		
☆ DJTTG	Tocotrienols in fats and olis Method: ISO 9936:2006				
	alpha-Tocotrienol	0.481	mg/100 g	0.08	
	beta-Tocotrienol	<0.5	mg/100 g	0.5	
	delta-Tocotrienol	<0.5	mg/100 g	0.5	
	gamma-Tocotrienol	<0.5	mg/100 g	0.5	
	Tocotrienols Total	0.481	mg/100 g		
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	1,2,3,4,6,7,8-HeptaCDD	< 0.131	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.0917	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.0638	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.0622	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.0966	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.0851	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.0884	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.0802	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.0655	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0409	pg/g		
	1,2,3,7,8-PentaCDF	< 0.0589	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.0802	pg/g		
	2,3,4,7,8-PentaCDF	< 0.0917	pg/g		
	2,3,7,8-TetraCDD	< 0.0311	pg/g		

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		Results	Unit	LOQ	LOD
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	2,3,7,8-TetraCDF	< 0.0851	pg/g		
	OctaCDD	< 0.949	pg/g		
	OctaCDF	< 0.196	pg/g		
	WHO(2005)-PCDD/F TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F TEQ (upper-bound)	0.169	pg/g		
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	PCB 101	< 0.164	ng/g		
	PCB 105	< 6.38	pg/g		
	PCB 114	< 0.867	pg/g		
	PCB 118	< 22.9	pg/g		
	PCB 123	< 0.655	pg/g		
	PCB 126	< 0.409	pg/g		
	PCB 138	< 0.164	ng/g		
	PCB 153	< 0.164	ng/g		
	PCB 156	< 3.60	pg/g		
	PCB 157	< 0.671	pg/g		
	PCB 167	< 1.80	pg/g		
	PCB 169	< 1.96	pg/g		
	PCB 180	< 0.164	ng/g		
	PCB 189	< 0.655	pg/g		
	PCB 28	< 0.164	ng/g		
	PCB 52	< 0.164	ng/g		
	PCB 77	< 16.4	pg/g		
	PCB 81	< 0.442	pg/g		
	Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g		
	Total 6 ndl-PCB (upper-bound)	0.982	ng/g		
	WHO(2005)-PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCB TEQ (upper-bound)	0.103	pg/g		
☆ GFTE1	TEQ-Totals WHO-PCDD/F and PCB Method: Internal method, Calculation				
	WHO(2005)-PCDD/F+PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	0.272	pg/g		
☆ J1054	Sulphur (S) Method: DIN EN ISO 11885, mod.				
	Sulphur total (S)	32	mg/kg	2	
☆ J1056	Silicon (Si) Method: DIN EN ISO 11885, mod.				
	Silicon (Si)	160	mg/kg	2	
☆ J5003	Aflatoxin M1 (milk products) Method: Internal method, IAC-LC-FLD				
	Aflatoxin M1	<0.01	µg/kg	0.01	
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	1,1,1,2-Tetrachloroethane	<0.01	mg/kg	0.01	
	1,1,1-Trichloroethane	<0.01	mg/kg	0.01	
	1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
	1,1-Dichloroethane	<0.05	mg/kg	0.05	
	1,2-Dichloroethane	<0.05	mg/kg	0.05	
	2-Butanon (Methylethylketon)	<1	mg/kg	1	
	2-Methylpentane	<1	mg/kg	1	
	3-Methylpentane	<1	mg/kg	1	
	Benzene	<0.01	mg/kg	0.01	
	Bromodichloromethane	<0.05	mg/kg	0.05	
	Chloroform (trichloromethane)	<0.01	mg/kg	0.01	

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		Results	Unit	LOQ	LOD
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	cis-Dichloroethene	<0.05	mg/kg	0.05	
	Dibromochloromethane	<0.05	mg/kg	0.05	
	Dichloromethane	<0.05	mg/kg	0.05	
	Ethyl Acetate	<1	mg/kg	1	
	Ethylbenzene	<0.01	mg/kg	0.01	
	m-/-p-Xylene	<0.01	mg/kg	0.01	
	Methylcyclopentane	<1	mg/kg	1	
	n-Heptane	<1	mg/kg	1	
	n-Hexane	<1	mg/kg	1	
	n-Pentane	<1	mg/kg	1	
	Styrene	<0.01	mg/kg	0.01	
	Sum 3 chlorinated solvents	Inapplicable	mg/kg		
	Technical Hexane (calculated)	Inapplicable	mg/kg		
	Tetrachloroethene	<0.01	mg/kg	0.01	
	Tetrachloromethane	<0.01	mg/kg	0.01	
	Toluene	<0.01	mg/kg	0.01	
	trans-Dichloroethene	<0.05	mg/kg	0.05	
	Tribromomethane	<0.05	mg/kg	0.05	
	Trichloroethene	<0.01	mg/kg	0.01	
	Xylene (ortho-)	<0.01	mg/kg	0.01	
☆ JJ04T	Phthalate + DEHA Method: Internal method, GC-MS				
	Acetyltributylcitrat (ATBC)	<1	mg/kg	1	
	Benzyl butyl phthalate (BBP)	<1	mg/kg	1	
	Dibutyl phthalate (DBP)	<0.3	mg/kg		0.3
	Diethyl hexyl phthalate (DEHP)	<1	mg/kg	1	
	Diethyl phthalate (DEP)	<1	mg/kg	1	
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1	
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg		0.3
	Diisodecylphthalate (DIDP)	<5	mg/kg	5	
	Diisononylphthalate (DINP)	<5	mg/kg	5	
	Dimethyl phthalate (DMP)	<1	mg/kg	1	
	DINCH	<5	mg/kg	5	
	Dioctyl phthalate (D-n-OP)	<1	mg/kg	1	
	Triisobutyl phosphate	<1	mg/kg	1	
☆ JJ088	Fumonisine B1, B2, B3 (maize and products derived from maize) Method: Internal Method, LC-MS/MS				
	Fumonisin B1 (FB1)	<20	µg/kg	20	
	Fumonisin B2 (FB2)	<20	µg/kg	20	
	Fumonisin B3 (FB3)	<20	µg/kg	20	
	Fumonisin sum (B1+B2)	<40	µg/kg	40	
	Fumonisin sum (B1+B2+B3)	<60	µg/kg		
☆ JJ0EW	Aflatoxin B1, B2, G1, G2 (spices, special matrix) Method: internal method based on EN 14123				
	Aflatoxin B1	<1	µg/kg	1	
	Aflatoxin B2	<1	µg/kg	1	
	Aflatoxin G1	<1	µg/kg	1	
	Aflatoxin G2	<1	µg/kg	1	
	Sum of all positive Aflatoxins	<4	µg/kg		
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Deoxynivalenol (Vomitoxin)	<20	µg/kg	20	
	HT-2 Toxin	<10	µg/kg	10	
	sum T-2 HT-2 toxin	<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	
	Zearalenone (ZON)	<10	µg/kg	10	
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				

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		Results	Unit	LOQ	LOD
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				
	Ochratoxin A (OTA)	<2	µg/kg	2	
☆ JJ0HV	Free fatty acids (FFA) Method: DGF C-V 2				
	Acid value (mg KOH/g)	<0.2	mg KOH/g	0.2	
	Free fatty acids (calculated as lauric acid)	<0.1	%	0.1	
	Free fatty acids (calculated as oleic acid)	<0.1	%	0.1	
	Free fatty acids (calculated as palmitic acid)	<0.1	%	0.1	
☆ JJW2Z	Sterigmatocystin Method: Internal method, LC-MS/MS				
	Sterigmatocystin	<10	µg/kg	10	
☆ JK07G	Unsaponifiable matter Method: ISO 18609				
	Unsaponifiable matter	0.8	%	0.1	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS) Method: Internal method, GC-MS				
	Acenaphthene	<0.1	µg/kg	1	
	Acenaphthylene	<2.0	µg/kg	2	
	Anthracene	<2.0	µg/kg	2	
	Benzo(a)anthracene	<0.50	µg/kg	0.5	
	Benzo(a)pyrene	<0.50	µg/kg	0.5	
	Benzo-(b)-Fluoranthene	<0.50	µg/kg	0.5	
	Benzo(ghi)perylene	<2.0	µg/kg	2	
	Benzo(k)fluoranthene	<3.0	µg/kg	3	
	Chrysene	<0.5	µg/kg	0.5	
	Dibenzo(a,h)anthracene	<3.0	µg/kg	3	
	Fluoranthene	<1.0	µg/kg	1	
	Fluorene	<2.0	µg/kg	2	
	Indeno(1,2,3-cd)pyrene	<2.0	µg/kg	2	
	Naphthalene	<20	µg/kg	20	
	Phenanthrene	<2.0	µg/kg	2	
	Pyrene	<1.0	µg/kg	1	
☆ QA117	Anisidine Value (ISO Method) Method: ISO 6885				
	Anisidine Value	1.7		1	
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 6:0 (Caproic acid)	<0.020	g/100 g	0.02	
	C 8:0 (Caprylic acid)	<0.020	g/100 g	0.02	
	C 10:0 (Capric acid)	<0.020	g/100 g	0.02	
	C 12:0 (Lauric acid)	<0.020	g/100 g	0.02	
	C 14:0 (Myristic acid)	0.386	g/100 g	0.02	
	C 14:1 (Myristoleic acid)	<0.020	g/100 g	0.02	
	C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02	
	C 15:1 (Pentadecenoic acid)	<0.020	g/100 g	0.02	
	C 16:0 (Palmitic acid)	7.236	g/100 g	0.02	
	C 16:1 (Palmitoleic acid)	0.120	g/100 g	0.02	
	C 17:0 (Margaric acid)	0.242	g/100 g	0.02	
	C 17:1 (Heptadecenoic acid)	0.067	g/100 g	0.02	
	C 18:0 (Stearic acid)	6.696	g/100 g	0.02	
	C 18:1 (Oleic acid)	5.891	g/100 g	0.02	
	C 18:1n7 (Vaccenic acid)	0.283	g/100 g	0.02	
	C 18:2n6 (Linoleic acid)	6.007	g/100 g	0.02	
	C 18:3n3 (alpha-Linolenic Acid)	0.072	g/100 g	0.02	
	C 18:3n6 (gamma-Linolenic Acid)	2.449	g/100 g	0.02	
	C 20:0 (Arachidic acid)	0.873	g/100 g	0.02	
	C 20:1 (Eicosenoic acid)	0.429	g/100 g	0.02	

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 20:2n6 (Eicosodienoic acid)	0.417	g/100 g	0.02	
	C 20:3n3 (Eicosatrienoic acid)	0.229	g/100 g	0.02	
	C 20:3n6 (homo-gamma-Linolenic acid)	4.771	g/100 g	0.02	
	C 20:4n6 (Aracihdonic Acid)	43.780	g/100 g	0.02	
	C 20:5n3 (Eicosapentaenoic acid)	0.099	g/100 g	0.02	
	C 21:0 (Heneicosanoic acid)	0.067	g/100 g	0.02	
	C 22:0 (Behenic acid)	3.411	g/100 g	0.02	
	C 22:1n9 (Erucic acid)	0.114	g/100 g	0.02	
	C 22:2n6 (Docosadienoic acid)	<0.020	g/100 g	0.02	
	C 22:6n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n6 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 23:0 (Tricosanoic acid)	<0.020	g/100 g	0.02	
	C 24:0 (Lignoceric acid)	11.346	g/100 g	0.02	
	C 24:1 (Nervonic acid)	0.371	g/100 g	0.02	
	Monounsaturated Fat	7.360	g/100 g	0.02	
	Omega-3 fatty acids	0.400	g/100 g	0.02	
	Omega-6 fatty acids	57.425	g/100 g	0.02	
	Polyunsaturated Fat	57.820	g/100 g	0.02	
	Saturated Fat	30.255	g/100 g	0.02	
	Total Fat	95.44	g/100 g	0.02	
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89				
	C 20:4n6 (Arachidonic acid)	419.8	mg/g	0.1	
☆ QA307	Glyceride Profile Method: AOCS Cd 11c-93				
	Diglycerides	4.39	%	1	
	Glycerol	<1.00	%	1	
	Monoglycerides	1.02	%	1	
	Triglycerides	93.29	%	1	
☆ QA934	Trans Fatty Acids, relative area% (GC-FID) Method: AOCS 2a-94				
	Total Trans Fatty Acids	0.25	%	0.05	
☆ QD04J	Lovibond Color - Lovibond Scale Method: AOCS Cc 13j-97, Cc 13e-92				
	Lovibond Color - Lovibond Scale	0.2R,1.1Y,0.0B,0.0N			
☆ QD106	Iodine Value Method: AOCS Cd 1d-92				
	Iodine value	185.7			
☆ S1102	Dithiocarbamates Method: EN 12396-3:2000				
	Dithiocarbamates (as CS2)	< 0.1	mg/kg	0.1	
☆ SF7DN	Fipronil Method: Internal method, GC-MS				
	Fipronil	<0.04	mg/kg	0.04	
☆ SF7K0	Fipronil, desulfinyl- Method: Internal method, GC-MS				
	Fipronil, desulfinyl-	<0.04	mg/kg	0.04	
☆ SP421	Organochlorine Pesticides, Pyrethroides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SP424	Organophosphorus Pesticides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SPGZ5	Organotin Pesticides Method: Internal method, GC-MS				
	Cyhexatin/Azocyclotin (Sum)	Inapplicable	mg/kg		
☆ SU007	Mercury (AAS) Method: BS EN 13806:2002				
	Mercury (Hg)	<0.005	mg/kg	0.005	
☆ SU04N	Sodium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Sodium (Na)	<1	mg/100 g	1	
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Manganese (Mn)	<0.1	mg/kg	0.1	

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		Results	Unit	LOQ	LOD
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Nickel (Ni)	<0.1	mg/kg	0.1	
☆ SU05D	Lead (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Lead (Pb)	<0.05	mg/kg	0.05	
☆ SU05E	Arsenic (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1	
☆ SU05F	Chromium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	Cadmium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	Iron (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Iron (Fe)	<0.1	mg/kg	0.1	
☆ SU05J	Copper (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Copper (Cu)	0.85	mg/kg	0.1	
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Phosphorus (P)	44.4	mg/kg	5	
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003				
	Peroxide value	<0.05	meq/kg	0.05	
☆ SU20L	Protein Method: AOAC 984.13				
	Protein	<0.1 (k=6.25)	g/100 g	0.1	
☆ SU20Q	Dietary fiber Method: AOAC 991.43				
	Dietary fiber	<0.5	g/100 g	0.5	
☆ SU20U	Total fat Method: AOAC 963.15				
	Total fat	100.0	g/100 g	0.1	
☆ SU20Y	Moisture (Direct drying method) Method: AOAC 935.29				
	Moisture	0.12	g/100 g	0.01	
☆ SU21B	Energy				
	Energy kcal (calculated)	900	kcal/100 g		
	Energy kJ (calculated)	3700	kJ/100 g		
☆ SU21C	Carbohydrates				
	Carbohydrates (available)	<0.1	g/100 g	0.1	
	Total carbohydrates	<0.1	g/100 g	0.1	
☆ SU21J	Moisture and Volatile matter Method: ISO 662:1998				
	moisture and volatile matter content	0.04	g/100 g	0.01	
☆ SU21L	Sugar Profile Method: AOAC 995.13, modified				
	Fructose	<0.1	g/100 g	0.1	
	Galactose	<0.1	g/100 g	0.1	
	Glucose	<0.1	g/100 g	0.1	
	Lactose	<0.1	g/100 g	0.1	
	Maltose	<0.1	g/100 g	0.1	
	Monosaccharides and Disaccharides	<0.1	g/100 g	0.1	
	Sucrose	<0.1	g/100 g	0.1	
☆ SU227	Ash Method: AOAC 941.12				
	Ash	<0.1	g/100 g	0.01	
◦ SU9QW	Butane residual Method: Internal method, Internal Method GC-MS				
	Butane	Not Detected	mg/kg	1	
VV00B	Coliforms Method: ISO 4832:2006				
	Coliforms	<1	cfu/ml		
VV00D	Yeasts and moulds Method: ISO 21527:2008				
	Moulds	<1	cfu/ml		
	Yeast	<1	cfu/ml		
VV00E	Salmonella Method: ISO 6579:2002				
	Salmonella	Not Detected	/25 g		

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		Results	Unit	LOQ	LOD
VV00G	Bacillus cereus Method: ISO 7932:2004				
	Bacillus cereus	<1	cfu/ml		
VV00P	Aerobic plate count Method: ISO 4833-1:2013				
	Aerobic plate count	<1	cfu/ml		
VV00V	Enterobacter sakazakii Method: ISO/TS 22964:2006				
	Cronobacter spp	Not Detected	/25 g		
VV0A2	Listeria monocytogenes Method: ISO 11290-1:1996/Amd.1:2004				
	Listeria monocytogenes	Not Detected	/25 g		
VV0A3	Coagulase-positive staphylococci Method: ISO 6888-1:1999/AMD 1:2003				
	Coagulase-positive staphylococci	<1	cfu/ml		
VV0A4	Escherichia coli Method: ISO 16649-2:2001				
	Escherichia coli	<1	cfu/ml		

List of screened and not detected molecules (* = limit of quantification)

SP421 Organochlorine Pesticides, Pyrethroides (LOQ* mg/kg)

2.3.4.6-Tetrachloranisol (0.005)	Aclonifen (0.01)	Acrinathrin (0.05)	Aldrin (0.005)	Aldrin/ Dieldrin (Sum) ()	Benfluralin (0.005)
Benzoylprop-ethyl (0.01)	Bifenox (0.02)	Binapacryl (0.02)	Bifenthrin (0.05)	Bromocyclen (0.01)	Bromoxynil-octanoate (0.01)
Butralin (0.02)	Chlordane (total) ()	Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)	Chlordane, trans- (0.005)	Chlorfenapyr (0.01)
Chlorfenprop-methyl (0.02)	Chlorfenson (0.01)	Chloroneb (0.02)	Chlorothalonil (0.01)	Chlorthal-dimethyl (0.005)	Cyfluthrin (0.05)
Cyhalothrin, lambda- (0.05)	Cypermethrin (0.05)	Cyphenothrin (0.05)	DDD, o,p- (0.005)	DDD, p,p'- (0.005)	DDE, o,p- (0.005)
DDE, p,p'- (0.005)	DDT (total) ()	DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.05)	Dibromobenzophenone, p,p- (0.02)
Dichlobenil (0.01)	Dichlone (0.02)	Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	Dicofol (sum) ()
Dicofol, o,p- (0.02)	Dicofol, p,p- (0.02)	Dieldrin (0.005)	Dienochlor (0.01)	Dinitramine (0.01)	Dinobuton (0.02)
Endosulfan (total) ()	Endosulfan, alpha- (0.005)	Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)	Endrin (0.005)	Endrin ketone (0.01)
Ethalfluralin (0.01)	Etridiazole (0.01)	Fenfluthrin (0.05)	Fenpropathrin (0.05)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers) (0.05)
Fenvalerate (RS-/SR-Isomers) (0.05)	Flubenzimine (0.01)	Fluchloralin (0.01)	Flucythrinate (0.05)	Flumetralin (0.01)	Fluorodifen (0.01)
Fluoroimide (0.02)	Genite (0.01)	Halfenprox (0.05)	HCH isomers (without lindane) ()	HCH, alpha- (0.005)	HCH, beta- (0.005)
HCH, delta- (0.005)	HCH, epsilon- (0.005)	Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)
Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)	Ioxynil-octanoate (0.01)	Isobenzan (0.005)	Isodrin (0.005)	Isopropalin (0.01)
Methoxychlor (0.01)	Mirex (0.005)	Nitrapyrin (0.01)	Nitrofen (0.01)	Nonachlor, trans- (0.005)	Octachlorstyrene (0.005)
Oxyfluorfen (0.01)	Pendimethalin (0.01)	Pentachloranisole (0.005)	Pentachloroaniline (0.005)	Pentachlorobenzene (0.01)	Pentachlorothioanisole (0.005)
Permethrin (0.05)	Plifenate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Profluralin (0.005)	Quintozene (0.005)	Quintozene (sum) ()
S 421 (0.01)	tau-Fluvalinate (0.05)	Tecnazene (0.005)	Tefluthrin (0.05)	Tetradifon (0.01)	Tetrasul (0.01)
Tralomethrin (0.05)	Transfluthrin (0.05)	Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)	

SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Acephate (0.02)	Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)	Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)	Chlorthiophos (0.02)	Coumaphos (0.1)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)	Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.1)	Dialifos (0.02)
Diazinon (0.02)	Dicapthon (0.02)	Dichlofenthion (0.02)	Dichlorvos (0.02)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethylvinphos (0.02)	Dioxabenzofos (0.02)	Dioxathion (0.05)	Disulfoton (0.05)	Disulfoton-sulfon (0.05)
Disulfoton-sulfoxide (0.05)	Ditalimfos (0.02)	Edifenphos (0.05)	Ethion (0.02)	Ethoprophos (0.02)	Etrimfos (0.02)
Fenamiphos (0.02)	Fenamiphos-sulfone (0.05)	Fenamiphos-sulfoxide (0.05)	Fenchlorphos (0.02)	Fenchlorphos oxon (0.05)	Fenitrothion (0.02)
Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)	Fensulfothion-oxon-sulfoxide (0.05)	Fensulfothion-sulfone (0.05)	Fenthion (0.02)	Fenthion-oxon-sulfone (0.05)
Fenthion-oxon-sulfoxide (0.05)	Fenthion-sulfone (0.05)	Fenthion-sulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosthietan (0.02)	Heptenophos (0.02)	Iodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
Isofenphos (0.02)	Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)	Malaoxon (0.02)	Malathion (0.02)
Mecarbam (0.02)	Mephosfolan (0.02)	Merphos (0.05)	Methacrifos (0.02)	Methamidophos (0.02)	Methidathion (0.02)
Mevinphos (0.02)	Monocrotophos (0.02)	Morphothion (0.05)	Omethoate (0.02)	Oxydemeton-methyl (0.1)	Paraoxon-ethyl (0.02)
Paraoxon-methyl (0.02)	Parathion (0.02)	Parathion-methyl (0.02)	Phenkapton (0.05)	Phenthoate (0.02)	Phorate (0.02)
Phorate-sulfone (0.05)	Phorate-sulfoxide (0.05)	Phosalone (0.05)	Phosmet (0.05)	Phosphamidon (0.02)	Pirimiphos-ethyl (0.02)
Pirimiphos-methyl (0.02)	Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)	Prothiofos (0.02)	Prothoate (0.02)
Pyraclofos (0.05)	Pyrazophos (0.05)	Pyridaphenthion (0.02)	Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	TEPP (0.02)	Terbufos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.02)	Trichlorfon (0.1)	Vamidothion (0.05)	

SIGNATURE (b) (6)

Kevin Fu
Authorized Signatory

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EXPLANATORY NOTE

≥ Greater than or equal to
< Less than
≤ Less than or equal to
N/A means Not applicable

☆ means the test is subcontracted within Eurofins group
● means the test is subcontracted outside Eurofins group

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END OF REPORT

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Analytical Report

Sample Code	128-2017-00005026	Report date	30-Jun-2017
Certificate No.	AR-17-VV-005480-02		

*This report invalidates all previous versions.

Linyi Youkang Biology Co., Ltd.
Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00005026/ AR-17-VV-005480-02
Client Sample Code:	A2017031701
Sample described as:	ARACHIDONIC ACID OIL
Sample Packaging:	Sealed metal bottle
Sample reception date:	02-Jun-2017
Analysis starting date:	02-Jun-2017
Analysis ending date:	30-Jun-2017
Arrival Temperature (°C)	-16.6
Sample Weight	3kg

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Method: Internal method, LC-MS/MS				
	Patulin	<20	µg/kg	20	
☆ AS403	Haloxyfop Method: Internal method, GC-MS				
	Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003	
☆ DJPFG	Vitamin E profile in Margarine, Butter, Fats & Oils. Tocopherole profile Method: EN 12822:2014				
	alpha-Tocopherol (vitamin E)	97.8	mg/100 g	0.5	
	beta-Tocopherol (vitamin E)	<0.5 (LOQ)	mg/100 g	0.5	
	delta-Tocopherol (vitamin E)	<0.5 (LOQ)	mg/100 g	0.5	
	gamma-Tocopherol (vitamin E)	<0.5 (LOQ)	mg/100 g	0.5	
	sum tocopherols	97.8	mg/100 g		
☆ DJTTG	Tocotrienols in fats and olis Method: ISO 9936:2006				
	alpha-Tocotrienol	0.411	mg/100 g	0.08	
	beta-Tocotrienol	<0.5 (LOQ)	mg/100 g	0.5	
	delta-Tocotrienol	<0.5 (LOQ)	mg/100 g	0.5	
	gamma-Tocotrienol	<0.5 (LOQ)	mg/100 g	0.5	
	Tocotrienols Total	0.411	mg/100 g		
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	1,2,3,4,6,7,8-HeptaCDD	< 0.131	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.0918	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.0639	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.0623	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.0967	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.0852	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.0885	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.0803	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.0656	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0410	pg/g		
	1,2,3,7,8-PentaCDF	< 0.0590	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.0803	pg/g		
	2,3,4,7,8-PentaCDF	< 0.0918	pg/g		
	2,3,7,8-TetraCDD	< 0.0311	pg/g		

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		Results	Unit	LOQ	LOD
☆ GFL01	Dioxins and Furans (17 PCDD/F) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	2,3,7,8-TetraCDF	< 0.0852	pg/g		
	OctaCDD	< 0.951	pg/g		
	OctaCDF	< 0.197	pg/g		
	WHO(2005)-PCDD/F TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F TEQ (upper-bound)	0.169	pg/g		
☆ GFL07	polychlorinated biphenyls (12 WHO PCB + 6 ICES PCB) Method: EC Reg 589/2014 (food) and EC Reg 709/2014 (feed)				
	PCB 101	< 0.164	ng/g		
	PCB 105	< 6.39	pg/g		
	PCB 114	< 0.869	pg/g		
	PCB 118	< 23.0	pg/g		
	PCB 123	< 0.656	pg/g		
	PCB 126	< 0.410	pg/g		
	PCB 138	< 0.164	ng/g		
	PCB 153	< 0.164	ng/g		
	PCB 156	< 3.61	pg/g		
	PCB 157	< 0.672	pg/g		
	PCB 167	< 1.80	pg/g		
	PCB 169	< 1.97	pg/g		
	PCB 180	< 0.164	ng/g		
	PCB 189	< 0.656	pg/g		
	PCB 28	< 0.164	ng/g		
	PCB 52	< 0.164	ng/g		
	PCB 77	< 16.4	pg/g		
	PCB 81	< 0.443	pg/g		
	Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g		
	Total 6 ndl-PCB (upper-bound)	0.984	ng/g		
	WHO(2005)-PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCB TEQ (upper-bound)	0.103	pg/g		
☆ GFTE1	TEQ-Totals WHO-PCDD/F and PCB Method: Internal method, Calculation				
	WHO(2005)-PCDD/F+PCB TEQ (lower-bound)	Not Detected	pg/g		
	WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	0.272	pg/g		
☆ J1054	Sulphur (S) Method: DIN EN ISO 11885, mod.				
	Sulphur total (S)	10	mg/kg	2	
☆ J1056	Silicon (Si) Method: DIN EN ISO 11885, mod.				
	Silicon (Si)	150	mg/kg	2	
☆ J5003	Aflatoxin M1 (milk products) Method: Internal method, IAC-LC-FLD				
	Aflatoxin M1	<0.01	µg/kg	0.01	
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	1,1,1,2-Tetrachloroethane	<0.01	mg/kg	0.01	
	1,1,1-Trichloroethane	<0.01	mg/kg	0.01	
	1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
	1,1-Dichloroethane	<0.05	mg/kg	0.05	
	1,2-Dichloroethane	<0.05	mg/kg	0.05	
	2-Butanon (Methylethylketon)	<1	mg/kg	1	
	2-Methylpentane	<1	mg/kg	1	
	3-Methylpentane	<1	mg/kg	1	
	Benzene	<0.01	mg/kg	0.01	
	Bromodichloromethane	<0.05	mg/kg	0.05	
	Chloroform (trichloromethane)	<0.01	mg/kg	0.01	

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		Results	Unit	LOQ	LOD
☆ JCSRA	Solvent residues (big scope) Method: Internal method, HS-GC-MS				
	cis-Dichloroethene	<0.05	mg/kg	0.05	
	Dibromochloromethane	<0.05	mg/kg	0.05	
	Dichloromethane	<0.05	mg/kg	0.05	
	Ethyl Acetate	<1	mg/kg	1	
	Ethylbenzene	<0.01	mg/kg	0.01	
	m-/-p-Xylene	<0.01	mg/kg	0.01	
	Methylcyclopentane	<1	mg/kg	1	
	n-Heptane	<1	mg/kg	1	
	n-Hexane	<1	mg/kg	1	
	n-Pentane	<1	mg/kg	1	
	Styrene	<0.01	mg/kg	0.01	
	Sum 3 chlorinated solvents	Nicht berechenbar	mg/kg		
	Technical Hexane (calculated)	Nicht berechenbar	mg/kg		
	Tetrachloroethene	<0.01	mg/kg	0.01	
	Tetrachloromethane	<0.01	mg/kg	0.01	
	Toluene	<0.01	mg/kg	0.01	
	trans-Dichloroethene	<0.05	mg/kg	0.05	
	Tribromomethane	<0.05	mg/kg	0.05	
	Trichloroethene	<0.01	mg/kg	0.01	
	Xylene (ortho-)	<0.01	mg/kg	0.01	
☆ JJ04T	Phthalate + DEHA Method: Internal method, GC-MS				
	Acetyltributylcitrat (ATBC)	<1	mg/kg	1	
	Benzyl butyl phthalate (BBP)	<1	mg/kg	1	
	Dibutyl phthalate (DBP)	<0.3	mg/kg		0.3
	Diethyl hexyl phthalate (DEHP)	<1	mg/kg	1	
	Diethyl phthalate (DEP)	<1	mg/kg	1	
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1	
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg		0.3
	Diisodecylphthalate (DIDP)	<5	mg/kg	5	
	Diisononylphthalate (DINP)	<5	mg/kg	5	
	Dimethyl phthalate (DMP)	<1	mg/kg	1	
	DINCH	<5	mg/kg	5	
	Dioctyl phthalate (D-n-OP)	<1	mg/kg	1	
	Triisobutyl phosphate	<1	mg/kg	1	
☆ JJ088	Fumonisine B1, B2, B3 (maize and products derived from maize) Method: Internal Method, LC-MS/MS				
	Fumonisin B1 (FB1)	<20	µg/kg	20	
	Fumonisin B2 (FB2)	<20	µg/kg	20	
	Fumonisin B3 (FB3)	<20	µg/kg	20	
	Fumonisin sum (B1+B2)	<40	µg/kg	40	
	Fumonisin sum (B1+B2+B3)	<60	µg/kg		
☆ JJ0EW	Aflatoxin B1, B2, G1, G2 (spices, special matrix) Method: internal method based on EN 14123				
	Aflatoxin B1	<1	µg/kg	1	
	Aflatoxin B2	<1	µg/kg	1	
	Aflatoxin G1	<1	µg/kg	1	
	Aflatoxin G2	<1	µg/kg	1	
	Sum of all positive Aflatoxins	<4	µg/kg		
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Deoxynivalenol (Vomitoxin)	<20	µg/kg	20	
	HT-2 Toxin	<10	µg/kg	10	
	sum T-2 HT-2 toxin	<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	

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		Results	Unit	LOQ	LOD
☆ JJ0FE	Fusarium toxins (DON, ZON, T2, HT2) Method: Internal method, LC-MS/MS				
	Zearalenone (ZON)	<10	µg/kg	10	
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method: internal method based on EN 14132, IAC-LC-FLD				
	Ochratoxin A (OTA)	<2	µg/kg	2	
☆ JJ0HV	Free fatty acids (FFA) Method: DGF C-V 2				
	Acid value (mg KOH/g)	<0.2	mg KOH/g	0.2	
	Free fatty acids (calculated as lauric acid)	<0.1	%	0.1	
	Free fatty acids (calculated as oleic acid)	<0.1	%	0.1	
	Free fatty acids (calculated as palmitic acid)	<0.1	%	0.1	
☆ JJW2Z	Sterigmatocystin Method: Internal method, LC-MS/MS				
	Sterigmatocystin	<10	µg/kg	10	
☆ JK07G	Unsaponifiable matter Method: ISO 18609				
	Unsaponifiable matter	0.8	%	0.1	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS) Method: Internal method, GC-MS				
	Acenaphthene	<1.0	µg/kg	1	
	Acenaphthylene	<2.0	µg/kg	2	
	Anthracene	<2.0	µg/kg	2	
	Benzo(a)anthracene	<0.50	µg/kg	0.5	
	Benzo(a)pyrene	<0.50	µg/kg	0.5	
	Benzo-(b)-Fluoranthene	<0.50	µg/kg	0.5	
	Benzo(ghi)perylene	<2.0	µg/kg	2	
	Benzo(k)fluoranthene	<3.0	µg/kg	3	
	Chrysene	<0.50	µg/kg	0.5	
	Dibenzo(a,h)anthracene	<3.0	µg/kg	3	
	Fluoranthene	<1.0	µg/kg	1	
	Fluorene	<2.0	µg/kg	2	
	Indeno(1,2,3-cd)pyrene	<2.0	µg/kg	2	
	Naphthalene	<20	µg/kg	20	
	Phenanthrene	2.5	µg/kg	2	
	Pyrene	<1.0	µg/kg	1	
☆ QA117	Anisidine Value (ISO Method) Method: ISO 6885				
	Anisidine Value	1.6		1	
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 6:0 (Caproic acid)	<0.020	g/100 g	0.02	
	C 8:0 (Caprylic acid)	<0.020	g/100 g	0.02	
	C 10:0 (Capric acid)	<0.020	g/100 g	0.02	
	C 12:0 (Lauric acid)	<0.020	g/100 g	0.02	
	C 14:0 (Myristic acid)	0.387	g/100 g	0.02	
	C 14:1 (Myristoleic acid)	<0.020	g/100 g	0.02	
	C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02	
	C 15:1 (Pentadecenoic acid)	<0.020	g/100 g	0.02	
	C 16:0 (Palmitic acid)	7.274	g/100 g	0.02	
	C 16:1 (Palmitoleic acid)	0.122	g/100 g	0.02	
	C 17:0 (Margaric acid)	0.245	g/100 g	0.02	
	C 17:1 (Heptadecenoic acid)	0.068	g/100 g	0.02	
	C 18:0 (Stearic acid)	6.714	g/100 g	0.02	
	C 18:1 (Oleic acid)	5.924	g/100 g	0.02	
	C 18:1n7 (Vaccenic acid)	0.283	g/100 g	0.02	
	C 18:2n6 (Linoleic acid)	6.044	g/100 g	0.02	
	C 18:3n3 (alpha-Linolenic Acid)	0.074	g/100 g	0.02	
	C 18:3n6 (gamma-Linolenic Acid)	2.455	g/100 g	0.02	

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06				
	C 20:0 (Arachidic acid)	0.872	g/100 g	0.02	
	C 20:1 (Eicosenoic acid)	0.434	g/100 g	0.02	
	C 20:2n6 (Eicosodienoic acid)	0.418	g/100 g	0.02	
	C 20:3n3 (Eicosatrienoic acid)	0.229	g/100 g	0.02	
	C 20:3n6 (homo-gamma-Linolenic acid)	4.794	g/100 g	0.02	
	C 20:4n6 (Aracihdonic Acid)	44.067	g/100 g	0.02	
	C 20:5n3 (Eicosapentaenoic acid)	0.101	g/100 g	0.02	
	C 21:0 (Heneicosanoic acid)	0.067	g/100 g	0.02	
	C 22:0 (Behenic acid)	3.400	g/100 g	0.02	
	C 22:1n9 (Erucic acid)	0.114	g/100 g	0.02	
	C 22:2n6 (Docosadienoic acid)	<0.020	g/100 g	0.02	
	C 22:6n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 22-5n6 (Docosapentaenoic acid)	<0.020	g/100 g	0.02	
	C 23:0 (Tricosanoic acid)	<0.020	g/100 g	0.02	
	C 24:0 (Lignoceric acid)	11.135	g/100 g	0.02	
	C 24:1 (Nervonic acid)	0.372	g/100 g	0.02	
	Monounsaturated Fat	7.405	g/100 g	0.02	
	Omega-3 fatty acids	0.405	g/100 g	0.02	
	Omega-6 fatty acids	57.775	g/100 g	0.02	
	Polyunsaturated Fat	58.180	g/100 g	0.02	
	Saturated Fat	30.090	g/100 g	0.02	
	Total Fat	95.68	g/100 g	0.02	
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89				
	C 20:4n6 (Arachidonic acid)	422.5	mg/g	0.1	
☆ QA307	Glyceride Profile Method: AOCS Cd 11c-93				
	Diglycerides	4.26	%	1	
	Glycerol	<1.00	%	1	
	Monoglycerides	<1.00	%	1	
	Triglycerides	93.77	%	1	
☆ QA934	Trans Fatty Acids, relative area% (GC-FID) Method: AOCS 2a-94				
	Total Trans Fatty Acids	0.25	%	0.05	
☆ QD04J	Lovibond Color - Lovibond Scale Method: AOCS Cc 13j-97, Cc 13e-92				
	Lovibond Color - Lovibond Scale	0.1R,0.9Y,0.0B,0.0N			
☆ QD106	Iodine Value Method: AOCS Cd 1d-92				
	Iodine value	182.9			
☆ S1102	Dithiocarbamates Method: EN 12396-3:2000				
	Dithiocarbamates (as CS2)	< 0.1	mg/kg	0.1	
☆ SF7DN	Fipronil Method: Internal method, GC-MS				
	Fipronil	<0.04 *	mg/kg	0.04	
☆ SF7K0	Fipronil, desulfinyl- Method: Internal method, GC-MS				
	Fipronil, desulfinyl-	<0.04 *	mg/kg	0.04	
☆ SP421	Organochlorine Pesticides, Pyrethroides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SP424	Organophosphorus Pesticides Method: ASU L00.00-34				
	Screened pesticides	Not Detected			
☆ SPGZ5	Organotin Pesticides Method: Internal method, GC-MS				
	Cyhexatin/Azocyclotin (Sum)	—	mg/kg		
☆ SU007	Mercury (AAS) Method: BS EN 13806:2002				
	Mercury (Hg)	<0.005	mg/kg	0.005	
☆ SU04N	Sodium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Sodium (Na)	<1	mg/100 g	1	

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		Results	Unit	LOQ	LOD
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Manganese (Mn)	<0.1	mg/kg	0.1	
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Nickel (Ni)	<0.1	mg/kg	0.1	
☆ SU05D	Lead (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Lead (Pb)	<0.05	mg/kg	0.05	
☆ SU05E	Arsenic (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1	
☆ SU05F	Chromium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	Cadmium (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	Iron (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Iron (Fe)	0.26	mg/kg	0.1	
☆ SU05J	Copper (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Copper (Cu)	0.81	mg/kg	0.1	
☆ SU05K	Phosphorus (ICP-MS) Method: BS EN ISO 17294-2 2004 mod.				
	Phosphorus (P)	36.7	mg/kg	5	
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003				
	Peroxide value	<0.05	meq/kg	0.05	
☆ SU20L	Protein Method: AOAC 984.13				
	Protein	<0.1 (k=6.25)	g/100 g	0.1	
☆ SU20Q	Dietary fiber Method: AOAC 991.43				
	Dietary fiber	<0.5	g/100 g	0.5	
☆ SU20U	Total fat Method: AOAC 963.15				
	Total fat	100.0	g/100 g	0.1	
☆ SU20Y	Moisture (Direct drying method) Method: AOAC 935.29				
	Moisture	0.12	g/100 g	0.01	
☆ SU21B	Energy				
	Energy kcal (calculated)	900	kcal/100 g		
	Energy kJ (calculated)	3700	kJ/100 g		
☆ SU21C	Carbohydrates				
	Carbohydrates (available)	<0.1	g/100 g	0.1	
	Total carbohydrates	<0.1	g/100 g	0.1	
☆ SU21J	Moisture and Volatile matter Method: ISO 662:1998				
	moisture and volatile matter content	0.03	g/100 g	0.01	
☆ SU21L	Sugar Profile Method: AOAC 995.13, modified				
	Fructose	<0.1	g/100 g	0.1	
	Galactose	<0.1	g/100 g	0.1	
	Glucose	<0.1	g/100 g	0.1	
	Lactose	<0.1	g/100 g	0.1	
	Maltose	<0.1	g/100 g	0.1	
	Monosaccharides and Disaccharides	<0.1	g/100 g	0.1	
	Sucrose	<0.1	g/100 g	0.1	
☆ SU227	Ash Method: AOAC 941.12				
	Ash	<0.1	g/100 g	0.01	
• SU9QW	Butane residual Method: Internal method, Internal Method GC-MS				
	Butane	Not Detected	mg/kg	1	
VV00B	Coliforms Method: ISO 4832:2006				
	Coliforms	<1	cfu/ml		
VV00D	Yeasts and moulds Method: ISO 21527:2008				
	Moulds	<1	cfu/ml		
	Yeast	<1	cfu/ml		

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		Results	Unit	LOQ	LOD
VV00E	Salmonella Method: ISO 6579:2002				
	Salmonella	Not Detected	/25 g		
VV00G	Bacillus cereus Method: ISO 7932:2004				
	Bacillus cereus	<1	cfu/ml		
VV00P	Aerobic plate count Method: ISO 4833-1:2013				
	Aerobic plate count	<1	cfu/ml		
VV00V	Enterobacter sakazakii Method: ISO/TS 22964:2006				
	Cronobacter spp	Not Detected	/25 g		
VV0A2	Listeria monocytogenes Method: ISO 11290-1:1996/Amd.1:2004				
	Listeria monocytogenes	Not Detected	/25 g		
VV0A3	Coagulase-positive staphylococci Method: ISO 6888-1:1999/AMD 1:2003				
	Coagulase-positive staphylococci	<1	cfu/ml		
VV0A4	Escherichia coli Method: ISO 16649-2:2001				
	Escherichia coli	<1	cfu/ml		

List of screened and not detected molecules (* = limit of quantification)

SP421 Organochlorine Pesticides, Pyrethroides (LOQ* mg/kg)

2.3.4.6-Tetrachloranisol (0.005)	Acrinathrin (0.05)	Aldrin (0.005)	Aldrin/ Dieldrin (Sum) ()	Benfluralin (0.005)	Bifenox (0.02)
Binapacryl (0.02)	Bifenthrin (0.05)	Bromocyclen (0.01)	Bromoxynil-octanoate (0.01)	Butralin (0.02)	Chlordane (total) ()
Chlordane, cis- (0.005)	Chlordane, oxy- (0.005)	Chlordane, trans- (0.005)	Chlorfenapyr (0.01)	Chlorfenprop-methyl (0.02)	Chlorfenson (0.01)
Chloroneb (0.02)	Chlorothalonil (0.01)	Chlorthal-dimethyl (0.005)	Cyfluthrin (0.05)	Cyhalothrin, lambda- (0.05)	Cypermethrin (0.05)
Cyphenothrin (0.05)	DDD, o,p- (0.005)	DDD, p,p'- (0.005)	DDE, o,p- (0.005)	DDE, p,p'- (0.005)	DDT (total) ()
DDT, o,p'- (0.005)	DDT, p,p'- (0.005)	Deltamethrin (0.05)	Dibromobenzophenone, p,p- (0.02)	Dichlobenil (0.01)	Dichlone (0.02)
Dicloran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	Dicofol (sum) ()	Dicofol, o,p- (0.02)	Dicofol, p,p- (0.02)
Dieldrin (0.005)	Dienochlor (0.01)	Dinitramine (0.01)	Dinobuton (0.02)	Endosulfan (total) ()	Endosulfan, alpha- (0.005)
Endosulfan sulphate (0.01)	Endosulfan, beta- (0.005)	Endrin (0.005)	Endrin ketone (0.01)	Ethalfluralin (0.01)	Etridiazole (0.01)
Fenfluthrin (0.05)	Fenpropathrin (0.05)	Fenson (0.01)	Fenvalerate (RR-/SS-Isomers) (0.05)	Fenvalerate (RS-/SR-Isomers) (0.05)	Flubenzimine (0.01)
Fluchloralin (0.01)	Flucythrinate (0.05)	Flumetralin (0.01)	Fluorodifen (0.01)	Fluoroimide (0.02)	Genite (0.01)
Halfenprox (0.05)	HCH isomers (without lindane) ()	HCH, alpha- (0.005)	HCH, beta- (0.005)	HCH, delta- (0.005)	HCH, epsilon- (0.005)
Lindane (gamma-HCH) (0.005)	Heptachlor (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)	Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)
Ioxynil-octanoate (0.01)	Isobenzan (0.005)	Isodrin (0.005)	Isopropalin (0.01)	Methoxychlor (0.01)	Mirex (0.005)
Nitrapyrin (0.01)	Nitrofen (0.01)	Nonachlor, trans- (0.005)	Octachlorstyrene (0.005)	Oxyfluorfen (0.01)	Pendimethalin (0.01)
Pentachloranisole (0.005)	Pentachloroaniline (0.005)	Pentachlorobenzene (0.01)	Pentachlorothioanisole (0.005)	Permethrin (0.05)	Plifenate (0.02)
Polychloroterpene (Camphechlor) (0.5)	Profluralin (0.005)	Quintozene (0.005)	Quintozene (sum) ()	S 421 (0.01)	tau-Fluvalinate (0.05)
Tecnazene (0.005)	Tefluthrin (0.05)	Tetradifon (0.01)	Tetrasul (0.01)	Tralomethrin (0.05)	Transfluthrin (0.05)
Triallate (0.02)	Trichloronat (0.01)	Trifluralin (0.005)			

SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Acephate (0.02)	Azinphos-ethyl (0.05)	Azinphos-methyl (0.05)	Bromfenvinphos (0.02)	Bromophos-methyl (0.02)	Bromophos-ethyl (0.02)
Butamifos (0.02)	Cadusaphos (0.02)	Carbophenothion (0.02)	Carbophenothion-methyl (0.02)	Chlorfenvinphos (0.02)	Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02)	Chlorpyrifos-methyl (0.02)	Chlorthion (0.02)	Chlorthiophos (0.02)	Coumaphos (0.1)	Crotoxyphos (0.02)
Crufomate (0.02)	Cyanofenphos (0.05)	Cyanophos (0.02)	Demeton-S-methyl (0.05)	Demeton-S-methyl-sulfone (0.1)	Dialifos (0.02)
Diazinon (0.02)	Dicapthon (0.02)	Dichlofenthion (0.02)	Dichlorvos (0.02)	Dicrotophos (0.02)	Dimefox (0.02)
Dimethoate (0.02)	Dimethylvinphos (0.02)	Dioxabenzofos (0.02)	Dioxathion (0.05)	Disulfoton (0.05)	Disulfoton-sulfon (0.05)
Disulfoton-sulfoxide (0.05)	Ditalimfos (0.02)	Edifenphos (0.05)	Ethion (0.02)	Ethoprophos (0.02)	Etrimfos (0.02)
Fenamiphos (0.02)	Fenamiphos-sulfone (0.05)	Fenamiphos-sulfoxide (0.05)	Fenchlorphos (0.02)	Fenchlorphos oxon (0.05)	Fenitrothion (0.02)
Fensulfothion (0.02)	Fensulfothion-oxon-sulfone (0.05)	Fensulfothion-oxon-sulfoxide (0.05)	Fensulfothion-sulfone (0.05)	Fenthion (0.02)	Fenthion-oxon-sulfone (0.05)
Fenthion-oxon-sulfoxide (0.05)	Fenthion-sulfone (0.05)	Fenthion-sulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosthietan (0.02)	Heptenophos (0.02)	Iodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
Isofenphos (0.02)	Isofenphos-methyl (0.02)	Isoxathion (0.05)	Leptophos (0.05)	Malaoxon (0.02)	Malathion (0.02)
Mecarbam (0.02)	Mephosfolan (0.02)	Merphos (0.05)	Methacrifos (0.02)	Methamidophos (0.02)	Methidathion (0.02)
Mevinphos (0.02)	Monocrotophos (0.02)	Morphothion (0.05)	Omethoate (0.02)	Oxydemeton-methyl (0.1)	Paraoxon-ethyl (0.02)
Paraoxon-methyl (0.02)	Parathion (0.02)	Parathion-methyl (0.02)	Phenkapton (0.05)	Phenthoate (0.02)	Phorate (0.02)
Phorate-sulfone (0.05)	Phorate-sulfoxide (0.05)	Phosalone (0.05)	Phosmet (0.05)	Phosphamidon (0.02)	Pirimiphos-ethyl (0.02)
Pirimiphos-methyl (0.02)	Profenofos (0.02)	Propaphos (0.02)	Propetamphos (0.02)	Prothiofos (0.02)	Prothoate (0.02)
Pyraclofos (0.05)	Pyrazophos (0.05)	Pyridaphenthion (0.02)	Quinalphos (0.02)	Quintiofos (0.02)	Sulfotep (0.02)
Sulprofos (0.05)	TEPP (0.02)	Terbufos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)
Tolclofos-methyl (0.02)	Triamiphos (0.05)	Triazophos (0.02)	Trichlorfon (0.1)	Vamidothion (0.05)	

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EXPLANATORY NOTE

≥ Greater than or equal to
< Less than
≤ Less than or equal to
N/A means Not applicable

☆ means the test is subcontracted within Eurofins group
◎ means the test is subcontracted outside Eurofins group

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Analytical Report

Sample Code	128-2017-00008162	Report date	18-Aug-2017
Certificate No.	AR-17-VV-007753-01		

Linyi Youkang Biology Co., Ltd.

Racheal GAO
Lianbang Road,
Economical and Technical Development Area,
Linyi City, ShanDong Province

Our reference:	128-2017-00008162/ AR-17-VV-007753-01
Client Sample Code:	A2017030201 A2017031001 A2017031701
Sample described as:	ARACHIDONIC ACID OIL
Sample Packaging:	Sealed metal bottle
Sample reception date:	07-Aug-2017
Analysis starting date:	07-Aug-2017
Analysis ending date:	18-Aug-2017
Arrival Temperature (°C)	5
Sample Weight	50g

		Results	Unit	LOQ	LOD
☆ FL023	Plant sterols and plant stanols (not enriched)	Method: NMKL 198:2014			
	24-Methylenecycloartanol	<1	mg/100 g	1	
	Brassicasterol	125	mg/100 g	1	
	Campesterol	33	mg/100 g	1	
	Cholesterol	1	mg/100 g	1	
	Citrostadienol	1	mg/100 g	1	
	Cycloartenol	1	mg/100 g	1	
	Delta-5,24-stigmastadienol	5	mg/100 g	1	
	delta-7-Avenasterol	1	mg/100 g	1	
	Delta-7-stigmastenol	2	mg/100 g	1	
	Sitostanol+ delta-5-avenasterol	4	mg/100 g	1	
	Sitosterol	51	mg/100 g	1	
	Stigmasterol	6	mg/100 g	1	
	Total plant sterols + plant stanols	861	mg/100 g	1	
	Unidentified sterols	633	mg/100 g	1	

COMMENT

Due to the sample matrix the results are reported without accrediation. This sample seems to contain unusual phytosterols and, therefore, the peak identifications have to be treated only tentative.

Cholesterol is not included in the sum of plant sterols and plant stanols.

The analysis of 24-Methylene-Cholesterol does not belong to our normal scope, but the component has been tentatively identified based on ISO 12228 standard method eluting just in front of Campesterol in the chromatogram.

SIGNATURE

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