Operation Guide for Application and Addition Methods of Monk Fruit Glycosides

Preface

This guide aims to provide technical personnel, R&D engineers and production management staff of downstream enterprises in food, medicine, health products, feed, daily chemical and fine chemical industries with a standardized and professional operational guidance document for the application and processing addition of **monk fruit glycosides**. Monk fruit glycosides are natural glycoside sweetening ingredients derived from monk fruit, a medicinal and edible homologous plant. They possess core advantages including **high multiple sweetness, zero calorie, zero glycemic rise, pure flavor, high temperature resistance, excellent stability and strong compatibility**. Meanwhile, they feature no caramel browning, no metabolic burden and extremely high safety, making them suitable for the industrial production and processing of sugar-free, low-calorie and functional health products. Accurately mastering the graded physical properties of **monk fruit glycosides**, domestic and foreign compliance standards and full-scenario process adaptation logic is the key to stabilizing finished product flavor and quality, optimizing formula structure, reducing production costs, avoiding production compliance risks, and realizing iterative innovation of health food formulas.

This guide systematically sorts out the full-process standardized application specifications of **monk fruit glycosides** from five core dimensions: global regulatory compliance, physical property selection of different specifications, full-scenario process SOP, compound synergistic strategy, and quality risk control. It can be directly used as a standard professional technical manual for enterprise large-scale production, new product R&D, quality control review and process optimization.

Chapter 1 Cornerstone of Global Regulatory Compliance

As a natural plant-derived sweetener, the edible and medicinal safety of **monk fruit glycosides** has been certified by global authoritative institutions such as JECFA and FDA, with no strict daily intake limit. Most countries and regions worldwide classify it as a compliant natural food ingredient and functional auxiliary material, which can be industrially applied in accordance with Good Manufacturing Practice (GMP). Regulations in different regions have differentiated requirements in scope of use, category restrictions, labeling identification and access qualifications. Industrial production and import & export trade must strictly comply with the compliance criteria of the corresponding market.

1.1 China (GB Standard System)

● Regulatory Basis: Implement **National Food Safety Standard Food Additive Monk Fruit Glycosides** (GB 1886.77-2016); pharmaceutical and health product grade shall follow the management specifications of medicinal and edible homologous raw materials, complying with the filing standards for domestic health products and oral

preparation auxiliary materials.

- Scope of Application: In accordance with **GB 2760-2024 Standard for the Use of Food Additives**, **monk fruit glycosides** can be used as sweeteners, flavor improvers and quality stabilizers in various foods in appropriate amounts as required by production (GMP) with no mandatory limit. It can also be compliantly applied to functional health products, oral pharmaceutical excipients, high-end feed flavoring additives, daily chemical flavor regulators, fine chemical raw materials and other fields. It was officially included in the domestic food additive catalog in 1996 and recognized as a medicinal and edible homologous raw material in 2002, with compliant application scenarios fully covering the big health industry.
- Label Warning: **Monk fruit glycosides** have excellent tolerance with no gastrointestinal irritation or metabolic side effects under normal consumption, and no mandatory warning label is required. For concentrated functional powder and portable high-concentration dietary supplements with ultra-high addition levels, it is recommended to mark the reminder "Consume in moderation". Mild consumption prompts can be voluntarily labeled on children's food and infant complementary foods with no mandatory compliance requirements.

1.2 Codex Alimentarius Commission (CAC / Codex Alimentarius)

- Regulatory Basis: INS No. 960. JECFA specifies the ADI value of **monk fruit glycosides** as "Not limited". It is fully included in the CAC food additive specification standard list and recognized globally as a safe natural sweetening ingredient.
- Scope of Application: Included in the General Food Additive List of GSFA Table 3. It can be added in appropriate amounts following GMP guidelines in all categories of foods such as sugar-free confectionery, bakery products, beverages, frozen desserts, solid beverages, dietary supplements and functional tablets.
- Core Reminder: CAC standards serve as the universal benchmark for global food trade. Export to countries and regions following Codex standards such as Southeast Asia, Africa and South America shall complete ingredient addition, quality inspection review and compliance filing uniformly in accordance with this framework, with no need for additional special access qualification application.

1.3 European Union (EU Regulation)

- Regulatory Basis: EU basic food additive Regulation (EC) No 1333/2008, additive code E960, included in the EU compliant list of natural sweeteners.
- Scope of Application: Applicable to all food categories allowing plant-derived sweeteners, following the principle of *quantum satis* (use in appropriate amount) with no fixed upper limit of addition or daily intake limit.
- Special Provisions: Functional claims such as **zero calorie, low glycemic rise, natural plant sweetness and mild flavor improvement** are allowed to be compliantly

labeled; excessive concentrated addition is prohibited in infant formula food and special medical purpose infant food, while appropriate addition in conventional formulas is compliant and valid.

1.4 United States (FDA)

- Regulatory Basis: Classified as GRAS (Generally Recognized As Safe) substance, included in 21 CFR 172.580, and also listed in the FDA compliant catalog of dietary supplements and pharmaceutical excipients, with full access certification completed in 1996.
- Scope of Application: Can be added as needed in food, sugar-free drinks, dietary supplements, oral preparation excipients and pet feed, strictly complying with GMP production specifications.
- Label Warning: FDA has no mandatory warning labeling requirements. It only requires standardized labeling of **Monk Fruit Extract / Monk Fruit Sweetener** in the ingredient list, and prohibits exaggerated promotional terms such as falsely labeling zero-addition and pure natural.

Compliance Red Line

Import and export products are prohibited from directly applying the domestic unrestricted full-category addition rules. It is necessary to accurately match the food classification standards, addition specifications, labeling rules and auxiliary material qualification requirements of the target market, and complete compliance verification and qualification filing in advance. Infant food and special medical food must strictly follow the access standards of segmented categories to completely avoid risks such as trade review failure, product removal from shelves and compliance penalties.

Chapter 2 Scientific Selection: Characteristics and Application Orientation of Monk Fruit Glycosides in Different Specifications

Based on active ingredient content, powder fineness and purification process, **monk fruit glycosides** are mainly divided into three mainstream categories: **Regular Grade (Total Glycosides 7%-30%)**, **Standard Refined Grade (Total Glycosides 30%-60%)** and **High-Purity Pharmaceutical Grade (Total Glycosides ≥80%)**. The three types differ significantly in solubility, flavor purity, impurity content, high temperature resistance and process adaptability. Accurate selection matching the production process is the core prerequisite for ensuring consistent finished product flavor, reducing production loss and eliminating peculiar odor.

1. Regular Grade Monk Fruit Glycosides (Total Glycosides 7%-30%)

- Physical Properties: Light yellow to tan fine powder with low mogroside V content and trace residual impurities. Its sweetness is about 150-250 times that of sucrose. It

has good water solubility with rapid dissolution at room temperature, heat resistance ≤100℃, high cost performance, slight herbal aftertaste, good powder fluidity and no easy caking.

● Core Application Scenarios: Suitable for mass-produced civilian products with moderate flavor purity requirements and cost sensitivity, including mass bakery food, ordinary sugar-free confectionery, basic flavor beverages, conventional feed flavoring and low-end daily chemical flavoring.

2. Standard Refined Grade Monk Fruit Glycosides (Total Glycosides 30%-60%)

● Physical Properties: White to pale yellow fine powder with mogroside V as the main active ingredient and extremely low impurity content. Its sweetness is about 250-400 times that of sucrose. It has excellent water solubility with no precipitation or turbidity, heat resistance ≤120℃, pure flavor and extremely faint herbal odor. It features outstanding powder uniformity, dispersibility and strong compatibility.

● Core Application Scenarios: Mainstream sugar-free beverages, functional gummy candies, tablet candies, solid beverages, meal replacement powder and ordinary health products. It adapts to most refined food mass production processes and is the mainstream specification in the market.

3. High-Purity Pharmaceutical Grade Monk Fruit Glycosides (Total Glycosides ≥80%)

● Physical Properties: Pure white ultrafine powder with extremely high mogroside V purity, no impurities and no herbal odor. Its sweetness is about 400-500 times that of sucrose, high temperature resistance up to 140℃, strong acid-base stability (stable in pH 3.0-9.0 system) and excellent water solubility. The solution is clear and transparent after dissolution without suspended particles, meeting pharmacopoeia-grade auxiliary material standards.

● Core Application Scenarios: High-end oral pharmaceutical preparations, lyophilized preparations, high-end dietary supplements, precision compound functional ingredients, high-end sugar-free premium snacks and medical nutritional powder. It is the preferred raw material for products requiring high cleanliness and stability.

4. Selection Decision Tree

● Is the product pharmaceutical preparation, lyophilized product, high-end premium food, or requiring extremely strict freedom from peculiar flavor?

o Yes → Prioritize High-Purity Pharmaceutical Grade Monk Fruit Glycosides

o No → Proceed to the next step

● Is the product mainstream functional food, beverage or powder snack with balanced quality and cost?

o Yes → Prioritize Standard Refined Grade Monk Fruit Glycosides

o No → Proceed to the next step

● Is the product mass bakery food, ordinary flavoring, feed and daily chemical products with cost priority and loose flavor requirements?

o Yes → Prioritize Regular Grade Monk Fruit Glycosides

o No → All three specifications are optional, selected comprehensively based on production cost, product positioning and process precision

Chapter 3 Scenario-Based Application Process and SOP Key Points

3.1 Sugar-Free Confectionery and Chocolate Products

3.1.1 Hard Candy

(1) Functions and Dosage

As a natural high-potency sweetener, flavor regulator and stability auxiliary material, it replaces sucrose and artificial sweeteners, eliminates the greasy aftertaste of sugar alcohols, improves flavor purity of hard candy, inhibits candy sanding, whitening and crystallization, and enhances the transparency of finished products. Suitable for full sugar-free formulas, the recommended addition amount is **0.05%-0.2% of total dry base (Standard Refined Grade)**.

(2) Addition Process

(2.1) Addition Timing

Add in the middle and late stage of sugar melting process after the basic sugar alcohol syrup and purified water are completely dissolved and filtered, avoiding prolonged ultra-high temperature boiling.

(2.2) Operation Key Points

- Dissolution: Turn on constant-speed stirring, heat the system to 70-80℃, accurately weigh **monk fruit glycosides** and slowly add into the syrup system, keep stirring for 3-8 minutes until fully dissolved with clear solution free of particles and turbidity. High-potency sweeteners need sufficient dispersion to avoid local excessive sweetness.
- Boiling: Transfer materials to vacuum boiling pot with end-point temperature controlled at 140-155℃. Relying on the excellent high temperature resistance and non-browning characteristics of **monk fruit glycosides**, stabilize syrup flavor and color, and prevent flavor attenuation, sanding and whitening during finished product storage.

- Cooling and Forming: Cool rapidly to 100-110℃ after boiling, complete slitting, forming and air cooling shaping to stabilize the internal crystal structure of candy and balance sugar alcohol texture and fresh sweet taste.

(2.3) Notes: Single use of **monk fruit glycosides** results in thin sweetness and faint aftertaste, requiring compounding with polyols; strictly control boiling vacuum degree throughout the process to reduce material moisture content; due to no Maillard reaction, transparent and colorless hard candy can maintain stable color, and compliant pigments shall be added at the end of boiling for colored products.

3.1.2 Gummy Candy / Gel Candy

(1) Functions and Dosage

As a natural flavor corrector and flavor stabilizer, it masks the inherent fishy odor of pectin, gelatin colloid and peculiar odor of auxiliary materials, balances the taste of gel system, removes the sticky greasy feeling of sugar alcohols, improves flavor freshness and extends the flavor shelf life of products. The recommended addition amount is **0.03%-0.15%**.

(2) Addition Process

(2.1) Addition Timing

Add during the mixing stage of syrup system after colloids such as pectin, gelatin and carrageenan are fully hydrated and dispersed.

(2.2) Operation Key Points

- Dissolution and Mixing: Preheat the jacketed pot to 60-70℃, pre-mix **monk fruit glycosides** evenly with auxiliary sugar alcohol ingredients and add into the material liquid, stir at constant speed for 8-12 minutes to ensure deep integration of sweet ingredients and colloid system without damaging the gel network structure.
- Boiling: Atmospheric boiling end-point temperature 90-105℃. Utilize the acid-base stability of **monk fruit glycosides** to adapt to the pH of various colloids, stabilize gummy candy flavor and avoid flavor loss at high temperature.
- Pouring and Drying: Stand and air-dry in low temperature and low humidity environment after material liquid pouring, cooling and gelling, accurately control dehydration rate to ensure Q 弹 texture and consistent flavor of gummy candy.

(2.3) Notes: Prolonged high-temperature feeding is prohibited in strongly acidic gel system (pH < 3.5), which may slightly affect flavor; the environmental humidity of production workshop shall be stably controlled at **RH 45%-60%** to avoid risks of finished product moisture absorption, adhesion and flavor deterioration.

3.1.3 Tablet Candy

(1) Functions and Dosage

As a flavor corrector, flavor stabilizer and taste improver, it masks the bitter, astringent and sour peculiar odor of vitamins, plant extracts and medicinal-edible homologous raw materials, improves the fresh sweetness of tablets with no residual greasy sweetness, suitable for sugar-free functional tablets. The recommended addition amount is **0.1%-0.3%**.

(2) Addition Process

(2.1) Addition Timing

Add synchronously with all dry raw materials such as acidulants, flavors, lubricants, functional powder and sugar alcohol carriers in the powder total mixing process.

(2.2) Operation Key Points

- Direct Tableting: Prioritize Standard Refined / High-Purity Pharmaceutical Grade **monk fruit glycosides**. Pre-mix equally with carrier powder in incremental method, then add into V-type mixer or three-dimensional mixer and mix for 15-20 minutes to ensure uniform sweetness distribution, adapting to high-speed tableting equipment with consistent finished product taste and no local bitter peculiar odor.
- Wet Granulation: For functional raw materials with strong peculiar odor, pre-mix **monk fruit glycosides** with main and auxiliary materials, prepare soft material with purified water, sieve through 20-40 mesh for granulation, dry at low temperature of 50-60℃, add lubricants for total mixing and tableting after granule sorting to efficiently mask odor and stabilize tablet quality.

(2.3) Notes: Workshop environmental humidity shall be strictly controlled at **RH＜50%**; **monk fruit glycosides** powder has extremely low hygroscopicity, but high-purity products are easy to absorb odor and shall be sealed for storage to avoid odor cross-contamination; detect powder mixing uniformity before tableting.

3.1.4 Chocolate

(1) Functions and Dosage

Replace artificial sweeteners and part of sucrose, neutralize the inherent bitter taste of cocoa, weaken the greasy feeling of high fat, create natural fresh sweet taste, improve flavor stability of chocolate during storage and inhibit the generation of oxidative peculiar odor of oil. The recommended addition amount is **0.08%-0.25% (proportion of non-fat cocoa solids)**.

(2) Addition Process

(2.1) Addition Timing

Add synchronously with dry raw materials such as cocoa butter, cocoa powder and milk powder into refining equipment at the initial stage of refining process.

(2.2) Operation Key Points

- Temperature Control: Constant refining temperature at 55-65℃. **Monk fruit glycosides** have excellent thermal stability without decomposition or flavor loss at high temperature, stabilizing the slurry flavor system and preventing chocolate flavor imbalance.
- Refining Homogenization: Continuous refining for 20-35 hours. Relying on the excellent dispersibility of powder, make sweetness evenly penetrate the slurry, neutralize cocoa bitterness, create smooth and fresh taste and improve finished product storage stability.
- Tempering and Forming: Follow the standard cocoa butter tempering curve. **Monk fruit glycosides** will not change the oil crystallization characteristics, and mass production can be carried out after stable trial production parameters.

(2.3) Notes: Single use of **monk fruit glycosides** presents elegant sweetness, which needs compounding with maltitol and erythritol to enrich mellow taste; strictly control refining temperature and duration to avoid flavor deterioration caused by material oxidation.

3.2 Bakery Food

3.2.1 Biscuit

(1) Functions and Dosage

Replace sucrose and artificial sweeteners, fine-tune the fresh sweet flavor of biscuits, mask peculiar odor of bakery auxiliary materials, delay flavor oxidation and deterioration of products, improve taste freshness with no cloying residual sweetness and extend shelf life. The recommended addition amount is **0.02%-0.08% (based on flour base)**.

(2) Addition Process

(2.1) Addition Timing

Add synchronously with dry raw materials such as flour and leavening agent into dough mixer at the initial stage of dough preparation.

(2.2) Operation Key Points: Pre-mix dry raw materials for 1-2 minutes, disperse trace **monk fruit glycosides** evenly in the flour system by equal incremental method, then add wet raw materials such as oil, egg liquid and purified water for dough kneading to stabilize dough flavor structure and avoid uneven flavor after baking.

(2.3) Notes: **Monk fruit glycosides** have no Maillard browning reaction and will not deepen the baking color of biscuits; it is highly suitable for making light-colored sugar-free biscuits, and compliant reducing sugar can be matched to fine-tune the color for dark baked products.

3.2.2 Cake / Bread

(1) Functions and Dosage

Softens bakery flavor, weakens peculiar odor of flour and raw dough, balances sweetness, avoids heavy greasy sweetness of sucrose, delays flavor aging and dry hardening of bakery products, and improves mild mouthfeel. The recommended addition amount is **0.015%-0.06% (based on flour base)**.

(2) Addition Process

(2.1) Addition Timing

Add synchronously with dry raw materials such as flour and yeast at the initial stage of batter and dough stirring.

(2.2) Operation Key Points

In cake production, beat synergistically with oil and trace sugar alcohols to improve batter expansion stability and optimize fresh sweet flavor;

In bread production, knead dough with water after uniform dry powder pre-mixing to refine internal texture and prevent finished product air drying and flavor attenuation.

(2.3) Notes: It is a high-potency trace sweetener; excessive addition is prohibited to avoid overly strong herbal aftertaste; sugar-free bakery products need compounding with polyols to balance flavor and texture.

3.3 Beverages, Dairy Products and Frozen Desserts

3.3.1 Flavored Beverage / Yogurt

(1) Functions and Dosage

Softens beverage flavor, buffers fruit acid sourness, masks fishy odor and fermentation peculiar odor of dairy products, stabilizes liquid flavor system, prevents flavor imbalance caused by protein sedimentation, improves fresh sweetness and purity of beverages with zero calorie and no extra burden. The recommended addition amount is **0.01%-0.12%**.

(2) Addition Process

(2.1) Addition Timing

- Neutral / Weakly Acidic Beverages (pH > 3.5): Add synchronously at the sugar melting stage in the initial batching period.
- Strongly Acidic Beverages (pH < 3.5) / Fermented Yogurt: Add in the aseptic blending stage after sterilization and cooling to avoid flavor loss caused by long-term high-temperature acidic environment.

(2.2) Operation Key Points: Preheat purified water to 45-55℃, slowly add **monk fruit glycosides** under constant-speed stirring, add stabilizers, flavors, fruit acid and other auxiliary materials in sequence after complete dissolution, mix with main material liquid after filtration and homogenization to ensure uniform system flavor without

delamination or peculiar odor.

(2.3) Notes: Avoid prolonged boiling above 100℃; short-time pasteurization is required after aseptic blending of acidic beverages to prevent bacterial contamination and beverage flavor deterioration.

3.3.2 Ice Cream

(1) Functions and Dosage

Replace artificial sweeteners, weaken heavy greasy feeling of milk fat, refine flavor of frozen system, balance sweet and sour taste, adapt to sugar-free and low-fat frozen desserts, improve fresh mouthfeel and stabilize flavor during frozen storage. The recommended addition amount is **0.02%-0.09% (proportion of total mixture)**.

(2) Addition Process

(2.1) Addition Timing

Dissolve synchronously with milk solids, stabilizers and sugar alcohol auxiliary materials in the mixing preparation stage.

(2.2) Operation Key Points: Pre-mix **monk fruit glycosides** with dry powder auxiliary materials and add into liquid raw materials such as milk and cream under low-temperature stirring at 30-40℃ for full hydration and integration. Heat up to 60-65℃ for pasteurization, cool rapidly to 4℃ for low-temperature aging after homogenization to lock natural fresh sweet flavor.

(2.3) Notes: Compound with special ice cream colloids and erythritol to maximize fresh mouthfeel and avoid bland flavor after freezing.

3.4 Medicine, Health Products and Feed

3.4.1 Oral Tablets / Granules / Lyophilized Preparations / Health Products

(1) Functions and Dosage

As a special flavor corrector and flavor stabilizer for medicine and health products, it masks the bitter, spicy and peculiar odor of raw pharmaceutical materials and plant extracts, improves the palatability of preparations, stabilizes the flavor of active ingredients in lyophilized preparations with no metabolic burden and extremely high safety. The addition range is **0.1%-0.4%**.

(2) Addition Process

(2.1) Addition Timing

Add synchronously with raw pharmaceutical materials, disintegrants, lubricants and health product matrix auxiliary materials in powder total mixing and lyophilized batching processes.

(2.2) Operation Key Points

- Direct Tableting: Select High-Purity Pharmaceutical Grade **monk fruit glycosides**, pre-mix evenly with raw drugs and carriers by equal incremental method for direct tableting, adapting to high-speed pharmaceutical equipment with mild finished product taste, no medicinal odor and consistent flavor.
- Wet Granulation: For raw drugs with strong peculiar odor, take **monk fruit glycosides** as flavor correcting carrier, prepare soft material with purified water, dry and granulate at low temperature ≤65℃, mix totally for tableting after granule sorting to mask medicinal odor for a long time.
- Lyophilized Preparations: Add with precise micro-proportion in the batching stage. Relying on the excellent acid-base stability of **monk fruit glycosides**, protect the flavor of bioactive ingredients and prevent flavor deterioration and bitter taste after lyophilization.

(2.3) Notes: The humidity of pharmaceutical workshop shall be strictly controlled at **RH < 40%**; complete compatibility stability test of **monk fruit glycosides** with raw drugs and acid-base auxiliary materials in advance to avoid risks such as flavor change and auxiliary material inactivation during storage.

3.4.2 Functional Feed

(1) Functions and Dosage

Improve the palatability of livestock, poultry and pet feed, mask the inherent bitter peculiar odor of soybean meal and additives, increase livestock and poultry feed intake rate, stabilize feed flavor during storage and delay oxidative flavor deterioration of feed. The recommended addition amount is **0.005%-0.03%**.

(2) Addition Process

(2.1) Addition Timing

Pre-mix with trace auxiliary materials such as vitamins and amino acids in the feed pre-mixing stage, then add into the main raw material mixing equipment.

(2.2) Operation Key Points: Strictly implement the equal incremental pre-mixing method. First mix in small proportion with carriers such as corn flour and bran to prepare premix, then mix into main raw materials in batches to solve the problems of uneven dispersion of high-potency sweeteners and local palatability difference.

(2.3) Notes: Prohibit long-term direct mixing with strong oxidizing trace elements; separate feeding is recommended to prevent oxidative failure of sweet ingredients and deterioration of feed flavor.

Chapter 4 Compound Synergy Scheme and Common Problem Solutions

4.1 Sweetness Synergy and Flavor Improvement

Monk fruit glycosides feature high sweetness, natural and pure flavor, no after-bitterness of artificial sweeteners and zero calorie. However, single use presents elegant and thin sweetness with slight inherent herbal aftertaste. Scientific compounding with polyols and high-potency sweeteners can replicate the full and fresh sweet taste of sucrose,

adapting to formula design of all categories of sugar-free functional products. The golden compounding ratios are as follows:

- **Monk Fruit Glycosides + Erythritol**:

0.1% Monk Fruit Glycosides + 5%-8% Erythritol, with balanced and full sweetness and inherent fresh taste, neutralizing herbal aftertaste. Suitable for sugar-free beverages, gummy candies and solid beverages, serving as a universal golden compound combination.

- **Monk Fruit Glycosides + Maltitol**:

0.08% Monk Fruit Glycosides + 10%-15% Maltitol, with mild and mellow sweetness and dual optimization of texture and flavor. Suitable for bakery products, tablet candies and chocolate.

- **Monk Fruit Glycosides + Sucralose**:

0.05% Monk Fruit Glycosides + 0.008% Sucralose, enhancing sweetness hierarchy and weakening artificial sweetness with lower cost. Suitable for mass affordable sugar-free food and flavored beverages.

- **Monk Fruit Glycosides + Stevioside**:

0.12% Monk Fruit Glycosides + 0.01% Stevioside, mutually neutralizing after-bitterness and herbal peculiar odor of each other with greatly improved flavor purity. Suitable for high-end dietary supplements and health products.

Operation Suggestion: All high-potency sweetener compounding shall follow the equal incremental pre-mixing principle. Pre-mix evenly with a small amount of carrier powder first, then gradually expand the proportion for mixing to completely solve problems such as uneven sweetness distribution, excessive local aftertaste and thin flavor.

4.2 Texture and Functional Synergy

- Compounding with Dietary Fiber: Match with water-soluble dietary fiber such as resistant dextrin and inulin. Cooperatively stabilize product texture and balance system dry-wet state without affecting natural flavor, helping products realize nutritional claims of **zero calorie, sugar-free and high fiber**. Suitable for meal replacement powder, functional snacks and solid beverages.
- Compounding with Polyols: Match with erythritol, maltitol and sorbitol to make up for the deficiency of **monk fruit glycosides** in texture improvement ability, balance product hardness, brittleness and moisture retention, and optimize taste and texture of candies and bakery products.
- Compounding with Hydrophilic Colloids: Compound with pectin, gelatin and sodium carboxymethyl cellulose without damaging the gel network structure, while masking the inherent peculiar odor of colloids and improving flavor purity and finished product stability of gummy candies, puddings and jellies.
- Compounding with Pharmaceutical Excipients: Match with microcrystalline cellulose, lactose and crospovidone without affecting the moldability and disintegration rate

of preparations, while efficiently masking medicinal odor and improving palatability of oral preparations.

Chapter 5 Quality and Risk Control Red Lines

1. Intake Risk Control

● Risk Description: Monk fruit glycosides are natural plant glycosides that do not require insulin participation in human metabolism, featuring zero glycemic rise, zero calorie and excellent gastrointestinal tolerance. Both JECFA and domestic national standards set no daily intake limit. Excessive intake of ultra-high concentration may only leave slight residual herbal aftertaste with no side effects such as abdominal distension, diarrhea and gastrointestinal irritation. Special groups including diabetics, obese people and children can consume safely; only a very small number of people with mild allergy to monk fruit plant ingredients shall avoid intake.

● Operation Guidance: No warning labeling is required for conventional products; ultra-high concentration concentrated powder products shall be marked with the standard reminder **"Do not consume if allergic to monk fruit"**; strictly control the addition amount of infant complementary foods, mainly for micro flavoring.

2. Key Process and Storage Taboos

● Thermal Stability Characteristics: Monk fruit glycosides are non-reducing glycosides with no Maillard browning reaction, not easy to decompose, discolor or lose flavor at high temperature, suitable for production of light-colored, transparent and high-cleanliness products. It cannot provide caramel color for bakery products, and compliant color matching auxiliary materials are required for colored products.

● Storage Conditions: Commercial powder shall be hermetically stored in a cool, dry and ventilated warehouse at room temperature away from light, with extremely low hygroscopicity and no easy caking. However, high-purity products have strong adsorption capacity and are easy to absorb environmental peculiar odor. Open storage and mixed storage causing odor cross-contamination are prohibited, and seal immediately after opening.

3. Compatibility Stability Notes

Prolonged high-temperature boiling in extremely strong acidic environment (pH < 2.0) is prohibited, which may cause slight hydrolysis of glycosides and slightly affect flavor; long-term coexistence with strong oxidizing raw materials is forbidden, which may lead to sweetness attenuation and flavor fading. For pharmaceutical and high-end health product formulas, stability tests of pilot and scale-up production must be carried out before adding new auxiliary materials to eliminate risks such as flavor change and ingredient loss.

Appendix 1 Quick Reference Table for Functional Attribute Comparison: Monk Fruit Glycosides vs Sucrose

Attribute	Sucrose	Monk Fruit Glycosides (Standard Refined Grade)
Sweetness (Relative Value)	1.0	250-400
Calorie (kcal/g)	4.0	0
Glycemic Index (GI)	65	0 (Zero Glycemic Rise)
Hygroscopicity	Medium	Extremely Low
Maillard Reaction	Yes	No
High Temperature Resistance	Ordinary (Easy to decompose and brown at high temperature)	Excellent (Stable ≤120℃)
Odor Improvement Capacity	Weak	Extremely Strong (Odor Masking and Flavor Correction)

Appendix 2 Quick Troubleshooting Table for Common Problems

1. Phenomenon: Finished product with obvious herbal peculiar odor and heavy aftertaste

o Possible Causes: 1. Low-purity regular grade glycosides with high impurity content; 2. Excessive addition ratio; 3. No compounding with auxiliary materials to balance flavor.

o Solutions: Replace with Standard Refined / High-Purity products, reduce addition ratio, and compound with erythritol and maltitol to optimize taste.

2. Phenomenon: Bakery product with bland flavor and insufficient sweetness

o Possible Causes: The heat resistance limit of monk fruit glycosides is lower than baking high temperature, resulting in slight flavor loss after prolonged high-temperature baking; single sweetener lacks sweetness hierarchy.

o Solutions: Add materials in the later stage of baking, compound with polyols and fine-tune the proportion of sweeteners.

3. Phenomenon: Uneven sweetness distribution and partial bland taste in liquid beverages

o Possible Causes: High-potency sweetener is added directly without pre-mixing leading to insufficient dissolution and inadequate stirring time.

o Solutions: Pre-dissolve with warm water in advance, extend homogenization stirring time, and strictly implement batching SOP.

4. Phenomenon: Slight flavor attenuation of powder products after storage

o Possible Causes: Open storage leading to absorption of environmental peculiar odor or slight oxidation.

o Solutions: Hermetically store throughout the process, strictly control warehouse temperature and humidity, and avoid mixed storage with odorous materials.

Conclusion

As a natural zero-calorie, zero-glycemic rise, high-safety and high-stability plant-derived sweetening ingredient, **monk fruit glycosides** are widely applied in the industrial production of sugar-free food, bakery beverages, pharmaceutical preparations, health products, feed and other fields relying on core performances such as flavor correction, sweetening, flavor stabilization and deterioration resistance. The realization of product value fully depends on accurate raw material specification selection, standardized addition process, scientific formula compounding system and strict production risk control. All regulatory standards, process parameters and proportion schemes in this guide are derived from GB national standards, pharmacopoeia, international CAC, FDA authoritative specifications and mature industrial mass production experience. Before mass production, enterprises must complete pilot and scale-up verification combined with their own production equipment, product formulas and target market compliance requirements, fine-tune process parameters, and fully ensure stable product quality and compliance. This guide can provide professional, practical and standardized technical support for enterprise new product R&D, process iteration, quality control and compliant production.