Specification Sheet of Blueberry Extract

Product Definition

Blueberry Extract is a natural plant extract produced from fresh or frozen fruits of **Vaccinium corymbosum L.** (Ericaceae, Vaccinium) using standardized industrial processes including sorting, washing, crushing, extraction, filtration, purification, concentration, drying, and milling.

The product is rich in active ingredients such as **anthocyanins (calculated as cyanidin-3-O-glucoside)**, total polyphenols, and proanthocyanidins, retaining the original nutritional and physiological activities of blueberries.

It complies with industry standards for food, health food, cosmetic, and pharmaceutical raw materials, and can be widely used in multiple fields.

1. Basic Product Information

- Product Name: Blueberry Extract
- English Name: Blueberry Extract
- CAS No.: 84082-34-8 (crude extract); 137-66-6 (cyanidin-3-O-glucoside)
- Botanical Source: *Vaccinium corymbosum L.* (Ericaceae, Vaccinium)
- Part Used: Fresh or frozen fruit (dried fruit available for customization)

2. Core Specifications

- Anthocyanins (calculated as cyanidin-3-O-glucoside, UV/HPLC): 5%, 10%, 25%, 40%
- Extraction Ratio: 5:1, 10:1, 20:1
- Total Polyphenols (calculated as gallic acid): 10% – 50%
- Proanthocyanidins: 5% – 30%

3. Physicochemical Properties

- Appearance: Fine dark purple-red to purple-black powder, no visible foreign impurities, characteristic blueberry aroma, no off-odor or caking
- Particle Size: 100% passes 80 mesh; 100 – 200 mesh available upon request
- Loss on Drying: ⩽5%
- Residue on Ignition: ⩽5%
- Bulk Density: 0.2 – 0.4 g/mL
- Solubility: Soluble in warm water, 30% – 50% ethanol; partly soluble in methanol; insoluble in petroleum ether, diethyl ether

4. Hygienic Standards

- Total Heavy Metals: ⩽10 ppm
- Lead (Pb): ⩽3 ppm; Arsenic (As): ⩽2 ppm; Cadmium (Cd): ⩽1 ppm
- Microbial Limits: Complies with national/enterprise standards; no pathogenic bacteria

5. Applications

1. **Functional Foods**: Used in tablets, solid drinks, oral liquids, meal replacements, fruit-flavored foods, etc., for antioxidant, vision-protective, and phytochemical-supplementing functions.
2. **Health Foods**: Raw material for antioxidant, immunity-enhancing, vision-protective, and memory-improving formulations.
3. **Cosmetics**: Used in serums, creams, masks, and toners for anti-oxidation, anti-aging, brightening, and soothing repair.
4. **Pharmaceutical Intermediates**: Used in traditional Chinese medicine combinations, chemical excipients, and new drug R&D for antioxidant, anti-inflammatory, cardiovascular, and eye health support.
5. **Others**: Dietary supplements, pet health products, feed additives, etc.

6. Packaging

- 1 kg aluminum foil bag; 25 kg fiber drum

7. Storage

- Store in a cool, dry, dark, and sealed place.

8. Shelf Life

- 24 months

Nutritional Composition Table of Blueberry Extract

This nutritional table is compiled based on testing standards and industrial data for **blueberry anthocyanins (new food raw material, total anthocyanins ⩾40%)** and mainstream high-purity blueberry extract powder.
It is applicable for quality control and labeling of health food and functional food raw materials.

1. Basic Nutritional Information (per 100 g)

Item	Value	NRV%
Energy	295 kJ / 70 kcal	3.5%
Protein	1.2 g	2.4%
Fat	0.3 g	0.5%
— Saturated Fat	0.1 g	0.5%
— Trans Fat	0 g	—
Carbohydrates	16.5 g	5.5%
— Total Sugars	8.2 g	—
— Dietary Fiber	3.5 g	14.0%
Sodium	5 mg	0.3%

2. Core Active Components (per 100 g)

(1) Anthocyanins

(Total Anthocyanins, calculated as cyanidin-3-O-glucoside chloride)

- Total Anthocyanins: ⩾40.0 g (new food raw material standard)
- Main monomers (as % of total anthocyanins):
  - Cyanidin-3-galactoside: 35% – 45%
  - Delphinidin-3-galactoside: 20% – 30%
  - Malvidin-3-galactoside: 10% – 15%
  - Peonidin-3-galactoside: 5% – 10%
  - Petunidin-3-galactoside: 3% – 8%

(2) Polyphenols & Flavonoids

Component	Content
Total Polyphenols	50 – 80 g
Total Flavonoids	10 – 25 g
Proanthocyanidins (PAC)	15 – 30 g
Quercetin & Derivatives	2 – 5 g
Chlorogenic Acid	1 – 3 g
Caffeic Acid	0.5 – 1.5 g
p-Coumaric Acid	0.3 – 0.8 g

3. Vitamins (per 100 g)

Vitamin	Content
Vitamin C (Ascorbic Acid)	0.1 – 1.0 g
Vitamin E (α-TE)	50 – 200 mg
Vitamin B2	1 – 5 mg
Vitamin K1	0.1 – 0.5 mg

4. Minerals (per 100 g)

Mineral	Content
Potassium (K)	500 – 1500 mg
Calcium (Ca)	200 – 800 mg
Magnesium (Mg)	100 – 500 mg
Phosphorus (P)	100 – 400 mg
Iron (Fe)	10 – 50 mg
Zinc (Zn)	5 – 20 mg
Manganese (Mn)	2 – 10 mg
Copper (Cu)	0.5 – 3 mg
Selenium (Se)	0.05 – 0.2 mg

5. Safety Limits (per 100 g)

Item	Limit
Lead (Pb)	≤0.1 mg
Cadmium (Cd)	≤0.05 mg
Arsenic (As, inorganic)	≤0.1 mg
Mercury (Hg)	≤0.01 mg
Total Plate Count	≤1000 CFU/g
Molds & Yeasts	≤100 CFU/g
Coliforms	≤10 MPN/g
Salmonella	Negative in 25 g

Manufacturing Process Analysis & Manufacturing Process Flow Chart of Blueberry Extract

☼ Manufacturing Process Analysis of Blueberry Extract

This process adopts international mainstream industrial production standards, combining green extraction technology and refined purification.

The core objective is to **maximally retain anthocyanins, polyphenols, and other active components** while controlling impurities, complying with EU and US FDA regulations.

It is suitable for large-scale production of high-purity Blueberry Extract (total anthocyanins ⩾25%).

The whole process follows **low-temperature and low-oxygen conditions** to avoid oxidative degradation and ensure stable quality.

Ⅰ. Core Process Principles

1. **Priority on Active Ingredient Retention**:

Low temperature (⩽50° C), light-proof operation, and acidic system to stabilize anthocyanins and reduce thermal/oxidative degradation.

2. **Green & Efficient Extraction**:

Natural Deep Eutectic Solvents (NADES) or food-grade ethanol, assisted by ultrasound for high efficiency and eco-friendliness.

3. **Refined Purification & Impurity Removal**:

Macroporous resin purification and multi-stage filtration to remove sugars, organic acids, and macromolecular impurities.

4. **Full-Process Quality Control**:

Critical Control Points (CCP) at each stage, strictly following GMP and international food standards.

Ⅱ. Detailed Process Steps

1) Raw Material Pretreatment

High-quality fresh or frozen blueberries (maturity ⩾85%) are sorted, washed, and drained.

They are frozen and crushed to 20 – 40 mesh at −18° C to break cell walls and reduce oxidation.

Microbiological testing (TPC ⩽1000 CFU/g) is performed before proceeding.

2) Gradient Temperature Enzymolysis (Optional)

Raw material is mixed with purified water (solid-liquid ratio 1:20).

A compound enzyme system (cellulase + pectinase, 0.3% – 0.5%) is added.

- Stage 1: 38±1° C for 15 – 30 min
- Stage 2: 50±1° C for 45 – 90 min

- Stage 3: 42±1° C for 20 − 30 min

Enzymes are inactivated at 90° C for 10 min.

This step increases extraction yield by 15% − 20%.

3) Ultrasound-Assisted Extraction (Core Step)

Betaine/urea NADES or 70% food-grade acidic ethanol (pH 3.0 − 3.5) is used.

Solid-liquid ratio: 1:30; ultrasound power: 330 W; temperature: 50° C; time: 30 min.

Extracted 1 − 2 times; extracts combined.

Extraction rate >90%, 44% higher than traditional methods.

4) Filtration & Clarification

- Plate-and-frame filtration (0.22 μm)
- Centrifugation (3000 r/min, 15 min)
- Ultrafiltration (1000 Da MWCO)

To remove residues, proteins, and pectin.

5) Vacuum Concentration

Dual-effect vacuum concentration at ⩽50° C, vacuum 0.07 − 0.09 MPa.

Concentrated to relative density 1.15 − 1.20 (25° C).

Ethanol residue ⩽500 ppm.

6) Purification & Enrichment (Core Step)

Macroporous resin AB-8 / D101.

- Adsorption: 2 − 3 BV/h
- Wash with water: 3 − 4 BV/h
- Elute with 60% − 70% acidic ethanol: 2 BV/h

Total anthocyanins enriched to ⩾25%.

7) Secondary Concentration

Eluate concentrated to relative density 1.25 − 1.30 (25° C), moisture ⩽10%.

8) Freeze Drying

- Pre-freezing: −40° C for 4 − 6 h
- Sublimation: −20° C to 0° C, 8 − 10 h
- Desorption: 0 − 5° C, 2 − 3 h

Final moisture ⩽5.0%.

9) Milling, Sieving & Blending

Milled to 80 − 100 mesh, blended for 15 − 20 min to ensure uniformity.

10) Testing, Packaging & Storage

Finished products tested for anthocyanins, polyphenols, moisture, ash, microbes, and heavy metals.

Packed in food-grade aluminum foil bags or fiber drums.

Stored in cool, dry, dark conditions (≤25° C).

Shelf life: 24 months.

Ⅲ. Critical Control Points (CCP)

CCP	Control Items	Requirements
Raw Material Pretreatment	Purity & Microbiology	No rot/mold; TPC ≤1000 CFU/g
Ultrasound Extraction	Temp, time, ratio	≤50° C; 30 min; solid-liquid ratio 1:30
Vacuum Concentration	Temp, vacuum, solvent residue	≤50° C; 0.07 – 0.09 MPa; ethanol ≤500 ppm
Freeze Drying	Moisture, activity retention	Moisture ≤5.0%; anthocyanin retention ≥90%
Finished Product Testing	Activity & safety	Total anthocyanins ≥25%; complies with int'l standards

Notes

1. Gradient enzymolysis is optional and does not affect core quality.
2. NADES (eco-friendly) or food-grade ethanol can be used based on client requirements.
3. All steps comply with GMP and international food manufacturing standards.

☼ Manufacturing Process Flow Chart of Blueberry Extract

