

ORYZA OIL & FAT CHEMICAL CO., LTD.

LINGONBERRY EXTRACT

For Skin Whitening and Anti-inflammation

- **LINGONBERRY EXTRACT-J**
(Concentrated juice, for foods)
- **LINGONBERRY EXTRACT-PJ**
(Water-soluble powder of concentrated juice, for foods)
- **LINGONBERRY EXTRACT-PO.5**
(Water-soluble powder, for foods)
- **LINGONBERRY EXTRACT-PJC**
(Water-soluble powder of concentrated juice, for cosmetics)
- **LINGONBERRY EXTRACT-PC0.5**
(Water-soluble powder, for cosmetics)
- **LINGONBERRY EXTRACT -LC**
(Water-soluble liquid, for cosmetics)

ORYZA OIL & FAT CHEMICAL CO., LTD.

ver. 1.7 YF

1. Introduction

Lingonberry (*Vaccinium vitis-idaea*) is a native plant of the forests of Lapland and Northern Eurasia. The fruits of Lingonberry are nutritionally rich in vitamin C and other phytonutrients. Lingonberries are collected in the wild in Finland and eaten raw, which preserves most of their nutrients. Besides, lingonberries can be incorporated into juices, jam, syrup and other form of processed food.

With respect to the functional effect of lingonberry, it has been renowned for its rich phytochemical contents such as arbutin, anthocyanidin and procyanidin. Research studies on the functional effects of lingonberry are increasing in recent years. With great honor, Oryza Oil & Fat Chemical Co., Ltd. together with Fingredients Ltd. successfully developed LINGONBERRY EXTRACT standardized with arbutin featuring on healthy skin whitening. LINGONBERRY EXTRACT is extracted from the fruits of wild lingonberry without an organic solvent. Therefore, LINGONBERRY EXTRACT is free from agricultural chemicals with excellent safety profile. In addition, research studies from our R&D showed that LINGONBERRY EXTRACT inhibits melanin production in guinea pigs allowed it to be incorporated into functional beauty food and cosmetic applications for skin whitening.



Fig. 1 Wild lingonberry (above); Lingonberry on sale in a market (below)

2. Bioactive compounds of Lingonberry

In addition to the arbutin content, Lingonberry is loaded with phenolic compounds resulting in strong antioxidant activity. (Fig. 2) Others phytochemicals such as lignan has been reported as well.

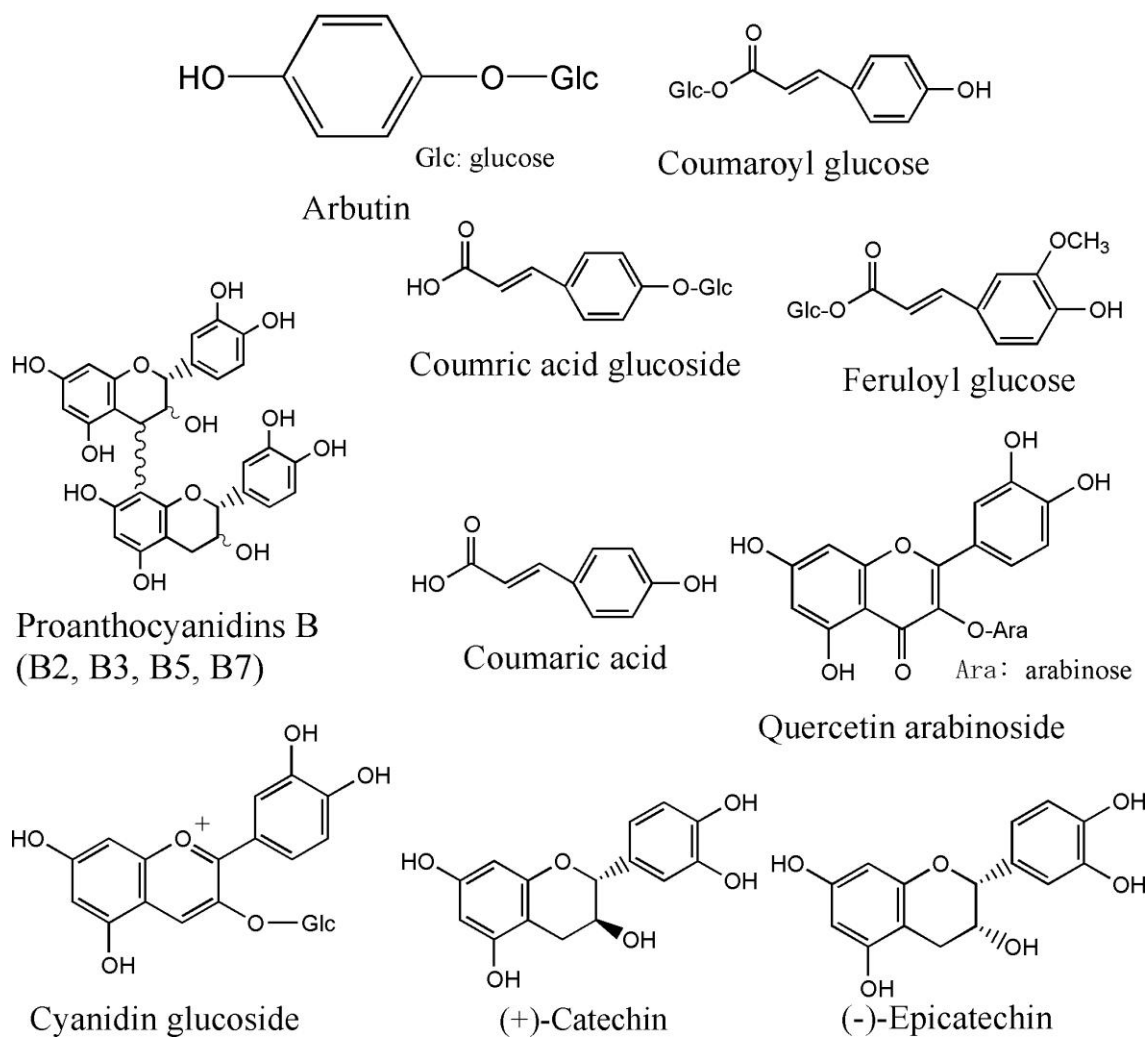


Fig. 2. Bioactive compounds of Lingonberry

*) Rihinen K. Phenolic compounds in berries. *Kuopio Univ. Publ. C. Nat. Environ. Sci.* 187: 1-97, 2005.

3. Studies References on the functional effect of Lingonberry & Arbutin

With respect to the pharmaceutical uses of Lingonberry, it has been reported to prevent cancer ¹⁻³⁾ and counteract urinary tract infection ⁴⁾. Nevertheless, it has been identified that Lingonberry exhibits anti-inflammatory effect in a study on UV-induced mice cells where activator protein-1 (AP-1) and nuclear factor- κ B (NF- κ B) production was inhibited ⁵⁾. In similar report, the mechanism on cytotoxicity of cytokine release was mentioned. Therefore, there is possibility that Lingonberry may suppress skin inflammation and flare.

References:

- 1) Mutanen M. *et al.* Berries as chemopreventive dietary constituents--a mechanistic approach with the ApcMin/+ mouse. *Asia. Pac. J. Clin. Nutr.* 1: Mutanen M *et al.* Berries as chemopreventive dietary constituents-a mechanistic approach with the ApcMin/+ mouse. *Asia Pac. J. Clin. Nutr.* 17 Suppl 1, 123-5, **2008**.
- 2) McDougall G. J. *et al.* Berry extracts exert different antiproliferative effects against cervical and colon cancer cells grown *in vitro*. *J. Agric. Food Chem.* 56, 3016-23, **2008**.
- 3) Misikangas M., *et al.* Three Nordic berries inhibit intestinal tumorigenesis in multiple intestinal neoplasia/+ mice by modulating beta-catenin signaling in the tumor and transcription in the mucosa. *J Nutr.* 13, 2285-90, **2007**.
- 4) Jepson R. G. *et al.* Cranberries for preventing urinary tract infections. *Cochrane Database Syst Rev.* Jan 23 (1), **2008**.
- 5) Wang S. Y. *et al.* Antioxidant activity in lingonberries (*Vaccinium vitis-idaea* L.) and its inhibitory effect on activator protein-1, NF- κ B, and mitogen-activated protein kinases activation. *J. Agric. Food Chem.* 53, 3156-66, **2005**.

On the other hand, the popular whitening component – arbutin has been reported to inhibit melanin production (Table 1) ⁶⁻⁸⁾. Similarly, studies on the anti-inflammatory effect of Lingonberry has been quoted accordingly.^{9, 10)}

Table 1. Related studies on the inhibition of melanin production by Arbutin

Description	Effective Concentration
Inhibition of Tyrosinase	
Mushroom derived	IC ₅₀ : 162 μ g/mL or 210 μ M
B16 Melanoma	Effective
Inhibition of melanin production	
B16 Melanoma	(1) at 50 μ M, 71% inhibition (2) IC ₅₀ : 6 mM
Human Melanoma	0.5-4 mM
Tyrosinase expression	
B16 Melanoma	At 2 mM, 60% inhibition

References:

- 6) Sugimoto K. *et al.*, Syntheses of α -arbutin- α -glycosides and their inhibitory effects on human

- tyrosinase. *J. Biosci. Bioengineering*, **99**, 272-276 (2005).
- 7) Yoshimura M. *et al.*, Inhibitory effect of an ellagic acid-rich pomegranate extract on tyrosinase activity and ultraviolet-induced pigmentation. *Biosci. Biotechnol. Biochem.*, **69**, 2368-2373 (2005).
 - 8) Sato K. *et al.*, Down-regulation of tyrosinase expression by acetylsalicylic acid in murine B16 melanoma. *Biol. Pharm. Bull.*, **31**, 33-37 (2008).
 - 9) Matsuda H., *et al.*, Combination of arbutin contained in bearberry and dexamethazone enhanced the anti-inflammatory effect in type IV allergy in mice *Yakugaku Zasshi*, **110**, 68 (1990).
 - 10) Wang X. *et al.*, Arbutin reduced capillary permeability in abdomen in mice. *Biol. Pharm. Bull.*, **28**, 1106 (2005).

4. The Whitening Effect of LINGONBERRY EXTRACT

(1) Inhibition of Tyrosinase

The effect of LINGONBERRY EXTRACT on tyrosinase activity was experimented and compared with β -arbutin. Mushroom derived tyrosinase was used. Results showed that LINGONBERRY EXTRACT-P0.5 demonstrated concentration dependent inhibition similar to that of β -arbutin.

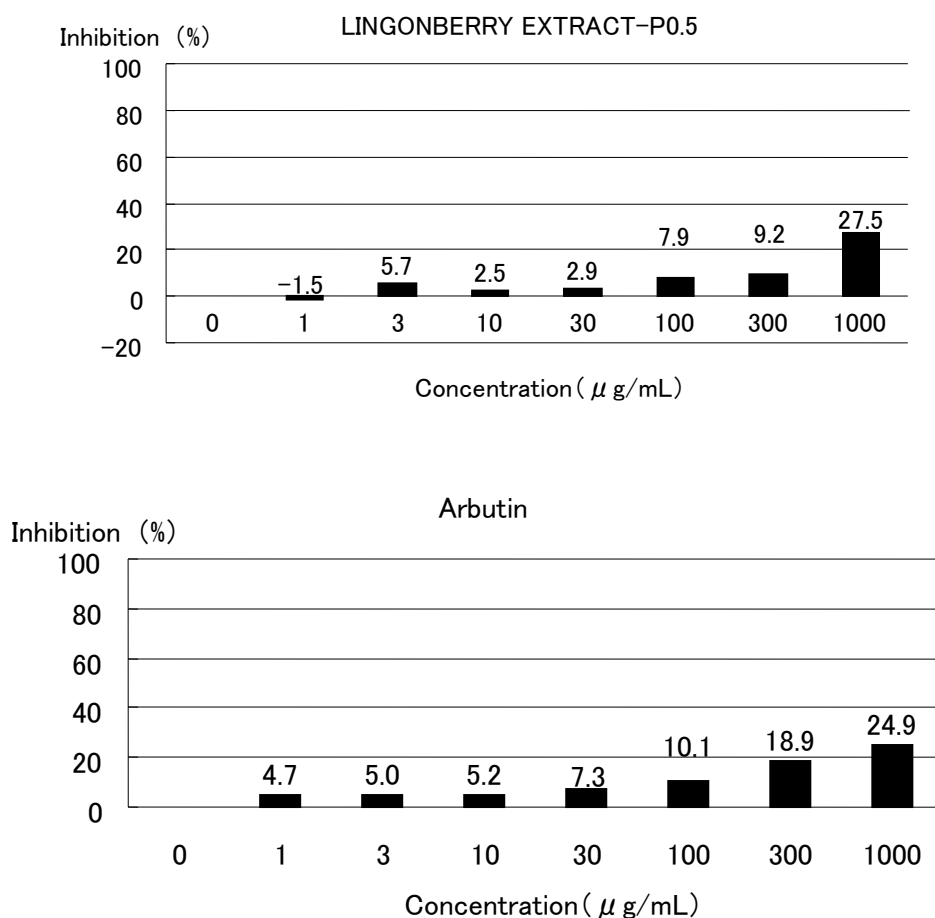


Fig. 3. The Effect of LINGONBERRY EXTRACT-P0.5 & Arbutin on Tyrosinase Activity

[Method] 40mM of phosphate buffer (pH6.8) 1360 μ L, 0.4 mg/mL L-DOPA (Acros Co.) 500 μ L was mixed with 40 μ L of sample previously dissolved in DMSO, mushroom derived tyrosinase (Sigma) 100 μ L (300 units/mL) was added and left for 5 min at room temperature for reaction to complete. Results were determined by light absorbance at 490nm.

(2) Inhibition of Melanin Production

The effect of LINGONBERRY EXTRACT on melanin production was experimented and compared with β -arbutin. Results showed that LINGONBERRY EXTRACT-P0.5 demonstrated concentration dependent inhibition on melanin production.

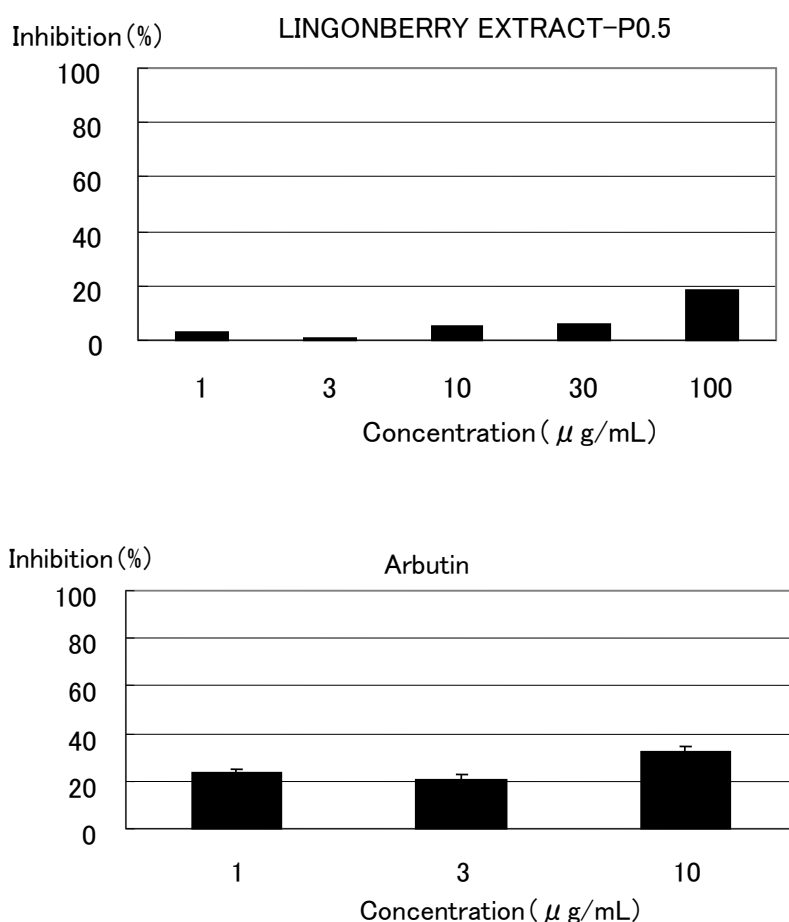


Fig. 4 The effect of LINGONBERRY EXTRACT-P0.5 & Arbutin on Melanin Production

[Method] B16 melanoma cells were cultured in a 24-well plate of MEM medium (5×10^4 cells/mL) suspension containing 2mM theophylline, 10% FCS, penicillin (100 units/mL) & streptomycin (100 μ g/mL). Sample solution (55 μ L) was added to the

culture medium and continued with 3 days incubation. Upon removal of culture medium, phosphate buffer saline (PBS, 300 μ L) was added and crushed by ultrasonication. The crushed cells were transferred to a 96-well plate for absorbance measurement at wavelength 415 nm using microplate reader.

(2) Prevention of UV induced hyperpigmentation

Study was prompted to examine and compare the effect of LINGONBERRY EXTRACT-P0.5 and arbutin on UV induced skin hyperpigmentation. Skin transparency value, L^* value was measured as pigmentation index. Results showed that LINGONBERRY EXTRACT-P0.5 exhibited skin lightening effect as the L^* value was higher compared with control on day-4 and day-10 (Fig. 5). On the other hand, arbutin showed reduced impact on skin lightening effect. At the end of experiment, photos of changes on UV induced area was taken (Fig. 6), thus indicating the skin lightening effect of LINGONBERRY EXTRACT-P0.5 and arbutin compared with control. In conclusion, LINGONBERRY EXTRACT demonstrated skin lightening effect on UV-induced skin. Upon comparison with Arbutin, LINGONBERRY EXTRACT-P0.5 significantly enhances the recovery from UV induced hyperpigmentation.

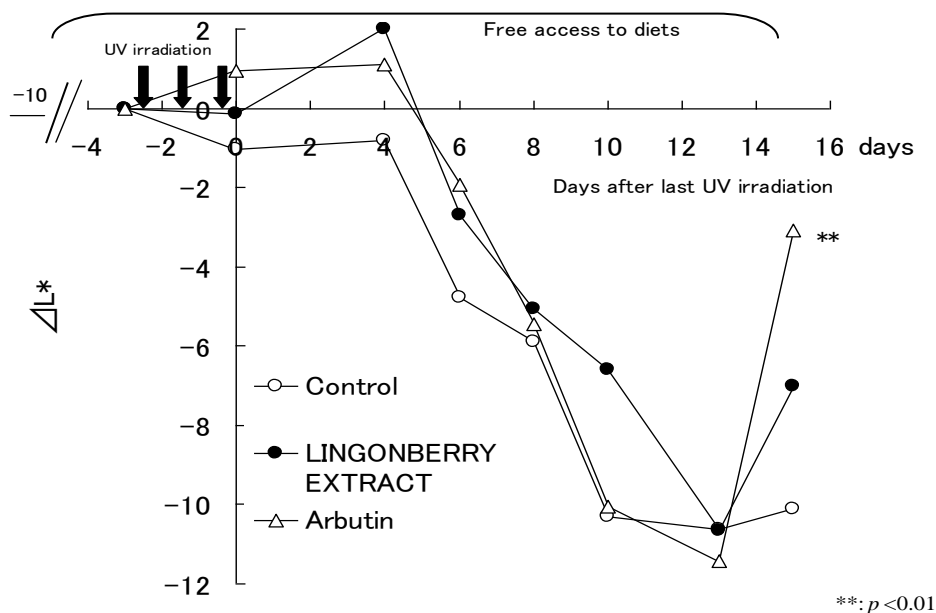


Fig. 5 The effect of LINGONBERRY EXTRACT-P0.5 and arbutin on UV-induced hyperpigmentation

ΔL : Decrease in L^* value indicates intensity of darkness.

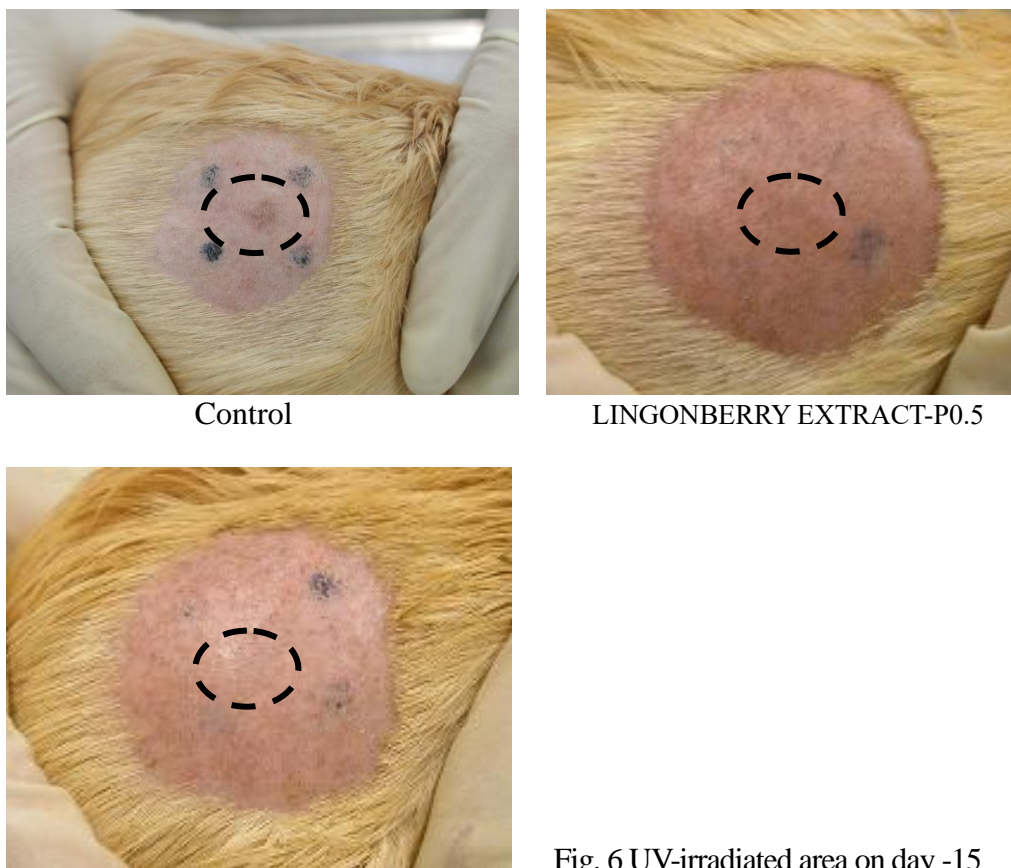


Fig. 6 UV-irradiated area on day -15

[Method] Brown guinea pigs were divided into 3 groups, namely, control, LINGONBERRY EXTRACT-P0.5 & Arbutin respectively. Samples (0.1% concentration) were given orally to guinea pigs 7 days prior to UV light induction. UV-B induction (using Solar simulator by Ushio Inc.) was introduced for 3 days at 2000 mJ/cm². Feeding of samples continued during UV induction period until end of experimental period (15 days). Skin transparency, L* value was measured using spectro-color difference meter (Nippon Denshoku Industries Co., Ltd) before and on day 4, 6, 8, 10, 13 & 15 after UV-induction.

(4) The skin lightening effect of topical arbutin on UV-induced hyperpigmentation on hairless mice

In this experiment, 1% arbutin in petroleum ointment was topically applied to hairless mouse to examine its effect on UV-induced hyperpigmentation. The L value of non-UV irradiated group (normal) was lower compared to control group. On the other hand, L value returned to normal level with the application of arbutin. “a” value which represents redness did not change while “b” value which represents yellowish has obviously increased (Table 2, Fig. 7).

Next, upon examination of mRNA expression in the skin, the expressions of

tyrosinase, tyrosinase related protein, melanocortin receptor 1, COX-2 mRNA and endothelin A receptor were increased by UV irradiation in control group. Expression of mRNA was suppressed in group treated with topical application of arbutin 1%. Tyrosinase and tyrosinase related protein are responsible for melanin synthesis in melanocytes. The melanocyte stimulating hormone receptor, melanocortin1 receptor controls the switch from pheomelanin (yellow) to eumelanin (black).¹¹⁾ Meanwhile, it has been demonstrated that human keratinocytes produce endothelins, which can be strong mitogens as well as melanogens for human melanocytes.¹²⁾ Results revealed that the expression of tyrosinase mRNA was suppressed with inhibitory effect of arbutin molecules on melanin production. In addition, expression of COX-2 (cyclooxygenase-2) was similarly suppressed due to inhibition of UV-induced inflammation by arbutin.

- 11) Valverde P. *et al.*, The Asp84Glu variant of the melanocortin 1 receptor (MC1R) is associated with melanoma. *Hum. Mol. Genet.* **5**, 1663 (1996).
- 12) Imokawa G. *et al.*, Signalling mechanisms of endothelin-induced mitogenesis and melanogenesis in human melanocytes. *Biochem. J.* **314** (Pt 1), 305 (1996).

Table 2. Color changes after topical application of arbutin 1%

	Conc. (%)	L	a	b
Normal	-	51.86±0.52	9.38±0.68	0.75±0.81
Control	-	49.01±1.01	8.63±0.67	0.28±0.44
Arbutin	1.0	52.17±1.11	8.68±0.43	1.89±0.64

Mean±SD (n=5)

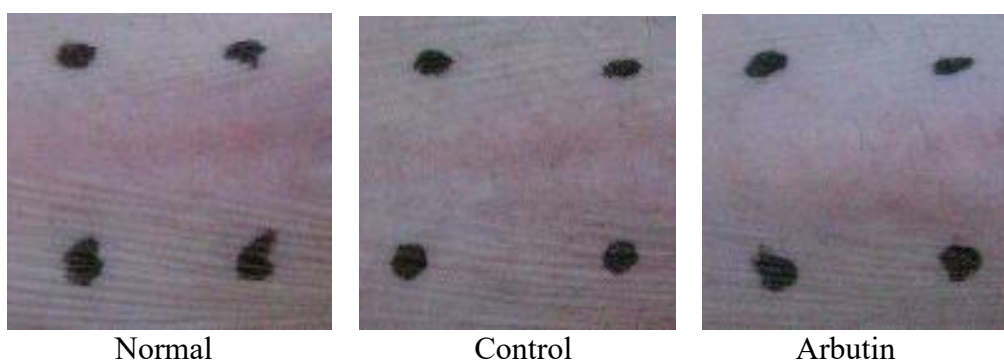


Fig. 7 UV-induced area (individual mouse no.2)

Table 3. Expression of mRNA of UV-induced skin area

	Normal	Control	Arbutin 1%
Tyrosinase	0.26±0.06	1.00±0.14	0.27±0.07
Tyrosinase related protein	0.28±0.08	1.00±0.16	0.32±0.10
Melanocortin receptor 1	0.16±0.04	1.00±0.23	0.25±0.07
COX-2	0.51±0.16	1.00±0.18	0.23±0.05
Neurotrophin-3	1.10±0.05	1.00±0.01	0.95±0.02
Endothelin 1	1.10±0.02	1.00±0.01	1.27±0.05
Endothelin A receptor	0.23±0.04	1.00±0.21	0.23±0.01
Endothelin B receptor [†]	1.24±0.13	1.00±0.06	0.66±0.07

[†] Endothelin B receptor is a strain for dissociation curve, for reference purpose.

[Method] Hairless mouse (Hos; HRM2, male, 5-week old) was preliminary bred for 12 days. Skin on the centre of mouse mid dorsal area was irradiated with UVB (160 mJ) by Solar Simulator, 0.1 mL of ointment was immediately applied topically to the irradiated site. These procedures were repeated for 7 days, on day 8-15, dosage of UVB irradiation was increased to 320 mJ. On day 16, L, a & b values were determined using spectro-color difference meter. The skin of irradiated site was then removed to determine the expression of mRNA according to the common procedures for extraction of RNA, RT-PCR etc.

5. Lingonberry extract improves blood circulation, swelling and blood circulation, swelling, and cooling effects of lingonberry extract

A research group at the University of Helsinki, Finland, has shown that lingonberry juice has stronger vasodilatory effects than black currant or cranberry. In an experiment, hypertensive rats were treated with three types of berry juice for 8 weeks, and then their blood vessels were excised and constricted with phenylephrine to test their response to acetylcholine-induced dilation. The results showed that lingonberry juice was the most potent vasodilator.

In addition, while the vasodilatory effects of other berries are largely dependent on the enhancement of prostaglandin and NO production in the vascular endothelium, lingonberry juice also has vasodilatory effects mediated by calcium-dependent potassium channels (Figure 8). This suggests that the vasodilatory effects of lingonberry may be stronger than those of other berries.

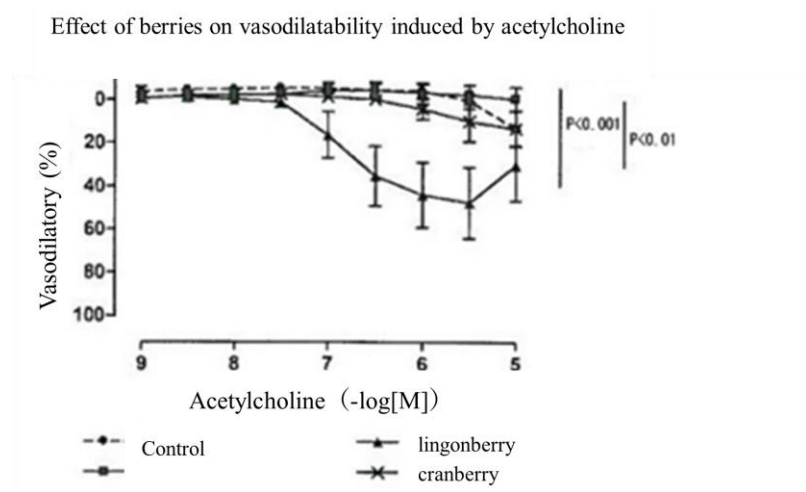


Figure 8: Effects of various berries on vascular reactivity in hypertensive rats (data provided by the author).

The polyphenol content of lingonberry juice used in the experiment (65 mg/100 g) was higher than that of black currant juice (29 mg/100 g) and cranberry juice (55.4 mg/100 g), suggesting that polyphenols are involved in vasodilation. It is also expected to improve swelling by increasing blood flow. On the other hand, a thermography study on our LINGONBERRY EXTRACT-P0.5 found that a single 100 mg dose of

LINGONBERRY EXTRACT-P0.5 promotes the recovery of limb skin surface temperature after cold stress (Figure 9). Based on the publication of this paper, we speculate that lingonberry's unique vasodilating action, which is not found in other berries, is involved in its ability to improve sensitivity to cold.



Figure 9. surface temperature immediately after cold loading (left: before ingestion of lingonberry extract-P0.5, right: after ingestion)

Kivimäki A. S. *et al.*, *J. Lingonberry juice improves endothelium-dependent vasodilation of mesenteric arteries in spontaneously hypertensive rats in a long-term intervention. Functional Foods*, (2011) in press.

6. Stability of LINGONBERRY EXTRACT

(1) Heat Stability

The heat stability of LINGONBERRY EXTRACT was conducted where the content of arbutin was the measurement standard. The high sugar nature in LINGONBERRY EXTRACT resulting in caramel formation at high temperature, however, the content of arbutin remained unchanged as illustrated below.

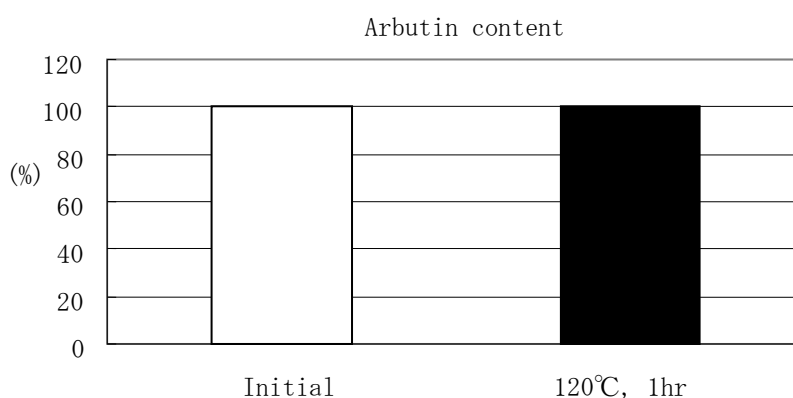


Fig. 8 Heat Stability of LINGONBERRY EXTRACT-P0.5

(2) pH Stability

The pH stability of LINGONBERRY EXTRACT was examined where 0.2% solution of LINGONBERRY EXTRACT-P0.5 was stored at different pH value at room temperature in dark for 1 week. The arbutin content of LINGONBERRY EXTRACT-P0.5 was measured. Results showed that pink color solution disappeared when pH >5, arbutin content of LINGONBERRY EXTRACT-P0.5 is stable between pH 3 - 8. Arbutin is not stable under alkaline environment.

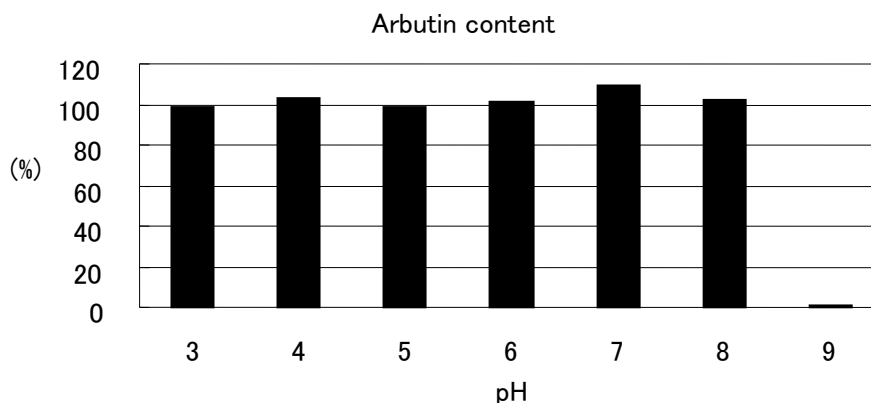


Fig. 9 pH Stability of Lingonberry Extract-P0.5 in aqueous solution

7. Nutritional Value of LINGONBERRY EXTRACT

Description	J ¹⁾	PJ ²⁾	P0.5 ³⁾	Units	Analytical method
Water	32.8	3.8	3.5	g/100g	Heat-drying at atmospheric pressure
Protein	0.4	0.2	0.3	g/100g	Kjeldahl Method
Fat	0.1	0.1	0.5	g/100g	Acid Degradation
Ash	1.3	0.5	1.1	g/100g	Direct Incineration
Carbohydrate	64.9	95.4	94.6	g/100g	⁶⁾
Energy	246	383	384	kcal/100g	Modified Atwater Method ⁷⁾
Sodium	Not tested	2	8	Mg/100g	Atomic absorption spectrophotometry

1) Data furnished by Finland manufacturer, 2) Test trustee: SRL, Inc., Date of analysis: April 24, 2008, Test No: 200804110033, 3) Test Trustee: SRL, Inc., Date of analysis: April 23, 2009, Test No: 200904170038, 4) P0.5 suitable usage, 5) Nitrogen, Protein conversion factor: 6.25, 6) Calculation: 100-(water + protein + fat + ash), 7) Energy conversion factor: protein 4, fat 9, sugar 4

8. Safety Profiles

(1) Residual Agricultural Chemicals

LINGONBERRY EXTRACT-P0.5 was tested by analysis centre in Finland with regards to the residual agricultural chemicals. LINGONBERRY EXTRACT-P0.5 is safe and conforms to the standards on 237 items stipulated.

Test Trustee: Customs Laboratory Finland
 Date of analysis: September 18, 2008
 Test No: 08-04827

(2) Acute toxicity (LD₅₀)

LINGONBERRY EXTRACT-P0.5 (2000mg/kg) was orally given to fasting male ddy mice (aged 5 weeks old) and kept for 14 days. No fatal event observed. Upon autopsy performance, no abnormalities of internal organs observed under macroscopic examination. LD₅₀ of LINGONBERRY EXTRACT-P0.5 is deduced to be >2,000 mg/kg in mice.

(3) Ames Test

Ames Test was conducted to assess the mutagenic potential of LINGONBERRY EXTRACT-P0.5 using the bacterium *S. typhimurium*, TA98 & TA100. Results showed that there is no increase in the number of colonies observed and thus LINGONBERRY

EXTRACT-P0.5 is non-mutagenic.

(4) Resveratrol

Resveratrol extracted from lingonberry fruit is usually less than 0.1%. However, there are products claiming its content of standardized resveratrol >1.0%, hence, it is believed to contain added resveratrol from external sources such as roots of Japanese knotweed (*Fallopia Japonica*).

9. Recommended dosage

The recommended daily dosage for LINGONBERRY EXTRACT-P0.5 is 50-100 mg/day

10. Commercial Applications

Category	Application	Claims / Benefits	Examples
Food	Beauty Supplement	Antioxidant, prevention of skin ailments	Beverage, hard & soft capsules, tablets, candy, chewing gum, gummy, cookies, chocolate etc.
Cosmetic	Whitening & Beautifying		Cleansing gel, toner, lotion, body gel etc.

11. Packaging

LINGONBERRY EXTRACT-J (concentrated juice, food grade)

25kg Interior packing: Aluminum-coated plastic bag
Exterior packing: Plastic container

1kg Interior packing: Aluminum-coated plastic bag (produced upon request)

LINGONBERRY EXTRACT-PJ (water-soluble concentrated juice powder, food grade)

LINGONBERRY EXTRACT-P0.5 (water-soluble powder, food grade)

5kg Interior packing: Aluminum-coated plastic bag
Exterior packing: Cardboard box

LINGONBERRY EXTRACT-PJC (water-soluble concentrated juice powder, cosmetic grade)

LINGONBERRY EXTRACT-PC0.5 (water-soluble powder, cosmetic grade)

5kg Interior packing: Aluminum-coated plastic bag
Exterior packing: Cardboard box

LINGONBERRY EXTRACT-LC (water-soluble liquid, cosmetic grade)

5kg Interior packing: Cubic polyethylene container
Exterior packing: Cardboard box

12. Storage

LINGONBERRY EXTRACT-J and LC are recommended to be stored and refrigerated below 4°C. Others to be stored in a cool, dry and dark place.

13. Expression

<Food Grade>

LINGONBERRY EXTRACT-J

Expression: Lingonberry Fruit Concentrated Juice or Vaccinium Vitis-Idaea Fruit Concentrated Juice

LINGONBERRY EXTRACT-PJ

Expression: Lingonberry Fruit Juice Powder, Vaccinium Vitis-Idaea Fruit Juice powder, or
Lingonberry Fruit Juice or Vaccinium Vitis-Idaea Fruit Juice & Dextrin

LINGONBERRY EXTRACT -P0.5

Expression: Lingonberry Extract Powder, Vaccinium Vitis-Idaea Extract Powder, or
Lingonberry Extract or Vaccinium Vitis –Idaea Extract & Dextrin

<Cosmetics Grade>

LINGONBERRY EXTRACT-PJC

INCI name: Vaccinium Vitis-Idaea Fruit Juice, Dextrin

LINGONBERRY EXTRACT-PC0.5

INCI name: Vaccinium Vitis-Idaea Fruit Extract, Dextrin

LINGONBERRY EXTRACT-LC

INCI name: Water, Butylene Glycol, Vaccinium Vitis-Idaea Fruit Juice

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-J

(FOOD)

This product is 7-fold concentrated juice from Lingonberry (*Vaccinium vitis-idaea*) fruits juice.

Appearance Dark red liquid with slightly unique smell

Purity Test

(1) Heavy Metals (as Pb₂) Max. 10 ppm (Sodium Sulfide Colorimetric Method)

(2) Arsenic (as As₂O₃) Max. 1 ppm (Standard Methods of Analysis in Food Safety Regulation, The Third Method, Apparatus B)

Standard Plate Counts Max. 1×10^3 cfu/g (Analysis for Hygienic Chemists)

Moulds and Yeasts Max. 1×10^2 cfu/g (Analysis for Hygienic Chemists)

Coliforms Negative (Analysis for Hygienic Chemists)

Composition

<u>Ingredients</u>	<u>Contents</u>
Lingonberry concentrated juice	100 %

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-PJ

(FOOD)

This product is powder prepared from juice of Lingonberry (*Vaccinium vitis-idaea*) fruits. The product is water-soluble.

<u>Appearance</u>	Pink powder with slightly unique smell									
<u>Loss on Drying</u>	Max. 10.0 %	(Analysis for Hygienic Chemists, 1g, 105°C, 2h)								
<u>Purity Test</u>										
(1) Heavy Metals (as Pb ₂)	Max. 10 ppm	(Sodium Sulfide Colorimetric Method)								
(2) Arsenic (as As ₂ O ₃)	Max. 1 ppm	(Standard Methods of Analysis in Food Safety Regulation, The Third Method, Apparatus B)								
<u>Standard Plate Counts</u>	Max. 1 × 10 ³ cfu/g	(Analysis for Hygienic Chemists)								
<u>Moulds and Yeasts</u>	Max. 1 × 10 ² cfu/g	(Analysis for Hygienic Chemists)								
<u>Coliforms</u>	Negative	(Analysis for Hygienic Chemists)								
<u>Composition</u>	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;"><u>Ingredients</u></th> <th style="text-align: right; border-bottom: 1px solid black;"><u>Contents</u></th> </tr> </thead> <tbody> <tr> <td>Maltodextrin</td> <td style="text-align: right;">50 %</td> </tr> <tr> <td><u>Lingonberry juice</u></td> <td style="text-align: right;"><u>50 %</u></td> </tr> <tr> <td>Total</td> <td style="text-align: right;">100 %</td> </tr> </tbody> </table>		<u>Ingredients</u>	<u>Contents</u>	Maltodextrin	50 %	<u>Lingonberry juice</u>	<u>50 %</u>	Total	100 %
<u>Ingredients</u>	<u>Contents</u>									
Maltodextrin	50 %									
<u>Lingonberry juice</u>	<u>50 %</u>									
Total	100 %									

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-PO. 5

(FOOD)

This product is water-soluble powder extracted and purified from Lingonberry (*Vaccinium vitis-idaea*) fruits. It guarantees minimum of 0.50% arbutin.

<u>Appearance</u>	Pink powder with slightly unique smell.									
<u>Arbutin</u>	Min. 0.50%	(HPLC)								
<u>Loss on Drying</u>	Max. 10.0 %	(Analysis for Hygienic Chemist, 1g, 105 °C,2h)								
<u>Purity Test</u>										
(1) Heavy Metals (as Pb ₂)	Max. 20 ppm	(Sodium Sulfide Colorimetric Method)								
(2) Arsenic (as As ₂ O ₃)	Max. 1 ppm	(Standard Methods of Analysis in Food Safety Regulation, The Third Method, Apparatus B)								
<u>Standard Plate Counts</u>	Max. 3 × 10 ³ cfu/g	(Analysis for Hygienic Chemists)								
<u>Moulds and Yeasts</u>	Max. 1 × 10 ³ cfu/g	(Analysis for Hygienic Chemists)								
<u>Coliforms</u>	Negative	(Analysis for Hygienic Chemists)								
<u>Composition</u>	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Ingredients</th> <th style="text-align: right; border-bottom: 1px solid black;">Contents</th> </tr> </thead> <tbody> <tr> <td>Dextrin</td> <td style="text-align: right;">50 %</td> </tr> <tr> <td>Lingonberry Extract</td> <td style="text-align: right;">50 %</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: right;">100 %</td> </tr> </tbody> </table>		Ingredients	Contents	Dextrin	50 %	Lingonberry Extract	50 %	Total	100 %
Ingredients	Contents									
Dextrin	50 %									
Lingonberry Extract	50 %									
Total	100 %									

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-PJC

(COSMETICS)

This product is powder prepared from juice of Lingonberry (*Vaccinium vitis-idaea*) fruits. The product is water-soluble.

<u>Appearance</u>	Pink powder with slightly unique smell.	
<u>Loss on Drying</u>	Max. 10.0 %	(1g, 105°C, 2h)
<u>Purity Test</u>		
(1) Heavy Metals (as Pb ₂)	Max. 10 ppm	(The Second Method of The Japanese Standards of Quasi-Drug Ingredients)
(2) Arsenic (as As ₂ O ₃)	Max. 1 ppm	(The Third Method of The Japanese Standards of Quasi-Drug Ingredients)
<u>Standard Plate Counts</u>	Max. 1 × 10 ² cfu/g	(Analysis for Hygienic Chemists)
<u>Moulds and Yeasts</u>	Max. 1 × 10 ² cfu/g	(Analysis for Hygienic Chemists)
<u>Coliforms</u>	Negative	(Analysis for Hygienic Chemists)
<u>Composition</u>	<u>Ingredients</u>	<u>Contents</u>
	Vaccinium Vitis-idaea Fruit Juice	43.5 %
	Alpha-glucan	28.25%
	<u>Dextrin</u>	<u>28.25 %</u>
	Total	100 %

Vaccinium Vitis-idaea Fruit Juice contained in the product is 7-fold concentrated lingonberry juice.

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-PC0.5

(COSMETICS)

This product is water-soluble powder extracted and purified from Lingonberry (*Vaccinium vitis-idaea*) fruits. It guarantees minimum of 0.50% arbutin.

<u>Appearance</u>	Pink powder with slightly unique smell.	
<u>Arbutin</u>	Min. 0.50%	(HPLC)
<u>Loss on Drying</u>	Max. 10.0 %	(1g, 105°C, 2h)
<u>Purity Test</u>		
(1) Heavy Metals (as Pb ₂)	Max. 20 ppm	(The Second Method of The Japanese Standards of Quasi-Drug Ingredients)
(2) Arsenic (as As ₂ O ₃)	Max. 1 ppm	(The Third Method of The Japanese Standards of Quasi-Drug Ingredients)
<u>Standard Plate Counts</u>	Max. 1 × 10 ² cfu/g	(Analysis for Hygienic Chemists)
<u>Moulds and Yeasts</u>	Max. 1 × 10 ² cfu/g	(Analysis for Hygienic Chemists)
<u>Coliforms</u>	Negative	(Analysis for Hygienic Chemists)

<u>Composition</u>	<u>Ingredients</u>	<u>Contents</u>
	Vaccinium Vitis-idaea Fruit Extract	50 %
	Dextrin	50 %
	Total	100 %

PRODUCT STANDARD

PRODUCT NAME

LINGONBERRY EXTRACT-LC

(COSMETICS)

This product is water-soluble liquid obtained by dilution of Lingonberry (*Vaccinium vitis-idaea*) fruits with aqueous 1,3-butylene glycol.

Appearance Red liquid with slight unique smell.

Purity Test

(1)Heavy Metals (as Pb₂) Max. 10 ppm (The Second Method of The Japanese Standards of Quasi-Drug Ingredients)

(2)Arsenic (as As₂O₃) Max. 1 ppm (The Third Method of The Japanese Standards of Quasi-Drug Ingredients)

Standard Plate Counts Max. 1×10² cfu/g (Analysis for Hygienic Chemists)

Moulds and Yeasts Max. 1×10² cfu/g (Analysis for Hygienic Chemists)

Coliforms Negative (Analysis for Hygienic Chemists)

Composition

<u>Ingredients</u>	<u>Contents</u>
Water	70 %
Butylene Glycol	29 %
Vaccinium Vitis-idaea Fruit Juice	1 %
Total	100 %

Vaccinium Vitis-idaea Fruit Juice contained in the product is 7-fold concentrated lingonberry juice.

ORYZA OIL & FAT CHEMICAL CO., LTD. striving for the development of the new functional food materials to promote health and general well-being.

From product planning to OEM - For any additional information or assistance, please contact :

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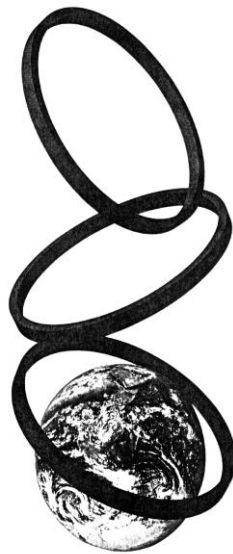
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