Operating Guidelines for the Addition of Onion Extract in Application Fields

I. Overview of Onion Extract: Characteristics and Application Advantages

1.1 Core Components and Physicochemical Properties

Onion Extract is a natural plant extract obtained by water extraction, alcohol extraction, or aqueous-alcohol mixed extraction from the bulbs of the Liliaceae Allium plant *Allium cepa* L. (in compliance with the national standards of the corresponding field). Its core efficacy stems from the synergistic effect of various natural active ingredients. The unique composition of ingredients endows it with physicochemical properties suitable for multiple fields, making it a high-quality natural raw material in the cosmetics, food and beverage, pharmaceutical health products, and feed additive industries, with both functionality and safety.

1.1.1 Core Active Ingredients and Content Standards (Conventional Commercial Specifications)

The efficacy of onion extract is directly determined by the content of core active ingredients. Different extraction processes affect the proportion of ingredients. The core parameters of conventional commercial specifications are as follows (unit: mass fraction). All detection methods comply with the standards of the corresponding fields:

- **Quercetin**: ≥ 1.0% (detected by High Performance Liquid Chromatography (HPLC) at a detection wavelength of 254 nm). Its core efficacy includes antioxidant, anti-inflammatory, and whitening effects. It is a core efficacy ingredient in cosmetics and health products. When the content meets the standard, the IC50 (concentration required to inhibit 50% of DPPH free radical scavenging activity) is ≤ 0.7 mg/mL.
- **Polysaccharides**: ≥ 4% (detected by the phenol-sulfuric acid method). Its core efficacy includes moisturizing and immune regulation. It is suitable for the moisturizing system of cosmetics, the immune enhancement formula of health products, and the growth-promoting formula of feed. It can significantly increase the water content of the skin stratum corneum by ≥ 12% and the phagocytosis rate of macrophages in livestock and poultry by ≥ 18%.
- **Sulfur-Containing Compounds (Allicin, Allicin Derivatives)**: ≥ 0.8% (detected by Gas Chromatography (GC)). They assist in anti-inflammation, bacteriostasis, and lipid-lowering, improve the stability of the final product, and have an inhibition zone diameter of ≥

11 mm against *Staphylococcus aureus* and *Escherichia coli*.

- **Other Ingredients**: Contain a small amount of flavonoids, amino acids, and vitamins (vitamin C, B vitamins), with a total content ≤ 1%. They can assist in enhancing efficacy synergy and improving the functionality of the final product.
- **Impurity Control**: Heavy metals (lead ≤ 10 mg/kg, arsenic ≤ 2 mg/kg, mercury ≤ 0.1 mg/kg) and microorganisms (total plate count ≤ 100 CFU/g, mold and yeast ≤ 10 CFU/g) must strictly comply with the standards of the corresponding fields, such as GB/T 30645-2014 *Plant Extracts for Cosmetics* and GB 1886.234-2016 *Food Additives - Onion Extract*.

1.1.2 Physical Properties

- **Appearance**: The aqueous extract is a light yellow to light brown powder with strong hygroscopicity; the alcohol extract is a dark brown to brown powder with weak hygroscopicity; the liquid extract (concentration 10%-50%) is a light yellow to brown transparent liquid without obvious precipitation. Different forms are suitable for different application scenarios.
- **Solubility**: The powdered extract is easily soluble in water (solubility ≥ 75 g/L at 25℃) and partially soluble in ethanol (solubility of alcohol extract in 75% ethanol ≥ 55 g/L), and insoluble in oil. The liquid extract can be directly dissolved in aqueous systems and has good compatibility with alcohol systems, achieving uniform dispersion without the need for additional solubilizers.
- **Form Compatibility**: The powdered extract has moderate fluidity with a bulk density of 0.50-0.60 g/cm³, which can be fully dry-mixed with solid raw materials. The liquid extract has good fluidity and can be directly incorporated into aqueous ingredients without complex pretreatment, adapting to the production of various dosage forms.

1.1.3 Chemical Stability

The stability of onion extract is greatly affected by temperature, pH value, and light. Processing parameters must be strictly controlled. The core stable characteristics are as follows:

- **pH Stability**: Stable in the pH range of 4.0-8.5. Beyond this range, the quercetin content will decrease by 4%-14% within 72 hours. The optimal stable pH range is 5.5-7.5, which is suitable for the pH of human skin, most food, and pharmaceutical systems.
- **High-Temperature Resistance**: Its high-temperature resistance is moderate. Heating at below 80℃ for 30 minutes results in a loss of active ingredients ≤ 2.5%; heating at above 100℃ for 10 minutes results in a loss of active ingredients ≥ 9%. Different application fields

need to adjust the temperature according to the processing technology to avoid the degradation of active ingredients.

- **Compatibility**: Good compatibility with common moisturizers (glycerin, hyaluronic acid), emulsifiers (Tween-80, Span-60), and preservatives (phenoxyethanol, parabens) in cosmetics; no obvious antagonistic effect with sweeteners, acidulants, and preservatives in food; can be mixed normally with excipients (starch, lactose) in pharmaceutical health products, and no antagonistic effect with antibiotics and minerals in feed. It is sensitive to light and is prone to oxidation and discoloration under strong light, so processing and storage must be carried out in a light-shielded environment.

1.1.4 Hygroscopicity

The hygroscopicity of powdered onion extract varies: the critical relative humidity of the aqueous extract is about 63%, which has strong hygroscopicity at room temperature and is prone to caking; the critical relative humidity of the alcohol extract is about 68%, with weak hygroscopicity; the liquid extract has no obvious hygroscopicity. During storage, the environmental humidity must be controlled according to the form to avoid the loss of active ingredients or caking caused by hygroscopicity.

1.2 Physiological Functions and Application Value

As a natural plant extract, onion extract has multiple functions including antioxidant, anti-inflammatory, whitening, moisturizing, bacteriostatic, immune regulation, and auxiliary lipid-lowering. It has high safety and no obvious toxic side effects, and thus has extremely high application value in multiple fields. Its core physiological functions are as follows:

1.2.1 Antioxidant Function

Quercetin, polysaccharides, and sulfur-containing compounds work synergistically to effectively scavenge free radicals in the body, inhibit oxidative stress reactions, and delay the oxidative deterioration of substances. In cosmetics, it can delay skin aging, improve dull skin color, and resist UV damage; in food, it can extend the shelf life and reduce oxidative browning; in health products, it can assist in protecting body cells and reducing oxidative damage; in feed, it can enhance the antioxidant capacity of livestock, poultry, and aquatic animals and improve meat quality.

1.2.2 Anti-Inflammatory and Soothing Function

It can inhibit the expression of inflammatory factors such as TNF-α and IL-6, and has significant anti-inflammatory and swelling effects, while

also soothing skin sensitivity. In cosmetics, it can soothe skin sensitivity, relieve redness and stinging, and is suitable for sensitive skin products; in pharmaceutical health products, it can assist in improving inflammatory reactions and relieving mild swelling and pain; in feed, it can reduce intestinal inflammation in livestock and poultry and lower the incidence of diarrhea.

1.2.3 Moisturizing and Repairing Function

Polysaccharides can adsorb and lock in moisture, increase the water content of the skin stratum corneum, repair the skin barrier, and enhance skin luster. It is mainly used in the cosmetics field, suitable for moisturizing products such as toners, lotions, creams, serums, masks, and facial cleansers. When the addition amount meets the standard, the water content of the skin stratum corneum can be increased by more than 12%, improving dry and rough skin problems.

1.2.4 Whitening Function

Quercetin can inhibit tyrosinase activity, reduce melanin production, and promote melanin metabolism, with significant whitening and brightening effects. It is mainly used in whitening products in the cosmetics field, which can improve uneven skin color, dullness, and spots, and is suitable for products such as serums and masks.

1.2.5 Bacteriostatic Function

It has a significant inhibitory effect on harmful microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, and *Bacillus subtilis*, with an inhibition zone diameter of ⩾ 11 mm. In food, it can inhibit the growth of harmful microorganisms and extend the shelf life; in cosmetics, it can reduce harmful bacteria on the skin surface and lower the risk of acne; in feed, it can replace part of antibiotics, inhibit harmful bacteria in the intestines, and promote the growth of beneficial bacteria.

1.2.6 Immune Regulation and Growth-Promoting Function

Polysaccharides can regulate the body's immune function, increase the phagocytosis rate of macrophages by ⩾ 18%, and enhance the body's resistance. In health products, it can assist in regulating human immunity; in feed, it can increase the daily weight gain of livestock and poultry and aquatic animals (⩾ 7% for livestock and poultry, ⩾ 9% for fish), enhance stress resistance, and improve meat quality.

1.2.7 Auxiliary Lipid-Lowering Function

Sulfur-containing compounds and quercetin work synergistically to assist in reducing the content of total serum cholesterol and triglycerides.

It is mainly used in the pharmaceutical health products field, suitable for auxiliary conditioning products for hyperlipidemia patients.

1.3 Main Application Fields

Relying on the characteristics of "natural safety, diverse functions, and multi-system compatibility", onion extract has achieved full coverage of four core fields. Different fields are suitable for different forms and specifications of extracts, with specific application scenarios as follows:

1.3.1 Cosmetics Field

The most widely used, it is corely suitable for aqueous systems, covering products such as toners, lotions, creams, serums, masks, and facial cleansers. For moisturizing and repairing products, aqueous extracts (high in polysaccharides) are preferred; for whitening, antioxidant, and anti-inflammatory products, alcohol extracts (high in quercetin and sulfur-containing compounds) are preferred. Liquid extracts are suitable for toners and serums, while powdered extracts are suitable for lotions, creams, and mask powders.

1.3.2 Food and Beverage Field

Suitable for various food and beverages, it corely exerts antioxidant, bacteriostatic, and nutritional enhancement effects, covering functional beverages, pastries, meat products, fruits and vegetable products, condiments, etc. Food-grade extracts are preferred. For functional beverages and fruits and vegetable products, liquid extracts (good solubility without affecting appearance) are preferred; for pastries, meat products, and condiments, powdered extracts (easy to mix and long shelf life) are preferred.

1.3.3 Pharmaceutical Health Products Field

It mainly plays the roles of anti-inflammatory and swelling, immune regulation, auxiliary lipid-lowering, and antioxidant. Common dosage forms include tablets, capsules, granules, oral liquids, etc. Pharmaceutical-grade extracts (quercetin content $\geqslant$ 1.5%, polysaccharide content $\geqslant$ 7.0%) are selected. For tablets and capsules, powdered extracts (high purity, easy to tableting and filling) are preferred; for oral liquids, liquid extracts (good solubility) are preferred.

1.3.4 Feed Additive Field

It is corely applied to livestock and poultry feeds (pigs, chickens, ducks) and aquatic feeds (fish, shrimp), exerting the effects of bacteriostasis and growth promotion, enhancing body resistance, and improving meat quality. Feed-grade extracts are selected, and powdered extracts (easy to mix and not easy to absorb moisture and cake) are preferred, which can withstand the high temperature of feed granulation and are suitable

for various feed systems.

II. Application in the Cosmetics Field: Production Process and Precautions

Onion extract is the most widely used in the cosmetics field, corely exerting moisturizing, soothing, whitening, antioxidant, and bacteriostatic effects. It is suitable for various water-based cosmetics systems. Processing parameters such as temperature, pH value, and stirring speed must be strictly controlled, and direct light exposure must be avoided to prevent the loss of active ingredients and ensure product stability and safety. The details are classified and explained as follows according to product types:

▶ Application in Toners/Solutions (Suitable for Liquid Extracts)

Production Process

1. **Pretreatment (Optional)**: If the concentration of the liquid extract is too high (e.g., 50%), it can be diluted with deionized water to a concentration of 10%-20% (the dilution ratio is adjusted according to the final product formula). Stir in the dark at room temperature for 3-5 minutes at a speed of 100 r/min to ensure uniform dispersion without precipitation.
2. **Formulation**: Slowly pour the diluted liquid extract (or the liquid extract at the original concentration) into the aqueous system of toners or serums according to the formula ratio, and stir in the dark (speed of 100-150 r/min) while pouring. Continue stirring for 5-10 minutes to ensure complete fusion.
3. **pH Adjustment**: Detect the pH value of the system and adjust it to the optimal range of 5.5-7.5 to ensure the stability of the extract and avoid precipitation or degradation of active ingredients.
4. **Post-Treatment**: Add preservatives, fragrances, and other ingredients, continue stirring in the dark for 3-5 minutes, detect the clarity and stability of the system, and perform sterile filling after qualification, with the entire process conducted in the dark.

Precautions

- **Addition Amount Control**: The addition amount of the extract in toners is 0.5%-2.0% (mass fraction, the same below), and in serums, it is 2.0%-5.0%. For whitening and antioxidant serums, it is recommended to add 3.0%-5.0%, with a DPPH free radical scavenging rate of over 80%. Excessive addition may cause system turbidity and a slight pungent odor.

- **Temperature Control**: The temperature of the aqueous system must be reduced to below 60℃, with an optimal temperature of 45-55℃. High temperatures will cause the decomposition of active ingredients such as quercetin and sulfur-containing compounds, with a loss rate of over 9%.
- **Clarity Control**: If turbidity occurs after addition, the addition amount of the extract can be appropriately reduced, or the pH value can be adjusted to 5.5-7.5. If necessary, a small amount of Tween-80 can be added for solubilization.
- **Sensitivity Compatibility**: For sensitive skin toners and serums, the addition amount of the extract is recommended to be controlled below 0.5% (liquid) to avoid skin irritation. Skin irritation tests must be conducted before addition.
- **Light Control**: The entire process of processing, filling, and packaging must be carried out in the dark. The finished products must be packaged in light-shielded containers to avoid the oxidation and discoloration of the extract caused by light, which may affect the appearance and efficacy of the product.

▶ Application in Lotions/Creams (Suitable for Powdered Extracts)

Production Process

1. **Pretreatment**: Take the required amount of powdered extract, add a small amount of deionized water (mass ratio of extract: deionized water = 1:5), and stir evenly in the dark at a speed of 200 r/min for 5-10 minutes to prepare a uniform suspension, avoiding caking and uneven dispersion when added directly.
2. **Aqueous Phase Preparation**: Pour the suspension into the aqueous phase system of cosmetics, adjust the temperature of the aqueous phase to 45-55℃, and stir in the dark for 10-15 minutes at a speed of 150-200 r/min to ensure complete fusion of the extract with the aqueous phase system without visible particles.
3. **Emulsification**: Slowly pour the aqueous phase into the oil phase system (the temperature of the oil phase is the same as that of the aqueous phase, 50-55℃), and perform high-speed emulsification in the dark for 10-15 minutes at a speed of 300-500 r/min to form a uniform emulsified system.
4. **Post-Treatment**: After emulsification, cool the system to below 45℃, add preservatives, fragrances, emulsifiers, and other ingredients, continue stirring in the dark for 5 minutes, detect the pH value and stability, and fill after qualification, with the entire process conducted

in the dark.

Precautions

- **Addition Amount Control**: The addition amount of the powdered extract in lotions/creams is 0.3%-1.0%. For moisturizing and anti-inflammatory products, it is recommended to add 0.8%-1.0% to effectively inhibit skin inflammatory reactions; for whitening products, it is recommended to add 0.6%-1.0% to significantly improve skin dullness. Insufficient addition cannot exert efficacy, while excessive addition may lead to system instability and granularity.
- **Stirring Control**: The stirring speed during pretreatment must not be too low to avoid uneven suspension. During the emulsification of the aqueous phase and oil phase, the speed must be sufficient to ensure uniform emulsification without stratification.
- **Compatibility Control**: Avoid directly mixing the powdered extract with oils and surfactants. It should first be dissolved in the aqueous phase and then merged with the oil phase. When mixed with moisturizers such as hyaluronic acid and glycerin, the stirring time can be appropriately extended to improve compatibility.
- **Storage Control**: The finished lotions/creams must be stored in sealed, light-shielded, and cool places, avoiding high temperature and humid environments to prevent the loss of active ingredients of the extract and affect product efficacy.
- **Hygroscopicity Control**: The pretreatment of the powdered extract must be carried out quickly to avoid prolonged exposure to air for hygroscopic caking. The remaining powder must be sealed immediately for storage.

▶ Application in Masks (Mask liquids are suitable for liquid extracts, and mask powders are suitable for powdered extracts)

Production Process (Mask Liquid)

1. **Formulation**: Add the liquid extract (1.0%-3.0%) into the aqueous phase system of the mask liquid according to the formula ratio, add moisturizers such as glycerin and hyaluronic acid, and stir evenly in the dark at a speed of 150 r/min for 8-10 minutes.
2. **pH Adjustment**: Adjust the pH value of the system to 5.5-7.5 to ensure the stability of the extract and skin compatibility.
3. **Sterilization**: Sterilize the prepared mask liquid using a 0.22μm filter membrane to avoid microbial contamination, with the entire process conducted in the dark.
4. **Filling**: Fill the sterile mask liquid into the mask cloth, seal the packaging to ensure no leakage, and use light-shielded packaging

materials.

Production Process (Mask Powder)

1. **Preliminary Mixing**: Take the powdered extract (addition amount 0.5%-1.0%) and mix it with the mask powder base material (kaolin, talc, vitamin C powder) at a mass ratio of 1:10 evenly to avoid caking when added directly.
2. **Total Mixing**: Add the pre-mixture into a three-dimensional mixer and mix evenly with other mask powder raw materials at a speed of 300 r/min for 15-20 minutes to ensure that the coefficient of variation of the mixing uniformity is ⩽ 5%, with the entire process conducted in the dark.
3. **Packaging**: Pack in sterile aluminum foil bags with desiccants to avoid moisture absorption and contamination, and the packaging materials must be light-shielded.

Precautions

- **Efficacy Compatibility**: For soothing and repairing mask liquids, it is recommended to add 2.0%-3.0% (liquid extract) to relieve skin redness and stinging; for whitening and antioxidant mask powders, it is recommended to add 0.8%-1.0% (powdered extract).
- **Sterility Control**: During the production of mask liquids and powders, tools and containers must be sterilized. The mask liquid must be filled immediately after filtration to avoid microbial contamination and affect the shelf life of the product.
- **Moisture Resistance of Mask Powder**: The powdered extract in the mask powder is easy to absorb moisture. Desiccants must be added during packaging, and it should be stored in a dry and ventilated place. Use it as soon as possible after opening.
- **Compatibility**: The compatibility of the extract with preservatives and fragrances in the mask liquid must be tested in advance to avoid the occurrence of odor and precipitation.
- **Light Control**: The entire process of mask liquid production, filling, and mask powder mixing and packaging must be carried out in the dark. The finished masks must be stored in the dark to prevent the oxidation and discoloration of the extract and reduce efficacy.

▶ Application in Facial Cleansers (Suitable for Powdered Extracts)

Production Process

1. **Pretreatment**: Add the powdered extract (addition amount 0.1%-0.3%) into a small amount of deionized water to prepare a suspension

(mass ratio of extract: water = 1:5), and stir evenly in the dark at a speed of 200 r/min for 5 minutes.

2. **Aqueous Phase Preparation**: Pour the suspension into the aqueous phase system of the facial cleanser, add surfactants (e.g., amino acid surfactants) and moisturizers, and stir evenly in the dark at a speed of 150 r/min for 10 minutes.
3. **Emulsification**: Add oil phase ingredients, and perform high-speed emulsification in the dark for 5-8 minutes at a speed of 300 r/min to form a uniform paste system.
4. **Post-Treatment**: Adjust the pH value of the system to 5.5-6.5 (suitable for skin pH), detect the viscosity and stability, and fill after qualification, with the entire process conducted in the dark.

Precautions

- **Addition Amount Control**: Strictly control the addition amount within 0.1%-0.3%. Excessive addition may cause astringency and caking of the facial cleanser, and may also irritate the skin, while affecting the foam delicacy of the facial cleanser.
- **Component Isolation**: Avoid directly mixing the powdered extract with surfactants. It should first be dissolved in the aqueous phase before addition to prevent surfactants from destroying the active ingredients of the extract.
- **Mildness Control**: In amino acid facial cleansers, the addition amount of the extract is recommended to be controlled at 0.1%-0.2% to ensure the product is mild and non-irritating, suitable for sensitive skin.
- **Stability Detection**: The finished product must be left to stand for 24 hours. If no stratification or precipitation is detected, it can be shipped from the factory.
- **Light Control Storage**: The finished facial cleansers must be packaged in light-shielded containers and stored in a cool and dry place to avoid the degradation of active ingredients caused by light.

III. Application in the Food and Beverage Field: Production Process and Precautions

In the food and beverage field, onion extract corely exerts antioxidant, bacteriostatic, and nutritional enhancement effects. It must follow the principles of "food safety standards + no impact on product taste and appearance". It is suitable for the aqueous or oil phase system of food (targeted pretreatment is required), and direct light exposure must be avoided during the entire process. The details are classified and explained

as follows according to food types:

▶ Application in Functional Beverages (Suitable for Liquid Extracts)

Production Process

1. **Dilution**: Dilute the food-grade liquid onion extract (concentration 30%-50%) with drinking water to a concentration of 5%-10% (the dilution ratio is adjusted according to the addition amount), and stir evenly in the dark at a speed of 100 r/min for 3-5 minutes to ensure no turbidity or precipitation.
2. **Formulation**: Pour the diluted extract into the aqueous ingredients of the beverage (e.g., purified water, fruit juice, sweetener solution), stir evenly in the dark at a speed of 150 r/min for 5-8 minutes while pouring, add other ingredients such as acidulants and vitamins, and supplement purified water to the total amount.
3. **pH Adjustment**: Adjust the pH value of the system to 4.0-8.5 to ensure the stability of the extract and avoid the degradation of active ingredients.
4. **Sterilization and Filling**: Use UHT sterilization (135℃, 3-5 seconds) or pasteurization (65℃, 30 minutes), cool to below 25℃, and perform sterile filling into PET bottles or aluminum cans to avoid secondary contamination. The filled products must be packaged in the dark.
5. **Quality Detection**: Detect the content of active ingredients, microbial indicators, taste, and color to ensure compliance with food safety standards.

Precautions

- **Addition Amount Control**: The addition amount of the liquid extract is 0.5%-2.0% (mass fraction, the same below). When the addition amount is 1.0%, the antioxidant effect is the best, and the shelf life of the beverage can be extended by 3-5 days. Excessive addition will result in an obvious pungent and astringent taste, affecting the taste.
- **Sterilization Control**: The sterilization temperature must not exceed 100℃, and the time must not be too long to avoid a large loss of active ingredients (over 9%). During UHT sterilization, rapid cooling is required to reduce the high-temperature residence time.
- **Taste Optimization**: The extract itself has a slight pungent and astringent taste, which can be masked by adding sweeteners (e.g.,

stevioside) and fragrances, with an addition amount of 0.03%-0.05%.

- **Clarity Control**: If turbidity occurs after addition, the concentration of the extract can be appropriately reduced, or secondary filtration (0.22μm filter membrane) can be performed to ensure the clarity and transparency of the beverage.
- **Light Control**: The entire production process must be carried out in the dark. The finished products must be packaged in light-shielded containers and stored in a cool and dark place to avoid the discoloration of the beverage and the degradation of active ingredients caused by light.

▶ Application in Pastries (Suitable for Powdered Extracts)

Production Process

1. **Preliminary Mixing**: Take the powdered extract and mix it with pastry excipients (flour, starch, powdered sugar) at a mass ratio of 1:10 evenly to avoid caking and uneven distribution when added directly.
2. **Raw Material Mixing**: Add the pre-mixed mixture into pastry ingredients (e.g., egg liquid, butter, water) according to the formula requirements, and stir evenly in the dark at a speed of 200 r/min for 8-10 minutes to ensure the complete fusion of the extract with all ingredients.
3. **Forming**: Knead and shape (e.g., bread and cookie forming) according to the conventional pastry production process to ensure uniform forming without obvious particles.
4. **Baking**: The baking temperature for bread is 180-200℃ (top fire 200℃, bottom fire 180℃) for 25-30 minutes; the baking temperature for cookies is 170-190℃ for 10-12 minutes. High-temperature baking results in a loss of active ingredients of 2.5%-4.5%, which is within the normal range.
5. **Cooling and Packaging**: After baking, cool to room temperature, seal, and package in the dark to avoid moisture absorption and oxidation.

Precautions

- **Addition Amount Control**: The addition amount of the powdered extract is 0.1%-0.5%. When the addition amount is 0.3%, it can exert antioxidant effects without affecting the taste and color of the pastries. Excessive addition will lead to astringency and darkening of the

pastries.

- **Preliminary Mixing Control**: The preliminary mixing ratio must be accurate, and the mixing time must be sufficient to ensure the uniform dispersion of the extract in the excipients, avoiding local high concentration and affecting the taste and appearance.
- **Temperature Control**: The baking temperature must not exceed 200℃, otherwise, it will lead to a large loss of active ingredients of the extract and may produce a burnt taste.
- **Storage Control**: The finished pastries must be stored in sealed, dry, and light-shielded places to avoid moisture absorption and softening, and at the same time reduce the loss of active ingredients of the extract, with the shelf life extended by 2-3 days.
- **Raw Material Moisture Resistance**: The powdered extract must be stored in a sealed container. The preliminary mixing must be carried out quickly to avoid moisture absorption and caking.

▶ Application in Meat Products (Suitable for Powdered Extracts)

Production Process

1. **Pretreatment**: Add the powdered extract into a small amount of normal saline (mass ratio of extract: normal saline = 1:8), stir in the dark to prepare a suspension at a speed of 200 r/min for 5-7 minutes to facilitate dispersion in meat products.
2. **Weighing**: According to the meat product formula, accurately weigh the suspension (error ≤ ±0.2%), and adjust the addition amount according to the type of meat product.
3. **Addition and Stirring**: Uniformly spray the suspension on the surface of meat product raw materials (e.g., pork, beef, chicken) or add it to the meat filling, and stir evenly in the dark at a speed of 150 r/min for 10 minutes to ensure the uniform coverage of the extract on the raw materials.
4. **Marination**: Place the raw materials in a marination tank and marinate in the dark at room temperature for 2-4 hours to allow the extract to fully penetrate and exert bacteriostatic and fresh-keeping effects.
5. **Subsequent Treatment**: Steam and sterilize according to the conventional meat product production process (steaming temperature 90-100℃, time 20-30 minutes), cool, and seal and package in the dark.
6. **Quality Detection**: Detect the bacteriostatic effect (inhibition rate against *Staphylococcus aureus* ≥ 55%), taste, and color of the meat

products to avoid excessive astringency.

Precautions

- **Addition Amount Control**: The addition amount of the powdered extract is 0.3%-1.0%. When the addition amount is 0.8%, the inhibition rate against *Staphylococcus aureus* and *Escherichia coli* can reach over 65%, and the shelf life of the meat products can be extended by 2-3 days.
- **Suspension Preparation**: The concentration of the normal saline must be controlled at 0.9% to avoid affecting the taste of the meat products due to excessive concentration. The suspension must be prepared immediately before use to avoid precipitation due to prolonged storage.
- **Marination Control**: The marination time must not be too short (less than 2 hours), otherwise, the extract cannot fully penetrate and affect the bacteriostatic effect. The marination temperature must not be too high to avoid the spoilage of raw materials.
- **Taste Optimization**: If the meat products have an obvious astringent taste, the addition amount of the extract can be appropriately reduced, or a small amount of cooking wine and rock sugar can be added during marination to mask the astringent taste.
- **Light Control**: The marination and stirring processes must be carried out in the dark. The finished products must be stored in a sealed and dark place to avoid the darkening of the meat products and the loss of active ingredients caused by light.

▶ Application in Fruits and Vegetable Products (Suitable for Liquid Extracts)

Production Process

1. **Raw Material Treatment**: Wash, peel, and core fresh fruits and vegetables, cut them into pieces (e.g., fruit dices, fruit strips), or make them into fruit and vegetable juices to ensure that the raw materials are free of impurities and rot.
2. **Addition and Stirring**: According to the fruit and vegetable product formula, accurately weigh the food-grade liquid extract (error ≤ ±0.2%), and pour it into the fruit and vegetable processing liquid (e.g., fruit and vegetable juice, marination liquid), and stir evenly in the dark at a speed of 100 r/min for 5 minutes.
3. **Processing**: Place the fruits and vegetables in the processing liquid, and perform marination, juicing, and filling according to the conventional process to ensure that the extract is fully in contact with the raw materials, with the entire process conducted in the dark.

4. **Sterilization**: Use pasteurization (80-85℃, 15 minutes) to avoid the destruction of active ingredients of the extract by high temperatures and kill harmful microorganisms.
5. **Cooling and Packaging**: After sterilization, cool to room temperature quickly, seal, and package in the dark, and store in a low-temperature environment.

Precautions

- **Addition Amount Control**: The addition amount of the liquid extract is 0.5%-1.5%. When the addition amount is 1.0%, it can effectively inhibit the oxidative browning of fruits and vegetables, maintain their color, and extend the shelf life by 2-3 days.
- **pH Control**: Most fruits and vegetable products are acidic (pH 3.0-5.0). The pH value of the system must be ensured to be ⩾ 4.0. If the pH < 4.0, a small amount of sodium bicarbonate can be appropriately added to avoid the degradation of active ingredients of the extract.
- **Color Control**: The extract itself is light yellow to brown. The addition amount must not be too high to avoid affecting the original color of the fruits and vegetable products (e.g., light-colored fruit and vegetable juices).
- **Storage Control**: The finished fruits and vegetable products must be stored in a refrigerator (0-4℃) to reduce the loss of active ingredients of the extract and inhibit microbial reproduction.
- **Light Control**: The entire production and filling process must be carried out in the dark, and the packaging must use light-shielded materials to avoid accelerating the oxidative browning of fruits and vegetable products caused by light.

▶ Application in Condiments (Suitable for Powdered Extracts)

Production Process

1. **Preliminary Mixing**: Take the powdered extract (addition amount 0.2%-0.6%) and mix it with condiment base materials (salt, monosodium glutamate, maltodextrin) at a mass ratio of 1:15 evenly to avoid caking.
2. **Total Mixing**: Add the pre-mixture into a mixer and mix evenly with other condiment raw materials (e.g., spices, flavor enhancers) in the dark at a speed of 150 r/min for 10-15 minutes to ensure that the coefficient of variation of the mixing uniformity is ⩽ 5%.
3. **Crushing (Optional)**: If a fine powder condiment is required, crush the mixture to a 80-mesh sieve to remove impurities and caking.

4. **Packaging**: Package in sterile sealed containers with desiccants to avoid moisture absorption and contamination, and the packaging materials must be light-shielded.
5. **Quality Detection**: Detect the content of the extract, microbial indicators, and taste to ensure compliance with food safety standards.

Precautions

- **Addition Amount Control**: Strictly control the addition amount within 0.2%-0.6%. Excessive addition will result in a pungent and astringent taste of the condiment, affecting the flavor.
- **Mixing Uniformity**: The preliminary mixing ratio must be reasonable, and the mixing time must be sufficient to avoid local high concentration and affect the overall flavor of the condiment.
- **Moisture Resistance Control**: The powdered extract is easy to absorb moisture. The production process must be carried out quickly. Desiccants must be added during packaging, and it must be stored in a dry, ventilated, and light-shielded place.
- **Compatibility**: The compatibility of the extract with spices must be tested in advance to avoid flavor antagonism and affect the taste of the condiment.

IV. Application in the Pharmaceutical Health Products Field: Production Process and Precautions

In the pharmaceutical health products field, onion extract corely exerts anti-inflammatory, immune regulation, auxiliary lipid-lowering, and antioxidant effects. It must follow the principles of "pharmaceutical standards + accurate exertion of efficacy", strictly control the addition amount, purity, and sterility, avoid direct light exposure, and ensure the medicinal safety and effectiveness of the product. The details are classified and explained as follows according to dosage forms:

▶ Application in Tablets (Suitable for Powdered Extracts)

Production Process

1. **Raw Material Preparation**: Select pharmaceutical-grade onion extract (quercetin content ⩾ 1.5%, polysaccharide content ⩾ 7.0%), pass through a 100-mesh sieve to remove caking and impurities; mix with pharmaceutical excipients (starch: lactose = 1:1) at a mass ratio of 1:5 evenly.

2. **Preliminary Mixing**: Adopt the method of equal incremental mixing (the extract is first mixed with a small amount of filler), put it into a V-type mixer, stir in the dark at a speed of 200 r/min for 10-15 minutes to ensure uniform mixing without caking, and the coefficient of variation of the mixing uniformity is ⩽ 3%.
3. **Granulation**: Add an appropriate amount of binder (e.g., hydroxypropyl methylcellulose solution) to the mixture, stir in the dark to prepare a soft material, then granulate using a granulator. The particle size is controlled at 0.5-1.0 mm, and dry at 50-60℃ until the particle moisture content is ⩽ 5%. The drying process must be carried out in the dark.
4. **Granulation and Tableting**: Pass the dried particles through a 20-mesh sieve for granulation, add 1% magnesium stearate (lubricant), mix for 10 minutes, and tablet using a rotary tablet press at a pressure of 10-15 MPa to produce tablets with a tablet weight of 0.3-0.5 g per tablet, ensuring that the tablets have moderate hardness without fragments or loose tablets.
5. **Coating (Optional)**: If coating is required, coat the pressed tablets (coating material is hydroxypropyl methylcellulose), dry to a moisture content of ⩽ 3% after coating, with the entire process conducted in the dark.
6. **Quality Detection**: Detect the disintegration time (⩽ 30 minutes), content of active ingredients, and microbial indicators of the tablets. Only when they meet the standards of the *Pharmacopoeia of the People's Republic of China* can they be packaged.

Precautions

- **Purity Control**: The purity of the pharmaceutical-grade extract must comply with the pharmacopoeia standards. The content of quercetin and polysaccharides must meet the requirements, and heavy metal and microbial contamination must be strictly controlled (lead ⩽ 5 mg/kg, arsenic ⩽ 1 mg/kg). The test report must be obtained when purchasing.
- **Dosage Control**: Each tablet contains 0.1-0.3 g of powdered extract (calculated based on quercetin content ⩾ 1.5%, each tablet contains ⩾ 1.5 mg of quercetin). The weighing error is ⩽ ±0.005 g to ensure that the content of active ingredients per tablet meets the requirements and avoid insufficient or excessive dosage.
- **Sterility Control**: During the production process, all tools, excipients, and equipment must be sterilized. The tablet press workshop must meet the D-level cleanliness standard, and operators must wear sterile clothing, gloves, and masks.
- **Stability Control**: The tablets must have a moisture content of ⩽ 3%, and be stored in a cool, dry, and light-shielded place to avoid

prolonged storage due to moisture absorption, which may increase the disintegration time and cause the loss of active ingredients.

- **Light Control**: The entire process of processing, drying, and coating must be carried out in the dark. The finished products must be packaged in light-shielded containers to prevent the oxidative degradation of active ingredients such as quercetin and affect the medicinal effect.

▶ Application in Capsules (Suitable for Powdered Extracts)

Production Process

1. **Raw Material Preparation**: Select pharmaceutical-grade powdered extract and mix it with pharmaceutical excipients (lactose) at a mass ratio of 1:2 evenly to ensure that the purity of the extract meets the requirements and there are no impurities.
2. **Mixing**: Put the mixture into a V-type mixer, stir in the dark at a speed of 150 r/min for 8-10 minutes to ensure uniform dispersion, and the coefficient of variation of the mixing uniformity is ≤ 3%.
3. **Weighing**: According to the capsule formula, accurately weigh the mixture (the error of the extract content per capsule is ≤ ±0.005 g) to ensure that the content of active ingredients per capsule meets the requirements, which is suitable for the dosage of 2-3 capsules per day for adults.
4. **Filling**: Add the mixture into a capsule filling machine, adjust the filling amount, and fill it into hollow capsules (0# or 1# specifications) to ensure that the filling is full without powder leakage or empty capsules.
5. **Polishing**: Polish the filled capsules to remove surface powder and ensure the neat appearance of the capsules.
6. **Quality Detection**: Detect the content uniformity (≤ ±7.5%), content of active ingredients, and microbial indicators of the capsules. Only when they meet the pharmacopoeia standards can they be packaged in the dark.

Precautions

- **Excipient Selection**: The excipients must be pharmaceutical-grade. Lactose must comply with the pharmacopoeia standards, and the compatibility with the extract must be tested in advance to avoid antagonistic effects and affect the exertion of efficacy.
- **Humidity Control**: The humidity in the filling workshop must be controlled at ≤ 60% to avoid the caking of the extract due to moisture absorption and affect the filling uniformity. The raw materials must be stored in a sealed container and used as soon as possible after

opening.

- **Filling Accuracy**: The filling machine must be calibrated regularly to ensure that the filling accuracy meets the requirements and avoid large differences in the content, which may affect the use effect.
- **Packaging and Storage**: Use aluminum-plastic blister light-shielded packaging, store in a light-shielded, sealed, and dry place with a shelf life of 18-24 months. After opening, it must be used within 7 days.
- **Light Control**: The mixing and filling processes must be carried out in the dark. The finished products must be stored in a light-shielded environment to prevent the oxidation of active ingredients.

▶ Application in Oral Liquids (Suitable for Liquid Extracts)

Production Process

1. **Raw Material Preparation**: Select pharmaceutical-grade liquid extract (concentration 50%), ensure that there are no heavy metal or microbial contamination, and meet the pharmacopoeia standards.
2. **Dilution**: Dilute the liquid extract with sterile water to a concentration of 20%, stir evenly in the dark at a speed of 100 r/min for 5-8 minutes to ensure no precipitation or turbidity.
3. **Formulation**: Add the diluted extract into a sterile mixing tank, add pharmaceutical sweeteners (e.g., stevioside) and preservatives (e.g., potassium sorbate), stir evenly in the dark at a speed of 150 r/min for 8-10 minutes, and adjust the pH value to 5.0-7.5.
4. **Filtration**: Filter the prepared oral liquid through a sterile filter (filter precision 0.22μm) to remove impurities and microorganisms and ensure sterility, with the entire process conducted in the dark.
5. **Filling**: Fill the filtered oral liquid into ampoules or oral liquid bottles (10 mL per ampoule/bottle) using sterile filling equipment, and seal it. The error of the extract content per ampoule/bottle is ⩽ ±0.01 g.
6. **Sterilization**: Sterilize the filled and sealed oral liquid at 121℃ for 15 minutes to ensure that the microbial indicators meet the requirements.
7. **Quality Detection**: Detect the clarity, disintegration time, and content of active ingredients of the oral liquid. Only when they meet the pharmacopoeia standards can they be packaged in the dark.

Precautions

- **Sterility Control**: The entire production process must be carried out in a sterile environment. The mixing tank, filter, and filling equipment must be sterilized in advance (121℃, 30 minutes) and used after cooling.
- **Dilution Control**: The dilution ratio must be accurate to ensure that the concentration of the extract after dilution is uniform, avoiding local high concentration and causing turbidity or precipitation. The sterile water used for dilution must meet the standard of injection water.
- **pH Control**: The pH value must be strictly controlled at 5.0-7.5 to avoid the degradation of active ingredients of the extract due to exceeding the range and affect the efficacy.
- **Sterilization Control**: The sterilization temperature is 121℃, and the time is controlled within 15 minutes to avoid a large loss of active ingredients due to over-long sterilization time. After sterilization, cool rapidly to avoid secondary contamination.
- **Light Control**: The entire process of processing and filling must be carried out in the dark. The finished products must be packaged in light-shielded containers and stored in a cool and dark place to prevent the discoloration of the oral liquid and the degradation of active ingredients.

V. Application in the Feed Additive Field: Production Process and Precautions

In the feed additive field, onion extract corely exerts the effects of bacteriostasis and growth promotion, enhancing body resistance, and improving meat quality. It must follow the principles of "feed industry standards + compatibility with animal physiological characteristics", ensuring that the extract is uniformly dispersed in the feed without affecting the palatability of the feed, and avoiding direct light exposure. The details are classified and explained as follows according to animal types:

▶ Application in Livestock and Poultry Feeds (Suitable for Powdered Extracts)

Production Process

1. **Raw Material Preparation**: Select feed-grade onion extract (quercetin content ⩾ 0.8%, polysaccharide content ⩾ 4.0%), which complies with GB/T 19424-2022 *General Requirements for Plant Extracts as Feed Additives*. The feed raw materials (corn, soybean meal, bran,

etc.) must be dried (moisture content ≤ 12%) and crushed to a particle size of 0.8-1.2 mm.

2. **Preliminary Dilution**: Take the feed-grade powdered extract and mix it with the feed carrier (corn powder) at a mass ratio of 1:20 evenly, stir in the dark at a speed of 100 r/min for 10-15 minutes to prepare a pre-mixture, avoiding direct addition and uneven dispersion.
3. **Weighing**: According to the feed formula, accurately weigh the pre-mixture (addition amount error ≤ ±0.1%), and adjust the addition amount according to the growth stage of livestock and poultry (different addition amounts for piglets, growing and fattening pigs, and broilers).
4. **Mixing**: Add the pre-mixture into a feed mixer and mix evenly with other feed raw materials, stir in the dark at a speed of 80-100 r/min for 20-30 minutes to ensure the uniform distribution of the extract in the feed (the coefficient of variation of the mixing uniformity is ≤ 7%).
5. **Granulation (Optional)**: If granular feed is required, add the mixed feed into a granulator for granulation at a temperature of 80-90℃, with a particle size of 2-4 mm (adjusted according to the type of livestock and poultry), and dry to a moisture content of ≤ 12%.
6. **Quality Detection**: Detect the uniformity, content of the extract, and microbial indicators of the feed to ensure compliance with the feed industry standards, with no caking or odor.

Precautions

- **Addition Amount Control**: The addition amount of the extract in piglet feed is 0.5%-1.0% (mass fraction, the same below), which can increase the daily weight gain of piglets by 7%-9% and reduce the diarrhea rate. The addition amount of the extract in growing and fattening pig feed is 0.3%-0.5%, which can improve the quality of pork. The addition amount of the extract in broiler and laying hen feed is 0.2%-0.4%, which can increase the daily weight gain of broilers and the egg production rate of laying hens.
- **Mixing Uniformity**: The dilution ratio of the pre-mixture must be reasonable, and the mixing time must be sufficient to ensure the uniform distribution of the extract in the feed, avoiding local high or low concentration and affecting the use effect.
- **Moisture Content Control**: The moisture content of the feed raw materials and finished feed must be controlled at ≤ 12% to avoid the caking of the extract due to moisture absorption and affect the shelf life of the feed.
- **Palatability Control**: The addition amount of the extract must not exceed 1.0% (exceeding this amount will affect the palatability of the

feed and cause a decrease in feed intake of livestock and poultry). If palatability problems occur, the proportion of the carrier can be appropriately increased.

- **Light Control**: The preliminary dilution and mixing processes must be carried out in the dark. The finished feed must be stored in a sealed and light-shielded place to avoid the degradation of active ingredients caused by light and affect the use effect.

▶ Application in Aquatic Feeds (Suitable for Powdered Extracts)

Production Process

1. **Raw Material Preparation**: Select feed-grade powdered extract and mix it with the feed carrier (fish meal) at a mass ratio of 1:15 evenly to prepare a pre-mixture. The aquatic feed raw materials (soybean meal, fish meal, minerals, etc.) must be dried and crushed to ensure no impurities.
2. **Weighing**: According to the aquatic feed formula, accurately weigh the pre-mixture (addition amount error ≤ ±0.1%), and adjust the addition amount according to the type of aquatic animals (different addition amounts for fish and shrimp).
3. **Mixing**: Add the pre-mixture into a feed mixer and mix evenly with other aquatic feed raw materials, stir in the dark at a speed of 100-150 r/min for 30 minutes to ensure uniform distribution.
4. **Granulation**: Granulate the mixed feed into granular feed with a particle size of 1-3 mm (adjusted according to the size of aquatic animals) at a granulation temperature of 90-100℃, dry to a moisture content of ≤ 10%, and ensure that the particles have good water stability (no disintegration after soaking for 30 minutes).
5. **Cooling and Packaging**: Cool to room temperature after granulation, seal and package in the dark to avoid moisture absorption and oxidation.
6. **Quality Detection**: Detect the water stability, content of the extract, and bacteriostatic effect of the feed to ensure compliance with the feed industry standards before use.

Precautions

- **Addition Amount Control**: The addition amount of the extract in fish feed (carp, grass carp) is 0.5%-1.0%, which can increase the survival rate of fish by 9%-14% and improve the meat quality. The addition amount of the extract in shrimp feed is 0.8%-1.2%, which can enhance

the stress resistance of shrimp and reduce the incidence of diseases.

- **Granulation Control**: The granulation temperature must not exceed 100℃, otherwise, it will cause a loss of active ingredients of the extract of ⩾ 9% and affect the bacteriostatic and growth-promoting effects. After granulation, thorough drying is required to ensure that the moisture content is ⩽ 10% to avoid the rapid disintegration of the feed in water, leading to the loss of the extract and affecting the feeding effect of aquatic animals.
- **Water Stability Control**: The aquatic feed particles must ensure no disintegration after soaking for 30 minutes. If the stability is insufficient, the proportion of the binder can be appropriately increased, and the uniform distribution of the extract must be ensured to avoid the cracking of the particles due to local high concentration.
- **Palatability Control**: The addition amount of the extract must not exceed 1.2%, otherwise, it will affect the palatability of the aquatic feed and cause a decrease in the feeding rate of fish and shrimp. If palatability problems occur, a small amount of attractants (e.g., fish meal extract) can be added to improve the feeding effect.
- **Storage Control**: The finished aquatic feed must be stored in a sealed, light-shielded, and dry place with a storage temperature controlled below 25℃ and humidity ⩽ 60% to avoid moisture absorption and oxidation. The shelf life is controlled within 6 months, and it must be used as soon as possible after opening.
- **Light Control**: The entire process of pre-mixture preparation, feed mixing, and granulation must be carried out in the dark to avoid the degradation of active ingredients of the extract caused by light and reduce the efficacy of the feed.
- **Compatibility Control**: The extract has good compatibility with minerals, vitamins, and probiotics in aquatic feed and can exert synergistic effects. However, it should be avoided to directly mix with strong acid or strong base feed additives to prevent the destruction of active ingredients.

VI. Quality Detection and Acceptance Standards After the Addition of Onion Extract

After the addition of onion extract, strict quality detection must be carried out to ensure that the final product meets the standards of the corresponding field. At the same time, verify the addition amount of the extract, the retention rate of active ingredients, and the compliance of

efficacy to avoid product unqualified due to improper addition or loss of active ingredients. The details are classified and explained according to the types of detection, covering the general standards and specific requirements of the four application fields.

6.1 General Detection Items and Standards (Universal for the Four Fields)

6.1.1 Retention Rate Detection of Active Ingredients

The retention rate of core active ingredients including quercetin, polysaccharides, and sulfur-containing compounds must be detected to ensure that the loss of active ingredients during processing is within a reasonable range. The detection methods are the same as those for the extract raw materials (HPLC, phenol-sulfuric acid method

6.1.1 Retention Rate Detection of Active Ingredients

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- **Quercetin Retention Rate**: ⩾ 85%. The higher the processing temperature and the longer the light exposure time, the lower the retention rate. The retention rate should be ⩾ 90% for cosmetics and pharmaceutical health products, and ⩾ 85% for food and feed fields. If it is lower than the standard, the processing temperature, light-shielding measures, or addition amount should be adjusted.
- **Polysaccharide Retention Rate**: ⩾ 90%. Polysaccharides have better heat and acid-alkali resistance than quercetin, and the loss is relatively small during processing. The standard is unified for all fields. If the retention rate is lower than 90%, the purity of the raw materials or the humidity control during processing should be checked.
- **Sulfur-Containing Compound Retention Rate**: ⩾ 80%. Sulfur-containing compounds are volatile and prone to oxidation. For high-temperature processing (e.g., feed granulation and food baking), the time must be strictly controlled. If the retention rate is lower than 80%, the processing technology should be optimized.

6.1.2 Uniformity Detection (Universal for Solid Final Products)

This test is applicable to powdered cosmetics (mask powder), powdered food (condiments, pastry ingredients), pharmaceutical health products (tablets, capsules, granules), and feed (premix, granulated feed). It detects the uniformity of the extract in the final product to avoid local high

or low concentration.

- **Detection Method**: Randomly select 3-5 samples, detect the content of the extract in each sample, and calculate the coefficient of variation.
- **Standard Requirements**: The coefficient of variation should be ≤ 5% for cosmetics and pharmaceutical health products, ≤ 5% for the food field, and ≤ 7% for the feed field. If the coefficient of variation is too high, re-mixing is required, and the proportion of the pre-mixture or stirring time should be adjusted.

6.1.3 Microbial Detection

Strictly control the microbial contamination of the final product to meet the national standards of the corresponding field. The core detection items include total plate count, mold and yeast count, and pathogenic bacteria (e.g., *Staphylococcus aureus*, *Escherichia coli*). The specific standards are as follows (unit: CFU/g or CFU/mL):

- **Cosmetics**: Total plate count ≤ 100 CFU/g (≤ 100 CFU/mL for liquids), mold and yeast ≤ 10 CFU/g (≤ 10 CFU/mL for liquids), and pathogenic bacteria must not be detected.
- **Food and Beverages**: Total plate count ≤ 1000 CFU/g (≤ 100 CFU/mL for liquids), mold and yeast ≤ 100 CFU/g (≤ 50 CFU/mL for liquids), and pathogenic bacteria must not be detected.
- **Pharmaceutical Health Products**: Total plate count ≤ 10 CFU/g (≤ 10 CFU/mL for liquids), mold and yeast ≤ 1 CFU/g (≤ 1 CFU/mL for liquids), and pathogenic bacteria must not be detected.
- **Feed**: Total plate count ≤ 10000 CFU/g, mold and yeast ≤ 100 CFU/g, and pathogenic *Salmonella* must not be detected.

6.1.4 Heavy Metal Detection

Detect the content of heavy metals such as lead, arsenic, and mercury in the final product to ensure compliance with the safety standards of the corresponding field, and avoid heavy metal contamination introduced by the extract raw materials or the processing process. The specific standards are as follows (unit: mg/kg):

- **Cosmetics**: Lead ≤ 10 mg/kg, arsenic ≤ 2 mg/kg, mercury ≤ 0.1 mg/kg.
- **Food and Beverages**: Lead ≤ 0.5 mg/kg, arsenic ≤ 0.2 mg/kg, mercury ≤ 0.01 mg/kg.

- **Pharmaceutical Health Products**: Lead ⩽ 5 mg/kg, arsenic ⩽ 1 mg/kg, mercury ⩽ 0.1 mg/kg.
- **Feed**: Lead ⩽ 5 mg/kg, arsenic ⩽ 2 mg/kg, mercury ⩽ 0.1 mg/kg.

6.2 Specific Detection Items and Standards for Each Field

6.2.1 Specific Detection for the Cosmetics Field

- **Skin Irritation Detection**: Applicable to all final cosmetic products. The products must be free of irritation through skin patch tests. For sensitive skin products, additional sensitive skin special tests must be conducted, with no redness or stinging reactions.
- **Stability Detection**: Place the finished products in an environment of 45℃ and strong light (4000 lx) for 28 days, and detect the appearance, color, and content of active ingredients. No obvious discoloration, stratification, or precipitation should be observed, and the retention rate of active ingredients should be ⩾ 88%.
- **Clarity Detection**: Applicable to liquid cosmetics (toners, serums, mask liquids). The products must be free of turbidity and precipitation, with a light transmittance of ⩾ 95%.

6.2.2 Specific Detection for the Food and Beverage Field

- **Taste and Color Detection**: No obvious pungent, astringent, or abnormal odor should be present, and the color should be consistent with that of similar products. No abnormal discoloration (e.g., yellowing of beverages, blackening of meat products) should occur.
- **Shelf Life Verification**: Simulate the room temperature storage environment to detect the shelf life of the product. It is ensured that the shelf life of the product added with the extract is extended by 2-5 days compared with the product without the extract, which meets the food shelf life standards.
- **Bacteriostatic Effect Detection**: Detect the inhibition rate against *Staphylococcus aureus* and *Escherichia coli*. The inhibition rate should be ⩾ 55% in the food field, and ⩾ 60% for meat products and fruits and vegetable products.
- **pH Value Detection**: Control the pH value within 4.0-8.5 to ensure the stability of the extract and meet the food taste requirements.

6.2.3 Specific Detection for the Pharmaceutical Health Products Field

- **Efficacy Ingredient Content Detection**: Each tablet or capsule should contain ⩾ 1.5 mg of quercetin and ⩾ 7.0 mg of polysaccharides. Each oral liquid ampoule should contain ⩾ 3.0 mg of quercetin, which meets the standards of the *Pharmacopoeia of the People's*

Republic of China.

- **Disintegration Time Detection**: The disintegration time of tablets should be ⩽ 30 minutes, and that of capsules should be ⩽ 60 minutes. The oral liquid should be clear without precipitation to ensure the normal release of efficacy ingredients.
- **Sterility Detection**: Oral liquids and injectable extracts (if any) must be sterile, which meets the pharmaceutical sterility standards and has no microbial contamination.
- **Stability Detection**: Store in a dark place at room temperature for 12 months. The loss of active ingredient content should be ⩽ 10%, and no obvious changes in appearance or properties should occur.

6.2.4 Specific Detection for the Feed Field

- **Water Stability Detection**: Applicable to aquatic feed. The granulated feed should not disintegrate after soaking for 30 minutes, and the loss rate of the extract should be ⩽ 5% to ensure that aquatic animals can feed fully.
- **Palatability Detection**: Through feeding tests with livestock, poultry, and aquatic animals, the feeding rate should be ⩾ 95% with no rejection of food, ensuring no impact on feed palatability.
- **Growth-Promoting Effect Detection**: For livestock feed, the daily weight gain should be increased by ⩾ 7% and the diarrhea rate should be reduced by ⩾ 15%. For aquatic feed, the survival rate should be increased by ⩾ 9%, which meets the feed industry efficacy standards.
- **Moisture Content Detection**: The moisture content of the finished feed should be ⩽ 12% (⩽ 10% for aquatic feed) to avoid moisture absorption and caking, affecting storage and use.

6.3 Detection Process and Acceptance Requirements

1. **Sampling**: After processing, randomly select samples. For solid products, 50-100 g are sampled; for liquid products, 50-100 mL are sampled. The samples are divided into test samples and reserved samples. The reserved samples are stored for 6 months for subsequent traceability.
2. **Detection**: Conduct detection in accordance with the general detection items + specific detection items in turn. The detection is entrusted to a testing institution or an internal laboratory with corresponding qualifications to ensure the accuracy of the detection data.

3. **Acceptance Judgment**: If all detection items meet the corresponding standards, the product is judged as qualified and can be shipped or put into use. If any item is unqualified, re-sampling and detection are required. If it is still unqualified, the product is judged as unqualified and needs to be reworked or discarded.
4. **Record Archiving**: The detection data and acceptance results must be recorded in detail and archived for at least 1 year, including the batch number of the extract, processing parameters, detection time, detection personnel, and detection results, which are convenient for subsequent quality traceability.

VII. Storage, Transportation, and Safety Operation Specifications for Onion Extract

The storage and transportation conditions of onion extract directly affect the stability of its active ingredients and use effect. The safety operation specifications can avoid safety hazards during processing. Combined with the characteristics of different forms (powdered, liquid) of the extract, general specifications and specific requirements are formulated, covering three links: storage, transportation, and safety operation, which are applicable to the four application fields.

7.1 Storage Specifications (Classified by Form)

7.1.1 Storage of Powdered Onion Extract

Powdered extract (aqueous extract, alcohol extract) is easy to absorb moisture, oxidize, and is sensitive to light. The storage environment must be strictly controlled with the following specifications:

- **Packaging Requirements**: Adopt a double-layer sealed packaging. The inner layer is a food-grade/pharmaceutical-grade/feed-grade aluminum foil bag, and the outer layer is a carton or plastic bucket, with desiccants (silicone desiccant) inside. The packaging must be tightly sealed to prevent moisture absorption, air leakage, and direct light exposure.
- **Environmental Requirements**: Store in a cool, dry, and ventilated warehouse with a temperature controlled at 15-25℃ and a relative humidity of ≤ 60% (≤ 55% for aqueous extract). Avoid humid, high-temperature, and strong light environments. The warehouse should be away from heat sources and fire sources.
- **Stacking Requirements**: The stacking height should not exceed 1.5 m to avoid extrusion of the packaging and seal failure. It should be

stacked separately from other raw materials to avoid cross-contamination, and labels such as "light-shielded, moisture-proof, sealed" should be pasted.

- **Shelf Life**: For unopened powdered extract, stored in a sealed, light-shielded place at room temperature, the shelf life is 18-24 months. After opening, it must be sealed immediately and used as soon as possible. The shelf life is shortened to 1 month to avoid the loss of active ingredients caused by moisture absorption and oxidation.
- **Precautions**: Regularly check the sealing of the packaging. If the packaging is found to be damaged or the extract is caked due to moisture absorption, it should be handled in a timely manner and must not be used again. Avoid storing with strong acids, strong bases, and oxidants to prevent the destruction of active ingredients.

7.1.2 Storage of Liquid Onion Extract

Liquid extract has no obvious hygroscopicity, but it is prone to oxidation and volatilization and is sensitive to temperature and light. The storage specifications are as follows:

- **Packaging Requirements**: Use food-grade/pharmaceutical-grade/feed-grade plastic buckets or glass bottles for packaging, which must be tightly sealed with no leakage at the bottle mouth. Glass bottles should be avoided to prevent collision and breakage.
- **Environmental Requirements**: Store in a cool, light-shielded warehouse with a temperature controlled at 10-20℃. Avoid high temperatures and direct light exposure. High temperatures can easily cause the volatilization of sulfur-containing compounds and the oxidation of active ingredients.
- **Stacking Requirements**: The stacking height of plastic buckets should not exceed 1 m, and glass bottles should be stacked separately to avoid collision and breakage. It should be stacked separately from other liquid raw materials, and labels such as "light-shielded, sealed, away from heat sources" should be pasted.
- **Shelf Life**: For unopened liquid extract, stored in a sealed, light-shielded place at room temperature, the shelf life is 12-18 months. After opening, it must be sealed and refrigerated (0-4℃), with the shelf life shortened to 15 days to avoid oxidation and microbial contamination.
- **Precautions**: Regularly check whether the packaging is leaking. If leakage is found, the extract should be transferred to a new packaging

immediately, and the leaked material should be cleaned up. Avoid violent shaking during storage to prevent component stratification. When refrigerated, avoid freezing to affect solubility.

7.2 Transportation Specifications

During transportation, the temperature and humidity must be strictly controlled to avoid light exposure, extrusion, and collision, ensuring that the extract is not damaged or deteriorated during transportation. It is applicable to different transportation methods (road, railway, air) with the following specifications:

- **Packaging Reinforcement**: Before transportation, check the sealing of the packaging. For powdered extract, add buffer materials (foam, carton) to the outer layer to avoid packaging damage caused by extrusion. For liquid extract, adopt shockproof packaging to avoid collision, breakage, and leakage.
- **Temperature Control**: During transportation, the temperature should be controlled at 15-25℃. For high temperatures in summer, refrigerated transportation (refrigerated truck) should be adopted to avoid temperatures exceeding 30℃. For low temperatures in winter, heat preservation measures should be taken to avoid freezing of liquid extract.
- **Light Control**: The transportation vehicle or container must be made of light-shielded materials (sunshade cloth, light-shielded carriage) to avoid direct light exposure, preventing the oxidation and discoloration of the extract and the loss of active ingredients.
- **Stacking Requirements**: During transportation, the extract should be stacked neatly to avoid extrusion and dumping. The stacking height of powdered extract should not exceed 1 m, and liquid extract should be stacked separately and kept away from sharp objects.
- **Transportation Prohibitions**: Avoid mixing and transporting with strong acids, strong bases, oxidants, and toxic and harmful substances to prevent cross-contamination and chemical reactions. The transportation vehicle must be clean, dry, free of odor and contaminants.
- **Transportation Records**: Keep detailed transportation records, including the batch number, quantity, transportation time, transportation temperature, and receiver of the extract, which are convenient for subsequent quality traceability. During transportation, arrange special personnel to track and handle emergencies in a timely manner (e.g., packaging damage, leakage).

7.3 Safety Operation Specifications (During Processing)

During processing, operators must strictly abide by safety operation specifications to avoid the contact of the extract with the skin and mucous

membranes, and prevent safety hazards such as fire and contamination. It is applicable to the processing scenarios of the four application fields with the following specifications:

- **Personal Protection**: Operators must wear work clothes, gloves, masks, and goggles to avoid inhaling powdered extract into the respiratory tract or contacting the skin, and avoid splashing liquid extract into the eyes and mouth. If accidentally contacted, rinse with a large amount of clean water immediately, and seek medical attention if necessary.
- **Operating Environment**: The processing workshop must be well-ventilated, equipped with ventilation equipment to avoid the accumulation and inhalation of powdered extract. The operating area for liquid extract must be dry and clean to avoid slipping caused by liquid leakage.
- **Equipment Operation**: When using equipment such as mixers, mixers, and granulators, check the operation status of the equipment in advance, and operate strictly in accordance with the equipment operation procedures to avoid equipment failure leading to the leakage and splashing of the extract. After operation, clean the equipment in a timely manner to avoid the residual and deterioration of the extract.
- **Fire and Explosion Prevention**: Although onion extract contains a small amount of sulfur-containing compounds, it is not flammable. It must be kept away from heat sources and fire sources. Smoking is prohibited in the processing workshop, and fire-fighting equipment (dry powder fire extinguisher) must be equipped to prevent fires.
- **Contamination Control**: During processing, avoid the contact of the extract with toxic and harmful substances and impurities. Tools and containers must be clean and disinfected. Tools for different fields must be used separately (tools for cosmetics and pharmaceutical health products must be sterile) to prevent cross-contamination.
- **Emergency Handling**: If the extract leaks, collect the powdered extract in a timely manner to avoid inhalation and clean the scene with water. For liquid extract, absorb it with adsorbent materials in a timely manner to prevent the spread of leakage. If a fire occurs, use a dry powder fire extinguisher to put out the fire immediately, and water is strictly prohibited.
- **Training Requirements**: Before taking up the post, operators must receive safety operation training, be familiar with the characteristics of the extract, safety operation specifications, and emergency handling methods, and can only take up the post after passing the

assessment.

VIII. Common Problems and Solutions (Universal for the Four Fields)

Combined with the actual processing scenarios of onion extract in the four application fields, common problems (loss of active ingredients, uneven dispersion, abnormal appearance, unqualified efficacy, etc.) are sorted out, the causes are analyzed, and targeted solutions are provided to help operators quickly troubleshoot and solve problems, ensuring the smooth progress of processing and improving the quality of the final product.

8.1 Excessive Loss of Active Ingredients (Core Common Problem)

Problem Manifestation

The retention rate of quercetin and sulfur-containing compounds in the final product is lower than the standard (< 85%), resulting in unqualified product efficacy (e.g., poor whitening effect of cosmetics, poor growth-promoting effect of feed, no extension of food shelf life).

Common Causes

- **Excessive Processing Temperature**: When the temperature exceeds 100℃ and the heating time is too long, a large number of active ingredients are degraded.
- **Direct Light Exposure**: No light-shielding measures are taken during processing, and the extract is oxidized by strong light, resulting in the loss of active ingredients.
- **Improper pH Value**: The pH value of the processing system exceeds the range of 4.0-8.5, leading to the degradation of active ingredients such as quercetin.
- **Improper Storage and Transportation**: The extract raw materials absorb moisture and oxidize during storage and transportation, resulting in insufficient active ingredient content of the raw materials.
- **Mixing with Prohibited Components**: Mixing with strong acids, strong bases, and oxidants causes chemical reactions and destroys active ingredients.

Solutions

- **Control Processing Temperature**: Control the processing temperature below 80℃. If necessary, shorten the heating time (e.g., pasteurization of food, granulation of feed). For high-temperature processing links (e.g., baking of pastries), the extract can be added at the later stage of processing to reduce the exposure time to high temperatures.
- **Strengthen Light-Shielding Measures**: Adopt light-shielded equipment and containers for the entire process of processing, filling, and mixing, and package the finished products in light-shielded containers.
- **Adjust pH Value**: Detect the pH value of the processing system and adjust it to the optimal stable range of 5.5-7.5 to avoid exceeding the range of 4.0-8.5.
- **Standardize Storage and Transportation**: Strictly store and transport the extract raw materials in accordance with the specifications in Chapter VII to ensure that the active ingredient content of the raw materials meets the standards. After the raw materials are opened, use them as soon as possible to avoid prolonged exposure.
- **Avoid Mixing with Prohibited Components**: Avoid mixing the extract with strong acids, strong bases, and oxidants during processing. If other components need to be added, test the compatibility in advance.
- **Remedial Measures**: If the loss of active ingredients is already too large, the addition amount of the extract can be appropriately increased, and the retention rate can be re-detected until it meets the standard. If it cannot be remedied, rework is required.

8.2 Uneven Dispersion of the Extract (Mainly for Solid Final Products)

Problem Manifestation

The extract is unevenly distributed in the final product, with local high concentration (caking, abnormal odor) and local low concentration (unqualified efficacy). The coefficient of variation of the mixing uniformity exceeds the standard range.

Common Causes

- **No Preliminary Mixing**: The powdered extract is directly added to a large amount of raw materials without pre-mixing with the carrier in advance, resulting in uneven dispersion.
- **Improper Preliminary Mixing Ratio**: The ratio of the extract to the carrier in the pre-mixture is too high, and the dosage of the carrier

is insufficient, which cannot achieve uniform dispersion.

- **Insufficient Stirring Time and Speed**: During mixing, the stirring speed is too low and the time is too short, resulting in the incomplete fusion of the extract with the raw materials.
- **Moisture Absorption and Caking of the Extract**: The powdered extract absorbs moisture and cakes. If it is not crushed and sieved before addition, it cannot be dispersed.
- **Large Difference in Particle Size of Raw Materials**: The particle size of the extract and other raw materials differs greatly, and stratification is easy to occur during mixing, resulting in uneven dispersion.

Solutions

- **Strictly Perform Preliminary Mixing**: The powdered extract must be pre-mixed with the carrier (corn powder, starch, lactose) at a ratio of 1:15-1:20 in advance to prepare a pre-mixture, and then added to other raw materials.
- **Adjust Preliminary Mixing Ratio**: Ensure that the ratio of the extract to the carrier in the pre-mixture is reasonable, and the dosage of the carrier is sufficient to improve dispersibility.
- **Optimize Stirring Parameters**: Adjust the stirring speed (80-200 r/min, adjusted according to the product type) and extend the stirring time (20-30 minutes) to ensure uniform mixing.
- **Treat Caked Extract**: If the powdered extract absorbs moisture and cakes, it must be crushed and sieved first to remove the cake, and then pre-mixed and mixed.
- **Unify Raw Material Particle Size**: Crush the extract and other raw materials to a similar particle size (0.8-1.2 mm) to avoid stratification caused by large particle size differences.
- **Detection and Verification**: After mixing, sample and detect the uniformity. If the coefficient of variation exceeds the standard, re-mix until it meets the standard.

8.3 Abnormal Appearance of the Final Product (Discoloration, Turbidity, Precipitation)

Problem Manifestation

Cosmetics (toners, serums) have turbidity, precipitation, or discoloration; food (beverages, fruit and vegetable juices) have turbidity or yellowing;

pharmaceutical health products (oral liquids) have precipitation or discoloration; feed has caking or discoloration.

Common Causes

- **Improper pH Value**: The pH value of the system exceeds the stable range of the extract, leading to the precipitation of active ingredients and turbidity or precipitation.
- **Light Oxidation**: No light-shielding measures are taken during processing and storage, and the extract is oxidized and discolored, resulting in yellowing or blackening.
- **Excessive Addition Amount**: The addition amount of the extract exceeds the applicable range, resulting in system instability and turbidity or precipitation.
- **Poor Compatibility**: Poor compatibility with other components (e.g., surfactants, preservatives) leads to reactions and precipitation.
- **Insufficient Purity of the Extract**: The raw material contains too many impurities, resulting in turbidity or precipitation of the final product.
- **Moisture Absorption and Caking**: The powdered extract absorbs moisture, resulting in caking of feed, mask powder, etc.

Solutions

- **Adjust pH Value**: Detect the pH value of the system and adjust it to 5.5-7.5. If turbidity or precipitation occurs, a small amount of solubilizer (e.g., Tween-80) can be added to promote dissolution.
- **Strengthen Light-Shielding**: The entire process of processing and storage must be carried out in the dark, and light-shielded packaging must be used. If slight discoloration occurs, the addition amount of the extract can be appropriately reduced, or an antioxidant (e.g., vitamin C) can be added to delay oxidation.
- **Control Addition Amount**: Strictly follow the addition amount standards of each field to avoid excessive addition. If it is already excessive, add an appropriate amount of carrier or raw materials to dilute the concentration.
- **Test Compatibility**: Before processing, test the compatibility of the extract with other components in advance to avoid using incompatible components. If a reaction has already occurred, replace the corresponding components.
- **Select High-Purity Raw Materials**: When purchasing the extract, choose raw materials with qualified purity and low impurity content,

and obtain the test report to avoid abnormal appearance caused by excessive impurities.

- **Moisture-Proof Treatment**: Take moisture-proof measures during the storage and processing of the powdered extract. If the product is already caked, the feed can be crushed and re-mixed, while cosmetics and food need to be reworked or discarded.

8.4 Unqualified Efficacy of the Final Product

Problem Manifestation

Cosmetics have poor whitening, moisturizing, and soothing effects; food has no extended shelf life or poor bacteriostatic effect; pharmaceutical health products have no obvious anti-inflammatory or immune regulation effects; feed has poor growth-promoting or survival rate-improving effects.

Common Causes

- **Insufficient Addition Amount of the Extract**: The addition amount is lower than the minimum required for efficacy, so the corresponding efficacy cannot be exerted.
- **Excessive Loss of Active Ingredients**: During processing and storage, a large number of active ingredients are degraded, and the retention rate is lower than the standard.
- **Inappropriate Extract Specification**: The selected extract specification does not meet the field requirements (e.g., the purity of the pharmaceutical-grade extract is insufficient), resulting in unqualified efficacy ingredient content.
- **Improper Processing Technology**: Improper stirring, over-long heating time, or improper pH value affect the exertion of efficacy.
- **Poor Adaptability of Raw Materials**: The form of the extract is not compatible with the processing system (e.g., powdered extract is used in liquid cosmetics without pretreatment).

Solutions

- **Increase Addition Amount**: According to the addition amount standards of each field, appropriately increase the addition amount of the extract to ensure that the concentration meets the required efficacy.
- **Reduce Loss of Active Ingredients**: Optimize the processing technology, control the temperature and light-shielding, adjust the pH value, and standardize storage and transportation to improve the retention rate of active ingredients.

- **Select Suitable Specifications**: According to the application field, select the corresponding specification of the extract (e.g., pharmaceutical-grade extract with quercetin ⩾ 1.5%), and check the test report when purchasing.
- **Optimize Processing Technology**: Adjust the stirring parameters and heating time to ensure the uniform dispersion of the extract and the non-degradation of active ingredients.
- **Adapt the Extract Form**: According to the processing system, select the corresponding form of the extract (e.g., liquid extract for liquid cosmetics). When the powdered extract is used in a liquid system, it must be pretreated in advance to prepare a suspension or solution.

8.5 Poor Palatability/Use Sensation (Food, Feed, Cosmetics)

Problem Manifestation

Food has a pungent, astringent, or abnormal odor; feed causes livestock, poultry, and aquatic animals to refuse to eat; cosmetics cause skin dryness or stinging after use.

Common Causes

- **Excessive Addition Amount of the Extract**: Excessive addition increases the pungent, astringent, or abnormal odor, or causes skin irritation.
- **Insufficient Purity of the Extract**: The raw material contains too many impurities, introducing abnormal odors.
- **Improper Processing Technology**: During food processing, the addition time of the extract is inappropriate, resulting in increased astringency. In cosmetics, the extract is not completely dissolved, resulting in skin stinging.
- **No Optimization of Palatability/Use Sensation**: Sweeteners and fragrances are not added to food to mask the astringent taste; moisturizers are not matched in cosmetics to relieve dryness.

Solutions

- **Reduce Addition Amount**: Strictly control the addition amount to avoid excess and ensure it is within the applicable range.
- **Select High-Purity Raw Materials**: Select extracts with low impurity content and high purity to reduce abnormal odors.
- **Optimize Processing Technology**: During food processing, add the extract at the later stage to shorten the exposure time to high temperatures and reduce astringency. In cosmetics, ensure the complete dissolution and uniform dispersion of the extract to avoid

granularity.

- **Optimize Formula**: Add sweeteners (stevioside) and fragrances to food to mask the pungent and astringent taste; match moisturizers such as glycerin and hyaluronic acid in cosmetics to relieve skin dryness; add attractants to feed to improve palatability.

IX. Supplementary Provisions

9.1 Scope of Application of the Guidelines

This guideline is applicable to the addition, processing, detection, storage, transportation, and safety operation of onion extract in four core fields: cosmetics, food and beverages, pharmaceutical health products, and feed additives. It covers two forms of extract: powdered and liquid, and is applicable to operators and managers of relevant production enterprises, processing workshops, and testing institutions.

9.2 Standard Update Instructions

This guideline is formulated based on the current national standards (GB/T 30645-2014, GB 1886.234-2016, GB/T 19424-2022, etc.) and industry practices. If the national or industry standards are updated later, the relevant content of this guideline must be revised synchronously to ensure compliance with the latest standard requirements.

9.3 Liability Statement

This guideline is only used as an operating guideline for the addition method of onion extract. Each enterprise must flexibly adjust the relevant parameters according to its own production process and product formula and must not copy them completely. Operators must strictly operate in accordance with this guideline and the enterprise operation procedures. If the product is unqualified or a safety hazard occurs due to improper operation or unreasonable parameter adjustment, the corresponding responsibilities shall be borne by the relevant operators and managers.

9.4 Definition of Terms

- **Onion Extract**: A natural plant extract obtained by water extraction, alcohol extraction, or aqueous-alcohol mixed extraction from the bulbs of the Liliaceae Allium plant, containing active ingredients such as quercetin, polysaccharides, and sulfur-containing compounds.
- **Retention Rate of Active Ingredients**: The ratio of the content of active ingredients in the final product to the content of active

ingredients in the extract raw materials, which reflects the loss of active ingredients during processing.

- **Mixing Uniformity**: The degree of distribution of the extract in the final product, which is expressed by the coefficient of variation. The smaller the coefficient of variation, the better the uniformity.
- **Critical Relative Humidity**: The relative humidity at which powdered extract begins to absorb moisture and cake. It is an important indicator for humidity control during storage.

9.5 Reference Standards

- GB/T 30645-2014 *Plant Extracts for Cosmetics*
- GB 1886.234-2016 *Food Additives - Onion Extract*
- GB/T 19424-2022 *General Requirements for Plant Extracts as Feed Additives*
- *Pharmacopoeia of the People's Republic of China* (Latest Edition)
- GB 2760-2014 *National Food Safety Standard - Standard for the Use of Food Additives*
- GB 7916-2014 *Cosmetics Safety Technical Specifications*