Guidelines for the Application and Dosing of Green Tea Extract

I. General Provisions

1.1 Scope of Application

This guideline applies to the dosing and application of green tea extract with **tea polyphenols (mainly EGCG)**, tea polysaccharides, and theanine as core active components in six major fields:

food, cosmetics, pharmaceutical & healthcare products, oral care, pet health, and agricultural applications.

It covers the entire process including raw material selection, dosage control, process operation, quality control, and safety & compliance, providing professional operational guidance for large-scale and standardized production.

1.2 Core Basis

- **Food**: GB 2760 *National Food Safety Standard – Standards for the Use of Food Additives*; GB 1886.211 *Food Additive – Tea Polyphenols*; regulations for novel food ingredients (EGCG, catechins)
- **Cosmetics**: *Safety and Technical Standards for Cosmetics*; EU ECOCERT; US GRAS certification
- **Pharmaceuticals & Healthcare Products**: National Medicine Approval standards; *Measures for the Registration and Filing of Health Food*
- **Agriculture / Pet**: Relevant standards of the Ministry of Agriculture and Rural Affairs; hygienic specifications for pet food

1.3 Definitions

- **Green Tea Extract**: A natural extract produced from authentic green tea (*Camellia sinensis*) via water extraction–alcohol precipitation, supercritical CO_2 extraction, membrane separation, etc.

Core active components: tea polyphenols (30%–80%), tea polysaccharides (5%–15%), theanine (1%–5%).

- **Dosage**: Content of active ingredients in the final product calculated as tea polyphenols / EGCG / tea polysaccharides / theanine, in units of g/kg, %, mg per serving.
- **Operational Control Points**: Raw material acceptance, pre-dissolution, timing of addition, mixing uniformity, stability testing, finished product release.

II. Raw Material Selection and Acceptance Criteria

2.1 Raw Material Classification and Selection

Application	Recommended Grade	Core Specifications	Suitable Processes
Food	Food grade	Tea polyphenols ⩾50%, EGCG ⩾30%, moisture ⩽8%, no solvent residues	Water extraction–alcohol precipitation, membrane separation
Cosmetics	Cosmetic grade	Tea polyphenols ⩾70%, EGCG ⩾40%, heavy metals ⩽10ppm, compliant microbial limits	Supercritical CO_2 extraction, microencapsulation
Pharma & Healthcare	Pharmaceutical / Healthcare grade	Tea polyphenols ⩾90%, EGCG ⩾50%, purity ⩾98%, sterile	Supercritical CO_2 extraction, chromatographic purification
Oral Care	Food / Cosmetic grade	Tea polyphenols ⩾60%, odorless, good solubility	Water extraction–alcohol precipitation, membrane separation
Pet Health	Food grade	Tea polyphenols ⩾50%, good palatability, non-irritating	Water extraction–alcohol precipitation
Agriculture	Industrial grade	Tea polyphenols ⩾20%, cost-effective, high stability	Water extraction–alcohol precipitation

2.2 Raw Material Acceptance Process

- **Document review**: Supplier provides QC reports, purity certificates, pesticide residue / heavy metal reports, and compliance certificates.
- **Organoleptic inspection**: Uniform powder or liquid, no caking, no odor, no impurities, color conforms to standards.
- **Key index testing**: Content of tea polyphenols / EGCG / tea polysaccharides / theanine, moisture, pH, solubility, microbial limits.
- **Retention sample management**: ⩾1kg retained per batch; storage period ⩾ shelf life + 6 months.

III. Dosing and Operation Specifications by Field

3.1 Food (Natural Preservation & Functional Upgrade; Core: Tea Polyphenols + Tea Polysaccharides)

3.1.1 Food Preservation (Meat Products, Fruits & Vegetables)

- **Dosage**:
  - Meat products (ham, sausage): tea polyphenols ⩾50%, dosage **0.1%–0.2% (0.3 g/kg)**
  - Fruits & vegetables (strawberry, grape): tea polyphenols ⩾40%, compounded with VC, soaking concentration **0.1%–0.15%**
- **Process**:

♣ Pre-dissolution: green tea extract + food-grade ethanol/water + citric acid (0.05%), stir until fully dissolved to prepare working solution.

♣ Application: spray or soak meat for 3–5 min; soak fruits/vegetables for 10 min, drain and package.

♣ Control points: uniform concentration, accurate soaking time, no residual liquid after draining, sealed packaging.

- **Compliance**: In line with GB 2760 maximum limits (meat ⩽0.3 g/kg, oil ⩽0.4 g/kg).

3.1.2 Functional Beverages (Antioxidant, Sugar Control)

- **Dosage**:
  - Regular green tea drink: tea polyphenols ⩾0.2 g/L, suitable amount of theanine
  - Sugar-control drink: tea polyphenols ⩾0.3 g/L + tea polysaccharides ⩾0.1 g/L, sugar-free formula
- **Process**:

♣ Pre-dissolve in purified water at 40–50°C, stir 15 min until clear, filter to remove impurities.

♣ Add during mid-formulation, mix with juice / sweetener / electrolytes; avoid high temperature (⩽80°C).

♣ Control points: dissolution temperature, filtration accuracy (⩾0.22 μm), mixing uniformity, pH 5.5–7.0.

- **Verification**: Antioxidant activity, no bitter taste, stability during shelf life.

3.1.3 Baked Food (Bread, Pastry)

- **Dosage**: tea polyphenols ⩾30%, dosage **0.05%–0.1%**, used with green tea powder.
- **Process**:

♣ Pre-mix with flour/sugar, or dissolve in water and add to dough.

♣ Add during dough mixing; avoid high-temperature baking (⩽180°C) to prevent activity loss.

♣ Control points: dry mixing uniformity, dough pH, baking temperature/time.

- **Verification**: Extended shelf life, no rancidity, rich green tea flavor.

3.2 Cosmetics (Whitening, Anti-Aging, Soothing & Repair; Core: Tea Polyphenols + Theanine)

3.2.1 Whitening & Spot Fading (Serum, Mask)

- **Dosage**:
  - Serum: tea polyphenols ⩾5%, EGCG ⩾3%, compounded with 5% niacinamide
  - Mask: tea polyphenols ⩾8%, compounded with hyaluronic acid
- **Process**:

♣ Pre-dissolve in propylene glycol/water (1:3) at 40–50°C, stir until transparent.

♣ Add after emulsification when cooled below 45°C; avoid direct contact with strong acids/alkalis.

♣ Control points: temperature, addition order, uniformity, pH 5.0–6.5.

- **Compliance**: Meets *Safety and Technical Standards for Cosmetics*, no prohibited ingredients, compliant microbes.

3.2.2 Antioxidant & Anti-Aging (Cream, Serum)

- **Dosage**: tea polyphenols ⩾10%, EGCG ⩾6%, compounded with retinol / pro-xylane
- **Process**:

♣ Optional microencapsulation: 50–200 nm microcapsules to improve transdermal absorption.

♣ Add after oil/water mixing at ⩽40°C, stir 30 min until uniform.

♣ Control points: capsule size, mixing speed, stability, active retention.

- **Verification**: Improved elasticity, reduced fine lines, decreased oxidative damage.

3.2.3 Soothing & Repair (Cream, Spray)

- **Dosage**: tea polyphenols ⩾2%–3% + theanine ⩾2%, compounded with ceramides / oat glucan
- **Process**:

♣ Dissolve in aqueous phase at 45°C, filter to remove impurities.

♣ Add during aqueous phase preparation with soothing ingredients; avoid high temperature.

♣ Control points: clarity, uniformity, mildness (non-irritating).

- **Verification**: Reduced redness, barrier repair, sensitive skin adaptability ⩾95%.

3.3 Pharmaceutical & Healthcare Products (Precision Conditioning, Clinical Evidence; Core: Tea Polyphenols + Tea Polysaccharides)

3.3.1 Cardiovascular & Cerebrovascular Care (Capsules, Tablets)

- **Dosage**: tea polyphenols ⩾90%, EGCG ⩾50%, 100–300 mg per capsule/tablet
- **Process**:

♣ Grind and sieve (100 mesh), mix with excipients (microcrystalline cellulose, magnesium stearate).

♣ Capsule filling / tableting; weight variation ⩽±5%.

♣ Control points: purity, uniformity, disintegration time, content uniformity.

- **Compliance**: National Medicine Approval / Health Food certification, clinical support, heavy metals ⩽2 ppm.

3.3.2 Immune Regulation & Liver Protection (Oral Liquid, Powder)

- **Dosage**: tea polysaccharides ⩾10% + tea polyphenols ⩾5%, compounded with wolfberry extract
- **Process**:

♣ Dissolve in purified water at 50°C, stir, filter for sterilization.

♣ Add sweetener/stabilizer, adjust pH 6.0–7.0, aseptic filling.

♣ Control points: clarity, aseptic processing, filling accuracy, stability.

- **Verification**: Improved immune indices, reduced liver injury markers.

3.3.3 Adjuvant Treatment of Oral Inflammation (Oral Gel)

- **Dosage**: tea polyphenols ⩾8%, for topical application
- **Process**:

♣ Prepare carbomer gel base, adjust pH 5.5–6.5.

♣ Dissolve extract in water, add to gel, mix uniformly.

♣ Control points: matrix uniformity, active content, sterility, irritation test.

- **Verification**: Shorter ulcer healing time, relieved inflammation.

3.4 Oral Care (Antibacterial, Gum Care, Fresh Breath; Core: Tea Polyphenols)

3.4.1 Toothpaste

- **Dosage**: tea polyphenols ⩾0.5%–0.8%, compounded with Yunnan Baiyao extract / mint extract
- **Process**:

♣ Pre-mix with abrasives / humectants or dissolve in aqueous phase.

♣ Add during paste preparation, stir 30 min; avoid high temperature.

♣ Control points: uniformity, fineness, no bitter taste, stability.

- **Verification**: Reduced bleeding, less plaque, fresh breath.

3.4.2 Mouthwash (Alcohol-Free)

- **Dosage**: tea polyphenols ⩾0.1%, compounded with fluoride, alcohol-free
- **Process**:

♣ Dissolve in purified water, add fluoride / sweetener, mix uniformly.

♣ Filter (⩾0.45 μm), aseptic filling.

♣ Control points: clarity, sterility, pH 6.0–7.0, stability.

- **Verification**: Reduced oral bacteria, lower caries incidence.

3.5 Pet Health (Mild, Natural & Safe; Core: Tea Polyphenols + Tea Polysaccharides)

3.5.1 Pet Skin Care (Shampoo)

- **Dosage**: tea polyphenols ⩾3%, compounded with aloe extract
- **Process**:

♣ Dissolve in aqueous phase at 40°C.

♣ Add surfactants / moisturizers, adjust pH 6.0–7.0.

♣ Control points: mildness, uniformity, stability.

- **Verification**: Relieved itching, improved dermatitis.

3.5.2 Pet Intestinal Health (Probiotic Powder)

- **Dosage**: tea polysaccharides ⩾5% + tea polyphenols ⩾2%, compounded with probiotics
- **Process**:

♣ Low-temperature dry mixing (⩽25°C) with carriers.

♣ Moisture-proof sealed packaging to protect probiotics.

♣ Control points: uniformity, probiotic activity, moisture ⩽5%.

- **Verification**: Relieved diarrhea, balanced flora, improved immunity.

3.6 Agricultural Applications (Green, Quality & Preservation; Core: Tea Polyphenols)

3.6.1 Crop Planting (Foliar Fertilizer)

- **Dosage**: industrial-grade green tea extract (tea polyphenols ⩾20%), diluted to 0.1%–0.2%
- **Process**:

♣ Dilute in water to prepare spray solution.

♣ Spray during growing period, avoid high temperatures (before 10:00 / after 16:00).

♣ Control points: concentration, uniformity, weather conditions.

- **Verification**: Higher yield, fewer diseases, enhanced stress resistance.

3.6.2 Fruit & Vegetable Preservation

- **Dosage**: tea polyphenols ⩾40%, diluted to 0.1%–0.15%
- **Process**:

♣ Dissolve in water with preservative auxiliaries.

♣ Soak or spray, drain and package.

♣ Control points: concentration, treatment time, drainage, sealing.

- **Verification**: Extended shelf life, reduced decay, no residues.

IV. General Operation Flow & Critical Control Points (CCP)

4.1 Standard Operation Procedure (SOP)

1. **Raw material preparation**: Weigh qualified materials, record batch and weight.
2. **Pre-dissolution / mixing**:
   - Water-soluble: dissolve in purified water at 40–60°C, filter (⩾0.22 μm)
   - Oil-soluble: dissolve in ethanol / propylene glycol at 40–50°C
   - Dry mix: low-temperature blending, sieve (⩾80 mesh)
3. **Dosing**: Add at defined stages, control temperature and mixing speed.
4. **Uniformity**: Stir / homogenize ⩾30 min, test uniformity.
5. **Stability test**: Observe 7–30 days, test active retention, appearance, pH.
6. **Finished product release**: Record dosage and parameters after passing tests.

4.2 Critical Control Points

Control Item	Parameters	Risk Control	Frequency
Raw material purity	Active content qualified	Insufficient activity	Per batch
Pre-dissolution	40–60°C, ⩾15 min	Incomplete dissolution	Per batch
Addition temperature	Food ⩽80°C, Cosmetics ⩽45°C, Pharma ⩽50°C	Active degradation	Per batch
Uniformity	Content variation ⩽±5%	Uneffectiveness, over-limit	Per batch
Stability	Active retention ⩾90%, no separation	Product failure	Weekly
Compliance	Meet national/industry standards	Non-compliance risk	Quarterly

V. Quality Control and Testing Standards

5.1 In-Process Testing

- Raw materials: active content, moisture, pH, solubility, microbes, heavy metals
- In-process: dosage accuracy, uniformity, clarity, temperature/time records
- Stability: accelerated (40°C/75% RH, 30 days); long-term (25°C/60% RH, 6 months)

5.2 Finished Product Testing

Application	Core Items	Standard
Food	Tea polyphenols, microbes, heavy metals, organoleptics	GB 2760, GB 14881
Cosmetics	Tea polyphenols, microbes, heavy metals, irritation	Cosmetic Safety Standards
Pharma & Healthcare	Active content, disintegration, sterility, heavy metals	National Medicine / Health Food
Oral Care	Tea polyphenols, microbes, pH, taste	Oral care specifications
Pet Health	Tea polyphenols, microbes, palatability, irritation	Pet food hygiene
Agriculture	Tea polyphenols, stability, residues	Agricultural industry standards

VI. Safety & Compliance Management

6.1 Safe Operation

- Operators wear masks, gloves, and protective clothing; avoid dust inhalation and skin contact.
- Good ventilation during dissolution to prevent solvent accumulation.
- Equipment cleaning: soak in 5% alkaline solution ⩾2 hours, autoclave ⩾5 minutes.

6.2 Compliance Requirements

- Strictly follow national and industry standards; no over-range or over-dose use.
- Novel food ingredients (EGCG, catechins): daily intake ⩽300 mg; not for infant food.

- Export products: comply with EU ECOCERT, US GRAS, Japan MHLW.
- Establish traceability: raw material batch → production → finished product → sales.

6.3 Risk Control

- **Allergy**: Skin/oral patch test before first use for cosmetics/food.
- **Overdose**: Strict dosing to avoid gastrointestinal irritation.
- **Stability**: Store away from light, sealed, ≤25°C to prevent degradation.