

CERTIFICATE OF ANALYSIS

Larch Tree Extract (Dihydroquercetin) /LIFEVITA™ v.s. FLAVIT™/

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Product name	Marketing name	Production date/ Lot#	Supplier/Distributor	Manufacturer	Country of origin	Date of Analysis
DIHYDROQUERCETIN Customs code 2932.99.8500 FDA code: 54YCZ07 CAS 480-18-2	Larch Tree Extract (Dihydroquercetin) Russia: FLAVIT™ EU: LifeVita™ or VitaLaVita™ USA: LarchVita™ or FlavitPURE™	March' 2010 Lot# FL03-10	JSC Scientific Production Firm "FLAVIT" (JSC NPF "FLAVIT") LIFEVITA UK Ltd. www.lifevita.co.uk	JSC Scientific Production Firm "FLAVIT" (JSC NPF "FLAVIT") FDA registered Number: 14000470926	RUSSIA	March'2010
Batch Net Weight, kilos		Packaging		Net weight of product per drum, kilos		Number of drums per batch
20		Drums		2		10
ITEM	SPECIFICATION	ANALYSIS RESULT	CONFORMITY	ANALYSIS REFERENCE SOURCE		
Appearance, Color, Odor, Taste	Light yellow solid crystalline powder, characteristic aromatic odor, astringent	Yellowish, fine crystalline powder, characteristic aromatic odor, mild bitter with sweetly aftertaste	Conforms	By Manufacture – Visual, Organoleptic		
Particle size / Shape	granular	granular	Conforms	Manufacture		
Characteristic Values HPLC λ 340 nm	> 90% Dihydroquercetin (anhydrous)	>90% Dihydroquercetin (anhydrous)	Conforms	HPLC system with reversed phase column and UV detector is used for peak separation and quantitation. Journal of chromatography, 605: pp. 41-48 (1992)		
Assay (HPLC λ 290 nm, retention time 9-11 minutes)	>92%	>94%	Conforms	Method: ALC114A		
* Assay (HPLC λ 258 nm, retention time 9-11 minutes)	> 93%	>95%	Conforms	Method: ALC114A		
Other Flavonoids: Dihydrokaempferol, Quercetin, Naringenin	<10%	Total: ~ 4-5% (Dihydrokaempferol ~ 4%, Quercetin ~ 0.5%, Naringenin ~ 0.13%)	Conforms	Method: ALC114A		
ORAC ^{***}	> 28,000 μ M TE/g	30,900 μ M TE/g	Conforms	<i>J. Agric. Food Chem.</i> 2001; 49(10), 4619-4626		
CAP-e ^{**} (Gallic Acid Equivalents)	>9 CAP-e units / gram	9.9 CAP-e units / gram	Conforms	NIS Labs : The cell-based antioxidant protection in erythrocytes (CAP-e) assay reflects whether antioxidants can enter into and protect live cells from oxidative damage.		
Solubility	DMSO, aqueous alkaline solutions, Ethanol, Ethers	DMSO, aqueous alkaline solutions, Ethanol, Ethers	Conforms	ChemIDplus, US National Library of Medicine (NLM) monograph http://www.chemindustry.com/chemicals/783153.html		
Log P(octanol-water)	Value = 1.47	Value = 1.47	Conforms	ChemIDplus, US National Library of Medicine (NLM) monograph http://www.chemindustry.com/chemicals/783153.html		
Water Solubility	2.20E+04 mg/L at 25°C	>2.20E+04 mg/L at 25°C up to 2 g per L	Conforms	ChemIDplus, US National Library of Medicine (NLM) monograph http://www.chemindustry.com/chemicals/783153.html		
Water Solubility@90°C	80%	>90%	Conforms	IP		
Stability	This product is stable for 2 years as supplied if, stored at +4°C up to 25 °C, and protected from light.	2 years	Conforms	Manufacture - In accordance with expertise conclusion by Institute of Nutrition of Russian Academy of Medicine Sciences issued on November 16 th , 2006		
Moisture * (Loss on Drying)	<15%	10-13%	Conforms	USP <6018>		
Nutritive Content	Protein – 0%, Carbohydrates, g/1g < 5%, Fat – 0%	Protein – 0%, Carbohydrates, g/1g < 5%, Fat – 0%	Conforms	Manufacture - In accordance with expertise conclusion by Institute of Nutrition of Russian Academy of Medicine Sciences.		
USP Heavy Metals, Impurities						
Total Heavy Metals, mcg *	USP limits	Passes	Conforms	Heavy Metals testing conducted by Nutra Manufacturing in accordance with Nutra Manufacturing SOP 5260. Heavy Metals intake limits based on California Prop 65 guidelines.		
Lead, ppm *	<0.5	0.080	Conforms	USP		
Arsenic, mcg *	<10	0.020	Conforms	USP		
Cadmium, mcg *	<4.1	None detected (ND)	Conforms	USP		
Mercury, mcg *	<0.3	0.001	Conforms	USP		
Peroxide Value	< 0.1 m eq/kg	ND	Conforms	AOAC		
Sulfite Residue	<0.1 ppm	ND	Conforms	AOAC		
Total Ash, %	<0.1	Passes	Conforms	USP		
Acid insoluble ash, %	<0.1	Passes	Conforms	USP		
Ethylene Oxide Residue, ppm	< 1	Passes	Conforms	USP		
Microbiological *	Passes	Passes	Conforms	USP		
*TEST (s) conducted by Nutra Manufacturing, Inc., US **TEST(s) conducted by NIS Labs/CAPe/AAPH/20081124						
*** TEST (s) conducted by Covance Laboratories, Inc. (Report # 126388-0), ORAC (ORAC_S.4), WU, et.al. Journal of Food Composition and Analysis, 17 (2004), 407-422 (Modified)						
Note: HPLC λ 258 nm shows possible contaminants such as larch resin acids might be occurred after extraction. The summary of total flavonoids result assay and HPLC λ 258 nm result assay shows actual purity of Dihydroquercetin from larch resin acids. Purity testing conducted by Nutra Manufacturing Inc under SOP 4000.						
Note: UV spectrophotometry shows that the quantity of long polymers of Dihydroquercetin (DHQ) in aqueous solutions can be estimated by the ratio of the absorption bands at λ 328 and λ 290 nm, since the λ 328-nm band was attributed to the monomeric form of DHQ, whereas the λ 290-nm band was attributed to both the monomeric and polymeric forms. <i>Institute of Cell Biophysics, Russian Academy of Sciences, Pushchino, Moscow oblast, 142290 Russia.</i> Detection of Polymeric Forms of Dihydroquercetin by Optical Absorption and Light Scattering, N. L. Vekshin, 2009.						

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USP Limits: Dithiocarbamates ***

Dithiocarbamates	<2000 ppb (USP Limit)	<2000 ppb	Pass	Analyst., Vol.106, pp.782-787 July(1981).
Pyrethrin I + II	<3000 ppb (USP Limit)	<3000 ppb	Pass	Food and Drug Administration, '302: Method I for Nonfatty foods', Pesticide Analytical Manual, Third Ed., Vol. 1, Food and Drug Administration, Washington D.C. (1994).
Piperonyl Butoxide	<3000 ppb (USP Limit)	<3000 ppb	Pass	

USP Pesticide Screen ***

ITEM	SPECIFICATION	ANALYSIS RESULT	CONFORMITY	ANALYSIS REFERENCE SOURCE
USP Pesticide Screen				
Alachlor	<20.0 ppb	<20.0 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Aldrin and Dieldrin (sum of)	<50.0 ppb	< 50.0 ppb	Pass	
Azinphos-Methyl	<1000 ppb	<1000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Bromopropylate	<3000 ppb	< 3000 ppb	Pass	
Chlordane (sum of cis & trans)	<50.0 ppb	<50.0 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Chlorfenvinphos	<500 ppb	<500 ppb	Pass	
Chlorpyrifos	<200 ppb	<200 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Chlorpyrifos-methyl	<100 ppb	<100 ppb	Pass	
Cypermethrin	<1000 ppb	<1000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
DDT and Isomer	<1000 ppb	<1000 ppb	Pass	
Deltamethrin	<500 ppb	<500 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Diazinon	<500 ppb	<500 ppb	Pass	
Endosulfan (isomers & endosulfate)	<3000 ppb	< 3000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Endrin	<50.0 ppb	<50.0 ppb	Pass	
Ethion	<2000 ppb	<2000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Fenitrothion	<500 ppb	<500 ppb	Pass	
Fenvalerate	<1500 ppb	<1500 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Fonofos	<50.0 ppb	<50.0 ppb	Pass	
Heptachlor (Heptachlor and Epoxide)	<50.0 ppb	<50.00 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Hexachlorbenzene	<100 ppb	<100 ppb	Pass	
Hexachlorcyclohexane isomers	<300 ppb	<300 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Lindane - Gamma BHC	<600 ppb	<600 ppb	Pass	
Malathion	<1000 ppb	<1000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Methidathion	<200 ppb	<200 ppb	Pass	
ET-Parathion	<500 ppb	<500 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Me-Parathion	<200 ppb	<200 ppb	Pass	
Permethrin	<1000 ppb	<1000 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Me-Pirimiphos	<4000 ppb	<4000 ppb	Pass	
Phosalone	<100 ppb	<100 ppb	Pass	U.S. Pharmacopeia 31, General Chapter <561> "General Method for Pesticide Residues Analysis", USD31/NF26, Rockville, MD (2008). Complies with British and European Pharmacopeia requirements and limits
Quintozene (Sum of Tecnazene and PCNB)	<1000 ppb	<1000 ppb	Pass	

Vapona

Vapona	<1.0 ppm	<1.0 ppm	Pass	Food and Drug Administration, '302: Method I for Nonfatty foods', Pesticide Analytical Manual, Third Ed., Vol. 1, Food and Drug Administration, Washington D.C. (1994).
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*** TEST(s) including pesticide screening, dithiocarbamates, pyrethrins & piperonyl butoxide and vapona conducted by Covance Laboratories, Inc., US (Report# 126388-0)

Radionuclide's

Caesium-137 (Bq/kg)	200	2.0 ± 11.2	Conforms	Gamma-ray spectrometry in accordance with State (RUS) Guide: MUK 2. 6.1.1194-03. Methodological recommendations. Ionizing radiation, radiation safety. Radiation control. Strontium- 90 and Cesium-137. Food products. Sampling analysis and hygienic assessment. 01/05/2003.
Strontium-90 (Bq/kg)	100	3.8 ± 20.6	Conforms	Gamma-ray spectrometry - In accordance with State (RUS) Guide: MUK 2. 6.1.1194-03. Methodological recommendations. Ionizing radiation, radiation safety. Radiation control. Strontium- 90 and Cesium-137. Food products. Sampling analysis and hygienic assessment. 01/05/2003.

Microbiological contaminants***

Mesophilic aerobic microorganisms and facultative anaerobic microorganisms (CFU/g)	5 x 10 ⁴	<1 x 10 ²	Conforms	USP <32> and In accordance with State (RUS) Standard: GOST 10444-15-94. Food products. Methods for determination quantity of mesophilic aerobes and facultative anaerobes. Date of consummation 01/01/1996. Official edition. Moscow: Publisher of Standards, 2002.
Coliform bacteria (in 0.1 g)	Not permitted	N/D	Conforms	USP <32> AOAC <991.14> and In accordance with State (RUS) Standard: GOST P 50474-93. Food products. Methods for detection and quantity determination of coliformes. Date of consummation 01/01/94. Official edition. Moscow: Publisher of Standards, 1993.
E. coli (in 1.0 g)	Not permitted	N/D	Conforms	USP <32> AOAC <991.14> and In accordance with State (RUS) Standard: GOST 30726-2001. Food-stuffs. Methods for detection and determination of Escherichia coli. Date of consummation 01/07/2002. Official edition. Moscow: Publisher of Standards, 2001.
Pathogenic, including salmonella (in 10.0 g)	Not permitted	N/D	Conforms	USP <32> AOAC <991.14> and In accordance with State (RUS) Standard: GOST P 50480-93. Food products. Method for detection of Salmonella. Date of consummation 01/01/1994. Official edition. Moscow: Publisher of Standards, 1993.
Mold (CFU/g)	<100	<10	Conforms	USP <32> AOAC <991.14> and In accordance with State (RUS) Standard: GOST 10444.12-88 - Food products. Method for determination of yeast and mould.
Yeast (CFU/g)	<100	<10	Conforms	USP <32> AOAC <991.14> and In accordance with State (RUS) Standard: GOST 10444.12-88. Food products. Method for determination of yeast and mould. Date of consummation 01/01/1990.

*** USP, 32nd Revision, Microbial Enumeration Tests <61>, Tests for specified microorganisms <62> National Formulary, NF 27th Revision. Microbial Enumeration Tests. Parts <2021> Microbial Procedures For Absence Of Specific Microorganisms. Parts <2020> USP Convention, Inc.: Rockville, Maryland (2009).