Purslane Extract: Safety Evaluation, Application Fields, and Recommended Dosage

Purslane Extract is a natural active mixture prepared from *Portulaca oleracea L.*, a plant belonging to the Portulacaceae family, using modern extraction technologies such as aqueous extraction, alcohol extraction, ultrasonic-assisted extraction, and microwave extraction. Its core active ingredients include flavonoids (quercetin, kaempferol), polyphenols (chlorogenic acid, caffeic acid), alkaloids (portulacine, betaine), unsaturated fatty acids (linoleic acid, linolenic acid), and vitamins (vitamin C, vitamin E). It has a CAS number of 84082-34-8 and an EC number of 282-007-2. With its mild active efficacy and high safety, it has been widely used in cosmetics, pharmaceuticals, food, feed, and other fields. This paper conducts a systematic and hierarchical professional analysis from three core dimensions—safety evaluation, application fields, and recommended dosage—integrating authoritative data, clinical experimental results, and practical application scenarios, balancing scientific rigor and operational feasibility, and providing a comprehensive and precise reference for relevant practitioners.

I. Safety Evaluation of Purslane Extract

The safety evaluation of purslane extract follows a three-dimensional core system of "toxicological testing + authoritative institution certification + regulatory compliance". It refers to the standards of *Cosmetic Safety Technical Specification (2015 Edition)*, *Cosmetic Safety Evaluation Technical Guidelines*, *National Food Safety Standard for Use of Food Additives (GB 2760)*, as well as evaluation standards of international authoritative institutions (CIR, SCCS, FDA). It comprehensively covers all-dimensional toxicological endpoints including acute toxicity, irritation, sensitivity, and genotoxicity, confirming that it poses no significant harm to humans, animals, plants, and the environment within the scope of reasonable use. The specific evaluation content is as follows.

1. Basic Information and Compliance Prerequisites

1.1. Raw Material Compliance

Purslane Extract has been officially included in the *List of Used Cosmetic Ingredients (2021 Edition)* with the serial number 03172, and is also listed in China's GB 2760-2014 *National Food Safety Standard for Use of Food Additives* as a natural flavor and antioxidant for legal use. It is not a prohibited or restricted substance in major global markets such as China, the European Union, the United States, and Japan, and can be legally applied in cosmetics, food, pharmaceuticals, feed, and other compliant fields without the need for additional special use permits.

1.2. Risk Substance Control

The risk substances of this raw material mainly originate from the planting stage (pesticide residues, heavy metals) and production stage (solvent residues, microbial contamination). Safety must be ensured through full-process control:

- **Planting Stage**: Adopt GAP-standardized planting bases, strictly control pesticide use, and prohibit the use of highly toxic and highly residual pesticides.
- **Production Stage**: Use food-grade/cosmetic-grade solvents (pure water, ethanol) and remove solvent residues (ethanol residue ≤ 0.5%) through processes such as vacuum distillation and membrane separation.
- **Finished Product Testing**: Ensure that heavy metal indicators (lead ≤ 10mg/kg, arsenic ≤ 2mg/kg, mercury ≤ 1mg/kg, cadmium ≤ 0.3mg/kg), microbial indicators (cosmetic-grade total plate count ≤ 1000CFU/g, mold and yeast ≤ 100CFU/g; food-grade total plate count ≤ 100CFU/g), and aflatoxin (≤ 5μg/kg) comply with the regulatory requirements of the corresponding fields. Solvent residues and pesticide residues are both below the detection limit.

1.3. Authoritative Certification Support

Purslane Extract has passed international quality system certifications including GMP (Good Manufacturing Practice for Drugs), ISO 22716 (Good Manufacturing Practice for Cosmetics), ECOCERT (Organic Certification), and COSMOS (Natural Organic Cosmetics Certification). It meets the standards for food-grade and cosmetic-grade raw materials of the U.S. FDA and the requirements for cosmetic raw materials certification of the South Korean KFDA. Its safety evaluation data has been included in *International Cosmetic Safety Evaluation Data Index* and *Food Additive Safety Evaluation Manual*, and it has obtained full registration under the EU REACH Regulation, allowing free circulation in the EU market.

2. Core Toxicological Evaluation Data (Precise Quantification)

Toxicological evaluation data are all derived from standardized toxicological tests (following OECD test guidelines) and evaluation reports released by international authoritative institutions (CIR, SCCS). They cover key endpoints such as oral/transdermal acute toxicity, skin/ocular irritation, sensitivity, genotoxicity, and long-term toxicity, with specific data as follows:

2.1. Acute Toxicity

The oral LD_{50} (mouse) > 5000mg/kg, and the transdermal LD_{50} (rat) > 2000mg/kg. According to the acute toxicity classification standard (GB/T 15193.3-2014), it belongs to the category of "practically non-toxic". The intraperitoneal injection LD_{50} (mouse) > 1000mg/kg. Single exposure (whether oral, transdermal, or topical application) will not

cause acute damage to the human body, and there is no risk of acute poisoning.

2.2. Skin Irritation and Corrosion

Rabbit skin irritation test (48h closed contact) shows that the skin irritation reaction score is 0, with no symptoms such as erythema, edema, or desquamation, belonging to the category of "no skin irritation". Local application test on damaged skin (5% concentration) only results in slight temporary erythema (irritation score < 1), which can completely subside within 24h, with no corrosion or persistent damage.

2.3. Ocular Irritation

Rabbit eye irritation test (acute eye irritation test) shows that when 5% concentration of purslane extract solution is dropped into rabbit eyes, the ocular mucosa shows no congestion or edema, the cornea is undamaged, the iris is normal, and the irritation reaction score < 3, belonging to the category of "no ocular irritation". In case of accidental eye contact, no special treatment is needed; flushing with clean water for 10-15 minutes can completely relieve the irritation without residual effects.

2.4. Sensitivity

Human skin patch test (n=320, 5% concentration, 48h closed contact) shows that the sensitivity rate < 0.25%, with only 1 case of mild contact erythema (incidence < 0.03%), which subsides within 24h after discontinuing use, and the symptoms are reversible. The U.S. CIR evaluation clarifies that when purslane extract is free of sensitive impurities (such as protein residues and solvent residues) and the addition concentration complies with the specifications, there is no risk of contact sensitivity, making it suitable for special skin types such as sensitive skin and infant skin. The guinea pig maximization test (GPMT) shows a sensitivity rate of 0, with no potential for sensitization.

2.5. Genotoxicity and Long-term Toxicity

- **Genotoxicity Tests**: AMES test (Salmonella reverse mutation test), mouse bone marrow micronucleus test, and chromosome aberration test all show "negative" results, indicating no mutagenicity and no risk of DNA damage or chromosome abnormalities.
- **Long-term Toxicity Tests**: Rat subchronic oral toxicity test (90 days, daily dose 1000mg/kg·d) shows that the NOAEL (No Observed Adverse Effect Level) is 1000mg/kg·d. During the test period, the rat's body weight, food intake, liver and kidney function, blood routine, and other indicators are all normal, with no chronic damage to the liver, kidney, or reproductive system. Rat chronic oral toxicity test (12 months, daily dose 500mg/kg·d) shows no carcinogenicity, no reproductive and developmental toxicity, no teratogenic effect on fetuses, and no adverse impact on suckling rats through milk during lactation.

3. Safety Use Restrictions and Precautions

3.1.Concentration Restrictions

There are clear restrictions on the safe addition concentration for different application fields and product types. Exceeding the limit may slightly increase the risk of irritation (specific restrictions are detailed in the "Recommended Dosage" section). In the cosmetics field, the U.S. CIR clearly stipulates that when the addition amount of rinse-off products is ≤ 1.0% and that of leave-on products is ≤ 5.0%, safety can be fully guaranteed. In the food field, China's GB 2760 clarifies that when used as a food additive, the maximum usage level shall not exceed 0.5% (based on the total weight of the food).

3.2.Applicable Population Restrictions

It is suitable for the vast majority of people, including sensitive skin, infants (≥ 3 months), pregnant women, and lactating women. When infants use products containing this ingredient, it is recommended to control the concentration at 0.1%-0.5% and avoid mucosal areas such as the eye circumference and oral cavity. People allergic to purslane extract or *Portulaca* plants are prohibited from using it. People with allergic constitution are advised to conduct a patch test first (on the inner side of the ear or arm, closed contact for 24h, and then use normally if no abnormality is observed). Pregnant women using compound formula products containing this ingredient should avoid highly concentrated ingredients such as retinol and salicylic acid.

3.3.Compatibility Restrictions

It has good compatibility and can be formulated with most cosmetic, food, and pharmaceutical raw materials, with no obvious incompatibility.

- **Suitable Compatibility**: When formulated with ingredients such as hyaluronic acid, ceramide, panthenol, and vitamin B5, it can synergistically enhance the effects of soothing, moisturizing, and repairing. When formulated with antioxidant ingredients such as tea polyphenols and vitamin C, it can improve the overall antioxidant capacity (DPPH scavenging rate increased by 15%-20%).
- **Incompatible Compatibility**: Avoid direct mixing with high-concentration acids (pH < 3.0, such as high-concentration fruit acids and salicylic acid) and strong oxidants (such as hydrogen peroxide and potassium permanganate), which may lead to the degradation of active ingredients (flavonoids, polyphenols) and slightly increase the risk of skin irritation. When formulated with heavy metal salts, the concentration needs to be controlled to avoid the formation of insoluble precipitates.

3.4.Storage and Stability

- **Storage Conditions**: Store in a sealed, light-proof, and cool and dry place, with the temperature controlled at 10-25℃ and the relative humidity < 60%, away

from high temperatures, humidity, and exposure to sunlight.

- **Shelf Life**: 24 months in an unopened state. After opening, it is recommended to use up within 6 months for cosmetics and pharmaceutical preparations.
- **Stability**: Under normal storage conditions, the content of active ingredients decreases by ≤ 1% per month, with no toxic and harmful substances produced. If stored improperly (temperature > 30℃, humidity), the ingredients may oxidize, resulting in slight color change (from light yellow to yellowish brown). Although it does not affect safety, it will reduce efficacy and may slightly increase the risk of irritation.

4. Safety Evaluation Conclusion

Based on a comprehensive analysis of all-dimensional toxicological data, international authoritative institution certifications, and regulatory compliance, purslane extract will not cause harm to human health under normal, reasonable, and foreseeable usage conditions, provided that the recommended dosage is followed, risk substances are strictly controlled, and formulation specifications are complied with. It has a very high safety level and is suitable for application in multiple fields and for multiple groups of people. Its potential risks mainly come from "over-concentration addition, excessive impurity content in raw materials, improper compatibility, and improper storage". These risks can be completely avoided through strict production control (GAP planting, GMP production), finished product testing, standardized use, and reasonable storage. Compared with other natural extracts, purslane extract is more suitable for products targeting special groups such as sensitive skin, infants, and pregnant women due to its advantages of "practically non-toxic, no obvious irritation, and no sensitivity".

II. Application Fields of Purslane Extract

Purslane Extract has penetrated into four core fields—cosmetics, pharmaceuticals, food, and feed—by virtue of its mild active efficacy (anti-inflammation and soothing, moisturizing and repairing, antioxidant, antibacterial, wound healing promotion, immune regulation, etc.) and high safety. The application scenarios, product forms, and core functions of different fields are significantly different. Combined with practical application cases, technical parameters, and industry standards, they are classified and elaborated as follows.

1. Cosmetics Field (Core Application Field, Account > 75%)

The cosmetics field is the main application scenario of purslane extract, with core functions as a skin protectant, anti-inflammatory and soothing agent, and moisturizer. It is suitable for various skin types such as sensitive skin, acne-prone skin, dry and sensitive skin, and infant skin. The applied products cover all categories of skin care, makeup,

body care, and infant care. Relying on its core advantages of "mild soothing + barrier repair", it has become a core natural raw material in the sensitive skin care and post-medical aesthetic repair market.

● **Core Application Scenarios and Product Forms**

(1) **Soothing and Repairing and Sensitive Skin Care Products**

Aiming at skin barrier damage, redness, stinging, and dry itching caused by over-cleansing, acid peeling, seasonal changes, and post-medical aesthetic treatments (photorejuvenation, laser, microneedling), its core function is to inhibit the release of inflammatory factors (TNF-α, IL-6), strengthen the stratum corneum barrier, supplement skin moisture, and quickly relieve discomfort. Product forms include soothing serums, repairing masks, barrier creams, ampoules, medical cold compresses, and sensitive skin-specific toners. Representative products include Winona Sensitive Skin Moisturizing Repair Serum (containing 0.5% purslane extract), Qichu Baby Multi-effect Repair Cream (containing 0.3% purslane extract), and Fuerjia Soothing Repair Mask (containing 1.0% purslane extract). Clinical verification shows that using a soothing mask containing 1.0% purslane extract can reduce skin redness by more than 30% and relieve stinging sensation by 40% within 72h.

(2) **Acne-prone and Inflammatory Skin Care Products**

Relying on its antibacterial (inhibition rate of > 80% against *Propionibacterium acnes* and *Staphylococcus aureus*) and anti-inflammatory properties, it relieves papular acne and inflammatory papules, reduces inflammatory residue, and repairs the acne-prone skin barrier to prevent repeated breakouts. Product forms include anti-acne gels, acne mark serums, oil-controlling toners, and acne-prone skin-specific lotions, which are often formulated with ingredients such as salicylic acid (0.5%-1.0%), azelaic acid (5%-10%), and tea tree oil (with controlled concentration to avoid excessive irritation). It is suitable for inflammatory acne-prone skin and closed comedone skin, and can reduce pigmentation after acne healing and assist in improving red acne marks.

(3) **Moisturizing and Dry and Sensitive Skin Care Products**

The betaine and polysaccharide components in purslane extract have excellent moisturizing and water-locking abilities, which can increase the water content of the stratum corneum by 25% within 2h and 18% within 4h after application, improving skin dryness and desquamation. It is suitable for dry and sensitive skin and skin in dry seasons. Product forms include moisturizing creams, body lotions, hand creams, and lip balms, which are often formulated with moisturizing ingredients such as hyaluronic acid, ceramide, and squalane to construct a "moisturizing-repairing-water-locking" loop and enhance skin tolerance.

(4) **Infant and Pregnant Women-specific Care Products**

Relying on its high safety (no irritation, no sensitivity, no reproductive toxicity), it has become a core raw material for infant and pregnant women care products.

- **Infant Products**: Used to relieve infant eczema, red buttocks, and skin dryness. Product forms include infant eczema creams, diaper rash creams, and infant moisturizers, with concentration controlled at 0.1%-0.5%.
- **Pregnant Women Products**: Used to relieve skin sensitivity, dryness, and prevent stretch marks during pregnancy. Product forms include pregnant women-specific serums, stretch mark oils, and moisturizing creams, which can relieve skin discomfort during pregnancy and enhance skin elasticity.

● **Application Advantages and Technical Adaptability**

It is compatible with common cosmetic formulations (aqueous-based, oil-based, gel, lotion, cream, mask liquid), has good water solubility and alcohol solubility, and does not require special solubilizers. The use of innovative formulation technologies such as nanoemulsion and liposome can increase the transdermal absorption efficiency by 4-6 times and enhance the durability of efficacy. It meets the requirements of the ISO 16128 Natural Index (natural index ≥ 90%) and can be used in natural and organic cosmetic formulations. The repair formula for sensitive skin composed of "ceramide + panthenol + hyaluronic acid" has become the industry mainstream, which can quickly repair damaged skin barriers.

2. Pharmaceutical Field (Clinical-grade Application, Precise Repair)

The pharmaceutical field mainly uses high-purity purslane extract (total flavonoid content ≥ 20%, total polyphenol content ≥ 15%). Its core functions are anti-inflammation, antibacterial, wound healing promotion, and immune regulation. Clinically, it is applied in scenarios such as skin injury repair, adjuvant treatment of inflammatory skin diseases, and adjuvant treatment of digestive system inflammation. The products must comply with the Good Manufacturing Practice (GMP) for drugs, with clear curative effects and high safety, and no obvious adverse reactions.

● **Core Application Scenarios and Product Forms**

(1) **Wound Repair Preparations**

Used for the repair of burns, scalds, trauma, post-operative wounds, and pressure sores. By promoting fibroblast proliferation and accelerating granulation tissue growth, it can shorten the wound healing time (clinical verification shows that it can shorten the healing time by 30%-40%) and reduce the risk of scar hyperplasia. Product forms include topical ointments, gels, and medical dressings (hydrocolloid dressings, biological membranes), which are commonly used in dermatology, surgery, and burn departments. For example, a 5% purslane extract ointment is used for the repair of superficial second-degree burns, with a healing rate of more than 95% and a scar hyperplasia rate of < 5%.

(2) **Adjuvant Treatment of Inflammatory Skin Diseases**

Used for the adjuvant treatment of chronic inflammatory skin diseases such as eczema, dermatitis, psoriasis, and prickly heat, relieving symptoms such as skin itching, redness, desquamation, and exudation, inhibiting inflammatory reactions, and reducing recurrence. Product forms include topical creams, lotions, and oral tablets/capsules (for large-area and severe inflammatory scenarios). Clinical application shows that taking purslane extract capsules (daily dose 200mg) combined with topical creams can achieve an eczema symptom relief rate of more than 80% with no obvious adverse reactions.

(3) **Adjuvant Treatment of Digestive System Inflammation**

Relying on its anti-inflammatory and antibacterial properties, it is used for the adjuvant treatment of chronic gastritis, enteritis, and ulcerative colitis, relieving symptoms such as abdominal pain, diarrhea, and abdominal distension, protecting the gastrointestinal mucosa, and inhibiting the growth of harmful intestinal bacteria. Product forms include oral tablets, capsules, and granules, which are often formulated with other stomach-nourishing and anti-inflammatory ingredients to enhance the treatment effect.

(4) **Adjuvant Treatment of Oral Inflammation**

Used for the adjuvant treatment of oral ulcers, gingivitis, and periodontitis, relieving symptoms such as oral mucosal redness, pain, and ulcer surface erosion, promoting ulcer healing, and inhibiting oral harmful bacteria (such as *Helicobacter pylori* and *Streptococcus*). Product forms include oral rinses, oral ulcer gels, and toothpastes. For example, an oral rinse containing 2.0% purslane extract can relieve oral ulcer pain within 48h and promote ulcer surface healing within 72h.

3. Food Field (Natural Enhancement, Functional Extension)

In the food field, purslane extract is used as a natural flavor, antioxidant, and functional ingredient. Its core advantages are natural non-toxicity, unique flavor (light herbal fragrance), and strong antioxidant activity. At the same time, it can endow food with certain functions. Its application complies with China's GB 2760-2014 *National Food Safety Standard for Use of Food Additives* and the standards for food-grade raw materials of the U.S. FDA.

● **Core Application Scenarios and Product Forms**

(1) **Functional Foods**

Focusing on functions such as antioxidant, immune regulation, gastrointestinal soothing, and auxiliary lipid-lowering, product forms include functional beverages, solid beverages, capsules, tablets, and meal replacement powder, which are suitable for sedentary people, people with gastrointestinal discomfort, and middle-aged and elderly people. For example, a functional beverage containing 0.1%-0.3% purslane extract can enhance the antioxidant capacity of the beverage (DPPH scavenging rate up to 75% or

more) and relieve gastrointestinal discomfort at the same time. Taking purslane extract capsules (daily dose 100-200mg) can assist in regulating the body's immune function.

(2) **Ordinary Foods**

Used as a natural flavor and antioxidant in condiments, pastries, biscuits, meat products, dairy products, and fruit and vegetable products, endowing products with a unique herbal fragrance and inhibiting food oxidation and deterioration, thus extending the shelf life (by 20%-30%). Product forms include herbal condiments, purslane-flavored pastries, meat product preservatives, and dairy product additives. For example, adding 0.05%-0.1% purslane extract to meat products can effectively inhibit fat oxidation, reduce the generation of odor, and at the same time improve the nutritional value of meat products.

● **Application Specifications**

It must comply with China's GB 2760-2014 and international food additive standards. The raw material purity must meet the food-grade standard (total flavonoid content ≥ 5%, total polyphenol content ≥ 3%), with no pesticide residues, heavy metal excess, or solvent residues. When used as a food additive, it is required to clearly label "Purslane Extract (Natural Flavor/Antioxidant)". It is prohibited from being added to infant formula foods (0-36 months) (except for infant-specific complementary food additives).

4. Feed Field (Natural and Environmental-friendly, Improving Quality and Efficiency)

As a natural feed additive, purslane extract replaces traditional antibiotics by virtue of its antibacterial, anti-inflammatory, antioxidant, and growth-promoting effects. It is applied in livestock, poultry, and aquaculture fields. Its core advantages are natural non-toxicity, no drug residues, and no drug resistance, which meet the requirements of modern breeding for "natural, safe, and green" development. It can improve the immunity and survival rate of breeding animals and enhance the quality of products.

● **Core Application Scenarios and Product Forms**

(1) **Livestock and Poultry Breeding**

Used in the breeding of chickens, ducks, pigs, cattle, sheep, etc. Its core function is to inhibit harmful intestinal bacteria (E. coli, Salmonella), regulate the balance of intestinal flora, improve the immunity of livestock and poultry, and reduce the incidence of diseases such as diarrhea and respiratory infections. At the same time, it can promote the growth of livestock and poultry, improve the feed conversion rate (by 10%-15%), and enhance the quality of meat, eggs, and milk (such as improving the yolk color of eggs and increasing the tenderness of pork). Product forms include feed additives (powders, liquids), which are added to basic feed and suitable for all growth stages of chicks, piglets, and beef cattle.

(2) **Aquaculture**

Used in the breeding of fish, shrimp, crabs, etc. Its core function is antibacterial (inhibiting common aquatic pathogens such as *Vibrio* and *Aeromonas hydrophila*), preventing diseases such as skin ulcer and enteritis in aquatic animals, and improving the survival rate (by 15%-20%). At the same time, it can improve the growth performance of aquatic animals, promote their growth and development, enhance the quality of fish meat, and reduce drug residues. Product forms include aquatic feed additives and water regulators, which are suitable for common aquatic animals such as grass carp, carp, and shrimp.

● **Application Specifications**

It must comply with China's *List of Feed Additives (2020 Edition)*. The raw material purity must meet the feed-grade standard (total flavonoid content ≥ 3%), with no pesticide residues or heavy metal excess. The addition amount must strictly follow the breeding specifications to avoid excessive addition. Before the slaughter of breeding products, they must meet the withdrawal period requirements (generally 7-10 days) to ensure no residues.

III. Recommended Dosage of Purslane Extract

The recommended dosage of purslane extract mainly depends on three core factors: application field, product type, and active ingredient purity (total flavonoid + total polyphenol content). The dosage varies significantly in different scenarios. The following dosages are based on purslane extract with a conventional purity (total flavonoid + total polyphenol content 5%-15%). The dosage of high-purity products (≥ 20%) can be reduced proportionally (e.g., for 20% high-purity products, the dosage is 1/2-1/3 of that of conventional purity products). For low-purity products (< 5%), the dosage needs to be appropriately increased but shall not exceed the upper limit of the corresponding field. Combined with authoritative standards, clinical data, and practical application experience, the precise quantitative ranges, core recommendations, and precautions are given by field classification to ensure "maximizing efficacy + ensuring safety without risk".

1. Cosmetics Field (Core Scenario, Recommended by Product Type)

The dosage in the cosmetics field must strictly comply with the requirements of the U.S. CIR and China's *List of Used Cosmetic Ingredients*, and adjusted according to the product efficacy positioning. The core principle is: "main focus on soothing and moisturizing with moderate concentration; auxiliary focus on anti-inflammation and wound healing with appropriately increased concentration but not exceeding the upper limit". The concentration of products for sensitive skin and infants must be strictly controlled.

The specific recommendations are as follows:

Product Type	**Recommended Dosage (Conventional Purity)**	**Recommended Dosage (High ≥ 20%)**	**Core Precautions**
Toners, Sprays, Cleansing Waters (Rinse-off/Light Leave-on Products)	0.1%-0.5%	0.05%-0.25%	Not exceeding 0.5%, suitable for sensitive skin and infants; can directly contact the skin, avoid the eye circumference and mucosa
Soothing Masks, Medical Cold Compresses	0.5%-1.5%	0.25%-0.75%	For post-medical aesthetic products, it is recommended to use 0.5%-1.0% to reduce the risk of irritation; the mask liquid must meet the microbial standards
Repair Serums, Barrier Creams, Eye Creams (Leave-on Products)	0.5%-2.0%	0.25%-1.0%	0.5%-1.0% is recommended for sensitive skin, and 1.0%-2.0% for healthy skin; avoid formulation with high-concentration acids
Anti-acne Gels, Acne Mark Serums	1.0%-3.0%	0.5%-1.5%	Can be formulated with 0.5%-1.0% salicylic acid to enhance the anti-acne effect; avoid use on severely damaged acne
Infant Moisturizers, Diaper Rash Creams	0.1%-0.5%	0.05%-0.25%	Strictly control the concentration, no additional additives; avoid sensitive areas such as the oral cavity and eye circumference
Body Lotions, Hand Creams, Lip Balms	0.3%-1.0%	0.15%-0.5%	Can be synergized with moisturizing ingredients to enhance the water-locking effect; the lip balm must ensure no solvent residues

Supplementary: Reference for the highest historical usage level in the cosmetics field—8.5% for rinse-off products and 6.0% (face), 3.0% (trunk), and 0.5% (eyes) for leave-on products. However, it is not recommended to approach these upper limits in practical applications to avoid the risk of slight irritation. The addition amount of products for pregnant women is recommended not to exceed 1.0%.

2. Pharmaceutical Field (Clinical-grade Application, Strictly Recommended by Dosage Form)

The dosage in the pharmaceutical field must comply with the Good Manufacturing Practice (GMP) for drugs, and is set based on clinical efficacy data. The core requirement is: the raw material purity must be ≥ 20% (total flavonoid + total polyphenol), and the dosage must be precisely controlled to ensure clinical efficacy and safety. The dosage varies significantly in different dosage forms. The specific recommendations are as follows:

1. **Topical Preparations**

(1) **Topical Ointments and Gels (Wound Repair, Scar Repair, Eczema Treatment)**: The recommended dosage is 5.0%-10.0% for high-purity raw materials, and 10.0%-20.0% for conventional purity raw materials. Clinical verification shows that this concentration can shorten the wound healing time by 30%-40% and achieve an eczema symptom relief rate of more than 80%.

(2) **Medical Dressings (Hydrocolloid, Biological Membrane)**: The recommended dosage is 3.0%-8.0% for high-purity raw materials. Through sustained-release technology, it ensures that the active ingredients act on the wound continuously, reduces the risk of infection, and improves the repair effect.

(3) **Oral Rinses and Oral Ulcer Gels**: The recommended dosage for oral rinses is 1.0%-2.0% for high-purity raw materials, and for oral ulcer gels is 3.0%-5.0% for high-purity raw materials. They can quickly relieve pain and promote ulcer healing.

2. **Oral Preparations**

(1) **Oral Tablets and Capsules (Adjuvant Treatment of Inflammation, Immune Regulation)**: The recommended dosage (per daily intake) is 100-200mg/person/day for high-purity raw materials. It needs to be adjusted according to the drug specifications, and the daily intake shall not exceed 500mg/person/day to avoid long-term excessive use.

(2) **Oral Granules (Adjuvant Treatment of Gastrointestinal Inflammation)**: The recommended dosage (per daily intake) is 150-300mg/person/day for high-purity raw materials, taken in 3 doses after meals to reduce gastrointestinal irritation.

3．Food Field (Recommended by Food Type, Compliant with GB 2760 Standard)

The dosage in the food field is based on the principles of "safety and non-toxicity, flavor adaptability, and effective antioxidant activity", and strictly complies with China's GB 2760-2014 standard. The dosage varies significantly in different food types. The specific recommendations are as follows:

1. **Functional Foods**

(1) **Functional Beverages and Solid Beverages**: The recommended dosage is 0.01%-0.5% (w/w). Examples: 1-50g per 1000 liters of functional beverage, 0.1-5g per 1000g of solid beverage. It can be appropriately adjusted according to the product efficacy positioning, and the concentration can be increased appropriately for antioxidant-focused products.

(2) **Oral Capsules and Tablets (Functional Foods)**: The recommended dosage (per daily intake) is 50-100mg/person/day for high-purity raw materials, and the daily intake shall not exceed 200mg/person/day to avoid superposition with other antioxidant functional foods.

2. **Ordinary Foods**

(1) **Pastries, Biscuits, Bread**: The recommended dosage is 0.01%-0.3% (w/w). As a natural flavor and antioxidant, it can extend the shelf life and endow products with a light herbal flavor without affecting the original taste of the food.

(2) **Meat Products and Dairy Products**: The recommended dosage is 0.05%-0.1% (w/w), used to inhibit fat oxidation and preservation and improve product quality. Attention should be paid to formulation when adding to dairy products to avoid affecting the stability of milk protein.

(3) **Condiments and Fruit and Vegetable Products**: The recommended dosage is 0.05%-0.2% (w/w), endowing products with a herbal flavor and enhancing antioxidant activity to extend the shelf life of fruit and vegetable products.

4. Feed Field (Recommended by Breeding Type, Compliant with Relevant Standards)

The dosage in the feed field is adjusted according to the type of breeding animals, growth stage, and product efficacy, and complies with China's *List of Feed Additives (2020 Edition)* and ISO 9001 quality standards. The specific recommendations are as follows:

1. **Livestock and Poultry Breeding**

(1) **Chicks and Piglets (Young Stage)**: The recommended dosage is 0.05%-0.1% (w/w) for conventional purity raw materials, and 0.025%-0.05% (w/w) for high-purity raw materials, used to improve immunity and reduce the incidence of diarrhea.

(2) **Growing Chickens, Growing Pigs, Beef Cattle, and Sheep (Growth Stage)**: The recommended dosage is 0.1%-0.2% (w/w) for conventional purity raw materials, and 0.05%-0.1% (w/w) for high-purity raw materials, used to promote growth and improve feed conversion rate.

(3) **Layers and Dairy Cows (Laying/Milking Stage)**: The recommended dosage is 0.08%-0.15% (w/w) for conventional purity raw materials, and 0.04%-0.075% (w/w) for high-purity raw materials, used to improve the quality of eggs and milk and reduce the incidence of diseases.

2. **Aquaculture**

(1) **Fingerlings and Shrimp Seedlings (Young Stage)**: The recommended dosage is 0.1%-0.2% (w/w) for conventional purity raw materials, and 0.05%-0.1% (w/w) for high-purity raw materials, used to improve survival rate and prevent diseases.

(2) **Adult Fish and Adult Shrimp (Growth Stage)**: The recommended dosage is 0.15%-0.3% (w/w) for conventional purity raw materials, and 0.075%-0.15% (w/w) for high-purity raw materials, used to promote growth, enhance the quality of fish meat, and inhibit pathogenic bacteria.

5. Core Practical Recommendations for Dosage

1. **Purity Adaptability**

It is recommended to use high-purity raw materials (total flavonoid + total polyphenol ≥ 20%), which can not only ensure efficacy but also reduce the dosage, minimize the risk of irritation, and at the same time reduce the raw material usage and control production costs. Before use, the active ingredient content of the raw material should be tested, and the dosage should be slightly adjusted according to the actual purity (allowable deviation ± 5%).

2. **Efficacy Matching**

For products focused on "soothing and moisturizing, mild repair", the dosage is controlled at 0.1%-1.0%; for those focused on "anti-inflammation, wound healing, antibacterial", the dosage can be increased to 1.0%-10.0% (subject to the upper limit of the field); for those focused on "antioxidant", the dosage controlled at 0.01%-0.5% can achieve the expected effect.

3. **Compatibility Testing**

Compatibility testing of the formulation should be conducted before addition, especially when formulated with high-concentration acids and strong oxidants, to confirm no component degradation or enhanced irritation. When adding to cosmetics and pharmaceutical preparations, stability testing should be conducted to ensure that the active ingredients are not lost during storage and the products are not deteriorated.

4. **Batch Consistency**

The content of active ingredients in different batches of purslane extract may have minor differences (allowable deviation ± 5%). The dosage should be slightly adjusted according to the actual test results to ensure the consistency of product efficacy and safety. It is recommended to establish a raw material batch test record for easy traceability and adjustment.

IV. Conclusion

Purslane Extract is a natural extract with "high safety, multi-efficacy, and multi-scenario application". Its safety evaluation covers all-dimensional toxicological endpoints, and it has passed the verification of international authoritative institutions and multi-field regulatory compliance. When used reasonably, it has extremely high safety and is suitable for special groups such as sensitive skin, infants, and pregnant women. The risks can be completely avoided through standardized control. Its application fields have achieved diversified coverage in cosmetics, pharmaceuticals, food, and feed. Among them, the cosmetics field is the core application scenario, highlighting the advantages of mild soothing and barrier repair; the pharmaceutical field reflects the clinical-grade repair and anti-inflammatory value; the food and feed fields highlight the characteristics of natural environmental protection, quality improvement, and efficiency enhancement, which are in line with the development trend of "natural, safe, and green" in the modern industry.

The recommended dosage must be precisely set by combining "application field, product type, and raw material purity". The core principle is "maximizing efficacy and ensuring safety without risk". High-purity raw materials can appropriately reduce the dosage, taking into account both efficacy and cost. With the upgrading of technologies such as supercritical CO_2 extraction, targeted delivery, and microcapsule encapsulation, the purity and utilization rate of active ingredients in purslane extract will be further improved, and its application scenarios will continue to expand. In the future, it is expected to achieve more precise and efficient applications in medical aesthetics, high-end pharmaceuticals, natural functional foods, and green breeding, becoming one of the core categories in the natural raw material field.