PERILLA SEED EXTRACT

Anti-allergy Ingredient

- PERILLA SEED EXTRACT-P
- PERILLA SEED EXTRACT-WSP
- PERILLA SEED EXTRACT-L
- PERILLA SEED EXTRACT-PC
- PERILLA SEED EXTRACT-WSPC
- PERILLA SEED EXTRACT-LC

(For cosmetic)
1. Introduction

The patients with allergies are increasing every year, and the diet is said to be one of the most important factors of this disease. Daily intake of ω-6 fatty acids, commonly found in fish or plant oil such as safflower, are accumulated as arachidonic acid which is converted to allergic mediators.

PERILLA SEED EXTRACT inhibits the production of allergic mediators, leukotrienes (LTs). The mediators are metabolites of arachidonic acid through 5-lipoxygenase (5-LO) pathway. PERILLA SEED EXTRACT selectively inhibits 5-LO activity (in vitro).

PERILLA SEED EXTRACT also inhibits type IV allergy as well as TPA-induced inflammation (in vivo).

Moreover, the serum IgE levels were suppressed by administration of PERILLA SEED EXTRACT, and allergic rhinitis, hay fever and urticaria were significantly improved on human.

2. What is Perilla Seed?

*Perilla frutescens* and a lot of herbs like lavandula belong to *Fam. LABIATAE*. Perilla seed has been cultivated in Japan, China, Korea and Southeast Asia and used as spices and also main supply for ω-linolenate rich oil.
3. The Functional Compounds of PERILLA SEED EXTRACT

The functional compounds of PERILLA SEED EXTRACT are flavonoid aglycons, such as luteolin, apigenin, chrysoeriol, and rosemarinic acid. Though flavonoids are normally exist as glycosides in the plant, perilla seeds contain aglycons. It is known that antioxidative activity and lipoxygenase inhibitory activity of flavonoid aglycons are stronger than that of corresponding glycosides.

![Fig.1 Polyphenols isolated from Perilla Seed](image)

4. Allergy and Metabolites of Arachidonic Acid

Arachidonic acid is released from cell membrane by a stimulation and converted to prostaglandins (PGs), thromboxanes (TXs), leukotrienes (LTs). LTs, the product of 5-lipoxygenase (5-LO) pathway, induce allergic reactions so that the specific inhibitors of 5-LO have the potentialities to regulate or prevent allergy and inflammation.

![Fig.2 Arachidonic Acid Cascade](image)
5. Effects of PERILLA SEED EXTRACT
5-1. Lipoxygenase Inhibitory Activity *(in vitro)*

PERILLA SEED EXTRACT control allergy and inflammatory responses due to its lipoxygenase inhibitory activity. The anti-lipoxygenase activity of PERILLA SEED EXTRACT is more than 50 times stronger than Ten-cha (Chinese tea) and more than 100 times stronger than perilla leaves. Ten-cha and perilla leaves contain mainly glycosides which anti-lipoxygenase activity is weaker than that of aglycons.

![Fig.3 5-Lipoxygenase Inhibitory Activity of Plant Extract](image)

Table 1 shows the IC₅₀ values of phenolic compounds isolated from perilla seed as well as other chemicals reported having anti-lipoxygenase activity. IC₅₀ of luteolin was 100 times stronger than that of caffeic acid isolated from olive.

**Table 1. IC₅₀ Values for Inhibition of Lipoxygenase Activities by Phenolic Compounds**

<table>
<thead>
<tr>
<th>Compound</th>
<th>IC₅₀ (µM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luteolin*</td>
<td>0.1</td>
</tr>
<tr>
<td>Chrysoeriol*</td>
<td>38.9</td>
</tr>
<tr>
<td>Rosmarinic acid*</td>
<td>6.4</td>
</tr>
<tr>
<td>Quercetin</td>
<td>0.2</td>
</tr>
<tr>
<td>Caffeic acid</td>
<td>72.0</td>
</tr>
</tbody>
</table>

*Main compounds of PERILLA SEED EXTRACT*
5-2. Anti-allergic Activity (*in vivo*)

Anti-allergic action of PERILLA SEED EXTRACT was examined by means of ear edematization test in mice. PERILLA SEED EXTRACT proved to oxazolone-induced type IV allergy. In endermatic test, luteolin have much strong inhibitory activity than other samples which are known for antihistamines or antiphlogistics.

![Graph showing the effect of PERILLA SEED EXTRACT on oxazolone-induced inflammation in mice](image)

1. Control (100%)
2. 1% PERILLA SEED EXTRACT (2weeks)
3. Luteolin (0.3mg/ear)
4. NDGA (1.0mg/ear)
5. Ketoprefen (1.0mg/ear)
6. Phenidone (1.0mg/ear)
7. Mebrophehydramine (1.0mg/ear)

**Fig.4** The Effect of PERILLA SEED EXTRACT on Oxazolone-induced Inflammation in Mice
5-3. Anti-inflammatory Activity (*in vivo*)

Anti-inflammatory action of PERILLA SEED EXTRACT was examined by edematization test in ears of mice. PERILLA SEED EXTRACT proved to inhibit on TPA-induced inflammation.

![Chart](chart.png)

1. Control (100%)
2. 1%PERILLA SEED EXTRACT (1 month)
3. Luteolin (0.3 mg/ear)
4. PERILLA SEED EXTRACT (0.5 mg/ear)
5. NDGA (0.5 mg/ear)

*Fig. 5 The Effect of PERILLA SEED EXTRACT on TPA-induced Inflammation in Mice*
5-4. Inhibitory Effect on Histamine Release (in vitro)

PERILLA SEED EXTRACT have inhibitory efficacy on histamine release. Studies on histamine release, PERILLA SEED EXTRACT have been found to inhibit the release of histamine from mast cell in a dose-dependent manner, thus PERILLA SEED EXTRACT was considered to be effective for improving symptoms of hay fever.

![Inhibitory Activity of PERILLA SEED EXTRACT on Histamine Release](image)

PERILLA SEED EXTRACT is mixture of phenolic compounds and showed synergistic inhibitory effect which was stronger than that of sodium cromoglycate, a mast cell stabilizer and other flavonoids such as catechin, quercetin and caffeic acid.

![Inhibitory Activity of PERILLA SEED EXTRACT and Compounds 2-9 on Histamine Release (125µg /ml)](image)
6. Effect on Serum IgE Level

The effect of PERILLA SEED EXTRACT on human serum IgE level was conducted. PERILLA SEED EXTRACT demonstrated selective inhibitory effect on serum IgE production as illustrated in graphs A and B below. PERILLA SEED EXTRACT has significantly reduced serum IgE level 150 mg/day, but increased again after discontinuation of PERILLA SEED EXTRACT.

![Graph A: IgE level (150mg/day for 2 weeks)](image)

**Fig.8** Serum IgE Level Before and After Administration of PERILLA SEED EXTRACT

7. Effect on Patient with Allergy

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cured</th>
<th>Significantly improved</th>
<th>Improved</th>
<th>Unchanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sneeze</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stuffed nose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blow nose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye itchy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin itchy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Graph B: IgE level (100mg/day for 4 weeks)](image)

**Fig.9** The Effect of PERILLA SEED EXTRACT on Patient with Allergy Before and After Administration of PERILLA SEED EXTRACT for Two Weeks (100mg-150mg/day)
8. Effect on Deodorization

PERILLA SEED EXTRACT has deodorizing effect on acetaldehyde, ammonia and methylmercaptan, which are commonly found in tobacco, alcohol, sweat and bad breath.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Smell Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetaldehyde</td>
<td>The smell of Tobacco and Alcohol</td>
</tr>
<tr>
<td>ammonia</td>
<td>The smell of Tobacco, Alcohol and Sweat</td>
</tr>
<tr>
<td>methylmercaptan</td>
<td>Bad breath</td>
</tr>
</tbody>
</table>

PERILLA SEED EXTRACT has demonstrated similar deodorizing effect to Oreganon powder against acetaldehyde, ammonia and methylmercaptan. Thus, PERILLA SEED EXTRACT is an effective deodorizing against tobacco, alcohol, sweat and bad breath.

(Protocol)

After deodorization sample is dissolved to distilled water, smelly substance is added. The concentration of acetaldehyde, ammonia and methylmercaptan in headspace is measured with Gas Detector Tubes.

![Graphs showing deodorization effectiveness](image)

**Fig.10** Effective against acetaldehyde  **Fig.11** Effective against ammonia

![Graph showing deodorization effectiveness](image)

**Fig.12** Effective against methylmercaptan
9. Stability of PERILLA SEED EXTRACT

9-1. Thermal Resistance

Evaluation of the heat stability of PERILLA SEED EXTRACT showed no changes in the content of polyphenols even after heating at a normal food processing temperature.

![Graph showing thermal resistance of PERILLA SEED EXTRACT](image13.png)

Fig.13  Thermal Resistance of PERILLA SEED EXTRACT

9-2. pH Stability

Polyphenols in the PERILLA SEED EXTRACT was found to be stable from acid to alkali range of pH.

![Graph showing pH stability of polyphenols](image14.png)

Fig.14  pH stability of the Polyphenols in the PERILLA SEED EXTRACT
9-2. Solubility

Stability of solubilized PERILLA SEED EXTRACT-WSP in water (pH 3.5) was examined at stipulated in the following conditions. PERILLA SEED EXTRACT-WSP was dissolved in water (pH 3.5) and stored at room temperature, 40°C and 5°C for 16 weeks and sedimentation and color change was observed.

<table>
<thead>
<tr>
<th>Add (pH 3.5)</th>
<th>Sedimentation</th>
<th>Water solubility (0.5 % solution)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sedimentation</td>
<td>Room temperature (light shielding)</td>
</tr>
<tr>
<td></td>
<td>Negative (observed in 16 weeks)</td>
<td>Negative (observed in 16 weeks)</td>
</tr>
<tr>
<td>Change color</td>
<td>Negative (observed in 16 weeks)</td>
<td>Negative (observed in 16 weeks)</td>
</tr>
</tbody>
</table>

PERILLA SEED EXTRACT-WSP was without any sedimentation and color change observed in 16 weeks.

10. Daily Dosage of PERILLA SEED EXTRACT

PERILLA SEED EXTRACT-P (powder) PERILLA SEED EXTRACT-WSP (powder) PERILLA SEED EXTRACT-L (liquid) 100~150mg/day 150~225mg/day

11. Nutrition Facts of PERILLA SEED EXTRACT

<table>
<thead>
<tr>
<th>Items Analyzed</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>3.1 g/100g</td>
</tr>
<tr>
<td>Protein*1</td>
<td>0.9 g/100g</td>
</tr>
<tr>
<td>Fat</td>
<td>0.2 g/100g</td>
</tr>
<tr>
<td>Ash</td>
<td>0.8 g/100g</td>
</tr>
<tr>
<td>Available carbohydrate*2</td>
<td>95.0 g/100g</td>
</tr>
<tr>
<td>Energy*3</td>
<td>385 kcal/100g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>0 g/100g</td>
</tr>
<tr>
<td>Sodium</td>
<td>7.1 mg/100g</td>
</tr>
</tbody>
</table>

*1 = N ÷ 6.25
*2 = 100-(Moisture + Protein + Fat + Ash + Dietary fiber)
*3 Factors for calculating the energy value:
- Protein - 4, Fat - 9, Available carbohydrate -4

Tested by: Japan Food Research Center Foundation
Research result issue number: 397060549-001
12. Residual Agricultural Chemicals

<table>
<thead>
<tr>
<th>Assayed Items</th>
<th>Results</th>
<th>Detection Limits</th>
<th>Assay Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHC</td>
<td>Not Detected</td>
<td>0.02ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>DDT</td>
<td>Not Detected</td>
<td>0.02ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Aldrin</td>
<td>Not Detected</td>
<td>0.01ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>Not Detected</td>
<td>0.01ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Endrin</td>
<td>Not Detected</td>
<td>0.01ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Diazinon</td>
<td>Not Detected</td>
<td>0.05ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Parathion</td>
<td>Not Detected</td>
<td>0.05ppm</td>
<td>Gas Chromatography</td>
</tr>
<tr>
<td>Malathion</td>
<td>Not Detected</td>
<td>0.05ppm</td>
<td>Gas Chromatography</td>
</tr>
</tbody>
</table>

Tested by: Japan Food Research Center Foundation
Research results issue number 397060549-002

13. Acute Toxicity and Safety

13-1. Acute Toxicity

After administering 2,000 mg/kg for 2 weeks, no toxic effects were observed, thus the LD_{50} (mouse) is more than 2000 mg/kg.

After administering 7.0g/day for two consecutive weeks on human, no toxic effects were observed.

13-2. Primary Cutaneous Irritation Test on the Albino Rabbit.

PERILLA SEED EXTRACT was applied on normal skin in 3 rabbits for 4 hours. The methodology indicated in the Official EEC Gazette of September 19, 1984 was used in this study. Examination of the skin at hour 1, 24, 48 and 72 after removed of the dressing reveals the absence of a desquamation reaction or a reduction in the cutaneous extensive range. The local tolerance is good. In these conditions, the product can be rated as: NON IRRITANT.

13-3. Test to Assess the Sensitizing Power on the Albino Guinea Pig.

PERILLA SEED EXTRACT at the Maximum Non Irritant Concentration did not display any sensitizing potential in the animals tested. The positive reference (1-chloro -2-4 dinitrobenzene 1 %), tested in the same conditions displayed 100% of positive reactions. The product in accordance with the method described in the protocol displays a VERY SLIGHT sensitizing power in the albino guinea pig.

13-4. Ocular Irritation Test.

PERILLA SEED EXTRACT was instilled in the fornix of the conjunctiva of 3 rabbits, by a 0.1 ml dosage. The eye was not rinsed. The procedure used in this study complies with OECD guidelines No 405 of February 24, 1987 and EEC guidelines 67/548. In these conditions, the product is rated as: SLIGHTLY IRRITANT.
13-5. Ocular Irritation Test.
0.03 g of PERILLA SEED EXTRACT -LC was spread over film. The film was patched on 12 subjects for just stick and 24 hours. No irritation on skin of human ware found.
14. Practical Applications of PERILLA SEED EXTRACT

<table>
<thead>
<tr>
<th>Applications</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confectionery</td>
<td>Candies, Gum, Cookies, Pudding, Jelly, Yogurt and Chocolate.</td>
</tr>
<tr>
<td>Drinks</td>
<td>Tea, Blended tea, Functional drinks and Nutritional drinks.</td>
</tr>
<tr>
<td>Others</td>
<td>Functional foods, Health foods and Nutraceutical foods.</td>
</tr>
<tr>
<td>Cosmetics</td>
<td>Base cosmetics (Lotion, Milk, Cream, and so on)</td>
</tr>
<tr>
<td></td>
<td>Body cosmetics (Body lotion, Body cream, and so on)</td>
</tr>
<tr>
<td></td>
<td>Cleansing cosmetics (Soap, and so on)</td>
</tr>
<tr>
<td></td>
<td>Make up cosmetics (Lipstick, Foundation, and so on) and so on.</td>
</tr>
</tbody>
</table>

15. Packing

PERILLA SEED EXTRACT-P (Powder, for food)
PERILLA SEED EXTRACT-WSP (Powder, for food)
5kg Interior packaging: a double-layered plastic plastic bag, can
Exterior packaging: cardboard box
PERILLA SEED EXTRACT-L (Liquid, for food)
5kg Interior packaging: cubic polyethylene container
Exterior packaging: cardboard box
PERILLA SEED EXTRACT-LC (Liquid, for cosmetics)
5kg Interior packaging: cubic polyethylene container
Exterior packaging: cardboard box

16. Storing Method

Store in cool, dry place. Avoid humidity

17. Expression of PERILLA SEED EXTRACT

PERILLA SEED EXTRACT
*Please refer to your nation's standard.

18. Others

PERILLA SEED EXTRACT-LC is recommended for cosmetics.
CTFA FILE NUMBER : 426
INCI name : Water (and) Butylene Glycol (and) Perilla Ocymoides Seed Extract
19. United States Patent

Murai et al.

(54) INHIBITORS OF LIPOXGENASE

(75) Inventors: Hirochika Murai, Ichinomiya; Tadashi Okuda, Gifu-ken; Hiroyo Yamamoto, Ichinomiya, all of (JP)

(73) Assignee: Oryza Oil & Fat Chemical Co., Ltd., Aichi-ken (JP)

(1) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/053,064

(22) Filed: Apr. 1, 1998

(30) Foreign Application Priority Data

App. 23, 1997 (JP) 9-089959

(51) Int. Cl.: A61K 38/78

(52) U.S. Cl.: 424/195.1

(58) Field of Search: 424/195.1

(56) References Cited

U.S. PATENT DOCUMENTS

4,678,964 * 11/1987 Allen 514/533
5,043,332 * 8/1991 Bombardelli et al. 514/25
5,858,571 * 1/1999 Singh et al. 424/195.1

FOREIGN PATENT DOCUMENTS


OTHER PUBLICATIONS


* cited by examiner

Primary Examiner—Jean C. Witz

(74) Attorney, Agent, or Firm—Lowe Hauptman Gilman & Berner, LLP

(57) ABSTRACT

Novel inhibitors of the enzyme action of lipoxigenase, especially 5-lipoxigenase and 12-lipoxigenase that are derived from the extraction of the seeds of the perilla (crispa) or perilla (frutescens) plant. These inhibitors are suitably extracted from these seeds using alcohol, preferably ethanol, to form an extract or more preferably to further extract the alcoholic extract with ethyl acetate and water to partition the active inhibitors to the ethyl acetate. The particularly preferred inhibitors are luteolin and chrysoeriol.

24 Claims, 8 Drawing Sheets
PRODUCT STANDARD

PRODUCT NAME

PERILLA SEED EXTRACT-P
(FOOD)

The product is extracted with aqueous ethanol from the seeds of perilla (*Perilla frutescens var. japonica*, *P. frutescens var. frutescens* or *Perilla frutescens var. crispa*). It includes more than 3.0% of polyphenols.

1. Appearance
   It is yellowish powder with slightly unique smell.

2. Certification Test
   Flavonoid
   To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow. (DAVIS method)

3. Content of Polyphenols
   Min. 3.0% (Folin-Denis method)

4. Loss on Drying
   Max. 5.0% (Analysis for Hygienic Chemists, 1g, 105 ºC, 2h)

5. Purity Test
   (1) Heavy Metals
   Max. 30 ppm (The Japanese Standards for Food Additives)
   (2) Arsenic
   Max. 1 ppm
   (Standard Methods of Analysis in Food Safety Regulation)

6. Standard Plate Counts
   Max. 1 × 10³ cfu/g (Analysis for Hygienic Chemists)

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

8. Coliforms
   Negative (Analysis for Hygienic Chemists)

9. Composition
<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perilla seed extract</td>
<td>30 %</td>
</tr>
<tr>
<td>Dextrin</td>
<td>70 %</td>
</tr>
<tr>
<td>Total</td>
<td>100 %</td>
</tr>
</tbody>
</table>
The product is extracted with aqueous ethanol from the seeds of perilla (*Perilla frutescens var. japonica*, *P.frutescens var.frutescens* or *Perilla frutescens var.crispa*). It includes more than 3.0 % of polyphenols. This product is water-soluble.

1. **Appearance**
   It is yellowish powder with slightly unique smell.

2. **Certification Test**
   **Flavonoid**
   To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow. (DAVIS method)

3. **Content of Polyphenols**
   Min. 3.0% (Folin-Denis method)

4. **Loss on Drying**
   Max. 5.0% (Analysis for Hygienic Chemists, 1g, 105°C, 2h)

5. **Purity Test**
   (1) **Heavy Metals**
   Max. 30 ppm (The Japanese Standards for Food Additives)
   (2) **Arsenic**
   Max. 1 ppm (Standard Methods of Analysis in Food Safety Regulation)

6. **Standard Plate Counts**
   Max. $1 \times 10^3$ cfu/g (Analysis for Hygienic Chemists)

7. **Moulds and Yeasts**
   Max. $1 \times 10^2$ cfu/g (Analysis for Hygienic Chemists)

8. **Coliforms**
   Negative (Analysis for Hygienic Chemists)

9. **Composition**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perilla seed extract</td>
<td>30 %</td>
</tr>
<tr>
<td>Dextrin</td>
<td>70 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
</tr>
</tbody>
</table>
The product is extracted with aqueous ethanol from the seeds of perilla (Perilla frutescens var. japonica, P. frutescens var. frutescens or Perilla frutescens var. crispa). It includes more than 2.0% of polyphenols.

1. Appearance
   It is dark brown liquid with unique smell.

2. Certification Test
   Flavonoid
   To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow. (DAVIS method)

3. Content of Polyphenols
   Min. 2.0% (Folin-Denis method)

4. Residue on Evaporation
   18.0—22.0% (Analysis for Hygienic Chemists)

5. Purity Test
   (1) Heavy Metals
   Max. 20 ppm (The Japanese Standards for Food Additives)
   (2) Arsenic
   Max. 1 ppm
   (Standard Methods of Analysis in Food Safety Regulation)

6. Standard Plate Counts
   Max. $1 \times 10^3$ cfu/g (Analysis for Hygienic Chemists)

7. Moulds and Yeasts
   Max. $1 \times 10^2$ cfu/g (Analysis for Hygienic Chemists)

8. Coliforms
   Negative (Analysis for Hygienic Chemists)

9. Composition

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perilla seed extract</td>
<td>20%</td>
</tr>
<tr>
<td>Ethanol</td>
<td>50%</td>
</tr>
<tr>
<td>Purified water</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>
The product is extracted with aqueous ethanol from the seeds of perilla (*Perilla frutescens var. japonica*, *P. frutescens var. frutescens* or *Perilla frutescens var. crispa*). It includes more than 3.0% of polyphenols.

1. Appearance
   - It is yellowish powder with slightly unique smell.

2. Certification Test
   - **Flavonoid**
     - To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow. (DAVIS method)

3. Content of Polyphenols
   - Min. 3.0% (Folin-Denis method)

4. Loss on Drying
   - Max. 5.0% (1g, 105°C, 2 h)

5. Purity Test
   - (1) Heavy Metals
     - Max. 30 ppm (The Second Method)
   - (2) Arsenic
     - Max. 1 ppm (The Third Method)

6. Standard Plate Counts
   - Max. $1 \times 10^2$ cfu/g (Analysis for Hygienic Chemists)

7. Moulds and Yeasts
   - Max. $1 \times 10^2$ cfu/g (Analysis for Hygienic Chemists)

8. Coliforms
   - Negative (Analysis for Hygienic Chemists)

9. Composition
   - | Ingredients          | Contents |
     |----------------------|---------|
     | Dextrin              | 70 %    |
     | Perilla seed extract | 30 %    |
     | Total                | 100 %   |
PRODUCT STANDARD

PRODUCT NAME

PERILLA SEED EXTRACT-WSPC
(COSMETIC)

The product is extracted with aqueous ethanol from the seeds of perilla (Perilla frutescens var. japonica, P. frutescens var. frutescens or Perilla frutescens var. crispa). It includes more than 3.0% of polyphenols. This product is water-soluble.

1. Appearance
   It is yellowish powder with slightly unique smell.

2. Certification Test
   Flavonoid
   To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow.
   (DAVIS method)

3. Content of Polyphenols
   Min. 3.0% (Folin-Denis method)

4. Loss on Drying
   Max. 5.0% (1g, 105°C, 2h)

5. Purity Test
   (1) Heavy Metals
      Max. 30 ppm (The Second Method)
   (2) Arsenic
      Max. 1 ppm (The Third Method)

6. Standard Plate Counts
   Max. \(1 \times 10^2\) cfu/g (Analysis for Hygienic Chemists)

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

8. Coliforms
   Negative (Analysis for Hygienic Chemists)

9. Composition
<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dextrin</td>
<td>70 %</td>
</tr>
<tr>
<td>Perilla seed extract</td>
<td>30 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
</tr>
</tbody>
</table>


PRODUCT STANDARD

PRODUCT NAME

PERILLA SEED EXTRACT-LC
(COSMETIC)

The product is extracted with aqueous ethanol from the seeds of perilla (Perilla frutescens var. japonica, P. frutescens var. frutescens or Perilla frutescens var. crispa). It includes more than 2.0% of polyphenols.

1. Appearance
   It is dark brown liquid with unique smell.

2. Certification Test
   Flavonoid
   To 1.0g of this product, add 8.5ml of 90% diethlene glycol and 0.5ml of 1N NaOH. Then it changes yellow. (DAVIS method)

3. Content of Polyphenols
   Min. 2.0% (Folin-Denis method)

4. Residue on Evaporation
   18.0~22.0% (Analysis for Hygienic Chemists)

5. Purity Test
   (1) Heavy Metals
      Max. 30 ppm (The Second Method)
   (2) Arsenic
      Max. 1 ppm (The Third Method)

6. Standard Plate Counts
   Max. 1 x 10^2 cfu/g (Analysis for Hygienic Chemists)

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

8. Coliforms
   Negative (Analysis for Hygienic Chemists)

9. Composition

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butylene Glycol</td>
<td>69 %</td>
</tr>
<tr>
<td>Water</td>
<td>30 %</td>
</tr>
<tr>
<td>Perilla Seed Extract</td>
<td>1 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 %</strong></td>
</tr>
</tbody>
</table>
ORYZA OIL & FAT CHEMICAL CO., LTD. striving for the development of the new functional food materials to promote your health.

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

Headquarters:
ORYZA OIL & FAT CHEMICAL CO., LTD.
No.1, Numata Kitagata-cho, Ichinomiya-city, Aichi-pref.,
493-8001 JAPAN
TEL : +81 (0) 586 86 5141
FAX : +81 (0) 586 86 6191
URL/http : //www.oryza.co.jp/
E-mail : info@oryza.co.jp

Tokyo sales office:
5F of Big Tokyo Building, Kanndasuda-cho 1-24-10
Chiyoda-ku, Tokyo, 101-0041 Japan
TEL (03)5209-9150 FAX (03)5209-9151
E-mail: tokyo@oryza.co.jp

*The unapproved copy of this catalogue and appropriation are forbidden except for the exception on the Copyright Act.
*The contents of this catalogue may be changed without prior notice.

Established Date: September 1, 1997
Revised Date: August 7, 2009