GRAS Notice (GRN) No. 730

https://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/NoticeInventory/default.htm

NutraSource, Inc. 6309 Morning Dew Ct, Clarksville, MD 21029 (410)-531-3336 or (301) 875-6454

September 9, 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 Arachidonic Acid (ARA)-Rich Oil for Infant Formula Applications

Dear Dr. Gaynor:

On behalf of Linyi Youkang Biology Co., Ltd., we are submitting a GRAS notification for Arachidonic Acid (ARA)-Rich Oil for infant formula 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) 9/9/2017

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

enclosure



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

Prepared for Linyi Youkang Biology Co., Ltd

Prepared by: NutraSource, Inc. 6309 Morning Dew Ct Clarksville, Maryland, USA Susanschol@yahoo.com +1-301-875-6454 (MP) +1-410-531-3336 (O)



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GENERALLY RECOGNIZED AS SAFE (GRAS) STATUS OF ARACHIDONIC ACID-RICH OIL INGREDIENTS AS FOOD INGREDIENTS FOR INFANT FORMULA APPLICATION

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PART 1. SIGNED STATEMENTS AND A CERTIFICATION

Pursuant to 21 CFR Part 170, subpart E, Shandong Linyi Youkang Biology, Ltd. (hereinafter referred to as 'Linyi Youkang Biology') submits a Generally Recognized as Safe (GRAS) notice and claims that the use of arachidonic acid (ARA)-rich oil (both oil and powder form) in foods, as described in Parts 2 through 7 of this GRAS notice, 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.

1.A. Name and Address of the Notifier

Contact person: Guobin Li

Company name: Linyi Youkang Biology Co., Ltd (herein after referred to as 'Linyi Youkang

Biology')

Address: Intersection of Lanbang Road, Economical and Technical Development Area, Linyi

City, Shandong Province, China

Telephone number: +86-539-2650092 E-mail address: liguobin.aaa@163.com

1.B. Common or Trade Name

Arachidonic acid-rich oil, ARA, ARA-rich oil.

1.C. Applicable Conditions of Use of the Notified Substance

1.C.1. Foods in Which the Substance is to be Used

ARA-rich oil ingredients (both oil and powder forms) are intended to be used as nutritional ingredients in infant formula (ages from birth to 12 months).

1.C.2. Levels of Use in Such Foods

ARA-rich oil ingredients will be used as food ingredients in the same foods (i.e., infant formula) and at same levels to those specified in GRNs 326 (both term and pre-term infants), GRN 80 (term infants) and GRN 94 (pre-term infants). Maximum levels of 0.75% and 0.40% ARA by weight of fatty acids will be used in term and pre-term infant formulas, respectively, in combination with docosahexaenoic acid (DHA) at a ratio ranging from 1:1 to 2:1. These concentrations correspond to 1.875% for term infants and 1.00% of total fat for pre-term infants as ARA-rich oil since ARA concentration of ARA-rich oil is 40% by weight (bw). Corresponding maximum use levels of ARA-rich oil powder will be 7.5% and 4.0% for term and pre-term infants, respectively, as ARA-rich oil powder contains 10% ARA.

1.C.3. Purpose for Which the Substance is Used

The substances will be used as food ingredients for infant formulas.

1.C.4. Description of the Population Expected to Consume the Substance

The population expected to consume the substance consists of pre-term and full term infants.

1.D. Basis for the GRAS Determination:

This GRAS conclusion is based on scientific procedures in accordance with 21 CFR 170.30(a) and 170.30(b).

1.E. Availability of Information

The data and information that are the basis for this GRAS conclusion will be made available to FDA upon request by contacting Susan Cho at NutraSource, Inc. at the address above. The data and information will be made available to FDA in a form in accordance with that requested under 21 CFR 170.225(c)(7)(ii)(A) or 21 CFR 170.225(c)(7)(ii)(B).

1.F. Availability of FOIA Exemption

Privileged or confidential information such as trade secrets and/or commercial or financial information has been redacted from this document and the information contained in this dossier can be made publicly available if warranted. None of the data and information in Parts 2 through 7 of this GRAS notice are exempt from disclosure under the Freedom of Information Act, 5 U.S.C. §552.

1.G. Certification

Linyi Youkang Biology certifies that, to the best of our knowledge, that this GRAS conclusion is based on a complete, representative, and balanced dossier that includes all relevant information, available and obtainable by Linyi Youkang Biology, including any favorable or unfavorable information, and pertinent to the evaluation of the safety and GRAS status of the use of ARA-rich oil ingredients. Linyi Youkang Biology accepts responsibility for the GRAS determination that has been made for ARA-rich oil ingredients, as described in this dossier.

1.H Name, Position/Title of Responsible Person Who Signs Dossier and Signature

(b) (6)	Date: September 8, 2017
Name: Guobin Li	
Title: Chairman	

Address correspondence to Susan S. Cho, Ph.D., NutraSource, Inc. Agent for Linyi Youkang Biology Co., Ltd.

1.I. FSIS/USDA Statement

Linyi Youkang Biology does not intend to add ARA-rich oil ingredients to any meat and/or poultry products that come under USDA jurisdiction. Therefore, 21 CFR 170.270 does not apply.

PART 2. IDENTITY, MANUFACTURING, SPECIFICATIONS, AND TECHNOCAL EFFECTS OF ARA-RICH OIL

2.A.1. Identity of the Notified Substance

2.A.1.1. Common or Trade Name: Arachidonic acid-rich oil, ARA, ARA-rich oil, or Arachidonic acid

2.A.1.2. Chemical Names

all-cis-5,8,11,14-eicosatetraenoic acid (20:4 n-6)

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

506-32-1

2.A.1.4. Empirical Formula

Molecular formula of C₂₀H₃₂O₂

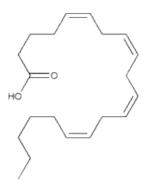
2.A.1.5. Molecular Weight

304.5

2.A.1.6. Structural Formula

Figure 1 shows the structure of ARA. In chemical structure, ARA is a carboxylic acid with a 20-carbon chain and four cis-double bonds; the first double bond is located at the sixth carbon from the omega end. Some chemistry sources define ARA to designate any of the eicosatetraenoic acids. However, almost all scientific literature limits the term to all-*cis*-5,8,11,14-eicosatetraenoic acid.

Figure 1. Chemical Structure of ARA.



2.A.1.7. Background

The ARA-rich oil contains approximately 40% ARA. Arachidonic acid is a polyunsaturated fatty acid (PUFA) present in the phospholipids (especially phosphatidylethanolamine, phosphotidylcholine, and phosphotidylinositides) in membranes of body cells, and is abundant in the brain, muscles, and liver. Arachidonic acid is a precursor of all prostaglandins, thromboxanes, and leukotrienes. Virtually all cellular ARA is esterified in membrane phospholipids where its presence is tightly regulated through multiple interconnected pathways. Arachidonic acid is not one of the essential fatty acids (FA). However, the infant may have a limited ability to convert essential precursor fatty acids linoleic acid (18:2n-6) to ARA and linolenic acid (18:3n-3) to DHA, due to reduced concentrations and activity of desaturase enzymes (Hadley et al., 2016; Martin et al., 2011). Arachidonic acid is one of the most abundant FAs in the brain, and is present in similar quantities to DHA. The two account for approximately 20% of its FA content. Like DHA, ARA is also involved in early neurological development. It also helps protect the brain from oxidative stress by activating peroxisome proliferator-activated receptor gamma. The supplementation of infant formula with ARA at levels consistent with those in human milk is important because the n-6 and n-3 fatty acids present in human milk have critical roles in membrane structure and as precursors of potent and highly reactive eicosanoids (Hadley et al., 2016). Although pre-term infants are capable of endogenous synthesis of ARA from precursor fatty acids, this capacity appears to be sub-optimal to meet the demands of the developing tissues. Thus, it is particularly important for pre-term infants to have supplemental ARA (FSANZ, 2003).

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

Potential toxicants have not been identified. In general, no dioxins and furan, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), pesticide residues (organochlorine and organophosphorus) and mycotoxins have been detected from Linyi Youkang Biology's ARA-rich oil products. The total amount of dioxins in ARA-rich oil derived was below 2 pg/g, the European Union (EU) maximum residual limit. All individual PAH components were below the limit of detection. There were no detectable levels of mycotoxins in ARA-rich oil: the levels of total aflatoxins and fumonisins were below 4 ppb and 60 ppb, respectively (Tables 2 to 9 and Appendix). The Certificates of Analysis are presented in Appendix.

TC 11 1	1 11 '	$\mathbf{p}_{\mathbf{q}}$: 1 $\mathbf{q}_{\mathbf{q}}$	CAD	1 D 1	\sim 1 $^{\circ}$	T 1'
Lable	I (Iraanachlarin	e Pesticides Screened	tor AR	\ _ K 10 h	()1	Ingredients
Taine	i. Oi zanocinoi in	c i cancidea acieciied		7-171011	(711	mercuicins

Pesticide (detection limit,	Pesticide (detection limit,	Pesticide (detection limit,
ppm)	ppm)	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-	Dichlorobenzophenone, p,p-
	(0.4)	(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-	Flubenzimine (0.01)	Fluchloralin (0.01)
Isomers) (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)	Heptachlor (0.005)
	(0.005)	
Heptachlor epoxide, cis-	Heptachlor epoxide, trans-	Hexachlorobenzene (HCB)
(0.005)	(0.005)	(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	Permethrin (0.02)
,	(0.005)	, ,
Plifenate (0.005)	Polychloroterpene	Profluralin (0.005)
	(Camphechlor) (0.2)	
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 2. Organophosphorus Pesticides Screened for ARA-Rich Oil Ingredients

Pesticide (detection limit,	Pesticide (detection limit,	Pesticide (detection limit,
ppm)	ppm)	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	Chlorfenvinphos (0.02)	Chlormephos (0.02)
(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	Dialifos (0.05)
	(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	Dimethylvinphos (002)
	(sum) ()	
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-	Fensulfothion-sulfone (0.02)	Fenthion (0.01)
sulfoxide (0.02)		
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-	Omethoate (0.02)	Oxydemeton-methyl (0.05)
methyl (0.02)		
Paraoxon-ethyl (0.02)	Paraoxon-methyl (0.02)	Parathion (0.02)
Parathion-methyl (0.02)	Parathion-methyl/Paraoxon-	Phenkapton (0.02)
	methyl (sum) ()	
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 3. Mycotoxins Screened for ARA-Rich Oil Ingredients

Mycotoxin, ug/g	Lot:	Lot:	Lot:
	A2017030201	A2017031001	A2017031701
Fumonosine			
Fumonisin B1 (FB1)	< 20	< 20	< 20
Fumonisin B2 (FB2)	< 20	< 20	< 20
Fumonisin B3 (FB3)	< 20	< 20	< 20
Fumonisin sum (B1+B2)	< 40	< 40	< 40
Fumonisin sum (B1+B2+B3)	< 60	< 60	< 60
Aflatoxin			
Aflatoxin B1	< 1	< 1	< 1
Aflatoxin B2	< 1	< 1	< 1
Aflatoxin G1	< 1	< 1	< 1
Aflatoxin G2	< 1	< 1	< 1
Aflatoxin M1	< 0.01	< 0.01	< 0.01
Sum of all positive Aflatoxins	< 4	< 4	< 4
Fusarium toxins			
Deoxynivalenol (Vomitoxin)	< 20	< 20	< 20
HT-2 Toxin	< 10	< 10	< 10
T-2 Toxin	< 10	< 10	< 10
Sum of T-2 and HT-2 toxin	< 20	< 20	< 20
Zearalenone (ZON)	< 10	< 10	< 10
Ochratoxin A (OTA)	< 2	< 2	< 2

Table 4. Dioxins and Furans Tested for the ARA-Rich Oil

Dioxins and Furans, pg/g	Lot: A2017030201	Lot: A2017031001	Lot: A2017031701
1,2,3,4,6,7,8-HeptaCDD	< 0.133	< 0.131	< 0.131
1,2,3,4,6,7,8-HeptaCDF	< 0.0933	< 0.0917	< 0.0918
1,2,3,4,7,8,9-HeptaCDF	< 0.0650	< 0.0638	< 0.0639
1,2,3,4,7,8-HexaCDD	< 0.0633	< 0.0622	< 0.0623
1,2,3,4,7,8-HexaCDF	< 0.0983	< 0.0966	< 0.0967
1,2,3,6,7,8-HexaCDD	< 0.0867	< 0.0851	< 0.0852
1,2,3,6,7,8-HexaCDF	< 0.0900	< 0.0884	< 0.0885
1,2,3,7,8,9-HexaCDD	< 0.0817	< 0.0802	< 0.0803
1,2,3,7,8,9-HexaCDF	< 0.0667	< 0.0655	< 0.0656
1,2,3,7,8-PentaCDD	< 0.0417	< 0.0409	< 0.0410
1,2,3,7,8-PentaCDF	< 0.0600	< 0.0589	< 0.0590
2,3,4,6,7,8-HexaCDF	< 0.0817	< 0.0802	< 0.0803

2,3,4,7,8-PentaCDF	< 0.0933	< 0.0917	< 0.0918
2,3,7,8-TetraCDD	< 0.0317	< 0.0311	< 0.0311
2,3,7,8-TetraCDF	< 0.0867	< 0.0851	< 0.0852
OctaCDD	< 0.967	< 0.949	< 0.951
OCtaCDF	< 0.200	< 0.196	< 0.197
WHO (2005)-PCDD/F	Not Detected	Not Detected	Not Detected
TEQ (lower-bound)			
WHO (2005)-PCDD/F	0.172	0.169	0.169
TEQ (upper-bound)			

Table 5. PCBs Tested for the ARA-Rich Oil

Polychlorinated	Lot:	Lot:	Lot:
Biphenyls	A2017030201	A2017031001	A2017031701
PCB 101, ng/g	< 0.167	< 0.164	< 0.164
PCB 105, pg/g	< 6.50	< 6.38	< 6.39
PCB 114, pg/g	< 0.883	< 0.867	< 0.869
PCB 118, pg/g	< 23.3	< 22.9	< 23.0
PCB 123, pg/g	< 0.667	< 0.655	< 0.656
PCB 126, pg/g	< 0.417	< 0.409	< 0.410
PCB 138, ng/g	< 0.167	< 0.164	< 0.164
PCB 153, ng/g	< 0.167	< 0.164	< 0.164
PCB 156, pg/g	< 3.67	< 3.60	< 3.61
PCB 157, pg/g	< 0.683	< 0.671	< 0.672
PCB 167, pg/g	< 1.83	< 1.80	< 1.80
PCB 169, pg/g	< 2.00	< 1.96	< 1.97
PCB 180, ng/g	< 0.167	< 0.164	< 0.164
PCB 189, pg/g	< 0.667	< 0.655	< 0.656
PCB 28, ng/g	< 0.167	< 0.164	< 0.164
PCB 52, ng/g	< 0.167	< 0.164	< 0.164
PCB 77, pg/g	< 16.7	< 16.4	<16.4
PCB 81, pg/g	< 0.450	< 0.422	< 0.443
Total 6 ndl- PCB	Not Detected	Not Detected	Not Detected
(lower-bound), ng/g			
Total 6 ndl- PCB	1.0	0.982	0.984
(upper-bound), ng/g			
WHO (2005)-PCB TEQ	Not Detected	Not Detected	Not Detected
(lower-bound), pg/g			
WHO (2005)-PCB TEQ	0.105	0.103	0.103
(upper-bound), pg/g			

Table 6. TEQ Tested for the ARA-Rich Oil

TEQ-Totals WHO-PCDD/F and	Lot:	Lot:	Lot:
PCB	A2017030201	A2017031001	A2017031701
WHO (2005)-PCDD/F+PCB	Not Detected	Not Detected	Not Detected
TEQ (lower-bound), pg/g			
WHO (2005)-PCDD/F+PCB	0.277	0.272	0.272
TEQ (upper-bound), pg/g			

Table 7. PAHs Tested for the ARA-Rich Oil

Polynuclear Aromatic	Lot:	Lot:	Lot:	Detection
Hydrocarbons, ug/kg	A2017030201	A2017031001	A2017031701	Limit
Acenaphthene	< 1.0	< 0.1	< 1.0	1
Acenaphthylene	< 2.0	< 2.0	< 2.0	2
Anthracene	< 2.0	< 2.0	< 2.0	2
Benzo(a)anthracene	< 0.50	< 0.50	< 0.50	0.5
Benzo (a)pyrene	< 0.50	< 0.50	< 0.50	0.5
Benzo-(b)-Fluoranthene	< 0.50	< 0.50	< 0.50	0.5
Benzo(ghi)perylene	< 2.0	< 2.0	< 2.0	2
Benzo(k)fluoranthene	< 3.0	< 3.0	< 3.0	3
Chrysene	< 0.50	< 0.5	< 0.50	0.5
Dibenzo(a,h)anthracene	< 3.0	< 3.0	< 3.0	3
Fluoranthene	< 1.0	< 1.0	< 1.0	1
Fluorene	< 2.0	< 2.0	< 2.0	2
Indeno(1,2,3-cd)pyrene	< 2.0	< 2.0	< 2.0	2
Naphthalene	< 20	< 20	< 20	20
Phenanthrene	< 2.0	< 2.0	2.5	2
Pyrene	< 1.0	< 1.0	< 1.0	1

Table 8. Residual Solvents Tested for the ARA-Rich Oil

Solvent Residues, mg/kg	Lot: A2017030201	Lot:	Lot: A2017031701
		A2017031001	
1,1,1,2-Tetrachloroethane	< 0.01	< 0.01	< 0.01
1,1,1-Trichloroethane	< 0.01	< 0.01	< 0.01
1,1,2-Tricholorethane	< 0.01	< 0.01	< 0.01
1,1-Dichloroethane	< 0.05	< 0.05	< 0.05
1,2-Dichloroethane	< 0.05	< 0.05	< 0.05
2-Butanon (Methylethylketon)	< 1	< 1	< 1
2-Methylpentane	< 1	< 1	< 1
3-Methylpentane	< 1	< 1	< 1
Benzene	< 0.01	< 0.01	< 0.01
Bromodichloromethane	< 0.05	< 0.05	< 0.05
Chloroform (trichloromethane)	< 0.01	< 0.01	< 0.01
cis-Dichloroethane	< 0.05	< 0.05	< 0.05

Dibromochloromethane	< 0.05	< 0.05	< 0.05
Dichloromethane	< 0.05	< 0.05	< 0.05
Ethyl Acetate	< 1	< 1	< 1
Ethylbenzene	< 0.01	< 0.01	< 0.01
m-/-p-Xylene	< 0.01	< 0.01	< 0.01
Methylcyclopentane	< 1	< 1	< 1
n-Heptane	< 1	< 1	< 1
n-Hexane	< 1	< 1	< 1
n-Pentane	< 1	< 1	< 1
Styrene	< 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
Tetrachloromethane	< 0.01	< 0.01	< 0.01
Toluene	< 0.01	< 0.01	< 0.01
trans-Dichloroethene	< 0.05	< 0.05	< 0.05
Tribromomethane	< 0.05	< 0.05	< 0.05
Trichloroethene	< 0.01	< 0.01	< 0.01
Xylene (ortho-)	< 0.01	< 0.01	< 0.01

2.A.3. Particle Size

ARA oil-Not Applicable

ARA powder - NLT 95% passing a 60 mesh screen.

2.B. Method of Manufacture

Manufacturing process of the ARA-rich oil meets current Good Manufacturing Practice (cGMP) requirements for the production of food. All growth media, raw materials, and processing aids used in ARA fermentation and manufacturing processes meet internationally recognized specification requirements for food production. The fermentation process is well-controlled and critical control points are monitored to detect insufficient controls on the process (such as incomplete sterilization, incorrect pH or temperature ranges, insufficient fatty acid composition, etc). If any of those control characteristics fail to meet internal specifications, the fermentation is terminated and the batch rejected. Contamination checks also are conducted in the seed and production fermenter. The main fermentation reaction is stopped when the ARA content reaches the desired percentage above 40%. All finished batches of ARA-rich oil undergo rigorous quality assurance testing to meet well-defined product specifications prior to release. Arachidonic acid is derived from a fungal strain, *M. alpina* (Yuan et al., 2002) which was obtained from Shanghai Institute of Biochemistry, Academia Sinica.

The manufacturing processes employed by Linyi Youkang Biology to produce ARA-rich oil ingredients are as follows:

- 1. Seed cultures of *M. alpina* are scaled up sequentially in flasks followed by first and second stage fermenters; all accomplished under aerobic conditions.
- 2. Microorganisms from those seed cultures then are introduced into a nutrient-rich fermentation broth containing glucose and yeast powder.

- 3. The fermentation broth is grown under aerobic conditions in a series of progressively larger stirred-tank fermenters to eventually yield an ARA-rich biomass.
- 4. This biomass is filtered, dried, and extracted by hexane to yield crude ARA-rich oil.
- 5. Arachidonic acid-rich oil is then refined via a series of steps that include degumming, acid degumming, alkali refining, decolorization (activated clay and silicon dioxide) deodorization (steaming), and antioxidant addition.
- 6. Finished ARA-rich oil is packaged under vacuum in polyethylene that is approved for contact with fatty foods.
- 7. Excipients are added to ARA-rich oil and mixed. The mixture is spray dried to produce powder form of ARA-rich oil.

Extraction with hexane to produce a crude oil that is further refined, bleached, and deodorized using process operations is commonly employed in the vegetable oil industry. All equipments that have direct contact with finished ARA-rich oil or its intermediates are made of food-grade polyethylene, stainless steel, or carbon steel. The raw materials and processing aids used in the ARA-rich oil manufacturing process are summarized in Table 9 and 10, respectively. The ARA-rich oil ingredients are manufactured under cGMP to meet ISO 22000 standards for Hazard Analysis and Critical Control Point (HACCP) and food additive regulations established by the U.S. Food and Drug Administration (FDA).

Table 9. Raw Materials Used in the Fermentation Process

Ingredient	CAS number	Regulatory status
Fermentation medium		
Yeast powder	8013-01-2	21CFR 184.1983
Glucose	50-99-7	21CFR 168.120

Table 10. Processing Aids

Item	CAS number	Regulatory status
Excipients for Powder Form		
Maltodextrin	9590-36-6	21CFR 184.1884
Sodium ascorbate	134-03-2	21CFR 182.3731
Processing aids		
Tocopherols	1406-66-2	21CFR 184.1890
Sodium hydroxide	1310-73-2	21CFR 184.1763
Citric acid monohydrate	5959-29-1	21CFR 184.1033
Activated clay (bentonite)	1302-78-9	21CFR 184.1155
Silicon dioxide	14808-60-7	21CFR 172.480
Hexane	110-54-3	21CFR 173.270

Key QC Point Acceptance of raw materials M. alpina, Glucose, Yeast Fermentation Powder -30℃, 2h Dry Solvent: n-hexane Extraction waste water Water Degumming Hot Water Citric acid monohydrate Acid Degumming hot water, 65-85 T waste water Sodium Hydroxide, Hot Water Alkali Refining waste water Hot Water, Citric Acid Monohydrate Water Washing Decolorizing Activated clay, Silicon dioxide Key QC Point Deodorization Steam Add Annoxidant Vitamin E QC Tresting Key QC Point ARA Oil Packaging Add Excipients and Mix Inspection and Storage Emulsion and Homogeneous Spray Dry and Screening Packaging as ARA-rich Oil Powder Inspection and Storage

Figure 2. Manufacturing Flow Diagram of ARA-Rich Oil Ingredients

Characterization of the Source Organism

The principle of production method (via fungal production) is similar to those described by other companies whose production methods for ARA-rich oils have received no objection letters from the FDA (GRNs 41, 80, 94 and 326). Mortierella alpina is the most efficient production organism for ARA. It is a common soil fungus to which humans are frequently exposed (Streekstra, 1997). M. alpina is non-pathogenic and does not form potentially allergenic spores. The genus *Mortierella* is presently classified as a member of the family, Mortierellaceae, within the order of the Mucorales, class Zygomycetes (Table 11). The Mortierellaceae are ubiquitous saprophytic fungi that are easily and frequently isolated from soil. The pathogenic potential of the genus seems to be quite low. Within *Mortierella*, *M. wolfii*, a well-known pathogen of cattle, is the only currently recognized pathogen of the genus (Streekstra, 1997). Like many fungi, M. alpina is associated with common root crops and is, therefore, in the direct food chain of many mammals. Many human and animal studies demonstrated that ARA-rich oil from M. alpina is safe. This production strain was derived via ion implantation from a wild strain isolated from soil in the People's Republic of China. Ion implantation is a routine technique used for the isolation of production strains in the fermentation industry and M. alpina used for the production of ARArich oil is not considered a genetically modified organism.

Class	Scientific Classification
Kingdom	Fungi
Phylum	Zygomycota
Subdivision	Mortierellomycotina
Class	Zygomycetes
Order	Mucorales
Family	Mortierellaceae
Genus	Mortierella
Species	Mortierella alpina

Table 11. Taxonomic Classification of M. alpina

2.C. Specifications and Composition

ARA-rich oil is a free flowing, yellow oil, predominantly triglycerides (TG; >93%) with some diglycerides (4.4%), monoglycerides (~1.0%), and unsaponifiable material (<1.5%) as is typical for food-grade vegetable oils (Table 12).

Tables 13-1, 13-2, and 14 show specifications and three non-consecutive lot analytical results of ARA-rich oil and powder. For each ingredient, 3 non-consecutive lots were analyzed for ARA, total fatty acids, unsaponifiable matter, anisidine value, peroxide value, residual solvents, heavy metals, and microbiology to ensure that Linyi Youkang Biology's ARA-rich oil and powder ingredients met the specifications and were free from contaminants. Specifications for Linyi Youkang Biology's ARA-rich oil are similar to those described in the previous GRAS notices (GRNs 326, 94, 80 and 41): ARA concentrations are ≥40% (≥40% in GRN 326 and 94; 38-44%, in GRNs 80 and 41). Linyi Youkang Biology's specifications for acid value (0.5 vs. 1.0 mg KOH/g), unsaponifiable matter (1.5 vs. 3.0%), and anisidine value (10 vs. 20 AV) were lower

than those specified in GRN 326. The data indicate that Linyi Youkang Biology's ARA-rich oil is substantially equivalent to existing ARA-rich oils that have been the subjects of previous GRAS determinations (GRNs 326, 94, 80, and 41). Specifications for Linyi Youkang Biology's ARA-rich oil powder are similar to those described in the oil form although the ARA content is diluted by approximately 4 times. Total tocopherol contents of ARA-rich oil and oil powder are 97.0 and 24.2 mg/100 g, respectively (data are shown in Appendix, but not in summary tables).

Tables 15 to 17 present fatty acid profiles of ARA-rich oil ingredients. As shown in Table 16, the fatty acid profile of Linyi Youkang Biology's ARA-rich oil is similar to that described in previous GRAS notices, in particular those of GRNs 326 and 41. Fatty acid profile of ARA-rich oil powder is similar to that of ARA-rich oil, but is diluted by approximately 4 times (Table 17).

Table 12. Glyceride Profile of Linyi Youkang Biology's ARA-Rich Oil

Glyceride Profile, %	Lot:	Lot:	Lot:	Mean
	A2017030201	A2017031001	A2017031701	
Triglycerides	93.28	93.29	93.77	93.45
Diglycerides	4.59	4.39	4.26	4.41
Monoglycerides	1.14	1.02	< 1.00	~1.05
Glycerol	< 1.00	< 1.00	< 1.00	<1.0

Table 13-1. Specifications of ARA-Rich Oil in Comparison with Those Specified in Previous GRAS Notices

Parameter	Current notice	GRN 326	GRN 94	GRNs 80 and 41
ARA, C 20:4n6, relative %	<u>≥</u> 40	≥40	≥40	38-44*
Acid value, mg KOH/g	≤0.5	≤1.0	NA	NA
Free fatty acids		≤0.2	≤0.2	<0.4
Free fatty acids, % oleic acid	<0.1			
Unsaponifiable matter, %	≤1.5	≤3.0	<1.0	<3.5
Anisidine value	≤10	≤20	NA	NA
Peroxide value, meq/kg	≤2.5	≤2.0	< 5.0	<5.0
Residual hexane, ppm	Not specified	≤1.0	NA	NA
Mercury (Hg), mg/kg	≤0.05	≤0.05	< 0.5	<0.2
Lead (Pb), mg/kg	NA	NA	<0.1	<0.2
Arsenic (As), mg/kg	≤0.1		< 0.2	< 0.5
Cadmium (Cd), mg/kg	≤ 0.1		NA	NA
Moisture and volatile matter	≤0.1	≤0.1	NA	NA
content, g/100 g	_			1
Coliforms, cfu/ml	≤1	≤3	NA	NA
Molds, cfu/ml	≤1	≤10	NA	NA
Yeast, cfu/ml	≤1	≤10	NA	NA
Salmonella, /25 g	Not Detected	NA	NA	NA

ACTORIC DIALE COURT, CIU/IIII \ 100 INA INA INA INA	Aerobic plate count, cfu/ml	<100	NA	NA	NA
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^{*}Specifications for other fatty acids are included.

Table 13-2. Analytical Values for ARA-Rich Oil

	Analytical Value			
Parameter	A20170302	A2017031	A2017031	Method of Analysis
	01	001	701	
ARA (C20:4n6), %	42.18	41.98	42.25	AOCS Ce 1b-89
Acid value, mg KOH/g	< 0.2	< 0.2	< 0.2	DGF C-V 2
FFA (Calc. as % oleic acid)	< 0.1	< 0.1	< 0.1	
Unsaponifiable matter, %	0.7	0.8	0.8	ISO 18609
Anisidine value (AV)	3.5	1.7	1.6	ISO 6885
Peroxide value, meq/kg	2.05	< 0.05	< 0.05	AOCS Cd 8b-90:2003
Residual hexane, ppm	< 1.0	< 1.0	< 1.0	Eurofin internal method,
				HS-GC-MS
Mercury (Hg), mg/kg	< 0.005	< 0.005	< 0.005	BS EN 13806:2002
Lead (Pb), mg/kg	< 0.05	< 0.05	< 0.05	BS EN ISO 17294-2 2004
				mod.
Arsenic (As), mg/kg	< 0.1	< 0.1	< 0.1	BS EN ISO 17294-2 2004
				mod.
Cadmium (Cd), mg/kg	< 0.01	< 0.01	< 0.01	BS EN ISO 17294-2 2004
				mod.
Moisture and volatile matter	0.03	0.04	0.03	ISO 662:1998
content, g/100 g				
Ash, g/100 g	< 0.1	< 0.1	< 0.1	AOAC 941.12
Coliforms, cfu/ml	< 1	< 1	< 1	ISO 4832:2006
Molds, cfu/ml	< 1	< 1	< 1	ISO 21527:2008
Yeast, cfu/ml	< 1	< 1	< 1	ISO 21527:2008
Salmonella, /25 g	Not	Not	Not	ISO 6579:2002
	Detected	Detected	Detected	
Aerobic plate count, cfu/ml	< 1	< 1	< 1	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. Specifications and Analytical Values for ARA-Rich Oil Powder

Parameter	Specifications	COA			
	1				Method Analysis
		A2017	A2017	A2017	
		030201	031001	031701	
ARA, C 20:4n6, %	>10.00	10.8	10.9	10.8	AOCS Ce 1b-89
Acid value, mg KOH/g	< 0.5	< 0.2	< 0.2	< 0.2	DGF C-V 2
Free fatty acids, % oleic acid	<0.1	<0.1	<0.1	<0.1	DGF C-V 2
Unsaponifiable matter, %	<1.0	0.7	0.8	0.8	ISO 18609
Anisidine value (AV)	≤ 10	3.5	1.7	1.6	ISO 6885
Peroxide value, meq/kg	<1.0	< 0.05	< 0.05	< 0.05	AOCS Cd 8b-
					90:2003
Residual hexane, ppm	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0	
Mercury (Hg), mg/kg	< 0.01	< 0.005	< 0.005	< 0.005	BS EN
					13806:2002
Lead (Pb), mg/kg	< 0.1	< 0.05	< 0.05	< 0.05	BS EN ISO
Arsenic (As), mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	17294-2 2004
Cadmium (Cd), mg/kg	< 0.1	< 0.01	< 0.01	< 0.01	mod.
Moisture (direct drying method), %	<0.5	0.03	0.12	0.12	ISO 662:1998
Moisture and volatile	<3.0	2.27	2.14	2.28	ISO 662:1998
matter content, %	-0.5	.0.1	4 O 1	4 O 1	A O A O O O O O O O
Ash, %	<0.5	< 0.1	< 0.1	< 0.1	AOAC 941.12
Coliforms, cfu/ml	<10	<10	<10	<10	ISO 4832:2006
Molds, cfu/ml	<10	<10	<10	<10	ISO 21527:2008
Yeast, cfu/ml	<10	<10	<10	<10	ISO 21527:2008
Salmonella, /25 g	Not Detected	Not	Not	Not	ISO 6579:2002
	1.0	Detected	Detected	Detected	YG 0, 4022
Aerobic plate count,	<10	< 10	< 10	< 10	ISO 4833-
cfu/ml	207 : 1			0.11 01	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 15. Fatty Acid Profiles of Linyi Youkang Biology's ARA-Rich Oil*

Fatty Acid Profile, g/100 g	Lot:	Lot:	Lot:	Mean
	A2017030201	A2017031001	A2017031701	
C 6:0 (Caproic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 8:0 (Caprylic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 10:0 (Capric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 12:0 (Lauric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 14:0 (Myristic acid)	0.386	0.386	0.387	0.386

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)	7.257	7.236	7.274	7.256
C 16:1 (Palmitoleic acid)	0.121	0.120	0.122	0.121
C 17:0 (Margaric acid)	0.243	0.242	0.245	0.243
C 17:1 (Heptadecenoic acid)	0.098	0.067	0.068	0.078
C 18:0 (Stearic acid)	6.721	6.696	6.714	6.710
C 18:1 (Oleic acid)	5.916	5.891	5.924	5.910
C 18:1n7 (Vaccenic acid)	0.295	0.283	0.283	0.287
C 18:2n6 (Linoleic acid)	6.009	6.007	6.044	6.020
C 18:3n3 (alpha-Linolenic acid)	0.073	0.072	0.074	0.073
C 18:3n6 (gamma-Linolenic	2.450	2.449	2.455	
acid)				2.451
C 20:0 (Arachidic acid)	0.873	0.873	0.872	0.873
C 20:1 (Eicosenoic acid)	0.430	0.429	0.434	0.431
C 20:2n6 (Eicosodienoic acid)	0.421	0.417	0.418	0.419
C 20:3n3 (Eicosatrienoic acid)	0.229	0.229	0.229	0.229
C 20:3n6 (homo-gamma-	4.781	4.771	4.794	4.782
Linolenic acid)				
C 20:4n6 (Arachidonic acid)	43.914	43.780	44.067	43.920
C 20:5n3 (Eicosapentaenoic	0.100	0.099	0.101	
acid)				0.100
C 21:0 (Heneicosanoic acid)	0.063	0.067	0.067	0.066
C 22:0 (Behenic acid)	3.415	3.411	3.400	3.409
C 22:1n9 (Erucic acid)	0.114	0.114	0.114	0.114
C 22:2n6 (Docosadienoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 22:6n3 (Docosahexaenoic	< 0.020	< 0.020	< 0.020	< 0.020
acid)				
C 22-5n3 (Docosapentaenoic	< 0.020	< 0.020	< 0.020	< 0.020
acid)				
C 22-5n6 (Docosapentaenoic	< 0.020	< 0.020	< 0.020	< 0.020
acid)				
C 23:0 (Tricosanoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 24:0 (Lignoceric acid)	11.381	11.346	11.135	11.287
C 24:1 (Nervonic acid)	0.372	0.371	0.372	0.372
Monounsaturated fat	7.425	7.360	7.405	7.397
Omega-3 fatty acids	0.400	0.400	0.405	0.402
Omega-6 fatty acids	57.575	57.425	57.775	57.592
Polyunsaturated fat	57.975	57.820	58.180	57.992
Saturated fat	30.340	30.255	30.090	30.228
Total fat	95.75	95.44	95.68	95.623
*Tl	7 mostle ad 006 06	·		

^{*}The analysis was done using AOAC method 996.06.

Table 16. Comparison of Fatty Acid Profiles of ARA-Rich Oils

Fatty Acid, g/100 g	Current	GRN 326	GRN 94	GRN 41
	notice	G14.720	Old ().	ora, ii
C 6:0 (Caproic acid)	< 0.02			
C 8:0 (Caprylic acid)	< 0.02	<0.01		
C 10:0 (Capric acid)	< 0.02	0.04		
C 12:0 (Lauric acid)	< 0.02	0.01		
C 14:0 (Myristic acid)	0.39	0.26	0.48	0.44
C 14:1 (Myristoleic acid)	< 0.02	0.01		
C 15:0 (Pentadecanoic acid)	< 0.02	0.09	0.17	
C 15:1 (Pentadecenoic acid)	< 0.02			
C 16:0 (Palmitic acid)	7.26	6.02	13.80	8.13
C 16:1 (Palmitoleic acid)	0.12	0.02	0.1	
C 17:0 (Margaric acid)	0.24	0.18	0.35	0.39
C 17:1 (Heptadecenoic acid)	0.08			
C 18:0 (Stearic acid)	6.71	5.27	7.75	9.04
C 18:1 (Oleic acid)	5.91	4.78	6.50	19.68
C 18:1n7 (Vaccenic acid)	0.29	0.22	0.40	0.28
C 18:2n6 (Linoleic acid)	6.020	7.87	10.90	6.78
C 18:3n3 (alpha-Linolenic acid)	0.07	0.04	0.57	
C 18:3n6 (gamma-Linolenic acid)	2.45	2.10	2.58	2.77
C 20:0 (Arachidic acid)	0.87	0.75	0.73	0.91
C 20:1 (Eicosenoic acid)	0.43	0.22	0.5	0.40
C 20:2n6 (Eicosodienoic acid)	0.42	0.44	0.63	0.63
C 20:3n3 (Eicosatrienoic acid)	0.23	0.03		
C 20:3n6 (homo-gamma-Linolenic acid)	4.78	3.69	3.27	1.96
C 20:4n6 (Arachidonic acid)	43.92	43.30	40.58	43.26
C 20:5n3 (Eicosapentaenoic acid)	0.10	0.14	0.20	~0.1
C 21:0 (Heneicosanoic acid)	0.067	0.10		
C 22:0 (Behenic acid)	3.41	3.11	2.45	2.00
C 22:1n9 (Erucic acid)	0.11	0.17	0.15	0.16
C 22:2n6 (Docosadienoic acid)	< 0.02	0.02		
C 22:6n3 (Docosahexaenoic acid)	< 0.02	0.04		
C 22-5n3 (Docosapentaenoic acid)	< 0.02	ND		
C 22-5n6 (Docosapentaenoic acid)	< 0.02	ND		< 0.01
C 23:0 (Tricosanoic acid)0	< 0.02			
C 24:0 (Lignoceric acid)	11.29	10.12	6.40	1.93
C 24:1 (Nervonic acid)	0.37	0.51		0.17
C26:0		1.34		
Saturated fat	30.23	27.50	32.17	22.85
Total fat	95.62	95.06	99.86	98.69

Table 17. Fatty Acid Profile of Linyi Youkang Biology's ARA-Rich Oil Powder*

Fatty Acid Profile, g/100 g	Lot:	Lot:	Lot:	Mean
ratty Acid Home, g/100 g	2017011001	2017020701	2017030101	Wican
C 6:0 (Caproic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 8:0 (Caprole acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 10:0 (Capric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 10.0 (Capric acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 12:0 (Lauric acid) C 14:0 (Myristic acid)	0.111	0.020	0.110	0.104
` •	< 0.020	< 0.020	< 0.020	< 0.020
C 14:1 (Myristoleic acid)	< 0.020	< 0.020	< 0.020	
C 15:0 (Pentadecanoic acid)				< 0.020
C 15:1 (Pentadecenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 16:0 (Palmitic acid)	1.778	1.631	1.775	1.728
C 16:1 (Palmitoleic acid)	0.035	0.035	0.033	0.035
C 17:0 (Margaric acid)	0.065	0.058	0.065	0.063
C 17:1 (Heptadecenoic acid)	< 0.020	< 0.020	< 0.020	< 0.020
C 18:0 (Stearic acid)	1.542	1.469	1.539	1.517
C 18:1 (Oleic acid)	1.436	1.548	1.434	1.473
C 18:1n7 (Vaccenic acid)	0.064	0.069	0.064	0.066
C 18:2n6 (Linoleic acid)	1.681	2.519	1.674	1.958
C 18:3n3 (alpha-Linolenic acid)	< 0.020	< 0.020	< 0.020	0.02
C 18:3n6 (gamma-Linolenic acid)	0.622	0.550	0.621	0.598
C 20:0 (Arachidic acid)	0.207	0.192	0.206	0.202
C 20:1 (Eicosenoic acid)	0.084	0.065	0.084	0.078
C 20:2n6 (Eicosodienoic acid)	0.112	0.103	0.112	0.109
C 20:3n3 (Eicosatrienoic acid)	0.057	0.050	0.054	0.054
C 20:3n6 (homo-gamma-	1.106	1.016	1.105	1.106
Linolenic acid)				
C 20:4n6 (Aracihdonic acid)	11.314	11.372	11.282	11.323
C 20:5n3 (Eicosapentaenoic acid)	< 0.020	0.032	< 0.020	0.02
C 21:0 (Heneicosanoic acid)	< 0.020	< 0.020	< 0.020	0.02
C 22:0 (Behenic acid)	0.837	0.801	0.833	0.824
C 22:1n9 (Erucic acid)	< 0.020	< 0.020	< 0.020	0.02
C 22:2n6 (Docosadienoic acid)	< 0.020	< 0.020	< 0.020	0.02
C 22:6n3 (Docosahexaenoic acid)	< 0.020	< 0.020	< 0.020	0.02
C 22-5n3 (Docosapentaenoic	< 0.020	< 0.020	< 0.020	0.02
acid)	0.020	0.020	0.020	0.02
C 22-5n6 (Docosapentaenoic	< 0.020	< 0.020	< 0.020	0.02
acid)	0.020	0.020	0.020	0.02
C 23:0 (Tricosanoic acid)	< 0.020	< 0.020	< 0.020	0.02
C 24:0 (Lignoceric acid)	3.111	3.270	3.086	3.156
C 24:1 (Nervonic acid)	0.084	0.093	0.085	0.087
Monounsaturated fat	1.715	1.810	1.700	1.741
Omega-3 fatty acids	0.055	0.080	0.050	0.062
Omega-6 fatty acids	14.835	15.560	14.795	15.063
Polyunsaturated fat	14.890	15.645	14.755	15.128
1 Oryunsaluraleu Tal	14.090	13.043	14.030	13.140

Saturated fat	7.650	7.515	7.615	7.593
Total fat	24.31	25.00	24.22	24.51

^{*}The analysis was done using AOAC method 996.06.

2.D. Stability

Based on commercial experience with similar oil derived from *M. alpina* (GRN 326 - FDA, 2010), a shelf life of 36 months is expected under frozen conditions.

2.E. Intended Technical Effects

ARA-rich oil ingredients can be used as a food ingredient in infant formula as a source of long-chain polyunsaturated fatty acids (PUFA) at concentrations consistent with cGMP.

PART III. DIETARY EXPOSURE

3.A. Estimated Dietary Intakes (EDIs) of ARA

The intended use of ARA-rich oil ingredients for addition to infant formula is to produce a product whose ARA concentration is consistent with that of human milk. The ARA content of human milk varies from 0.34% to 1.22% of total fatty acids among different populations. Therefore, the proposed use of 0.75% and 0.40% ARA by weight of fatty acids in term and preterm infant formulas, respectively, is within the range of ARA percentages found in human milk. The intended use of ARA-rich oil suggested in this GRAS notice is the same as concentrations mentioned in GRN 80 (term infants), GRN 94 (pre-term infants) and GRN 326 (term and pre-term infants). These concentrations correspond to 1.875% for term infants and 1.00% of total fat for pre-term infants as ARA-rich oil since ARA concentration of ARA-rich oil is 40% by weight. These concentrations also correspond to 7.50% for term infants and 4.00% of total fat for pre-term infants as ARA-rich oil powder since ARA-rich oil powder contains 10% ARA by weight. The ratios of ARA:DHA are expected to be in the range of 2:1 -1:1.

An estimate of exposure to ARA from its addition to infant formula is based on mean target ARA concentrations of 0.75% and 0.40% of total fat for term and pre-term infants, respectively. Assuming human infants consume about 100 kcal/kg bw/day (term infants) to 120 kcal/kg bw/day (pre-term infants), of which fat comprises about 50%, an infant will consume about 5.6 g (term infants) to 6.7 g (pre-term infants) of fat/kg bw/day (1 g fat = 9 kcal). These correspond to intakes of ARA of 42 mg and 27 mg ARA/kg bw/day (corresponding to 104 and 67 mg of ARA-rich oil/kg bw/day or 420 and 270 mg ARA-rich oil powder/kg bw/day) for term infants and pre-term infants, respectively. This estimation method is the same as that used in GRN 326 (FDA, 2010).

3.B. Food Sources of ARA

Human milk provides small quantities of DHA and ARA, usually less than 1% of total fatty acids (Agostoni et al., 1999; Bahrami and Rahimi, 2005; Brenna et al., 2007; Young et al., 1997; Yuhas et al., 2006). Mean ARA content of American women's milk ranged from 0.40 to 0.67% of total FA (Brenna et al., 2007; Bopp et al., 2005; Jensen et al., 2005; Yuhas et al., 2006). Arachidonic acid content in colostrums tends to be higher (usually by 50%) than that of mature milk. Asian mothers tend to have higher ARA concentrations in their milk than their Western counterparts, and ARA concentrations ranged from 0.30 to 1.22% of total FA (Brenna et al., 2007).

3.C. EDIs of ARA from the Diet

It is not expected that infants would consume ARA from other foods while consuming infant formulas.

PART 4. SELF LIMITING LEVELS OF USE

No known self-limiting levels of use are associated with the ARA-rich oil ingredients. However, the ratios of ARA:DHA are expected to be in the range of 2:1 -1:1.

PART 5. HISTORY OF CONSUMPTION

EXPERIENCE BASED ON COMMON USE IN FOODS BEFORE 1958

The statutory basis for the conclusion of GRAS status of ARA-rich oil derived from *M. alpina* in this document is not based on common use in food before 1958. The GRAS determination is based on scientific procedures. ARA is present naturally in food. It is reasonable to conclude that it was present in food prior to 1958.

ARA-rich oils derived by fermentation of the fungus *M. alpina* have been used in commercially available infant formulas in at least 50 countries since the early 1990s.

PART 6. BASIS FOR GRAS DETERMINATION

6.A. Current Regulatory Status

Currently, ARA-rich oil has established a GRAS notice status with U.S. FDA. Table 3 summarizes the maximum ARA use concentrations in infant formulas approved for term and pre-term infants. The ARA concentrations for supplementation to infant formula ranged from 0.4 to 0.75% of total FA. Table 18 summarizes the recommendations specified in previous GRAS notices and those by various government agencies or health organizations.

Assumptions for the conversion between ARA intake and ARA level: (1) pre-term and term infants consume 120 kcal/kg bw/day and 100 kcal/kg bw/day, respectively, (2) fatty acids comprise 50% of the available energy in breast milk or infant formula, and (3) 1 g of fat contains 9 kcal.

	ARA source	Infants	% of total fat	Estimated intake
				(mg/kg bw/day)
GRN 041	M. alpina	Term	0.5	30
GRN 080	M. alpina	Term	0.75	45
GRN 094	M. alpina	Term	0.40	26.3
	_	Pre-term,	0.40	32.4
		hospitalized		
		Pre-term, post-	0.40	27.7
		discharge		
GRN 326	M. alpina	Pre-term	0.40	27
		Term	0.75	42
Present notice	M. alpina	Pre-term	0.40	27
(same as GRNs 326,		Term	0.75	42
094 and 080)				

Table 18. Maximum ARA Use Concentrations in Infant Formulas

6.B. Review of Safety Data

As noted above, the FDA has issued 'no question' letters on four GRAS notices (GRNs 041, 080, 094, and 326) related to food uses of ARA-rich oils derived from *M. alpina* for infant formula applications. Based on a comparison of the specifications for these products, it is concluded that ARA in this GRAS determination is substantially equivalent to the other ARA-rich oils described in the FDA GRAS notices; thus, it is recognized that the information and data in the other GRAS notices are pertinent to the safety of the ARA-rich oil in this GRAS determination. Therefore, this notice incorporates by reference the safety and metabolism studies discussed in previous GRNs (GRN 326 - pages 61-153; GRN 94 - pages 78 - 318; GRN 80 - stamped pages 16-23 and 48-55; GRN 41 - stamped pages 108-118 and 175-418) and will not discuss previously reviewed references in detail. Additionally, this notice discusses additional animal and human studies that have been published since the FDA's last review of 2010 (or in the period of January 2010 and July 2017). The subject of the present GRAS assessment is ARA-rich oil (both oil and powder forms).

6.B.1. Metabolic Fate of ARA

(adopted from Kremmyda et al., 2011; Kroes et al., 2003; Martin et al., 1993; 2011)

In breast milk, ARA and DHA are mainly found in the form of TG, although they also occur in phospholipids (Martin et al., 1993). Breast milk TG are primarily esterified at the sn-2 and sn-3 positions, with the sn-1 position being relatively deficient in these acids. Arachidonic acid accounts for approximately 0.77% of FAs (0.4% at the sn-2 position and 0.37% at the sn-3 position; DHA accounts for approximately 0.39% of FAs [0.26% at the sn-2 position and 0.13% at the sn-3 position]; Martin et al., 1993).

In general, dietary TGs undergo enzymatic hydrolysis in the upper intestine to free FAs and 2monoglycerides. These products then are 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 free FAs to the tissues for metabolism or for cellular uptake, with subsequent reesterification 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 $\Delta 9$ 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 polyunsaturated FA (PUFA) is possible, but not very efficient in humans. Examples of 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.

In pre-term infants, approximately 80% of ingested ARA (either from breast milk or fungal ARA-supplemented formula) is absorbed. Non-absorbed ARA is excreted via the feces. In general, long chain PUFA concentrations increase from maternal tissues to fetal circulation to fetal tissues. Placenta FA composition can be indicative of maternal FA status and reflects FAs that are selectively transferred to the fetus. During the last trimester of pregnancy, the placenta provides the fetus with ARA and DHA. It is known that pre-term birth, which curtails maternal supply of ARA and DHA to the fetus, is associated with sub-optimal neural and visual

development, which can be improved by providing exogenous ARA and DHA (Kremmyda et al., 2011). After delivery, the premature infant becomes dependent on external sources for its nutritional requirements due to the shorter period and lesser extent of intrauterine long chain PUFA accumulation. In addition, the infant may have a limited ability to convert essential precursor fatty acids linoleic acid (18:2n-6) to ARA and linolenic acid (18:3n-3) to DHA, due to reduced concentrations and activity of desaturase enzymes (Martin et al., 2011). Supplementation of these precursor fatty acids may not provide normal concentrations of the downstream FA. Thus, pre-term infants should have higher postnatal long chain PUFA requirements than full-term infants although ARA supplementation can benefit both term and pre-term infants.

6.B. 2. Studies on Mutagenicity and Genotoxicity of ARA-Rich Oil (from M. alpina)

Studies published since FDA's review in 2010 (or from January 2010 to July 2017; Table 19) In a study by Lewis et al. (2016), the safety of ARA-rich oil from *Mortierella alpina* was evaluated by testing for gene mutations and genotoxicity. The results of all genotoxicity tests were negative.

Bacterial Reverse Mutation Assays for ARA-Rich OiL

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 ARA-rich oil or DHA-rich oil. There was no dose-related increase over the range tested for any of the five tester strains used. The results indicate that ARA-rich oil is not mutagenic.

In Vitro Chromosomal Aberration Tests Using Human Blood Peripheral Lymphocyte with ARA-Rich Oil

In Phase I, the cultures were treated for 4 h with ARA- rich oil and the mean percent aberrant cells was determined in the presence and in the absence of metabolic activation for concentrations of 0.00 (water control), 0.00 (vehicle control), 1.25, 2.5, and 5.0 mg ARA-rich oil/mL and positive controls, respectively. For Phase II, test item treatment concentrations were 1.25, 2.5, and 5.0 mg ARA- rich oil/mL culture in the presence and in the absence of metabolic activation (2%). 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 ARA-rich oil. Under these experimental conditions, ARA-rich oil did not induce chromosomal aberration and was not genotoxic both in the presence and in the absence of metabolic activation.

Mammalian Erythrocyte Micronucleus Tests for ARA-Rich Oil

Wistar rats treated with ARA-rich oil at all doses exhibited group 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. The data suggested no evidence of genotoxicity.

Table 19. Summary of Studies Showing No Mutagenicity and Genotoxicty of ARA-Rich Oil

Test	Test system	Concentration/dose of ARA-rich or
		DHA-rich oils
Bacterial reverse	S. typhimurium TA98,	0.1, 0.5, 1.25, 2.5, 3.75 and 5.0
mutation assay	TA100, TA1535,	mg/plate, plate incorporation and
-	TA1537, E. coli WP2	preincubation \pm S9
	uvrA	
In vitro chromosomal	Human blood peripheral	Phase I: Concentration of 0.0, 1.25, 2.5,
aberration test using	lymphocytes	and 5 mg Phase II: 1.25, 2.5, and 5.0 g
human blood peripheral		mg/mL culture in presence and absence
lymphocyte		of metabolic activation (2%)
Mammalian erythrocyte	Polychromatic	1000, 2500, and 5000 mg/kg bw/day
micronucleus test	erythrocytes in bone	
	marrow of treated rats	

Adopted from Lewis et al. (2016)

The Studies Reviewed in GRN 326

Hempenius et al. (1997) reported that ARA-rich oil from *M. alpina* did not induce mutagenic or genotoxic activity (the Ames test in *Salmonella typhimurium* strains TA1535, TA1537, TA100, and TA102, as well as *E. coli* WP2uvrA, with and without S9 activation; up to 5,000 ug/plate showed no mutagenic activities of ARA-rich oil from *M. alpina*; Hempenius et al., 1997).

6.B.3. Animal Toxicity Studies of ARA-Rich Oil Derived from M. alpina

This review covers animal toxicity studies using ARA-rich oils derived from *M. alpina* (Table 20).

Acute Toxicity Study on Linyi Youkang Biology's ARA-Rich Oil

Gao (2017) evaluated acute toxicity of ARA-rich oil (42.1% ARA) in rats. ARA-rich oil was administered to 10 young rats (5 males and 5 females) by oral gavage at the dosage of 15.2 g/kg bw. Water control and vehicle control (sunflower oil) were included. 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 of organs. The author found that the mean lethal dose (LD₅₀) of ARA-rich oil was far above 15.2 g/kg bw.

Studies Published Between January 2010 and July 2017

In a study by Lewis et al. (2016), the safety of ARA-rich oil from *Mortierella alpina* 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 ARA-rich oils and two control diets: water and corn oil (vehicle control). There were no treatment-related effects of ARA-rich oil on clinical observations, body weight, food consumption, behavior, hematology, clinical chemistry, coagulation, urinalysis parameters, or necropsy findings. Increases in cholesterol and triglyceride (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 no observable adverse effect level (NOAEL) for the ARA-rich oil from *M. alpina* was determined to be 5,000 mg/kg bw/day, the highest dose tested. The ARA-rich oil contained 40.3% ARA mostly in a form of TG (91%).

A study by Falk et al. (2017) investigated the reproductive and developmental toxicity of dietary exposure to ARA-rich oil (40.3% ARA) derived from *M. alpina*. In the 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 ARA-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 ARA-rich oil via gavage throughout the mating period, pregnancy, and the nursing and lactation periods. 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 doserelated or significantly different from control groups, and were not considered to be treatment related. The NOAEL for maternal toxicity and embryo/fetal development and for paternal or maternal treatment-related reproductive toxicity for the ARA-rich oil administered by oral gavage was found to be 5,000 mg/kg bw/day in rats.

Gao et al. (2014) evaluated the potential toxicity of refined ARA-rich oil (48.3% ARA) derived from *M. alpina* by performing a 90-day subchronic study in F1 Sprague Dawley (SD) rats with *in utero* exposure. This study was preceded by a 4-week pretreatment period of parental (F0) rats and exposure of the F0 dams throughout mating, gestation, and lactation. The results indicated that ARA-rich oil, at concentrations of 0.5%, 1.5%, and 5.0% of diet, did not affect either reproductive performance of the parental rats, or any characteristics of the pups. In the subchronic study with the offspring (F1) rats, no treatment related abnormalities were observed. Thus, the NOAEL was placed at 5% ARA-rich oil, the highest level tested. This level corresponds to approximately 3,750 mg/kg in F0 females, 2,850 mg/kg in F0 males, 4,850 mg/kg in F1 females, and 4,480 mg/kg in F1 males.

Tyburczy et al. (2012) evaluated the effect of physiologically high dietary ARA-rich oil derived from *M. alpina* on growth, clinical chemistry, hematology, and immune function in newborn piglets. Three-day old piglets were administered one of seven diets for 25 days: 6 diets with varying ratios of ARA:DHA as follows (g/100 g FA/FA): 0.1/1.0; 0.53/1.0; 0.69/1.0; 1.1/1.0; 0.67/0.62; and 0.66/0.33. A seventh group was maternal-reared and remained with the dam during the study. No treatment-related abnormalities were observed in formula intake, growth, clinical chemistry, hematology, or immune status measurements. The authors concluded that a

dietary ARA concentration up to 1% total FA (or 49 mg/100 kcal of the formula) was safe and had no adverse effect on any of the safety outcomes measured.

The 2011 study of Tyburczy et al. compared the bioequivalency of three different sources of ARA-rich oils when the formula contained 0.64% ARA derived from M. alpina and 0.32% DHA (from C. cohnii) of total lipids. It was hypothesized that the three ARA-rich oils would be nutritionally bioequivalent and equally safe in rapidly-growing neonatal pigs. Piglets were fed one of three ready-to-use formulas that provided ARA at approximately 0.64% and DHA at 0.34% total FA from day 3 to 22 of life, upon which tissues were harvested and analyzed for ARA and DHA accretion. All 3 ARA-rich oils were manufactured using M. alpina by 3 different companies. Bioequivalence was assessed by 90% confidence intervals on the least squares geometric mean ratio of tissue ARA from the experimental groups compared with the Control. Bioequivalence was met if the confidence intervals, expressed as percentages with 100% equaling unity (i.e. 1:1 ratio), fell within the limits of 80 – 125%. For both experimental diets, the 90% confidence intervals fell within the 80 - 125% limits for every tissue (including liver histology) as well as clinical chemistry and hematological parameters examined, establishing that two sources of ARA-rich oils (Cargill's RAO and Nippon Suisan Kaisha, Ltd.'s SUNTGA40S) were bioequivalent sources of ARA for tissue and RBC ARA accretion compared with reference ARA-rich oil, ARASCO (Martek/DSM).

Studies Reviewed in GRN 326

The LD₅₀ was found to be 18.2 g for ARA-rich oil or 6.2 g for ARA (Hempenius et al., 1997). Subchronic toxicity study in rats reported the following NOAEL values: 3.0% in diet for *M. alpina* biomass in the first generation (F0) rats (Nisha et al., 2009) and 970 mg ARA-rich oil/kg bw/day or 374 mg ARA/kg bw/day in the second generation (F1) rats after *in utero* exposure (Hempenius et al., 2000). Shorter-term studies also reported the NOAEL value of up to 3,000 mg ARA-rich oil/kg bw/day or 1,000 mg ARA/kg bw in F0 rats (Hempenius et al., 1997; Merritt et al., 2003). A blend of ARA-oil from *M. alpina* and DHA-oil from *C. cohnii* was found to be safe up to 12% of the diet (Burns et al., 1999; Wibert et al., 1997).

Conclusion:

Based on the above listed studies, for purposes of safety evaluation, a NOAEL of 5,000 mg/kg bw/day was chosen for ARA-rich oil and 2,000 mg/kg bw/day for ARA in rats. The NOAEL of 2,000 mg ARA/kg bw/day may represent approximately 74 times the infant intake of ARA in human milk.

Table 20. Summary of Animal Toxicity Studies of ARA-Rich Oils Derived from M. alpina

Species	Test substance	Dose	Duration	NOAEL	Reference				
	oukang Biology's ARA	A-Rich Oil	1	1	1				
Rat	ARA-rich oil from	0 or 15.2	Single dose	LD50>>>15,200	Gao et al.,				
	M. alpina (ARA	g/kg bw		mg/kg bw	2017				
	42.1% of total FA)								
	Studies Published since FDA's Review in 2010								
Rat,	ARA-rich oil from	0, 1,000,	13 wk	ARA-rich oil-	Lewis et al.,				
Wistar	M. alpina (40.3%	2,500,		5,000 mg/kg	2016				
	ARA)	5,000		bw/day					
Rat,	ARA-rich oil from	mg/kg 0, 1,000,	Gestation	ARA-rich oil-	Falk et al.,				
Wistar	M. alpina (40.3%	2,500,	days 6-20-	5,000 mg/kg	2017				
Wistai	ARA)	5,000	developmental	bw/day	2017				
		mg/kg	toxicity	o way					
Rat,	ARA-rich oil from	0, 1, 1.5, or	13-wk of F1,	ARA-rich oil-	Gao et al.,				
Wistar	M. alpina (48.3%	5% of diet	after in utero	5,000 mg/kg	2014				
	ARA)		exposure of	bw/day					
			F0						
Piglet	ARA-rich oil from	0.1-1.0%	19-25 days	1.0% ARA of	Tyburczy et				
	M. alpina	ARA of		total FA	al., 2012				
~ 4.		total FA							
	Reviewed in GRN 326		G: 1 1	10.0					
Rat,	ARA-rich oil	18.2 g	Single dose;	$LD_{50}=18.2 \text{ g}$	Hempenius				
Wistar	(ARA ~34% of	ARA-rich	observed 14	ARA-rich oil/kg	et al., 1997				
	total FA)	oil /kg bw or	days	bw or 6.2 g ARA/					
		6.2 g ARA/		kg bw					
		kg bw		KS OW					
Rat,	ARA-rich M.	Up to 5	Single dose;	LD ₅₀ >5 g	Nisha et al.,				
Wistar	alpina biomass	g/kg bw	observed	biomass/kg bw	2009				
			14 days	or >0.63 g					
				ARA/kg bw					
Piglet	ARA-rich oil (40%	62 or 96	16 days	96 mg ARA/100	Merritt et				
	ARA)	mg		kcal or 154 mg	al., 2003				
		ARA/100		ARA/kg bw/day					
		kcal							
Rat,	ARA-rich oil	100, 600,	4 wk	3,000 mg ARA-	Hempenius				
Wistar	(34% ARA)	2,000, or		rich oil/kg	et al., 1997				
		3,000 mg ARA-rich		bw/day or 1,000					
		oil		mg ARA/kg bw					
Rat,	ARA-rich <i>M</i> .	0, 0.25, 0.5,	13 wk	3.0% <i>M. alpina</i>	Nisha et al.,				
Wistar	alpina biomass	1.0, 2.0 and	15 WK	biomass in diet	2009				
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(13.1% ARA)	3.0% of		Clothago in divi					
		diet							
L	ı		l	I.	1				

Rat,	ARA-rich oil,	3,000,	13-wk of F1,	15,000 ppm in	Hempenius
Wistar	(38.6% ARA)	15,000, or	after in utero	diet, 970 mg	et al., 2000
		75,000 ppm	exposure of	ARA-rich oil/kg	
			F0	bw/day, or 374	
				mg ARA/kg	
				bw/day	
Blend of	ARA-oil from M. alp	<i>ina</i> and algal I	OHA-oil		
Rat,	Blend of ARA-oil	1.8, 6, or	4 wk	12% of the oil	Wibert et
SD	from M. alpina	12% of the		blend in the diet	al., 1997
	+DHA-oil from <i>C</i> .	diet			
	cohnii				
Rat,	Blend of ARA-oil	1.8, 6, or	13 wk after in	12% of the oil	Burns et al.,
SD	from M. alpina	12% of the	utero	blend in the diet	1999
	+DHA-oil from <i>C</i> .	diet	exposure		
	cohnii				

6.B.4. Human Clinical Studies of ARA-Rich Oils

Our review has focused on the papers that have been published since FDA's last review of 2010 or the papers published between January 2010 and July 2017.

Pre-term infants

The studies published since 2010 reported no adverse effects of ARA-rich oils of unknown sources in pre-term infants (Table 21; Almaas et al., 2015, 2016; Alshweki et al., 2015; Kitamura et al., 2016; van de Lagemaat et al., 2011; Westerberg et al., 2011). These studies reported that ARA supplementation was safe up to 0.91% total FAs. Measurements included adverse effects and safety, growth and anthropometric parameters (Kitamura et al., 2016).

GRN 326 included the studies on ARA derived from *M. alpina* which found no adverse effects of ARA in preterm infants (Table 22; Carnelli et al., 2007; Clandinin et al., 2005; Groh-Wargo et al., 2005). These studies found that ARA supplementation was safe up to 0.84% total FAs.

Regardless of sources, no studies found adverse effects of ARA supplementation (up to 0.91% total fatty acids) in pre-term infants (Tables 21 and 22).

Term infants

Due to the abundance of literature demonstrating the safety of ARA or ARA-rich oil derived from *M. alpina* for full term infant formula applications, our review of term infant studies is limited to the papers on ARA derived from *M. alpina* only. A few papers published since the FDA's last review in 2010 demonstrated the safety of ARA-rich oils derived from *M. alpina* (Tables 23 and 24). Studies show that supplementation of ARA-rich oils did not show any adverse effects at doses up to 0.64% total FAs as ARA (Birch et al., 2010; Colombo et al., 2011; De Jong et al., 2010, 2011, 2012; Drover et al., 2011, 2012).

In GRN 326, term infant studies demonstrated the safety of ARA-rich oils derived from *M. alpina* at up to 0.72% of total FAs (Birch et al., 2005, 2007; Drover et al., 2009; Fields et al., 2008; Hoffman et al., 2008).

Overall, the studies using 0.64-0.72% of total FAs as ARA (0.72% - Birch et al., 2005, 2007; 0.64% - Birch et al., 2010; Colombo et al., 2011; Drover et al., 2011, 2012) demonstrated the safety of ARA-rich oil derived from *M. alpina* in term infants. Measurements included adverse effects and safety (Birch et al., 2005, 2010; Hoffman et al., 2008), growth and anthropometric parameters, incidence of upper respiratory infections, and common allergic diseases (Birch et al., 2010); mental development index scores and visual acuity (Drover et al., 2009, 2011, 2012); behavioral and psychophysiological indices of attention and cognitive development (Colombo et al., 2011, 2013; De Jong et al., 2010, 2011, 2012), and/or cardiovascular and growth (De Jong et al., 2010, 2011, 2012). No studies reported adverse effects of ARA or ARA-rich oil.

Table 21. Pre-term Infants Studies Published since 2010

Objective	Subject	Test materials	Duration	Measurements	Reference
To investigate the safety	35 low or very	Two groups: 1) 4.6 mg	Intervention	Adverse events and	Kitamura
and efficacy of an infant	low birth	ARA +9.1 mg DHA/100	started at bw	safety; growth; ARA	et al., 2016
formula fortified with DHA	weight infants	mL (test); 2) 1 mg	of >2,000 g or	and DHA contents of	
and ARA	with bw of	ARA+9.1 mg DHA/100	higher (after	the erythrocyte	
	>1000 g	mL (control)	discharge	membrane	
		source-Morinaga	ICU)		
To determine the effects of	60 newborns	Three groups: 1)	14 mo; 24 mo	Risk factors (APGAR	Alshweki
a balanced contribution of	<1500 g and/or	formula containing	follow-up	score, use of surfactant,	et al., 2015
arachidonic acid in very	<32 wk	0.66% ARA (0.62-		sepsis, need for	
preterm newborns fed with	gestational age	0.72%) and 0.33%		mechanical ventilation,	
formula milk		(0.31-0.36%) DHA; 2)		use of FiO2 $>$ 30 %,	
		formula with 0.30-		presence of intracranial	
		0.37% ARA and 0.30-		hemorrhage,	
		0.37% DHA; or 3)		administration of	
		breast milk		ibuprofen for patent	
		source-NA		ductus arteriosus, and	
				presence of	
				bronchopulmonary	
				dysplasia); psychomotor	
				development;	
				anthropometric	
				assessment; risk and	
				plasma levels of fatty	
				acids	
To test the hypothesis that	129 VLBW	Human milk	9 wk after	White matter measured	Almaas et
DHA/ARA supplementation	infants with	supplemented with 31	birth; 8 yr	by diffusion tensor	al., 2016
of very low birth weight	birth weights of	mg ARA (0.91% of total	follow-up	imaging of brain; and	
(VLBW) infants would	<1500 g	FAs) and 32 mg DHA		behavioral outcome	
influence cerebral white		(0.86% of total FAs);			
matter measured by		source-NA			

diffusion tensor imaging and improve behavioral outcome at 8 years of age. To test the hypothesis that DHA/ARA supplementation of VLBW infants fed human milk would show	129 VLBW infants with birth weights of <1500 g	Human milk supplemented with 31 mg ARA (0.91% of total FAs) and 32 mg DHA	9 wk after birth; 8 yr follow-up	Cognitive testing, general intellectual abilities, short-term and working memory,	Almaas et al., 2015
persistent positive effects on cognition		(0.86% of total FAs); source-NA		learning and memory, MRI analysis;	
To study associations between growth and RBC concentrations of ARA and DHA	139 pre-terms (51% male, mean gestational age 30.3 wk, mean birth weight 1341 g)	Human milk with breast milk fortifier or pre-term formula until term, followed by post- discharge formula (0.4% ARA, 0.4% DHA), term formula (0.2% ARA, 0.2% DHA), or human milk. Source-NA	6 mo	Growth (weight gain, length, and head circumference); RBC concentrations of ARA, DHA, and EPA; and	van de Lagemaat et al., 2011
To investigate the effect of ARA and DHA in early neonatal life on cognitive functions among human milk fed very low birth weight infants (<1500 g) at 20 mo of chronological age.	92 VLBW infants	Human milk with 0.5 mL oil (containing 31 mg ARA plus 32 mg DHA or placebo) per 100 mL milk; source- NA	1 wk after birth until discharge from hospital; 9 wk on average; follow up at 20 mo	Cognitive function tests were performed at 20 months (Free-play sessions, Bayley Scales of Infant Development - the Ages and Stages Questionnaire); and plasma DHA and ARA concentrations	Westerberg et al., 2011

DHA and ARA= Percentages in diet given as % of total FAs unless noted otherwise. EPA = eicosapentaenoic acid; ICU = intensive care unit; *M. alpina* = *Mortirella alpina*; NA = not available; RBC = red blood cell; VLBW = very low birth weight.

Table 22. Pre-term Infants Studies Included in GRN 329

Objective	Subjects	Test Material and Dose	Duration	Measurements	Reference			
Studies with ARA-o	Studies with ARA-oil derived from <i>M. alpina</i>							
To evaluate growth and body composition of pre-mature infants who were fed formulas with ARA and DHA to 1 y of gestation-corrected age	60 pre-term infants (birth wt 750-1,800 g and gestational age at birth <33 wk)	3 groups until 40 wk corrected age:1) formula with 0.42% ARA (egg-derived TG and 0.26% DHA (fish oil); 2) 0.42% ARA (fungal oil) and 0.26% DHA (fish oil) or 3) control, unsupplemented; At 40 wk, -0.42% ARA and 0.16% DHA from same sources or control	Up to 52-wk gestational corrected age of infants	Growth, lean body mass, and bone mineralization (bone mineral content and bone mineral density)	Groh- Wargo et al., 2005			
To evaluate safety and benefits of feeding pre-term infants formulas containing DHA and ARA until 92 wk postmenstrual age (PMA), with follow-up to 118 weeks PMA	361 pre-term infants <35 wk PMA randomized over the control and test groups	4 groups: 1) Formula plus 34 mg ARA (<i>M. alpina</i>) + 17 mg algal DHA (/100 kcal; 2) Formula plus 34 mg ARA(funga1) + 17 mg DHA (fish oil)/100 kcal; Concentrations of ARA (0.6%) and DHA (0.3%) of total fatty acids chosen to be similar to concentrations in human milk. 3)-4) two controlsunsupplemented formula and human breast milk	A prospective, RCT; 92 wk PMA with follow-up in second phase at 118 wk PMA	Growth, tolerance, adverse events, morbidity, and Bayley development scores	Clandinin et al., 2005			
To quantify the synthesis of long chain PUFA in pre-term	22 pre-term infants	Fungal ARA (0.84%) 12.0 mg + DHA (fish oil), 7.1 mg per 100 mL of formula; or control –	From birth to 7 mo	Absolute long chain PUFA synthesis and the percentage of	Carnielli et al., 2007			

ARA-Rich Oil (Linyi Youkang Biology)

infants fed infant	non-supplemented	long chain PUFA
formula	formula	synthesis relative
containing long		to dietary intake;
chain PUFA		and plasma
		phospholipids

DHA and ARA= percentages in diet given as % of total FA unless noted otherwise. PMA = postmenstrual age; *M. alpina* = *Mortirella alpina*; PUFA = polyunsaturated fatty acids; RCT = randomized controlled trial.

Table 23. Term Infant Studies Published Since 2010

Objective	Subject	Test materials	Duration	Measurements	Reference
To evaluate	81 full term	ARA, 0.64% (34	Formula fed	Performance on standardized tests of	Colombo et al.,
cognition beyond 18	infants	mg/100 kcal,	for 12 mo;	language and performance (Bayley	2013
mo and longitudinal		from M. alpina)	re-enrolled	Scales of Infant Development,	
cognitive change		for all 3 DHA	at 18 mo	version 2 and MacArthur-Bates	
from 18 mo to 6 y in		concentrations;	and tested	Communicative Development	
children who were		DHA (from <i>C</i> .	every 6 mo	Inventory; Delayed Response task;	
fed variable amounts		cohnii oil),	until 6 yr	Bear-Dragon Go/No-Go Task;	
of DHA and a fixed		DHA: 0.32%		Stroop tasks; Dimensional Change	
concentration of		(Enfamil		Card Sort; Tower of Hanoi task;	
ARA (0.64%)		LIPILW),		Peabody Picture Vocabulary Test,	
compared with		0.64%, or		3rd edition; The Weschler Preschool	
children who were		0.96%.		Primary Intelligence Scale, 3rd	
not fed ARA/DHA		Control-		edition	
as infants.		unsupplemented			
To determine the	181 term		First 12 mo	Cognitive development as measured	Drover et al., 2011
optimal DHA	infants		of life, sole	by Bayley Scales of Infant	
concentration with			source of	Development II (including the	
fixed ARA conc. in			nutrition	Psychomotor Development Index	
term formula to			until < 4 mo	and the Behavior Rating Scale	
support cognitive			of age;		
maturation.			Follow up at		
			18 mo		
To determine the	182 term		Prospective,	School readiness at age 2.5 and 3.5	Drover et al., 2012
effects of	infants at 1-9		RCT; 12 m	yr; receptive vocabulary at age 2 and	
ARA/DHA provided	days of age		intervention;	3.5 yr	
during the first 12			follow up		
mo of life on			until age 2-		
language			3.5 yr		
development and					
school readiness					
To determine the	122 term		RCT; from	A cognitive index derived from the	Colombo et al.,

effects of ARA/DHA on visual habituation protocol that yielded both behavioral and psycho- physiological indices of attention at 3, 6, and 9 mo	infants		birth to 12 mo RCT	convergence of behavioral and cardiac responses; a visual habituation protocol that yielded both behavioral and psychophysiological indices of attention	2011
To determine the effect of ARA/DHA supplementation on the visual acuity of formula-fed infants	343 healthy term infants		First 12 mo of life (from days 1-9), sole source of nutrition until < 4 mo of age	Physical growth (weight, length, weight/length ratio, and head circumference); visual acuity maturation, RBC fatty acids, tolerance, anthropometric measures, and adverse events	Birch et al., 2010
To investigate whether 2 mo long chain PUFA formula supplementation affects cardiovascular and anthropometric development at 9 yr	Intervention until 2 mo of age; all formula-fed infants had control formula from 2 mo to 6 mo; follow-up at 18 mo and 9 yr	Test-0.45% ARA (from egg yolk & M. alpina) + 0.30% DHA (from egg/tuna oil) (n=145); or 2 controls- unsupplemented formula and breast-fed	473-475 term infants	Cardiovascular and anthropometric development, neurological function and cognition at up to 9 yr; measured blood pressure, heart rate, growth, and cognition	De Jong et al., 2010, 2011, 2012

DHA and ARA= percentages in diet given as % of total FA unless noted otherwise. *M. alpina* = *Mortirella alpina*; PUFA = polyunsaturated fatty acids; RCT = randomized controlled trial.

Table 24. Term Infants Studies Included in GRN 329

Objective	Test material and concentration in infant formula	Type and duration of the study	Subjects	Measurements	Reference				
ARA-Rich Oils Derived from M. alpina									
To evaluate DHA and ARA-supplementation of infant formula on visual and cognitive outcomes at 4 yr of age	4 groups: 2 Tests- test 1) 0.72% ARA + 0.36% DHA (algal; n=17); test 2) only with 0.36% DHA (n=16); and 2 controls- unsupplemented formula (n=19) and human milk (n=32). Source: <i>M. alpina</i>	Prospective, RCT. Intervention from birth to 2 mo of age; follow up at age of 4 yr	healthy term infants	Cognition and visual acuity (HOTV visual acuity, Wechsler preschool and primary scale of intelligence)	Birch et al., 2007				
To evaluate ARA/DHA supplementation in amounts typical for human milk (based on local and worldwide surveys) in a large cohort of infants by using sweep visual evoked potential (VEP) acuity as the functional outcome	Test-0.72% ARA + 0.36% DHA (algal oil); or control- unsupplemented. Source: <i>M. alpina</i>	Intervention from day 5 to 52 wk	103 term infants	Sweep VEP acuity; Red blood cell DHA concentrations; visual function and total red blood cell lipid composition; growth; gastrointestinal tolerance	Birch et al., 2005				
To examine whether feeding infant formula supplemented with ARA/DHA improves cognitive function of 9-month olds	2 groups: 1) formula with 0.72% ARA + 0.36% DHA; or 2) controlunsupplemented formula Source: <i>M. alpina</i>	12-month feeding and 6- week weaning studies	229 term infants	Problem solving at 9 mo	Drover et al., 2009				

Table 24. Term Infants Studies Included in GRN 329, Continued

Objective	Test Material and Dose	Type and Duration of the Study	Subjects	Measurements	Reference
ARA-Rich Oils Derived from	M. alpina	Study			
To determine the effect of feeding formula containing long-chain PUFA on immune function in healthy term infants	3 groups: 1) 0.34% ARA and 0.20% DHA (algal) 2) controlunsupplemented; or 3) breast milk Source: <i>M. alpina</i>	2-6 wk	46 full term infants	Growth; immune cell distribution (CD3+CD44+ and CD4+CD28+ cells) and cytokine profile (TNF-alpha post-stimulation); the rate of ³ H thymidine uptake in response to phytohaemagglutinin	Fields et al., 2008
To evaluate safety, benefits, and growth when supplemented with DHA and ARA formula in infants	3 groups- 1) 21 mg ARA +8 mg algal DHA; 2) 34 mg ARA + DHA 17 mg; or 3) control, non-supplemented formula Source: <i>M. alpina</i>	From 14 to 120 d of age	244 healthy term infants	Growth rates; tolerance assessed by stool frequency and characteristics as well as amounts of gas; incidence of atopic dermatitis; ARA/DHA conc. in RBC, and plasma phospholipids	Hoffman et al., 2008

DHA and ARA= percentages in diet given as % of total FA unless noted otherwise. PUFA = polyunsaturated fatty acids; *M. alpina* = *Mortirella alpina*; RBC= red blood cell; RCT = randomized controlled trial; TNF = tumor necrosis factor; VEP = visual evoked potentials.

6.C. Potential adverse effects

The *Mortierella* genus is presently classified in the Order, Mortierellales, and Family, Mortierellaceae. A few organisms in the Order, Mortierellales, have been associated with mucormycosis, a disease resulting from an opportunistic infection. Classic risk groups for mucormycosis infection include individuals who are immunocompromised and those with uncontrolled diabetes (Chew et al., 2008). No references were found in the literature suggesting any specific toxin production by members of the genus, *Mortierella*, with the exception of the pathogenic species *M. wolfii*, a well-known pathogen of cattle. There has never been any report of mycotoxin production from *M. alpina* or any other of the many species of the genus *Mortierella*. Three non-consecutive batches of ARA-rich oil ingredients (both oil and powder forms) showed no detectable mycotoxin contamination.

6.D. Safety Determination

Numerous human and animal studies have reported benefits of ARA-rich oils with no major adverse effects. Linyi Youkang Biology uses a HACCP-controlled manufacturing process and rigorously tests its final production batches to verify adherence to quality control specifications. There is broad-based and widely disseminated knowledge concerning the chemistry of ARA-rich oils. This GRAS determination is based on the data and information generally available for the safety of ARA-rich oil. The literature indicates that ARA-rich oils offer infants health benefits without adverse effects.

The following safety evaluation fully considers the composition, intake, nutritional, microbiological, and toxicological properties of ARA-rich oils as well as appropriate corroborative data.

- 1. Linyi Youkang Biology's ARA-rich oil ingredients are manufactured under cGMP using common oil industry materials and processes.
- 2. Analytical data from multiple lots indicate that the ARA-rich oil ingredients (both oil and powder forms) comply reliably with the established food-grade product specifications and meet all applicable purity standards.
- 3. Linyi Youkang Biology's ARA-rich oil ingredients will be used as food ingredients in infant formulas. Intended use and use levels will be the same as those described in GRNs 326, 80, and 41.
- 4. An estimate of exposure to ARA from its addition to infant formula is based on mean target ARA concentrations of 0.75% and 0.40% of total fat for term and pre-term infants, respectively. These correspond to intakes of ARA of 42 mg and 27 mg ARA/kg bw/day (corresponding to 104 and 67 mg of ARA-rich oil/kg bw/day or 420 and 270 mg of ARA-rich oil powder/kg bw/day) for term infants and pre-term infants, respectively.

- 5. These levels are below the reference dose safe for human exposure. Studies with infants found no adverse effects of ARA supplementation up to 0.91% of total fatty acids.
- 6. Studies have shown that ARA-rich oils are not mutagenic or genotoxic. In addition, subchronic studies have reported that NOAELs for ARA-rich oils are over 5,000 mg/kg bw/day in male and female rats, respectively.
- 7. The EDI values are based on the assumption that Linyi Youkang Biology's ARA-rich oil will replace currently marketed ARA ingredients. Thus, cumulative exposures are not expected.
- 8. In the previous GRAS notices (GRNs 326, 94, 80, and 41) to the FDA, the safety of ARA-rich oils had been established in toxicological studies in animals, mutagenicity studies, and is further supported by clinical studies in humans. The FDA responses to GRAS notifications on ARA-rich oils indicate that the FDA is satisfied with the safety-in-use of the ARA-rich oils as long as consumption simulates ARA content in mothers' milk content.
- 9. Additional human and animal studies published subsequent to the FDA's last review in 2010 continue to support the safety of ARA-rich oil as a food ingredient.

6.E. Conclusions and General Recognition of the Safety of ARA

Several sources of ARA-rich oils have been evaluated by the FDA and other global regulatory agencies over the past 16 years for proposed incorporation of ARA-rich oils in foods for human consumption. Relevant U.S. GRAS notifications include GRNs 326, 94, 80, and 41 (FDA, 2001a, 2001b, 2006, 2010). All of the GRAS notices provided information/clinical study data that supported the safety of the proposed ARA-rich oil ingredients for use in infant formulas. In all of the studies summarized in these notifications, there were no significant adverse effects/events or tolerance issues attributable to ARA-rich oils derived from *M. alpina*. 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 ARA-rich oil ingredients 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 and composition of Linyi Youkang Biology's ARA-rich oil are almost identical to those that have received FDA no question letters. Linyi Youkang Biology's ARA-rich oil powder has similar specifications and composition although its ARA content is diluted by four times. No toxicants have been detected from Linyi Youkang Biology's ARA-rich oil ingredients.

The ARA-rich oil and powder ingredients that are the subject of this GRAS determination are produced by the non-toxigenic fungus, *M. alpina*, and its purity is over 40% and 10%, respectively. The ARA-rich oil ingredients are manufactured consistent with cGMP for food (21 CFR Part 110 and Part 117 Subpart B). The raw materials and processing aids used in the manufacturing process are food grade and/or commonly used in fermentation and food

manufacturing processes. Literature searches did not identify safety or toxicity concerns related to ARA-rich oil. Toxicity studies of ARA-rich oils include acute, subacute, and subchronic toxicity, a battery of genotoxicity studies, and developmental and reproductive toxicity studies in animals. In all of these reports, no evidence of toxicity was noted at up to 5,000 mg/kg bw/day, the highest dose levels tested, in rats. The publicly available scientific literature on the consumption and safety of ARA-rich oils in infant clinical studies is extensive and sufficient to support the safety and GRAS status of the proposed ARA-rich oil ingredients.

Linyi Youkang Biology also has concluded that ARA-rich oil ingredients are GRAS under the intended conditions of use on the basis of scientific procedures. Therefore, they are excluded from the definition of a food additive and may be marketed and sold for its intended purpose in the U.S. without the promulgation of a food additive regulation under Title 21 of the CFR.

Linyi Youkang Biology is not aware of any information that would be inconsistent with a finding that the proposed use of ARA-rich oil ingredients meets appropriate specifications, and their use according to cGMP, is GRAS.

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

6.F. 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 ARA-rich oil ingredients in infant formulas, meeting appropriate specifications and used according to cGMP, is GRAS.

PART 7. REFERENCES

7.A. References That Are Generally Available

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7.B. Reference That Is Not Generally Available

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Analytical Report.

Sample Code 128-2017-00005021 Certificate No. AR-17-VV-005521-01 Report date 28-Jun-2017.



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128-2017-00005021/ AR-17-VV-005521-01 Our reference:

2017011001 **Client Sample Code:**

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) 2kg -0.6 Sample Weight

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Meth	od: Internal method, LC-MS/MS			
	Patulin	not analyzable	μg/kg	20	
☆ A7297	Vitamin E (tocopherol profile) Me	ethod: EN 12822:2014			
	alpha-Tocopherol (vitamin E)	23.5	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	23.5	mg/100 g		
☆ GFL01	,	- ,) and EC Reg	709/2014	(feed)
	1,2,3,4,6,7,8-HeptaCDD	< 0.217	pg/g		
	1,2,3,4,6,7,8-HeptaCDF	< 0.152	pg/g		
	1,2,3,4,7,8,9-HeptaCDF	< 0.106	pg/g		
	1,2,3,4,7,8-HexaCDD	< 0.103	pg/g		
	1,2,3,4,7,8-HexaCDF	< 0.160	pg/g		
	1,2,3,6,7,8-HexaCDD	< 0.141	pg/g		
	1,2,3,6,7,8-HexaCDF	< 0.146	pg/g		
	1,2,3,7,8,9-HexaCDD	< 0.133	pg/g		
	1,2,3,7,8,9-HexaCDF	< 0.108	pg/g		
	1,2,3,7,8-PentaCDD	< 0.0678	pg/g		
	1,2,3,7,8-PentaCDF	< 0.0976	pg/g		
	2,3,4,6,7,8-HexaCDF	< 0.133	pg/g		
	2,3,4,7,8-PentaCDF	< 0.152	pg/g		
	2,3,7,8-TetraCDD	< 0.0515	pg/g		
	2,3,7,8-TetraCDF	< 0.141	pg/g		
	OctaCDD	< 1.57	pg/g		
	OctaCDF	< 0.325	pg/g		
	WHO(2005)-PCDD/F TEQ	Not Detected	pg/g		
	(lower-bound)				
	WHO(2005)-PCDD/F TEQ	0.280	pg/g		
	(upper-bound)				
☆ GFL07	polychlorinated biphenyls (12 WH	O PCB + 6 ICES PCB) Method:	EC Reg 589/2	2014 (food)) and EC Reg 709/2014 (feed)

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	Results	Unit	LOQ LOD	
☆ GFL07 polychlorinated biphenyls (12 WHO P	CB + 6 ICES PCB) Method	l: EC Reg 589	/2014 (food) and EC Reg 709/2014 (feed)	
PCB 101	< 0.271	ng/g		
PCB 105	< 10.6	pg/g		
PCB 114	< 1.44	pg/g		
PCB 118	< 37.9	pg/g		
PCB 123	< 1.08	pg/g		
PCB 126	< 0.678	pg/g		
PCB 138	< 0.271	ng/g		
PCB 153	< 0.271	ng/g		
PCB 156	< 5.96	pg/g		
PCB 157	< 1.11	pg/g		
PCB 167	< 2.98	pg/g		
PCB 169	< 3.25	pg/g		
PCB 180	< 0.271	ng/g		
PCB 189	< 1.08	pg/g		
PCB 28	< 0.271	ng/g		
PCB 52	< 0.271	ng/g		
PCB 77	< 27.1	pg/g		
PCB 81	< 0.732	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)	0.170	pg/g		
☆ GFTE1 TEQ-Totals WHO-PCDD/F and PCB	Method: Internal method, C	alculation		
WHO(2005)-PCDD/F+PCB TEQ	Not Detected	pg/g		
(lower-bound)				
WHO(2005)-PCDD/F+PCB TEQ	0.450	pg/g		
(upper-bound)				
☆ J1054 Sulphur (S) Method: DIN EN ISO 11				
Sulphur total (S)	16	mg/kg	2	
★ J1056 Silicon (Si) Method: DIN EN ISO 116				
Silicon (Si) ★ JCSRA Solvent residues (big scope) Methor	6.0	mg/kg	2	
☆ JCSRA Solvent residues (big scope) Method 1,1,1,2-Tetrachloroethane	a: Internal method, HS-GC-W <0.01		0.01	
1,1,1-Trichloroethane	<0.01	mg/kg		
1,1,2-Trichloroethane	<0.01	mg/kg	0.01	
1,1-Dichloroethane	<0.05	mg/kg	0.01 0.05	
1,2-Dichloroethane	<0.05 <0.05	mg/kg	0.05	
2-Butanon (Methylethylketon)	<0.05 <1	mg/kg		
, , , ,		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 <0.05	mg/kg	0.05	
Dibromochloromethane		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-M	S		
	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:	nternal 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	• • •		Method: Inter	nal 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	,	es, special matrix) Method: internal		ed on EN 14	123
	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	•	Γ2, HT2) Method: Internal method,			
	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 bas		132, IAC-LO	C-FLD
	Ochratoxin A (OTA)	<2	μg/kg	2	
☆ JJW2Z	Sterigmatocystin Method: In	ternal method, LC-MS/MS			
	Sterigmatocystin	<10	μg/kg	10	
☆ QA049	Polynuclear Aromatic Hydroca	rbons (GC-MS) Method: Internal m	ethod, GC-M	S	
	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 r	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)	0.111	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)	1.778	g/100 g	0.02	
C 16:1 (Palmitoleic acid)	0.035	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)	1.542	g/100 g	0.02	
C 18:1 (Oleic acid)	1.436	g/100 g	0.02	
C 18:1n7 (Vaccenic acid)	0.064	g/100 g	0.02	
C 18:2n6 (Linoleic acid)	1.681	g/100 g	0.02	
C 18:3n3 (alpha-Linolenic Acid)	<0.020	g/100 g	0.02	
C 18:3n6 (gamma-Linolenic Acid)	0.622	g/100 g	0.02	
C 20:0 (Arachidic acid)	0.207	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)	0.057	g/100 g	0.02	
C 20:3n6 (homo-gamma-Linolenic	1.106	g/100 g	0.02	
acid)				
C 20:4n6 (Aracihdonic Acid)	11.314	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)	0.837	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)	3.111	g/100 g	0.02	
C 24:1 (Nervonic acid)	0.084	g/100 g	0.02	
Monounsaturated Fat	1.715	g/100 g	0.02	
Omega-3 fatty acids	0.055	g/100 g	0.02	
Omega-6 fatty acids	14.835	g/100 g	0.02	
Polyunsaturated Fat	14.890	g/100 g	0.02	
	7.650	g/100 g		

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		Results	Unit	LOQ	LOD
☆ QA156	Fatty Acid Profile Method: AOAC 996.06	- Toodito			_
A QA 100	Total Fat	24.31	g/100 g	0.02	
 ☆ QA184			g/100 g	0.02	
A 00 (10-1	C 20:4n6 (Arachidonic acid)	108.5	mg/g	0.1	
 ☆ QA934	•		1119/9	0.1	
A CO 100 1	Total Trans Fatty Acids	1.35	%	0.05	
 ☆ SP421	Organochlorine Pesticides, Pyrethroides Me		70	0.00	
~ 0	Screened pesticides	Not Detected			
 ☆ SP424	Organophosphorus Pesticides Method: ASI				
	Screened pesticides	Not Detected			
☆ SU007	•				
	Mercury (Hg)	< 0.005	mg/kg	0.005	
☆ SU051	Manganese (ICP-MS) Method: BS EN ISO	17294-2 2004 mod.			
	Manganese (Mn)	0.34	mg/kg	0.1	
☆ SU055	Molybdenum (ICP-MS) Method: BS EN ISC	17294-2 2004 mod.			
	Molybdenum (Mo)	<0.1	mg/kg	0.1	
☆ SU056	Nickel (ICP-MS) Method: BS EN ISO 17294	1-2 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 (As)	<0.1	mg/kg	0.1	
d SU05F	, , , , , , , , , , , , , , , , , , , ,				
	Chromium (Cr)	<0.1	mg/kg	0.1	
☆ SU05G	,		_		
	Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H	,		,,		
 ☆ SU05J	Iron (Fe)	0.73	mg/kg	0.1	
🛪 2003)	Copper (ICP-MS) Method: BS EN ISO 1729 Copper (Cu)	0.61	malka	0.4	
 ☆ SU05K	• • • • •		mg/kg	0.1	
A 3003N	Phosphorus (P)	1940	mg/kg	5	
 ☆ SU207	• • • •		mg/ng	Ü	
	Peroxide value	<0.05	meg/kg	0.05	
SU21J	Moisture and Volatile matter Method: ISO 6		- 1 3		
	moisture and volatile matter content	2.27	g/100 g	0.01	
● SU9QV	Butane residual Method: Internal method, Ir	nternal Method GC-MS			
	Butane	Not Detected	mg/kg	1	
● SUA4Q	Test of Veterinary Drug and toxin Residues	Method: Internal Metho	d, LC-MS		
	24-Methyl	1.8	mg/100 g	0.1	
	Cholesta-5,(25)27-dien-3β-ol				
	24-Methyl	21.6	mg/100 g	0.1	
	Cholesta-5,24(25)-dien-3β-ol	_			
	24-Methyl Cholesterol	14.8	mg/100 g	10	
	31-Norlanosterol	5.6	mg/100 g	0.1	
	4α-Methyl Zymosterol	7.6	mg/100 g	0.1	
	Beta-sitosterol	11.7	mg/100 g	0.1	
	Brassicasterol	30.9	mg/100 g	0.1	
	Desmosterol	14.3	mg/100 g	0.1	
	Lanosterol	4.8	mg/100 g	0.1	
	Total unknown sterols	57.4	mg/100 g	0.1	
,,,,,,	Zymosterol	4.9	mg/100 g	0.1	
VV00B	Coliforms Method: ISO 4832:2006	.46			
10.000	Coliforms	<10	cfu/g		
VV00D	Yeasts and moulds Method: ISO 21527:200	JO			

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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)

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
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)	Dibromobenzopheno (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 (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	HCH, alpha- (0.005)	HCH, beta- (0.005)

Heptachlor epoxide, trans-Hexachlorobenzene (HCB) (0.005) (0.005)

HCH, epsilon- (0.005)

Methoxychlor (0.01) Mirex (0.005) Oxyfluorfen (0.01) Pendimethalin (0.01) Permethrin (0.05) Plifenate (0.02)

S 421 (0.01) tau-Fluvalinate (0.05) Tralomethrin (0.05) Transfluthrin (0.05) SP424 Organophosphorus Pesticides (LOQ* mg/kg)

Pentachloranisole (0.005) Polychloroterpene (Camphechlor) (0.5) Tecnazene (0.005) Triallate (0.02)

Azinphos-ethyl (0.05) Cadusaphos (0.02) Chlorpyrifos-methyl (0.02) Cyanofenphos (0.05) Chlorthion (0.02) Dicapthon (0.02)

Ditalimfos (0.02) Fenamiphos-sulfone (0.05) Fensulfothion-oxon-sulfor Fenthion-sulfone (0.05) Heptenophos (0.02) Isofenphos-methyl (0.02) Mephosfolan (0.02) Monocrotophos (0.02) Parathion (0.02) Phorate-sulfoxide (0.05)

Dimethylvinphos (0.02)

Profenofos (0.02) Pyrazophos (0.05) TEPP (0.02) Triamiphos (0.05)

Azinphos-methyl (0.05) Carbophenothion (0.02)

Lindane (gamma-HCH)

loxynil-octanoate (0.01)

Nitrapyrin (0.01)

Cyanophos (0.02) Dichlofenthion (0.02) Dioxabenzofos (0.02) Edifenphos (0.05) Fenamiphos-sulfoxide (0.05) Fensulfothion-oxon-sulfoxide Fenthion-sulfoxide (0.05)

lodofenphos (0.05) Isoxathion (0.05) Merphos (0.05) Morphothion (0.05) Phosalone (0.05) Propaphos (0.02) Pyridaphenthion (0.02) Terbufos (0.02)

Heptachlor (0.005) Isobenzan (0.005) Nitrofen (0.01)

Pentachloroaniline (0.005)

Profluralin (0.005) Tefluthrin (0.05) Trichloronat (0.01)

Bromfenvinphos (0.02) Carbophenothion-methyl (0.02) Chlorthiophos (0.02) Dichlorvos (0.02)

Dioxathion (0.05) Ethion (0.02) Fenchlorphos (0.02) Fensulfothion-sulfone (0.05) Fonofos (0.02) Iprobenfos (0.02)

Leptophos (0.05) Methacriphos (0.02) Omethoate (0.02) Phenkapton (0.05) Phosmet (0.05) Propetamphos (0.02) Quinalphos (0.02) Terbufos-sulfone (0.05) Trichlorfon (0.1)

Heptachlor (sum) () Isodrin (0.005) Nonachlor, trans- (0.005) Pentachlorobenzene (0.01)

Quintozene (0.005)

Tetradifon (0.01) Trifluralin (0.005) Bromophos-methyl (0.02) Chlorfenvinphos (0.02)

Coumaphos (0.1) Demeton-S-methyl-sulfone (0.1)Dicrotophos (0.02) Disulfoton (0.05) Ethoprophos (0.02) Fenchlorphos oxon (0.05) Fenthion (0.02)

Formothion (0.02) Isazophos (0.02) Malaoxon (0.02) Methamidophos (0.02) Oxydemeton-methyl (0.1) Phenthoate (0.02) Phosphamidon (0.02) Prothiofos (0.02) Quintiofos (0.02)

Tetrachlorvinphos (0.02)

Vamidothion (0.05)

ctanoate (0.01) (0.01) 005) ophenone, p,p-()

.02) (0.01)

0.005) Hentachlor enoxide cis-Isopropalin (0.01) Octachlorstyrene (0.005) Pentachlorothioanisole Quintozene (sum) ()

> Bromophos-ethyl (0.02) Chlormephos (0.02) Crotoxyphos (0.02) Dialifos (0.02)

Tetrasul (0.01)

Dimefox (0.02) Disulfoton-sulfon (0.05) Etrimfos (0.02) Fenitrothion (0.02) Fenthion-oxon-sulfone (0.05)

Fosthiazate (0.05) Isocarbofos (0.02) Malathion (0.02) Methidathion (0.02) Paraoxon-ethyl (0.02) Phorate (0.02) Pirimiphos-ethyl (0.02) Prothoate (0.02) Sulfotep (0.02) Thiometon (0.02)

SIGNATURE

SP421

HCH. delta- (0.005)

Acephate (0.02)

Butamifos (0.02)

Dimethoate (0.02)

Fenamiphos (0.02) Fensulfothion (0.02)

Isofenphos (0.02) Mecarbam (0.02)

Mevinphos (0.02)

Sulprofos (0.05)

Paraoxon-methyl (0.02) Phorate-sulfone (0.05)

Pirimiphos-methyl (0.02) Pyraclofos (0.05)

Tolclofos-methyl (0.02)

Chlorpyrifos (-ethyl) (0.02) Crufomate (0.02)

Disulfoton-sulfoxide (0.05)

Fenthion-oxon-sulfoxide (0.05) Fosthietan (0.02)

(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 outside Eurofins group

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END OF REPORT.

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Analytical Report.

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



Linyi Youkang Biology Co., Ltd.

Racheal GAO

Lianbang Road, .

Economical and Technical Development Area, .

Linyi City, ShanDong Province.

128-2017-00005022/ AR-17-VV-005522-01 Our reference:

2017020701 **Client Sample Code:**

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) 2kg -0.6 Sample Weight

		Results	Unit	LOQ	LOD
☆ A7165	Patulin (solid/dry samples) Meth	od: Internal method, LC-MS/MS			
	Patulin	<20	μg/kg	20	
☆ A7297	` ' ' '	thod: 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	,	- ,) 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	Not Detected	pg/g		
	(lower-bound)				
	WHO(2005)-PCDD/F TEQ	0.281	pg/g		
	(upper-bound)				
☆ GFL07	polychlorinated biphenyls (12 WH)	D PCB + 6 ICES PCB) Method: I	EC Reg 589/2	014 (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	l) 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-boun		ng/g		
Total 6 ndl-PCB (upper-bour	•	ng/g		
WHO(2005)-PCB TEQ (lowe	-	pg/g		
WHO(2005)-PCB TEQ (uppe	•	pg/g		
, , , , , , , , , , , , , , , , , , , ,	F and PCB Method: Internal method, Ca			
WHO(2005)-PCDD/F+PCB 1		pg/g		
(lower-bound)				
WHO(2005)-PCDD/F+PCB 1	EQ 0.452	pg/g		
(upper-bound)				
☆ J1054 Sulphur (S) Method: Di	N EN ISO 11885, mod.			
Sulphur total (S)	200	mg/kg	2	
☆ J1056 Silicon (Si) Method: DII				
Silicon (Si)	8.0	mg/kg	2	
	pe) Method: Internal method, HS-GC-M	S		
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		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	3		
	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:	nternal 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			Method: Inte	rnal 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	, , , , , , , , , , , , , , , , , , , ,				123
	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,	Γ2, HT2) Method: Internal method, L <20		00	
	Deoxynivalenol (Vomitoxin)		μg/kg	20	
	HT-2 Toxin sum T-2 HT-2 toxin	<10	μg/kg	10	
		<20 <10	μg/kg	20	
	T-2 Toxin	<10	μg/kg	10	
☆ JJ0G5	Zearalenone (ZON)	matrix) Method: internal method bas	μg/kg	10	2 [] [
	Ochratoxin A (OTA)	matrix) Metriod, internal metriod bas	µg/kg	2 132, IAC-LC	J-FLD
☆ JJW2Z	Sterigmatocystin Method: In		µg/kg	2	
	Sterigmatocystin Method: In	<10	μg/kg	10	
☆ QA049	Polynuclear Aromatic Hydroca				
	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 r	nethod, 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 g/100 g	0.02
C 20:3n3 (Eicosatrienoic acid)	0.050	g/100 g g/100 g	0.02
C 20:3n6 (homo-gamma-Linolenic	1.016	g/100 g g/100 g	0.02
acid)	1.010	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 g/100 g	0.02
Omega-3 fatty acids	0.080	g/100 g g/100 g	0.02
Omega-6 fatty acids	15.560	g/100 g g/100 g	0.02
Polyunsaturated Fat	15.645	g/100 g g/100 g	0.02
Saturated Fat	7.515	g/100 g g/100 g	0.02
Catulated I at	7.010	g, roo g	U.UZ

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		Results	Unit	LOQ	LOD
☆ QA156 Fa	tty Acid Profile Method: AOAC 996.06				-
Total Fat	•	25.00	g/100 g	0.02	
	achidonic Acid (ARA) Method: AOCS Ce		9, 100 9		
	(Arachidonic acid)	109.1	mg/g	0.1	
	ans Fatty Acids, relative area% (GC-FID)	Method: AOCS 2a-94			
	ns Fatty Acids	0.93	%	0.05	
☆ SP421 Or	ganochlorine Pesticides, Pyrethroides M	ethod: ASU L00.00-34			
Screene	d pesticides	Not Detected			
☆ SP424 Or	ganophosphorus Pesticides Method: AS	U L00.00-34			
	d pesticides	Not Detected			
	ercury (AAS) Method: BS EN 13806:2002				
Mercury	` ='	<0.005	mg/kg	0.005	
	anganese (ICP-MS) Method: BS EN ISO				
Mangane		0.41	mg/kg	0.1	
	olybdenum (ICP-MS) Method: BS EN ISC		,,		
•	num (Mo)	<0.1	mg/kg	0.1	
	ckel (ICP-MS) Method: BS EN ISO 1729	4-2 2004 mod. <0.1	ma/ka	0.4	
Nickel (N ☆ SU05D Le	ıı) ad (ICP-MS) Method: BS EN ISO 17294		mg/kg	0.1	
Lead (Pb	,	-2 2004 mod. <0.05	mg/kg	0.05	
•	'/ senic (ICP-MS) Method: BS EN ISO 172	0.00	····g/Ng	0.00	
Arsenic (,	<0.1	mg/kg	0.1	
`	romium (ICP-MS) Method: BS EN ISO 1				
Chromiu	` ,	<0.1	mg/kg	0.1	
	idmium (ICP-MS) Method: BS EN ISO 17	7294-2 2004 mod.	3. 3		
Cadmiun	n (Cd)	<0.01	mg/kg	0.01	
☆ SU05H Iro	n (ICP-MS) Method: BS EN ISO 17294-2	2 2004 mod.			
Iron (Fe)		1.28	mg/kg	0.1	
☆ SU05J Co	pper (ICP-MS) Method: BS EN ISO 1729	94-2 2004 mod.			
Copper (Cu)	0.57	mg/kg	0.1	
	osphorus (ICP-MS) Method: BS EN ISO				
Phospho		1970	mg/kg	5	
	roxide value Method: AOCS Cd 8b-90:2				
Peroxide		<0.05	meq/kg	0.05	
	pisture and Volatile matter Method: ISO 6		- /4.00 -		
	and volatile matter content	2.14	g/100 g	0.01	
SU9QW Butane	tane residual Method: Internal method, I	Not Detected	mg/kg	1	
	st of Veterinary Drug and toxin Residues			1	
24-Methy		2.5	mg/100 g	0.1	
-	-5,(25)27-dien-3β-ol	2.0	9, 100 9	· · ·	
24-Methy		18.9	mg/100 g	0.1	
	-5,24(25)-dien-3β-ol		J J	-	
	/I Cholesterol	16.6	mg/100 g	10	
31-Norla		3.6	mg/100 g	0.1	
	/l Zymosterol	9.7	mg/100 g	0.1	
Beta-sito		9.7	mg/100 g	0.1	
Brassica		19.8	mg/100 g	0.1	
Desmost		11.7	mg/100 g	0.1	
Lanoster	ol	5.6	mg/100 g	0.1	
	known sterols	62.7	mg/100 g	0.1	
Zymoste		4.7	mg/100 g	0.1	
=	oliforms Method: ISO 4832:2006		5 . 5		
Coliforms	S	<10	cfu/g		
VV00D Ye	asts and moulds Method: ISO 21527:20	08			

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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 Orga	anochlorine Pesticides, F	Pyrethroides (LOQ* mg/kg	j)		
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 Orga	anophosphorus Pesticide	es (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)	lodofenphos (0.05)	Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0.02)
	1. (1	1 - 1 - 1 (0.05)	M-I (0.00)	14 -1 - (1 - (0 00)

Omethoate (0.02)

Phenkapton (0.05) Phosmet (0.05)

Trichlorfon (0.1)

Propetamphos (0.02) Quinalphos (0.02)

Terbufos-sulfone (0.05)

Leptophos (0.05) Methacriphos (0.02)

Malaoxon (0.02) Methamidophos (0.02)

Phenthoate (0.02) Phosphamidon (0.02)

Tetrachlorvinphos (0.02) Vamidothion (0.05)

Prothiofos (0.02) Quintiofos (0.02)

Oxydemeton-methyl (0.1)

Malathion (0.02) Methidathion (0.02)

Paraoxon-ethyl (0.02)

Phorate (0.02) Pirimiphos-ethyl (0.02)

Prothoate (0.02) Sulfotep (0.02)

Thiometon (0.02)

SIGNATURE

Isofenphos (0.02) Mecarbam (0.02)

Mevinphos (0.02)

Mevinphos (0.02) Paraoxon-methyl (0.02) Phorate-sulfone (0.05) Pirimiphos-methyl (0.02) Pyraclofos (0.05)

Sulprofos (0.05) Tolclofos-methyl (0.02)

(b) (6)

Kevin Fu **Authorized Signatory**

Isofenphos-methyl (0.02) Mephosfolan (0.02)

Monocrotophos (0.02)

Parathion (0.02) Phorate-sulfoxide (0.05)

Profenofos (0.02) Pyrazophos (0.05) TEPP (0.02)

Triamiphos (0.05)

Propaphos (0.02) Pyridaphenthion (0.02) Terbufos (0.02)

Isoxathion (0.05) Merphos (0.05) Morphothion (0.05) Parathion-methyl (0.02) Phosalone (0.05)

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EXPLANATORY NOTE

- ≥ Greater than or equal to
- < Less than
- ≤ Less than or equal to

- $\ensuremath{\,{\not\!\!\!\!/}}$ means the test is subcontracted within Eurofins group
- means the test is subcontracted outside Eurofins group

N/A means Not applicable

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END OF REPORT.

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Analytical Report /

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



Linyi Youkang Biology Co., Ltd.

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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-2017Analysis starting date:02-Jun-2017Analysis ending date:28-Jun-2017

Arrival Temperature (°C) -0.6 Sample Weight 2kg

		Results	Unit	LOQ	LOD	
☆ A7165	Patulin (solid/dry samples) Meth-	od: Internal method, LC-MS/MS				
	Patulin	<20	μg/kg	20		
☆ A7297	Vitamin E (tocopherol profile) Me	thod: 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	d) 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, 1,	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	Not Detected	pg/g			
	(lower-bound)					
	WHO(2005)-PCDD/F TEQ	0.302	pg/g			
	(upper-bound)					
☆ GFL07	polychlorinated biphenyls (12 WH)	PCB + 6 ICES PCB) Method:	EC Reg 589/2	014 (food) and EC Reg 709/2014 (feed)	

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	Results	Unit	LOQ	LOD
☆ GFL07 polychlorinated biphenyls (12 WHO I)	PCB + 6 ICES PCB) Method	l: 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				
WHO(2005)-PCDD/F+PCB TEQ	Not Detected	pg/g		
(lower-bound)				
WHO(2005)-PCDD/F+PCB TEQ	0.485	pg/g		
(upper-bound)				
★ J1054 Sulphur (S) Method: DIN EN ISO 1	1885, mod.			
Sulphur total (S)	16	mg/kg	2	
☆ J1056 Silicon (Si) Method: DIN EN ISO 1				
Silicon (Si)	6.0	mg/kg	2	
☆ JCSRA Solvent residues (big scope) Method		1S		
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	A Solvent residues (big scope)	Method: Internal method, HS-GC-M	/IS		
	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:		3 3		
	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		e and products derived from maize)	Method: Inter	rnal 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	•	es, special matrix) Method: interna		ed on EN 14	123
	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		T2, HT2) Method: Internal method,			
	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 Ochratoxin A (OTA)	matrix) Method: internal method ba	ased on EN 14 µg/kg	132, IAC-LO 2	C-FLD
☆ JJW2Z	• •		μg/kg	10	
☆ QA049	•	arbons (GC-MS) Method: Internal n			
3/1078	Acenaphthene	<1.0	µg/kg	1	
	Acenaphthylene	<2.0	μg/kg μg/kg	2	
	Anthracene	<2.0 <2.0		2	
	Benzo(a)anthracene	<0.50	μg/kg μg/kg	0.5	
	Benzo(a)pyrene	<0.50	μg/kg		
		<0.50 <0.50	μg/kg	0.5	
	Benzo-(b)-Fluoranthene		μg/kg	0.5	

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	Results	Unit	LOQ	LOD
) Method: Internal r	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		100		
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 g/100 g	0.02	
C 17:1 (Heptadecenoic acid)	<0.020	g/100 g g/100 g	0.02	
C 18:0 (Stearic acid)	1.539	g/100 g g/100 g	0.02	
C 18:1 (Oleic acid)	1.434	g/100 g g/100 g	0.02	
C 18:1n7 (Vaccenic acid)	0.064	g/100 g g/100 g	0.02	
C 18:2n6 (Linoleic acid)	1.674	g/100 g g/100 g	0.02	
C 18:3n3 (alpha-Linolenic Acid)	<0.020	g/100 g g/100 g	0.02	
C 18:3n6 (gamma-Linolenic Acid)	0.621	g/100 g g/100 g	0.02	
C 20:0 (Arachidic acid)	0.206	g/100 g g/100 g	0.02	
C 20:1 (Eicosenoic acid)	0.200			
C 20:2n6 (Eicosodienoic acid)	0.004	g/100 g	0.02	
C 20:3n3 (Eicosatrienoic acid)	0.054	g/100 g	0.02	
,	4 40-	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 g/100 g	0.02	
C 21:0 (Heneicosanoic acid)	<0.020			
C 22:0 (Reheric acid)	0.833	g/100 g	0.02	
C 22:10 (Benefit acid) C 22:1n9 (Erucic acid)	<0.020	g/100 g	0.02	
C 22:2n6 (Docosadienoic acid)		g/100 g	0.02	
,	<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	J. 11 J		
C 20:4n6 (Arachidonic acid)	108.2	mg/g	0.1	
☆ QA934 Trans Fatty Acids, relative area% (GC-FID)	Method: AOCS 2a-94	0.0		
Total Trans Fatty Acids	1.35	%	0.05	
☆ SP421 Organochlorine Pesticides, Pyrethroides M	ethod: ASU L00.00-34			
Screened pesticides	Not Detected			
☆ SP424 Organophosphorus Pesticides Method: AS	U L00.00-34			
Screened pesticides	Not Detected			
★ SU007 Mercury (AAS) Method: BS EN 13806:200:	2			
Mercury (Hg)	<0.005	mg/kg	0.005	
★ SU051 Manganese (ICP-MS) Method: BS EN ISO				
Manganese (Mn)	0.33	mg/kg	0.1	
★ SU055 Molybdenum (ICP-MS) Method: BS EN ISC				
Molybdenum (Mo)	<0.1	mg/kg	0.1	
★ SU056 Nickel (ICP-MS) Method: BS EN ISO 1729	4-2 2004 mod. <0.1	m m/ls =-	0.4	
Nickel (Ni) ★ SU05D Lead (ICP-MS) Method: BS EN ISO 17294		mg/kg	0.1	
★ SU05D Lead (ICP-MS) Method: BS EN ISO 17294 Lead (Pb)	-2 2004 mod. <0.05	ma/ka	0.05	
★ SU05E Arsenic (ICP-MS) Method: BS EN ISO 172	0.00	mg/kg	0.00	
Arsenic (As)	<0.1	mg/kg	0.1	
★ SU05F Chromium (ICP-MS) Method: BS EN ISO 1		mg/kg	0.1	
Chromium (Cr)	<0.1	mg/kg	0.1	
★ SU05G Cadmium (ICP-MS) Method: BS EN ISO 1	====	9/119	0	
Cadmium (Cd)	<0.01	mg/kg	0.01	
☆ SU05H Iron (ICP-MS) Method: BS EN ISO 17294-2	2 2004 mod.	0 0		
Iron (Fe)	0.96	mg/kg	0.1	
☆ SU05J Copper (ICP-MS) Method: BS EN ISO 172	94-2 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-90:2				
Peroxide value	<0.05	meq/kg	0.05	
☆ SU21J Moisture and Volatile matter Method: ISO 6				
moisture and volatile matter content	2.28	g/100 g	0.01	
SU9QW Butane residual Method: Internal method, I				
Butane Test of Veterinary Drug and toyin Residues	Not Detected	mg/kg	1	
 SUA4Q Test of Veterinary Drug and toxin Residues 24-Methyl 	3.1	mg/100 g	0.1	
Cholesta-5,(25)27-dien-3β-ol	3.1	mg/ roo g	0.1	
24-Methyl	14.3	mg/100 g	0.1	
Cholesta-5,24(25)-dien-3β-ol	17.0	111g/ 100 g	0.1	
24-Methyl Cholesterol	15.2	mg/100 g	10	
31-Norlanosterol	6.8	mg/100 g mg/100 g	0.1	
4α-Methyl Zymosterol	7.7	mg/100 g mg/100 g	0.1	
Beta-sitosterol	8.5	mg/100 g 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	0.0	g , .00 g	···	
Coliforms	<10	cfu/g		
W00D Yeasts and moulds Method: ISO 21527:20		·		

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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 Orga	anochlorine Pesticides, F	Pyrethroides (LOQ* mg/kg	g)		
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 Orga	anophosphorus Pesticide	es (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)

Dimethoate (0.02) Disulfoton-sulfoxide (0.05) Fenamiphos (0.02) Fensulfothion (0.02) Fenthion-oxon-sulfoxide (0.05) Fosthietan (0.02) Isofenphos (0.02) Mecarbam (0.02) Mevinphos (0.02)

Mevinphos (0.02) Paraoxon-methyl (0.02) Phorate-sulfone (0.05) Pirimiphos-methyl (0.02) Pyraclofos (0.05) Sulprofos (0.05) Tolclofos-methyl (0.02)

Ditalimfos (0.02) Fenamiphos-sulfone (0.05) Fensulfothion-oxon-sulfone Fenthion-sulfone (0.05) Heptenophos (0.02) Isofenphos-methyl (0.02) Mephosfolan (0.02)

Monocrotophos (0.02) Parathion (0.02) Phorate-sulfoxide (0.05) Profenofos (0.02) Pyrazophos (0.05) TEPP (0.02) Triamiphos (0.05)

Dioxabenzofos (0.02) Edifenphos (0.05) Fenamiphos-sulfoxide (0.05)

Fensulfothion-oxon-sulfoxide Fenthion-sulfoxide (0.05)

Iodofenphos (0.05) Isoxathion (0.05) Merphos (0.05) Morphothion (0.05) Parathion-methyl (0.02) Phosalone (0.05) Propaphos (0.02) Pyridaphenthion (0.02) Terbufos (0.02)

Ethion (0.02) Fenchlorphos (0.02) Fensulfothion-sulfone (0.05) Fonofos (0.02)

Leptophos (0.05) Methacriphos (0.02) Omethoate (0.02) Phenkapton (0.05) Phosmet (0.05) Propetamphos (0.02) Quinalphos (0.02)

Disulfoton (0.05) Ethoprophos (0.02) Fenchlorphos oxon (0.05)

Iprobenfos (0.02) Isazophos (0.02) Malaoxon (0.02) Methamidophos (0.02) Oxydemeton-methyl (0.1) Phenthoate (0.02) Phosphamidon (0.02) Prothiofos (0.02) Quintiofos (0.02) Terbufos-sulfone (0.05) Tetrachlorvinphos (0.02) Trichlorfon (0.1) Vamidothion (0.05)

Fenthion (0.02)

Formothion (0.02)

Disulfoton-sulfon (0.05) Etrimfos (0.02) Fenitrothion (0.02) Fenthion-oxon-sulfone (0.05)

Isocarbofos (0.02) Malathion (0.02) Methidathion (0.02) Paraoxon-ethyl (0.02) Phorate (0.02) Pirimiphos-ethyl (0.02) Prothoate (0.02) Sulfotep (0.02)

Fosthiazate (0.05)

Thiometon (0.02)

SIGNATURE

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Analytical Report.

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



Linyi Youkang Biology Co., Ltd.

Racheal GAO

Lianbang Road, .

Economical and Technical Development Area, .

Linyi City, ShanDong Province.

128-2017-00008162/ AR-17-VV-007753-01 Our reference:

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) 50g 5 Sample Weight

		Results	Unit	LOQ	LOD
☆ FL023	Plant sterols and plant stanols (not enriched)	Method: NMKL 198	3:2014		
	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.

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Analytical Report

Sample Code Certificate No. 128-2017-00005024

AR-17-VV-005478-01

Report date 27-Jun-2017



Linyi Youkang Biology Co., Ltd.

Racheal GAO Lianbang Road,

Sample Weight

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: Sample Packaging: ARACHIDONIC ACID OIL 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

3kg

	Results	Unit	LOQ	LOD		Total I
☆ A7165 Patulin (solid/dry samples) Method: Ir	nternal method, LC-MS/MS			THE PERSON NAMED IN	7 1 TO 10 TO	-17
Patulin	<20	µg/kg	20			
AS403 Haloxyfop Method: Internal method, C	GC-MS					
Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003			
DJPFG Vitamin E profile in Margarine, Butter, F	Fats & Oils. Tocopherole pro	ofile 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 (vitamín 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				
	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) Med		od) 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 Re	g 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	Not Detected	pg/g		
	(lower-bound)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Para		
	WHO(2005)-PCDD/F TEQ	0.172	pg/g		
	(upper-bound)	0.112	Para		
GFL07	polychlorinated biphenyls (12 WH	O PCB + 6 ICES PCB) Method:	EC Reg 589	/2014 (food	and EC Reg 709/2014 (feed)
	PCB 101	< 0.167	ng/g	MALL NEET	,
	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			
	PCB 157	< 0.683	pg/g		
	PCB 167		pg/g		
	PCB 169	< 1.83 < 2.00	pg/g		
	PCB 189		pg/g		
		< 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		pg/g		
	WHO(2005)-PCB TEQ (upper-bound	추가 있는 경우 나는 사람들이 되었다. 사람들은 하는 경우에 가는 사람이 되었다. 그는 것이	pg/g		
A GFTE1			culation		
	WHO(2005)-PCDD/F+PCB TEQ	Not Detected	pg/g		
	(lower-bound)	100 100 100			
	WHO(2005)-PCDD/F+PCB TEQ	0.277	pg/g		
	(upper-bound)				
☆ J1054	Sulphur (S) Method: DIN EN ISC		3/4		
	Sulphur total (S)	2.0	mg/kg	2	
☆ J1056	Silicon (Si) Method: DIN EN ISC		0.00	2	
	Silicon (Si)	130	mg/kg	2	
☆ J5003		thod: Internal method, IAC-LC-FLC			
	Aflatoxin M1	<0.01	µg/kg	0.01	
& JCSRA	[17] [18] [18] [18] [18] [18] [18] [18] [18	thod: 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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On the last of the		Results	Unit	LOQ	LOD
# JCSRA	Solvent residues (big scope)	Method: Internal method, HS-GC-MS	3		The The Arriver Washington
	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		1	
	n-Hexane	<1	mg/kg	1	
			mg/kg		
	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:				
	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	-	1	
	[2] [2] [4] [4] [4] [4] [4] [4] [4] [4] [4] [4	<0.3	mg/kg	1	0.2
	Di-isobutyl phthalate (DIBP)		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	
A JJ088	Fumonisine B1, B2, B3 (maize	and products derived from malze)	Method: Inte	rnal Method	I, 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		
☆ JJOEW	Aflatoxin B1, B2, G1, G2 (spic	es, special matrix) Method: internal	method base	ed on EN 14	1123
	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		
A JJOFE		T2, HT2) Method: Internal method, I			
	Deoxynivalenol (Vomitoxin)	<20	μg/kg	20	
	HT-2 Toxin	<10	ha/ka	10	
	sum T-2 HT-2 toxin		100000		
		<20	µg/kg	20	
	T-2 Toxin	<10	µg/kg	10	
	Zearalenone (ZON)	<10	µg/kg	10	Control of the Contro
☆ JJ0G5	Ochratoxin A (spices, special	matrix) Method: internal method bas	ed on EN 14	132, IAC-LO	C-FLD

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		Results	Unit	LOQ LOD	T In 1 No.
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method:	: Internal method ba	sed on EN 14	132, IAC-LC-FLD	3 - 100
	Ochratoxin A (OTA)	<2	µg/kg	2	
& JJW2Z	Sterigmatocystin Method: Internal method, LC	C-MS/MS	2.00		
	Sterigmatocystin	<10	µg/kg	10	
☆ QA049	Polynuclear Aromatic Hydrocarbons (GC-MS)	Method: Internal n	nethod, GC-MS	3	
	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	
à QA156		-1.0	Paria		
ST CONTRACTOR NO.	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	
	G 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	
		6.721	g/100 g	0.02	
	C 18:0 (Stearic acid)	5.916	g/100 g		
	C 18:1 (Oleic acid)		-	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 (Elcosenoic 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	
à QA156 Fatty Acid Profile Method: AOAC 996.06			7. 7. 3.0		1000
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		
A 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					
lodine 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 Met	hod: ASU L00.00-34				
Screened pesticides	Not Detected				
☆ SP424 Organophosphorus Pesticides Method; ASU	L00.00-34				
있다. 이는 경우 아이들이 아마라 하루가 없었어요. 없이 불어 아니라 아이에는 그리고 그 때문에 그리고 그렇게 되었다. 그리고 그리고 그렇게 되었다.	Not Detected				
SPGZ5 Organotin Pesticides Method: Internal metho					
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 1729					
Sodium (Na)	<1	mg/100 g	1		
SU051 Manganese (ICP-MS) Method: BS EN ISO 1					
Manganese (Mn)	<0.1	mg/kg	0.1		
SU055 Molybdenum (ICP-MS) Method: BS EN ISO		0	4		
Molybdenum (Mo)	<0.1	mg/kg	0.1		
SU056 Nickel (ICP-MS) Method: BS EN ISO 17294-		632.0	15.0		
Nickel (Ni)	<0.1	mg/kg	0.1		
SU05D Lead (ICP-MS) Method: BS EN ISO 17294-2			2 3000		
Lead (Pb)	<0.05	mg/kg	0.05		
SU05E Arsenic (ICP-MS) Method: BS EN ISO 17294			1.		
Arsenic (As)	<0.1	mg/kg	0.1		
SU05F Chromium (ICP-MS) Method: BS EN ISO 17:					
Chromium (Cr)	<0.1	mg/kg	0.1		
SU05G Cadmium (ICP-MS) Method: BS EN ISO 172			×2.623		
Cadmium (Cd)	<0.01	mg/kg	0.01		
SU05H Iron (ICP-MS) Method; BS EN ISO 17294-2;		4	20		
Iron (Fe)	<0.1	mg/kg	0.1		
SU05J Copper (ICP-MS) Method: BS EN ISO 17294					
Copper (Cu)	0.80	mg/kg	0.1		
SU05K Phosphorus (ICP-MS) Method: BS EN ISO 1					

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internation and		Results	Unit	LOQ	LOD	2000	- 25
A SU05K	(Phosphorus (ICP-MS) Method: BS EN IS	O 17294-2 2004 mod.		ann an	- Inches de la company	***************************************	
	Phosphorus (P)	41.6	mg/kg	5			
SU20L	. Protein Method: AOAC 984.13						
	Protein	<0.1 (k=6.25)	g/100 g	0.1			
* SU200	Dietary fiber Method: AOAC 991.43	Same of the second	20/2/2				
	Dietary fiber	<0.5	g/100 g	0.5			
A SUZOL							
	Total fat	99.9	g/100 g	0.1			
A SUZOY	Moisture (Direct drying method) Method:	AOAC 935.29	0				
	Moisture	0.12	g/100 g	0.01			
A SU21E	B Energy						
A STATE OF THE PARTY OF	Energy kcal (calculated)	899	kcal/100 g				
	Energy kJ (calculated)	3696	kJ/100 g				
à SU210		0000	100 g				
N OUL IC	Carbohydrates (available)	<0.1	g/100 g	0.1			
	Total carbohydrates	<0.1	g/100 g	0.1			
& SU21J	그 마음에 가게 하고 있었다. 나를 가게 하면 하면 하면 하면 하고 있다.		grioo g	0.1			
A 30210	moisture and volatile matter content	0.03	m/400 m	0.01			
À SU21L			g/100 g	0.01			
N SUZIL	 Sugar Profile Method: AOAC 995.13, mo Fructose 	<0.1	-1400				
			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			
SU9QV	V Butane residual Method: Internal method	, Internal Method GC-Ms	3				
	Butane	Not Detected	mg/kg	1			
VVOOB	Coliforms Method: ISO 4832:2006						
	Coliforms	<1	cfu/ml				
VV00D	Yeasts and moulds Method: ISO 21527:2	8008					
	Moulds	<1	cfu/ml				
	Yeast	<1	cfu/ml				
WOOE	Salmonella Method: ISO 6579:2002						
	Salmonella	Not Detected	/25 g				
W00G	Bacillus cereus Method: ISO 7932:2004						
	Bacillus cereus	<1	cfu/ml				
VVOOP	Aerobic plate count Method: ISO 4833-1:	2013					
	Aerobic plate count	<1	cfu/ml				
VVOOV	Enterobacter sakazakii Method: ISO/TS		GP TO VA				
	Cronobacter spp	Not Detected	/25 g				
VV0A2		290-1:1996/Amd.1:2004	, 9				
	Listeria monocytogenes	Not Detected	/25 g				
VV0A3	Coagulase-positive staphylococci Method		A. T. S.				
	Coagulase-positive staphylococci	<1	cfu/ml				
VV0A4	Escherichia coli Method: ISO 16649-2:20		Vitariii				
	Escherichia coli	<1	cfu/ml				

I	List	of	screened	and not	detected	molecules	(* =	limit o	of quantification	1)

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

2.3.4.6-Tetrachlorania (0.005)

Acionifan (0.01)

Aprinathrin (0,05)

Aldrin (0.005)

Aldrin/ Diejdrin (Sum) ()

Benfluralin (0.005)

Benzoylprop-ethyl (0.01) Butralin (0.02) Chlorfenprop-methyl (0.02) Cyhalothrin, lambda- (0.05)

Bifenox (0.02) Chlordene (totel) () Chlorfenson (0.01) Cypermethrin (0.05)

Binepeoryl (0.02) Chlordane, cis- (0.005) Chloroneb (0.02) Cyphenothrin (0.05)

Bifenthrin (0.05) Chlordane, oxy- (0.005) Chlorothistorii (0.01) DDD, o.p- (0.005)

Bromocyclen (0.01) Chlordane, trans- (0.005) Chlorthal-dimethyl (0.005) DOD, p.p'- (0.005)

Bromoxynii-octanoate (0.01) Chlorfenapyr (0.01) Cyfluthrin (0.05) DDE, o.p- (0.005)

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SP421	Organochlorine Pesticides, F	ryrethroides (LOQ* mg/kg	1)		
DOE, p.p'- (0.005)	DDT (total) ()	DDT, o.p'- (0.005)	DDT, p.p'- (0.005)	Deitamethrin (0.05)	Dibromobenzophenone, p.p- (0.02)
Dichlobenii (0.01)	Dichlone (0.02)	Dicioran (0.005)	Dichlorobenzophenone, a,p- (0.02)	Dichlorobenzophenone, p.p- (0.02)	Dicefel (sum) ()
Dicofol, o.p. (0.02) Endosulfan (total) () Ethalfluralin (0.01)	Dicofol, p.p. (0.02) Endosulfan, alpha- (0.005) Etridiazole (0.01)	Dieldrin (0.005) Endosulfan sulphata (0.01) Fenfluthrin (0.05)	Dienochlor (0.01) Endosulfan, beta- (0.005) Fenpropathrin (0.05)	Dinitramine (0.01) Endrin (0.005) Fanson (0.01)	Dinobuton (0.02) Endrin ketone (0.01) Fenvalerate (RR-/SS-Isomers)
Fanvalerate (RS-/SR-Isome	ers) Flubenzimine (0.01)	Fluchioralin (0.01)	Flucythrinate (0.05)	Flumetratin (0.01)	(0.05) Fluorodden (0.01)
(0.05) Fluoroimide (0.02)	Genite (0.01)	Haifunprox (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) ()	Reptachior spoxide, cis- (0.005)
Heptachlor epoxide, trans- (0.005)	Hexachlorobenzene (HCB) (0.005)	loxynii-octanoste (0,01)	Isobenzan (0,005)	Isodrin (0,005)	Isopropalin (0.01)
Methoxychlor (0.01) Oxyfluorien (0.01)	Minex (0.005) Pendimethalin (0.01)	Nitrapyrin (0.01) Pentachioranisole (0.005)	Nitrofen (0.01) Pentechloroaniline (0.005)	Nenachlor, trans- (0.005) Pentachloroberzene (0.01)	Ootschlorstyrene (0.005) Pentschlorothiosnisola (0.005)
Permethrin (0.05)	Plifenate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Proflunsin (0.005)	Quintozene (0.005)	Quintoxene (eum) ()
S 421 (0.01) Traiomethrin (0.05)	tau-Fluvalinate (0.05) Transfuthrin (0.05)	Tecnazene (0.005) Trialiate (0.02)	Tefluthrin (0.05) Trichloronet (0.01)	Tetradifon (0.01) Trifluratin (0.005)	Tetrasol (0.01)
SP424	Organophosphorus Pesticide	es (LOQ* mg/kg)			
Acephate (0.02) Butemifos (0.02)	Aziriphos-sthyl (0.05) Cadusaphos (0.02)	Azinphos-methyl (0.05) Carbophenothion (0.02)	Bromferivinphos (0.02) Carbophenothiori-methyl (0.02)	Bromophos-methyl (0.02) Chlorfenvinphos (0.02)	Bromophos-ethyl (0.02) Chlormephos (0.02)
Chlorpyrifos (-ethyl) (0.02) Crufomete (0.02)	Chlorpyrifos-methyl (0.02) Cysnofenphos (0.05)	Chlorthion (0.02) Cyanophos (0.02)	Chlorthlophos (0.02) Demeton-S-methyl (0.05)	Coursphos (0.1) Demetor-S-methyl-sulfone (0.1)	Crotoxyphos (0.02) Dialifos (0.02)
Diszinon (0.02) Dimethosis (0.02) Disulfoton-sulfoxide (0.05) Fehamiphos (0.02) Fensulfothion (0.02)	Dicaphon (0,02) Dinathykinphos (0,02) Ditalimfos (0,02) Fensmiphos-sulfone (0,05) Fensulfothion-oxon-sulfone	Dichlosenthion (0.02) Dioxabenzofos (0.02) Edifenphos (0.05) Fenamiphos-eutloxide (0.05) Fenantifothion-exen-sulfoxide	Dictionvos (0.02) Dioxathion (0.05) Ethion (0.02) Fenchlorphos (0.02) Fensulfothion-suffons (0.05)	Dicrotophos (0.02) Disuffoton (0.05) Ethoprophos (0.02) Fenchlarphos oxon (0.05) Fenthion (0.02)	Dimefox (0.02) Disurfator-sulfan (0.05) Etnimfos (0.02) Fenilrathion (0.02) Fenthion-oxon-sulfane (0.05)
Fenthion-axon-sulfaxida (0.05)	(0.05) Fenthion-sulfone (0.05)	(0.05) Fenthion-sulfoxida (0.05)	Fonofos (0.02)	Formothion (0.02)	Fosthiazate (0.05)
Fosihietan (0.02) Isofenphos (0.02) Mecerbarn (0.02) Mevinphos (0.02) Paracotor-methyl (0.02) Phorate-sulfone (0.05) Pirimiphos-methyl (0.02) Pyraciofos (0.05) Sulprofos (0.05)	Heptenophoe (0.02) isolerphoe-metry (0.02) Mephostolan (0.02) Menocrotophoe (0.02) Paratishon (0.02) Phorate-eufiside (0.05) Profesoro (0.05) Pyracophoe (0.05) TEPP (0.02)	lodofenphos (0.05) lsoxisthion (0.05) Marphos (0.05) Morphoshion (0.05) Parathion-methyl (0.02) Phosalone (0.05) Propaphos (0.02) Pyridaphanthion (0.02) Terbulos (0.02)	Iprobenifos (0.02) Laptophos (0.05) Methactiphos (0.02) Omethoate (0.02) Phenicapton (0.05) Phoamet (0.05) Propetamphos (0.02) Quinsiphos (0.02) Terbulos-sulfone (0.05)	Isazophos (0.02) Malicosor (0.02) Methamidophos (0.02) Oxydemeton-mathyl (0.1) Phorthosto (0.02) Prostriofice (0.02) Protriofice (0.02) Curistofos (0.02) Tetrachloryinphos (0.02)	Isocarbofoe (0.02) Melinidation (0.02) Methidation (0.02) Patraoxon-ethyl (0.02) Phrante (0.02) Pirmiphos-ethyl (0.02) Prothoate (0.02) Sulfotop (0.02) Thiometon (0.02)

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

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END OF REPORT

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Analytical Report

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

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: Sample Packaging: ARACHIDONIC ACID OIL Sealed metal bottle

Sample reception date: Analysis starting date:

02-Jun-2017 02-Jun-2017 27-Jun-2017

Analysis ending date: Arrival Temperature (°C)

-16.6

Sample Weight 3kg

	Results	Unit	LOQ	LOD	
A7165 Patulin (solid/dry samples) Meth	od: Internal method, LC-MS/MS	-			1
Patulin	<20	µg/kg	20		
AS403 Haloxyfop Method: Internal meth	od, GC-MS				
Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003		
☆ DJPFG Vitamin E profile in Margarine, But			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			
	nod: 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)		d) and EC Reg	709/2014	4 (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 (foo	d) and EC Re	eg 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	Not Detected	pg/g	
	(lower-bound)			
	WHO(2005)-PCDD/F TEQ	0.169	pg/g	
	(upper-bound)			
☆ GFL07			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			14 (1986)	
	WHO(2005)-PCDD/F+PCB TEQ	Not Detected	pg/g	
	(lower-bound)		2.19/5	
	WHO(2005)-PCDD/F+PCB TEQ	0.272	pg/g	
	(upper-bound)			
☆ J1054	Sulphur (S) Method: DIN EN ISO	11885, mod.		
	Sulphur total (S)	32	mg/kg	2
☆ J1056	Silicon (Si) Method: DIN EN ISO			
	Silicon (Si)	160	mg/kg	2
A J5003	보다 그는 그들은 그렇게 한 경험적인 개인이 가지 아무리를 보고 있다고 하면 하게 되고 생각하는 날이 아니다.	od: Internal method, IAC-LC-FL		
	Aflatoxin M1	<0.01	µg/kg	0.01
☆ JCSRA	[Hallander 17] [17] [17] [17] [17] [17] [17] [17]	nod: 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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	A CONTRACTOR OF THE CONTRACTOR	Results	Unit	LOQ	LOD	
JCSRA	Solvent residues (big scope)	Method: Internal method, HS-GC-MS	3		ter in a language play in the continu	
	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		0.01		
			mg/kg			
	Technical Hexane (calculated)	Inapplicable	mg/kg	0.41		
	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:					
	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		
	Trilsobutyl phosphate	<1	mg/kg	1		
☆ JJ088	Fumonisine B1, B2, B3 (maize	e and products derived from maize)	Method: Inte	mal Method	I, 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			
☆ JJOEW	Aflatoxin B1, B2, G1, G2 (spic	es, special matrix) Method: internal	method base	ed on EN 14	1123	
	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			
☆ JJOFE		T2, HT2) Method: Internal method, I				
	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		matrix) Method: internal method bas				

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Maria Cara Cara Cara Cara Cara Cara Cara		Results	Unit	LOQ LOD
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method:	internal method ba	esed on EN 141:	32, IAC-LC-FLD
	Ochratoxin A (OTA)	<2	µg/kg	2
A JJOHV	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	< 0.1	%	0.1
	acid)			
	Free fatty acids (calculated as oleic	<0.1	%	0.1
	acid)			
	Free fatty acids (calculated as palmitic	<0.1	%	0.1
	acid)			
≿ JJW2Z	Sterigmatocystin Method: Internal method, LC	C-MS/MS		
	Sterigmatocystin	<10	µg/kg	10
& JK07G	Unsaponifiable matter Method: ISO 18609			
	Unsaponifiable matter	0.8	%	0.1
A QA049	Polynuclear Aromatic Hydrocarbons (GC-MS)	Method: Internal r	nethod, 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	ha/ka	2
	Naphthalene	<20	µg/kg	20
	Phenanthrene	<2.0	ha/ka	2
	Pyrene	<1.0	V202	
& QA117			ha/ka	1
A GATTI	Anisidine Value	1.7		1
& QA156		1.7		J.
. 901100	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		0.02
	C 15:0 (Pentadecanoic acid)		g/100 g	
	C 15:0 (Pentadecanoic acid)	<0.020	g/100 g	0.02
	그렇게 그리고 하게 되었다. 그리고 얼마 없는 아이를 가는 사람이 되었다.	<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	-05
& QA156	Fatty Acid Profile Method: AOAC 996	5.06		-		
C 20:2	n6 (Eicosodienoic acid)	0.417	g/100 g	0.02		
C 20:3	n3 (Eicosatrienoic acid)	0.229	g/100 g	0.02		
C 20:3	n6 (homo-gamma-Linolenic	4.771	g/100 g	0.02		
acid)						
C 20:4	n6 (Aracihdonic Acid)	43.780	g/100 g	0.02		
	n3 (Eicosapentaenoic acid)	0.099	g/100 g	0.02		
	(Heneicosanoic acid)	0.067	g/100 g	0.02		
	(Behenic acid)	3,411	g/100 g	0.02		
	n9 (Erucic acid)	0.114	g/100 g	0.02		
	n6 (Docosadienoic acid)	<0.020	g/100 g	0.02		
	n3 (Docosahexaenoic acid)	<0.020	g/100 g	0.02		
	in3 (Docosapentaenoic acid)	<0.020	g/100 g	0.02		
	in6 (Docosapentaenoic acid)	<0.020				
		<0.020	g/100 g	0.02		
	(Tricosanoic acid)		g/100 g	0.02		
	(Lignoceric acid)	11.346	g/100 g	0.02		
	(Nervonic acid)	0.371	g/100 g	0.02		
	insaturated Fat	7.360	g/100 g	0.02		
	a-3 fatty acids	0.400	g/100 g	0.02		
	a-6 fatty acids	57.425	g/100 g	0.02		
	saturated Fat	57.820	g/100 g	0.02		
Satura	ted Fat	30.255	g/100 g	0.02		
Total F	Fat	95.44	g/100 g	0.02		
CA184	Arachidonic Acid (ARA) Method: AO	CS Ce 1b-89				
C 20:4	n6 (Arachidonic acid)	419.8	mg/g	0.1		
L QA307	Glyceride Profile Method: AOCS Cd	110-93				
Diglyo	erides	4.39	%	1		
Glycer	ol	<1.00	%	1		
Monog	lycerides	1.02	%	1		
Triglyo	erides	93.29	%	1		
QA934	Trans Fatty Acids, relative area% (GC-	FID) Method: AOCS 2a-94				
Total	rans Fatty Acids	0.25	%	0.05		
QD04J	Lovibond Color - Lovibond Scale Mel	hod: AOCS Cc 13j-97, Cc 13	e-92			
Lovibo	nd Color - Lovibond Scale	0.2R,1.1Y,0.0B,0				
		.ON				
QD106	Iodine Value Method: AOCS Cd 1d-9	7				
lodine		185.7				
	Dithiocarbamates Method: EN 12396					
	arbamates (as CS2)	< 0.1	mg/kg	0.1		
	Fipronil Method: Internal method, GC					
Fipron		<0.04	mg/kg	0.04		
	Fipronil, desulfinyl- Method: Internal i					
The second secon	il, desulfinyl-	<0.04	mg/kg	0.04		
	Organochlorine Pesticides, Pyrethroide					
	ned pesticides	Not Detected				
The second second	Organophosphorus Pesticides Metho					
	ned pesticides	Not Detected				
	Organotin Pesticides Method: Interna	20 8 20				
	atin/Azocyclotin (Sum)	Inapplicable	mg/kg			
The state of the s	Mercury (AAS) Method: BS EN 1380					
	ry (Hg)	<0.005	mg/kg	0.005		
	Sodium (ICP-MS) Method: BS EN IS					
Sodiur		<1	mg/100 g	1		
	Manganese (ICP-MS) Method: BS El	N ISO 17294-2 2004 mod.				
Manage	nese (Mn)	<0.1	mg/kg	0.1		

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	- Miles	Results	Unit	LOQ	LOD
À 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.			
S 342/115 0	Nickel (Ni)	<0.1	mg/kg	0.1	
& SU05D	(BOT) :	2004 mod.			
	Lead (Pb)	<0.05	mg/kg	0.05	
SU05E					
.,	Arsenic (As)	<0.1	mg/kg	0.1	
& SU05F	Chromium (ICP-MS) Method: BS EN ISO 17	Color Colors (Colors)	99		
	Chromium (Cr)	<0.1	mg/kg	0.1	
SU05G	[10] [10] [10] [10] [10] [10] [10] [10]		mgmg	0.1	
11222000	Cadmium (Cd)	<0.01	mg/kg	0.01	
à SU05H			iliging	0.01	
Carlo Service	Iron (Fe)	<0.1	malka	0.1	
& SU05J	Copper (ICP-MS) Method: BS EN ISO 17294		mg/kg	0.1	
a marketa					
	Copper (Cu)	0.85	mg/kg	0.1	
SU05K			Life was	_	
	Phosphorus (P)	44.4	mg/kg	5	
☆ SU207				Ser 3000	
	Peroxide value	<0.05	meq/kg	0.05	
A SU20L	Protein Method: AOAC 984.13				
		<0.1 (k=6.25)	g/100 g	0.1	
& SU20Q					
	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	
A SU20Y		AC 935.29			
	Moisture	0.12	g/100 g	0.01	
A SU21B	Energy				
	Energy kcal (calculated)	900	kcal/100 g		
	Energy kJ (calculated)	3700	kJ/100 g		
& SU21C					
	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 66		g, 100 g	0.1	
	moisture and volatile matter content	0.04	g/100 g	0.01	
à SU21L	Sugar Profile Method: AOAC 995.13, modifie		g/100 g	0.01	
	Fructose		-1400 a		
		<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	
à SU227	Ash Method: AOAC 941.12				
Maria Cara	Ash	<0.1	g/100 g	0.01	
SU9QV				-24-9	
STORY OF		Not Detected	mg/kg	1	
W00B	Coliforms Method: ISO 4832:2006				
	Coliforms	<1	cfu/ml		
WOOD	Yeasts and moulds Method: ISO 21527:200		Giornii		
V V GOD	Moulds	<1	of the		
			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		WY-1			
	Bacillus cereus	<1	cfu/ml			
VVOOP	Aerobic plate count Method: ISO 4833-1:2013					
	Aerobic plate count	<1	cfu/ml			
VV00V	Enterobacter sakazakii Method: ISO/TS 22964	:2006				
	Cronobacter spp Ne	ot Detected	/25 g			
VV0A2	Listeria monocytogenes Method: ISO 11290-1:	1996/Amd.1:2004	4			
	Listeria monocytogenes Ne	ot Detected	/25 g			
VV0A3	Coagulase-positive staphylococci Method: ISC	6888-1:1999/AM	ID 1:2003			
	Coagulase-positive staphylococci	<1	cfu/ml			
VV0A4	Escherichia coli Method: ISO 16649-2:2001					
	Escherichia coli	<1	cfu/ml			

23077	erichia coli	5505a4mpress	<1 cfu/ml		
lst of screen	ed and not detected mol	ecules (* = limit of qu	antification)		
SP421	Organochlorine Pesticides,	Pyrethroides (LOQ* mg/kg	1)		
2.3.4.6-Tetrachloranisc (0.005)	of Actorifen (0.01)	Aorinathrin (0.05)	Aldrin (0.005)	Aldrini Dieldrin (Sum) ()	Benfluralin (0.005)
Benzoylprop-ethyl (0.0 Butralin (0.02) Chlorfenprop-methyl (0 Gyhalothrin, lambda- (1 DDE, p.p'- (0.005)	Chlordene (total) () Chlorfenson (0.01)	Binapacryl (0.02) Chlordana, cis- (0.005) Chloroneb (0.02) Cyphanothrin (0.05) DBT, o.p. (0.005)	Bifenthrin (0.05) Chlordane, oxy- (0.005) Chlorothelonii (0.01) DDD, o.p- (0.005) DDT, p.p'- (0.005)	Bromosyclen (0.01) Chlordane, trans- (0.005) Chlorthal-dimethyl (0.005) DDD, p.p*- (0.005) Deltamethrin (0.05)	Bromoxynil-octanoata (0.01) Chlortenapyr (0.01) Cylluthrin (0.05) DDE, o.p. (0.005) Dibromobenzophenone, p.p.
Dichlobenil (0.01)	Dichlone (0,02)	Distoran (0.005)	Dichlorobenzophenone, o,p- (0.02)	Dichlorobenzophenone, p,p- (0.02)	(0.02) Dicofol (sum) ()
Dicofol, o.p. (0.02) Endosulfan (total) () Ethalfluralin (0.01)	Dicofol, p.p- (0.02) Endosulfan, alpha- (0.005) Etridiazole (0.01)	Dieldrin (0.005) Endosulfan sulphate (0.01) Fenfluthrin (0.05)	Dienobhlor (0.01) Endosuffan, beta- (0.005) Fenpropathrin (0.05)	Dinitramine (0.01) Endrin (0.005) Fenson (0.01)	Dinobuton (0.02) Endrin ketone (0.01) Fenvalerate (RR-/SS-tsomers (0.05)
Fenvalerate (RS-/SR-In (0.05)	somers) Flubenzimine (0.01)	Fluchioralin (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)	Lindans (gemma-HCH) (0.005)	Heplachior (0.005)	Heptachlor (sum) ()	Heptachlor epoxide, cis- (0.005)
Haptachlor epoxide, tra (0.005)	ans- Hexachlorobenzens (HCB) (0.005)	loxynil-octanoste (0.01)	Isobenzan (0.005)	isodrin (0.005)	Isopropalin (0.01)
Methoxychlor (0.01) Oxyfluorfen (0.01)	Mirax (0.005) Pandimethalin (0.01)	Nitrapyrin (0.01) Pentachioranisole (0.005)	Nitrofen (0.01) Pentachioroaniline (0.005)	Nonachior, trens- (0.005) Pentachiorobenzena (0.01)	Octachiorstyrene (0.005) Pentachtorothioanisole (0.005)
Permethrin (0.05)	Plifecate (0.02)	Polychloroterpene (Camphechlor) (0.5)	Profluratin (0.005)	Quintozene (0.005)	Quintozene (sum) ()
8 421 (0.01) Tralomethrin (0.05)	tau-Fluvalinate (0.05) Transituthrin (0.05)	Tecnazene (0.005) Trialiste (0.02)	Tefluthrin (0.05) Trichloronat (0.01)	Tetradifon (0.01) Trifluralin (0.005)	Tetrasul (0.01)
SP424	Organophosphorus Pesticio	les (LOQ* ma/ka)		-1.00-0-0-0	
Acephata (0.02) Butamifos (0.02)	Azinphos-ethyl (0.05) Cedusaphos (0.02)	Azinphos-methyl (0.05) Carbophenothion (0.02)	Bromfenvinphos (0,02) Carbophenothion-methyl (0,02)	Bromophos-methyl (0.02) Chlorienvinphos (0.02)	Bromophos-ethyl (0.02) Chlormophos (0.02)
Chlorpyrifos (-ethyl) (0. Crufomete (0.02)	.02) Chlorpyritos-mathyl (0,02) Cyanofenphos (0,05)	Chlorthion (0.02) Cyanophos (0.02)	Chlorthiophos (0.02) Demeton-S-mathyl (0.05)	Coursephos (0.1) Demeton-S-methyl-sulfone (0.1)	Crotoxyphos (0.02) Dialifos (0.02)
Diszinon (0.02) Dimethoste (0.02) Disulfoton-autfoxide (0. Fenemiphos (0.02) Fensulfothion (0.02)	Dicapthon (0.02) Dimethylvinphoe (0.02) Ottelimba (0.02) Fenamiphoe-sulfone (0.05) Fenamiphoe-sulfone (0.05) Fenamiphon-oxon-sulfone (0.05)	Dichlofenthion (0.02) Dioxaberuzofos (0.02) Edifenphos (0.05) Fenamiphos-sulfoxide (0.05) Fenamiphos-sulfoxide (0.05) Fenamichon-oxon-sulfoxide (0.05)	Dichloryos (0.02) Dicxathion (0.05) Ethion (0.02) Penchlorphos (0.02) Fansuifathion-suifona (0.05)	Dicrotophos (0.02) Disulfoton (0.05) Ethoprophos (0.02) Fenchlorphos oxon (0.05) Fanthion (0.02)	Dimefox (0.02) Disulfoton-sulfon (0.05) Etrimfoe (0.02) Fenitrothion (0.02) Fenthion-oxon-sulfone (0.05)
Fenthion-exen-suffexid (0.05)	Fenthion-sulfone (0.05)	Fenthion-aulfoxide (0.05)	Fonofos (0.02)	Formothion (0.02)	Posthiazate (0.05)
Fostbieten (0.02) Isofenphos (0.02) Meoriben (0.02) Mevinphos (0.02) Paranxon-methyl (0.02) Phorate-sulfons (0.05) Pirimiphos-methyl (0.02) Pyractofos (0.05)	Phorate-suifoxide (0.05) Profenofos (0.02) Pyrazophos (0.05)	Icodefanphos (0.05) feovathino (0.05) Merphos (0.05) Merphosition (0.05) Parathion-mathyl (0.02) Phosalichis (0.05) Propathos (0.02) Pytidapharathion (0.02)	Iprobantos (0.02) Lapiophos (0.05) Methactiphos (0.02) Omethoste (0.02) Phenkaphon (0.05) Phoward (0.05) Propetamphos (0.02) Quinelphos (0.02)	Isszophos (0.02) Malacon (0.02) Methamidophos (0.02) Oxydemator-methyl (0.1) Phenthaset (0.02) Phosphamidon (0.02) Profilolos (0.02) Culnitolos (0.02)	Isocarbofos (0.02) Mulathipo (0.02) Methidathipo (0.02) Paracxon-ethyl (0.02) Phorate (0.02) Primiphos-ethyl (0.02) Prothoste (0.02) Sulfotep (0.02)
Sulprofos (0.05) Totalofos-methyl (0.02)	TEPP (0.02) Triamiphos (0.05)	Terbufes (0.02) Triazophos (0.02)	Terbufos-sulfane (0.05) Triahlarfon (0.1)	Tetrachiorvinphos (0.02) Vamidothion (0.05)	Thiometon (0,02)

SIGNATURE

(b) (6)

Kevin Fu Authorized Signatory

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EXPLANATORY NOTE

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Analytical Report

Sample Code Certificate No. 128-2017-00005026

Report date 30-Jun-2017

AR-17-VV-005480-02

This report invalidates all previous version

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: Sample Packaging: ARACHIDONIC ACID OIL Sealed metal bottle

Sample reception date: Analysis starting date: 02-Jun-2017 02-Jun-2017

30-Jun-2017

Analysis ending date: Arrival Temperature (°C)

-16.6

Sample Weight 3kg

	Results	Unit	LOQ LOD
★ A7165 Patulin (solid/dry samples) Metho	d: Internal method, LC-MS/MS		
Patulin	<20	µg/kg	20
AS403 Haloxyfop Method: Internal method	od, GC-MS		
Haloxyfop (total, after hydrolysis)	< 0.003	mg/kg	0.003
★ DJPFG Vitamin E profile in Margarine, Butter	er, Fats & Oils. Tocopherole pro	ofile Method: I	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 oils Method	od: 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 (foo	od) 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	d) and EC Re	eg 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	Not Detected	pg/g	
	(lower-bound)			
	WHO(2005)-PCDD/F TEQ	0.169	pg/g	
	(upper-bound)			
dr GFL07			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	< 18.4	pg/g	
	PCB 81	< 0.443	pg/g	
	Total 6 ndl-PCB (lower-bound)	Not Detected	ng/g	
	Total 6 ndi-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 PC	CB Method: Internal method, Ca	lculation	
	WHO(2005)-PCDD/F+PCB TEQ	Not Detected	pg/g	
	(lower-bound)			
	WHO(2005)-PCDD/F+PCB TEQ	0.272	pg/g	
	(upper-bound)			
☆ J1054	Sulphur (S) Method: DIN EN ISC	11885, mod.		
	Sulphur total (S)	10	mg/kg	2
☆ J1056	Silicon (Si) Method: DIN EN ISO			
	Silicon (Si)	150	mg/kg	2
☆ J5003		hod: Internal method, IAC-LC-FL		
	Aflatoxin M1	<0.01	µg/kg	0.01
☆ JCSRA		thod: Internal method, HS-GC-M		
	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-M	S	40-11-11		
	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				
	n-Hexane	<1	mg/kg	1		
			mg/kg	1		
	n-Pentane	<1	mg/kg	1		
	Styrene	<0.01	mg/kg	0.01		
	Sum 3 chlorinated solvents	Nicht	mg/kg			
		berechenbar				
	Technical Hexane (calculated)	Nicht	mg/kg			
	er it and it is an	berechenbar				
	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		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		0.0	
		<1		1		
	Diethyl phthalate (DEP)		mg/kg	1		
	Diethylhexyl adipate (DEHA)	<1	mg/kg	1		
	Di-isobutyl phthalate (DiBP)	<0.3	mg/kg	4	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: Inte	rnal 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	-10		
☆ JJOEW	[2] 이상 아름이 뭐래? 내일 어느 사람이 되었다면 어린지 않아니다.			od on EN 12	1123	
A COULTY	Aflatoxin B1	<1 ×1	μg/kg	1	12.0	
	Aflatoxin B2	<1		1		
			µg/kg			
	Aflatoxin G1	<1	µg/kg	1		
	Aflatoxin G2	<1	µg/kg	1		
	Sum of all positive Aflatoxins	<4	µg/kg			
☆ JJOFE		T2, HT2) Method: Internal method,				
	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) Metho	d: Internal method,	LC-MS/MS			
	Zearalenone (ZON)	<10	µg/kg	10		
☆ JJ0G5	Ochratoxin A (spices, special matrix) Method	internal method ba	ased on EN 1413	2, IAC-LO	C-FLD	
	Ochratoxin A (OTA)	<2	µg/kg	2		
	Free fatty acids (FFA) Method: DGF C-V 2	200				
	Acid value (mg KOH/g)	<0.2	mg KOH/g	0.2		
	Free fatty acids (calculated as lauric	<0.1	%	0.1		
	acid)			2.1		
	Free fatty acids (calculated as oleic	<0.1	%	0.1		
	acid) Free fatty acids (calculated as palmitic	<0.1	O/			
	acid)	~0.1	%	0.1		
JJW2Z		-MS/MS				
	Sterigmatocystin	<10	µg/kg	10		
à JK07G		-10	pana	10		
	Unsaponifiable matter	0.8	%	0.1		
à QA049						
	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 6	885				
	Anisidine Value	1.6		1		
☆ QA156						
	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	160.
☆ 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	4.794	g/100 g	0.02		
	acid)					
	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			g. 100 g	0.00		
	C 20:4n6 (Arachidonic acid)	422.5	mg/g	0.1		
☆ QA307			5-5	41.		
	Diglycerides	4.26	%	1		
	Glycerol	<1.00	%	1		
	Monoglycerides	<1.00	%	1		
	Triglycerides	93.77	%	1		
☆ QA934						
	Total Trans Fatty Acids	0.25	%	0.05		
☆ QD04J	Lovibond Color - Lovibond Scale Method:			0.00		
N. Section		1R,0.9Y,0.0B,0	77.00			
		.ON				
☆ QD106	lodine Value Method: AOCS Cd 1d-92					
	lodine value	182.9				
☆ S1102	Dithiocarbamates Method: EN 12396-3:20	00				
	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 metho	od, GC-MS				
	Fipronil, desulfinyl-	<0.04 *	mg/kg	0.04		
☆ SP421	Organochlorine Pesticides, Pyrethroides	Method: ASU L00.00-34	and the second second			
	Screened pesticides	Not Detected				
☆ SP424	Organophosphorus Pesticides Method: AS	SU L00.00-34				
	Screened pesticides	Not Detected				
☆ SPGZ5		hod, GC-MS				
	Cyhexatin/Azocyclotin (Sum)	_	mg/kg			
☆ SU007	Mercury (AAS) Method: BS EN 13806:200	2				
	Mercury (Hg)	<0.005	mg/kg	0.005		
☆ SU04N	Sodium (ICP-MS) Method: BS EN ISO 17	294-2 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 1	7294-2 2004 mod.			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	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		
A 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	1-2 2004 mod.				
	Arsenic (As)	<0.1	mg/kg	0.1		
A SUOSF	Chromium (ICP-MS) Method: BS EN ISO 17	294-2 2004 mod.				
	Chromium (Cr)	<0.1	mg/kg	0.1		
& SU05G		94-2 2004 mod.				
	Cadmium (Cd)	<0.01	mg/kg	0.01		
SU05H						
	Iron (Fe)	0.26	mg/kg	0.1		
& SU05J	Copper (ICP-MS) Method: BS EN ISO 17294	Carried Carried	mgmg	0.1		
	Copper (Cu)	0.81	mg/kg	0.1		
SU05K		CTOP TANKS TO SERVICE AND ADDRESS OF THE PARTY OF THE	mana	0,1		
	Phosphorus (P)	36.7	mg/kg	5		
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:200	7.00	iliging	3		
	Peroxide value	<0.05	manilen	0.05		
A SU20L	Protein Method: AOAC 984.13	~0.00	meq/kg	0.05		
W. Therefore		0 4 // 05)	-1400 -			
☆ SU20Q		:0.1 (k=6.25)	g/100 g	0.1		
		-O.F	-1400 -			
à SU20U	Dietary fiber	<0.5	g/100 g	0.5		
R 30200	The state of the s	400.0	-1400			
Laurani	Total fat	100.0	g/100 g	0.1		
☆ SU20Y	Moisture (Direct drying method) Method: AO					
	Moisture	0.12	g/100 g	0.01		
☆ SU21B			41 70 000			
	Energy kcal (calculated)	900	kcal/100 g			
	Energy kJ (calculated)	3700	kJ/100 g			
☆ SU21C		4.4	10.2			
	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 66	2:1998				
	moisture and volatile matter content	0.03	g/100 g	0.01		
A SU21L	Sugar Profile Method: AOAC 995.13, modifie	d				
	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	-0.1	grioo g	0,1		
	Ash	<0.1	a/100 a	0.04		
SU9QW			g/100 g	0.01		
		Not Detected	mg/kg	1		
VV00B	Coliforms Method: ISO 4832:2006		and a facel			
	Coliforms	<1	cfu/ml			
VV00D	Yeasts and moulds Method: ISO 21527:2008		(a)			
	Moulds	<1	cfu/ml			
	Yeast	<1	cfu/ml			

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or The		Results	Unit	LOQ	LOD	
VV00E	Salmonella Method: ISO 6579:2002					
	Salmonella Not I	Detected	/25 g			
VVOOG	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 22964:20	06				
	Cronobacter spp Not I	Detected	/25 g			
VV0A2	Listeria monocytogenes Method: ISO 11290-1:19	96/Amd.1:2004	1			
	Listeria monocytogenes Not I	Detected	/25 g			
VV0A3	Coagulase-positive staphylococci Method: ISO 68	88-1:1999/AM	D 1:2003			
	Coagulase-positive staphylococci	<1	cfu/ml			
VV0A4	Escherichia coli Method: ISO 16649-2:2001					
	Escherichia coli	<1	cfu/ml			

Dichlobeni (0.01)	SP421 Or	ganochlorine Pesticides	Purethroides (I OO* malk	7)		
Betrack (0.02)	2.3.4.6-Tetrachloranisol		The state of the s		Aldrin/ Dietdrin (Sum) ()	Benifuralio (0.005)
Christomer (10.02) Christomer (10.03) Christo		Bifenox (0.02)	Binapacryl (D 02)	Billipothero (D.06)	Bromounten (0.01)	Removal retenants (201)
Chieferprep-methyl (0.00)	Butratin (0.02)					
Cyphanophin (Losp) Cyphano				Chigrathalonii (0.01)		
DOTE, pp. CO.005 DOTE, pp. CO.005 DOTE, pp. CO.005 Deltametern (D.05 Discrete receptation (D.07 Discrete (D.07						
Dichtore (0.02) Dichtor (0.02) Dic		DDT (total) ()				Dibromobenzophenone, p.p-
Dicotol., p. (0.02)	Dishlobenil (0.01)	Dichlone (0.02)	Dicloran (0.005)			
Endestrating (0.01)		Dicofol, p.p- (0.02)	Dieldrin (0.005)			Dinobuton (D 02)
Emailtainis (0.01)		Endosulfan, elpha- (0.005)	Endosulfan sulphate (0.01)			
Famoustarials (R479RF-scorners) Fluorizatine (0.01) Fluoriza		400	Fentluthrin (0.05)			Fenvelerate (RR-/SS-Isomer
HCH, delta- (0.005) HCH, spellon- (0.005) HCH, spellon- (0.005) Heptachior (0.005) Heptac	(0.05)	Flubenzimine (0.01)	Fluonioratin (0.01)	Flucythrinata (0.05)	Flumetralin (0.01)	
Horth actable (0.005) HCH, spallon-(0.005) Lindans (gamma-HCH) (0.005) Heptachior (south) (0.005) Hoptachior (south) (0.005) Pertachioroberszene (0.01) Pertachioroberszene (0.0		Genite (0.01)	Halfenprox (0.05)		HCH, alpha- (0.005)	HCH, beta-(0.005)
Heplachior epoxide, trans-	HCH, delts- (0.005)	HCH, epsilon- (0.005)			Heptachior (eum) ()	Heptachior apoxide, sis-
Display of the Color Display of Color Display			loxynil-octanoste (0,01)	Isobenzan (0.005)	hodrin (0.005)	
Oxyfluoritan (0.01) Pendimethalin (0.01) Pendimethalin (0.01) Pendimethalin (0.01) Pendimethalin (0.01) Pendimethalin (0.02) Polychiorotarpene (0.005) Pendimethalin (0.05) Quintozene (0.01) Quintozene (0.01) Quintozene (0.005) Traismillatio (0.05) Traism			Nitrapyrin (0.01)	Nitrollers (0.01)	Nonnobler teams (7) 005)	Octachicantumen (O COE)
Permethrin (0.05) Pilfenate (0.02) Polychiortespene (0.05) Culniozane (0.005) Culniozane (0.005) Culniozane (0.005) Culniozane (0.005) Culniozane (0.005) Culniozane (0.005) Tetrasuli (0.01) Tetrasuli (0.02) Tetrasuli (0	Oxyfluorfan (0.01)	Pendimethalin (0.01)			Pentschlorobenzene (0.01)	Pentachiorothiounisole
Trainmaithrin (0.05) Trainmait	110000000000000000000000000000000000000			Profluralin (0.005)	Quintoziane (0.005)	
Azirphos-phorus Pesticides (LOQ* mg/kg) Azirphos-methyl (0.05) Butamifola (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Carbophenothion methyl Chlorfervirphos (0.02) Chlorpyrifos (-sthyl) (0.02) Chlorpyrifos (0.02) Demeton-S-methyl-sulfone (0.02) Disaption (0.03) Disa						Tetrasul (0.01)
Asinphose-withyl (0.05) Butamiflos (0.02) Asinphose (0.05) Butamiflos (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Carbophenothion-methyl (0.02) Chioryprifos-methyl (0.02) Chioryprifos (-sthyl) (0.02) Chioryprifos (-sthyl) (0.02) Chioryprifos (-sthyl) (0.02) Chioryprifos (-sthyl) (0.02) Chioryprifos (0.02) Disable (0.03) Disabl	SP424 On	anophosphorus Pesticide	s (LOQ* ma/ka)			
Butamifica (0.02) Carbophenothion (0.02) Carbophenothion (0.02) Chlorpyrifice (-sthyl) (0.02) Chlorpyrifice (0.02) Chlorethion (0.02)	Apephate (0.02)	Azinehoe ethyl (0.05)		Remarked January 12 DOS	0	
Chlorpyrifos (esthyl) (0.02) Chlorpyrifos (esthyl) (0.02) Cyanofrenos (0.05) Demeteris-smethyl-sulfone (0.07) Demeteris-smethyl-sme	Butamifos (0.02)			Carbophenothion-methyl		
Crulomate (0.02) Cyanofenphos (0.05) Cyanophos (0.02) Demeton-S-mathyl (0.05) Demeton-S-mathyl-sulfone (0.02) Disables (0.02)		Chlorpyrifos-methyl (0.02)	Chlorthian (0.02)		Coumanhos (0.1)	Contourshoe (0.03)
Disaption (0.02) Disaption (0.02) Dishloro (0.					Demeton-S-methyl-sulfone	
Dimethylvinphos (D.02) Disamble (D.02) Disamble (D.02) Disamble (D.03) Disam				Dichloryos (0.02)		Dimefox (0.02)
Disublicon-outlicoxide (0.05) Disalimfos (0.02) Ediferaphos (0.05)						
Fensalidation (0.02) Fensalidation (0.05) Fensible (0.05) Fens						
Fernsillothion (0,02) Fernshillothion-oxon-sulfone (0,02) Fernshillothion-oxon-sulfone (0,05) (0,05) (0,05) Fernshillothion-oxon-sulfone (0,05) Fernshillothion (0,02) Fernshillothion-oxon-sulfone (0,05) Fernshillothion (0,02) Fernshillothion (0,02) Fernshillothion (0,02) Fernshillothion (0,02) Isosenbotos (0,		Fensmiphos-sulfone (0.05)		Fenchlorphos (0.02)		
(0.05) (0.02) (0		(0.05)	(0.05)	Fensulfothion-sulfone (0.05)		Fenthion-oxon-suifone (0.05)
Isofanphos (0.02) Isofanphos-methyl (0.02) Isosathion (0.05)	(0.05)			Fonafos (0.02)	Formathion (0.02)	Fosthiazate (0.05)
Idefamphics (0.02) Idefamphics (0.02) Identify (0.02) Iden	rostnietan (0.02)			Iprobenfos (0.02)	Isazophos (0.02)	Isocarbofos (0,02)
Mephastolan (0.02) Mephastolan (0.02) Mephastolan (0.02) Methastolan (0.02) Presidente (0.02) Professe (0.02) Pr			Isoxathion (0.05)		Malaoxon (0.02)	
Memperologhous (U.Uz). Memperologhous (U.Uz). Memperologhous (U.Uz). Memperologhous (U.Uz). Memperologhous (U.Uz). Paretinologhous (U.Uz). Paretinologhous (U.Uz). Paretinologhous (U.Uz). Paretinologhous (U.Uz). Paretinologhous (U.Uz). Paretinologhous (U.Uz). Phorata (U.						
Parasovin-metry (0.02) Parathion (0.02) Parathion-metry (0.02) Phenikapton (0.05) Phenihode (0.02) Phorata (0.02) Phorata-aulfond (0.05) Phosemet (0.05) Phosemet (0.05) Phosemet (0.05) Phosemet (0.05) Properties (0.02) Profession (0.02) Purity (0.02) Profession (0.02) Sulfosto (0.02) Sulfosto (0.02) Sulfosto (0.02) Sulfosto (0.02) Sulfosto (0.02) Sulfosto (0.02)				Omathosta (0.02)		
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Printiphor-metry (0.02) Profeno(os (0.02) Propephos (0.02) Prophos (0.02) Profinotes (0.02) Profinotes (0.02) Profinotes (0.02) Profinotes (0.02) Profinotes (0.02) Profinotes (0.02) Quintiotes (0.02) Sulfotes (0.02)				Phosmat (0.05)		
Pyractorios (0.05) Pyracophos (0.05) Pyracophos (0.05) Pyracophos (0.02) Quintifons (0.02) Quintifons (0.02) Sulfotop (0.02)	Printiphos-methyl (0,02)					
Terbufos (0.02) Terbufos (0.02) Terbufos (0.02) Terbufos (0.02) Terbufos (0.02) Triemphos (Sulprofos (0.05)	TEPP (0.02)	Terbutos (0.02)	Terbufos-sulfone (0.05)	Tetrachlorvinphos (0.02)	Thiometon (0.02)

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

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Analytical Report

Sample Code Certificate No. 128-2017-00003832

AR-17-VV-004039-04

Report date 27-May-2017

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: Sample reception date: Sealed aluminum foil bag

Analysis starting date:

27-Apr-2017

Analysis starting date:

27-Apr-2017 27-May-2017

Arrival Temperature (°C)

20.1

Sample Weight 220g

		Results	Unit	LOQ LOD
☆JJOHV	Free fatty acids (FFA) Method: DGF C-V 2			
A	Acid value (mg KOH/g)	< 0.2	mg KOH/g	0.2
	ree fatty acids (calculated as lauric acid)	<0.1	%	0.1
	ree fatty acids (calculated as oleic acid)	<0.1	%	0.1
	ree fatty acids (calculated as palmitic acid)	<0.1	%	0.1
☆ JK07G	Unsaponifiable matter Method: ISO 18609			
ι	Insaponifiable matter	0.7	%	0.1
# QA117	Anisidine Value (ISO Method) Method: ISO 6885			
A	Anisidine Value	3.5		1
☆ QA184	Arachidonic Acid (ARA) Method: AOCS Ce 1b-89	9		
(20:4n6 (Arachidonic Acid)	421.8	mg/g	0.1
☆ QD04J	Lovibond Color - Lovibond Scale Method: AOCS	Cc 13j-97, Cc 1	13e-92	
L	ovibond Color - Lovibond Scale 1.1R,11	.0Y,0.0B,		
		0.5N		
☆ SU207	Peroxide value Method: AOCS Cd 8b-90:2003			
F	Peroxide value	2.05	meq/kg	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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Analytical Report

Sample Code Certificate No.

128-2017-00008163 AR-17-VV-007754-01 Report date 18-Aug-2017



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

Cherk Campic Gode

2017020701

Sample described as:

ARACHIDONIC ACID POWDER

Sample Packaging: Sample reception date: Sealed metal bottle 07-Aug-2017

Analysis starting date: Analysis ending date: 07-Aug-2017 07-Aug-2017 18-Aug-2017

Arrival Temperature (°C)

5

Sample Weight	50g
Sample Weight	009

		Results	Unit	LOQ	LOD
☆ FL023	Plant sterols and plant stanols (not enriched)	Method: NMKL 198	3:2014		
	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.

SIGNATURE

(b) (6)

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