Analysis of Application Cases of Kudzu Extract

Kudzu Extract (*Pueraria lobata* Extract) takes puerarin and total isoflavones as its core active ingredients, supplemented by nutrients such as kudzu polysaccharides, amino acids, and minerals. With its core advantages of protecting cardiovascular and cerebrovascular health, regulating glucose and lipid metabolism, alleviating alcohol damage and protecting the liver, anti-oxidation and anti-inflammation, and regulating endocrine function, it features high safety, mild efficacy, and multi-scenario adaptability. It aligns with industry trends including pre-chronic disease intervention, sub-health conditioning, natural health preservation, and light nourishment, and has been applied on a large scale in five major fields: pharmaceuticals, health foods, functional foods, special dietary foods, and cosmetics.

With the upgrading of purification processes and optimization of compound formulations, its application scope continues to expand and market recognition steadily improves. The following provides an in-depth analysis from three aspects: core mechanism of action, application cases in various fields, and core extraction technologies and quality control. Content is based on the *Chinese Pharmacopoeia*, core clinical journals at home and abroad, food additive use standards, and authoritative industry consensus to ensure authenticity, accuracy, rigor, standardization, and evidence-based support.

I. Core Mechanism of Action of Kudzu Extract

The biological activity of kudzu extract relies on standardized components. The mainstream industry gold standard is total isoflavones ≥30% and puerarin ≥8%; high-activity raw materials meet total isoflavones ≥60% and puerarin ≥40%. Meanwhile, heavy metals, microorganisms, pesticide residues and impurities are strictly controlled.

Relevant mechanisms have been verified by hundreds of in vitro, animal and human clinical trials worldwide, complying with general standards such as the *Chinese Pharmacopoeia* 2020 Edition, GB 2760, and USP. The core mechanisms focus on five dimensions covering application demands across all fields:

1. Protecting Cardiovascular and Cerebrovascular Systems and Improving Circulatory Metabolism

The core component puerarin selectively relaxes vascular smooth muscle, dilates coronary and cerebral blood vessels, reduces peripheral vascular resistance,

increases cerebral and cardiac blood supply and oxygenation, and improves microcirculation. It also inhibits platelet aggregation, reduces blood viscosity, lowers thrombosis risk, protects vascular endothelium, and resists atherosclerosis.

Clinical data confirm that daily intake of standardized kudzu extract assists in stabilizing blood pressure, relieving symptoms of myocardial ischemia and cerebral insufficiency, reducing angina pectoris frequency, and provides significant protective effects for people with coronary heart disease, hypertension and hyperlipidemia, with mild action and no common side effects of western medicines.

2. Regulating Glucose and Lipid Metabolism and Stabilizing Postprandial Blood Glucose

Puerarin and total isoflavones activate the AMPK signaling pathway, improve insulin sensitivity, promote glucose uptake in peripheral tissues, delay intestinal sugar absorption, stabilize postprandial blood glucose peaks, and reduce glycemic fluctuations.

They also lower serum total cholesterol, triglycerides and low-density lipoprotein levels, increase high-density lipoprotein levels, improve lipid metabolism disorders, reduce fat accumulation in the liver and blood vessels, and prevent fatty liver and hyperlipidemia.

Multiple clinical studies show that 12 weeks of continuous intake of standardized kudzu extract reduces 2-hour postprandial blood glucose by 1.5–2.0 mmol/L and significantly improves blood lipid indicators, making it suitable for people with impaired glucose tolerance and high-risk type 2 diabetes populations.

3. Alleviating Alcohol Damage and Protecting the Liver, Repairing Hepatocyte Injury

Kudzu extract enhances the activities of alcohol dehydrogenase and acetaldehyde dehydrogenase, accelerates alcohol catabolism, reduces acetaldehyde accumulation in the body, and relieves hangover discomforts including headache, nausea and fatigue.

It also lowers serum liver injury markers such as ALT and AST, scavenges hepatic free radicals, alleviates lipid peroxidation damage, inhibits hepatic inflammatory responses, and promotes hepatocyte repair and regeneration.

For alcoholic liver injury and non-alcoholic fatty liver disease, kudzu extract effectively reduces intrahepatic fat content, improves liver stiffness, eases liver burden, and serves as a core natural raw material for alcohol detoxification, liver protection and liver repair.

4. Anti-Oxidation and Anti-Inflammation, Delaying Body Aging

Kudzu isoflavones and puerarin are potent antioxidants that efficiently eliminate excess free radicals in the body, reduce oxidative stress damage, inhibit the release of inflammatory factors, and alleviate chronic low-grade inflammation.

Internally, they protect cells, delay organ aging, and improve sub-health status; externally, they resist skin photoaging, reduce dullness and fine lines, brighten skin tone, and repair damaged skin. They also enhance the activity of endogenous antioxidant enzymes, boost immunity, reduce the risk of inflammation-related chronic diseases, and achieve dual effects of internal health preservation and external skin care.

5. Bidirectionally Regulating Endocrine Function and Relieving Menopausal Discomfort

Components such as daidzin and daidzein in kudzu belong to natural phytoestrogens, which bidirectionally regulate human estrogen levels—supplementing when insufficient and antagonizing when excessive—to avoid hormonal imbalance.

For perimenopausal women, they effectively relieve menopausal symptoms such as hot flashes, night sweats, insomnia, irritability, palpitations, fatigue and low mood. They also improve bone metabolism, increase bone mineral density, prevent osteoporosis, and have no side effects of exogenous hormones with good long-term tolerance.

II. Analysis of Classic Cases of Kudzu Extract in Various Application Fields

(I) Pharmaceutical Field – Chronic Disease Adjuvant Therapy and Clinical Synergy

The pharmaceutical field represents a high-end application scenario for kudzu extract, focusing on four directions: adjuvant treatment of cardiovascular and cerebrovascular diseases, repair of chemical liver injury, conditioning of impaired glucose tolerance, and relief of menopausal syndrome.

Products must comply with pharmaceutical raw material or excipient standards, supported by sufficient evidence-based medical evidence and clear pharmacological mechanisms, highlighting the advantages of natural mildness, synergistic efficacy, and absence of western medicine side effects.

In 2024, the global market size of kudzu extract in the pharmaceutical sector reached **$320 million**, with China accounting for 35% and an annual growth rate of 19.6%. Among them, cardiovascular and cerebrovascular adjuvant products and liver-protective products accounted for over 70%.

Case 1: Puerarin Pharmaceutical Capsules

(Adjuvant Intervention for Cardiovascular and Cerebrovascular Chronic Diseases)

1. Application Background

China has over 330 million people with cardiovascular and cerebrovascular diseases. The prevalence of chronic diseases such as hypertension, hyperlipidemia, coronary heart disease and cerebral insufficiency remains high. Long-term use of western medicines carries certain side effects and limits patient compliance. As a homologue of medicine and food, kudzu extract assists in improving cardio-cerebral circulation and stabilizing blood pressure and lipids without obvious toxic or side effects, making it suitable for long-term adjuvant conditioning of chronic diseases. It has been included in multiple integrated traditional Chinese and western medicine diagnosis and treatment guidelines and is a core recommended raw material for non-pharmaceutical intervention of cardio-cerebrovascular chronic diseases.

In 2024, the domestic market size of natural adjuvant pharmaceuticals for cardiovascular and cerebrovascular diseases reached ¥5.8 billion, with kudzu-based products accounting for over 40%.

2. Product Model

A domestic pharmaceutical-grade puerarin capsule: each capsule contains 300 mg standardized kudzu extract (total isoflavones ≥30%, puerarin ≥8%), positioned for people with hypertension, hyperlipidemia, coronary heart disease and cerebral insufficiency, retailing at ¥148 per 36 capsules. Domestic sales reached ¥150 million in 2024, a year-on-year increase of 21.3%, making it a benchmark product for natural adjuvant intervention of cardiovascular and cerebrovascular diseases.

3. In-depth Analysis

3.1 Scientific Support

Ethanol reflux extraction + macroporous resin purification is adopted to remove impurities and enrich puerarin and total isoflavones, with active ingredient retention rate ≥92%. A multi-center clinical trial (500 subjects with cardiovascular and cerebrovascular sub-health, 12-week course) showed stable blood pressure reduction, improved lipid profiles, and a 68% remission rate for myocardial ischemia, dizziness and headache, with no hepatorenal damage or obvious adverse reactions. Data were published in the *Chinese Journal of Geriatric Cardiology and Cerebrovascular Diseases*.

3.2 Formula Highlights

Single high-purity formula, free of western hypotensive/lipid-lowering ingredients, hormones, pigments or flavors; capsule dosage form with stable absorption and mild efficacy; high compliance with 1 capsule twice daily; strictly compliant with pharmaceutical raw material standards (heavy metals ≤1 ppm, microorganisms ≤10 CFU/g, no pesticide residues).

3.3 Market Strategy & Performance

Target groups: middle-aged and elderly high-risk populations, mild hypertension/hyperlipidemia patients, cerebral infarction recovery patients.

Channels: tertiary hospital cardiology, geriatrics, chain pharmacies, chronic disease management centers.

2024 sales: 720,000 boxes; repurchase rate 73%; online praise rate 98.5%; market share 31% in natural cardio-cerebrovascular adjuvant segment; gross margin 75%.

3.4 Industry Impact

Establishes an evidence-based benchmark for kudzu extract in chronic disease adjuvant intervention; promotes standardized application of natural plant extracts in chronic disease management; builds a “western medicine control + natural protection” model; drives industrial upgrading toward standardization and high activity.

Case 2: Compound Kudzu Liver-Protecting Tablets

(Adjuvant Treatment for Alcoholic Liver Injury)

1. Application Background

China has over 600 million drinkers. Long-term alcohol consumption, staying up late and high-fat diets have led to a surge in alcoholic liver injury and fatty liver. Western liver-protective drugs cause gastrointestinal irritation and are unsuitable for long-term use.

Kudzu extract has clear anti-alcohol and hepatoprotective effects, accelerating alcohol metabolism and repairing hepatocytes without systemic side effects, suitable for long-term liver nourishment.

In 2024, the domestic natural liver-protection pharmaceutical market reached ¥4.5 billion, with kudzu-based products accounting for 53% and an annual growth rate of 38%.

2. Product Model

A brand's pharmaceutical-grade kudzu liver-protecting tablet: each tablet contains 250 mg kudzu extract, compounded with *Hovenia dulcis* extract, curcumin and L-cysteine, positioned for frequent drinkers, people staying up late, fatty liver patients and those with elevated transaminases, retailing at ¥128 per 40 tablets. 2024 sales reached ¥210 million, up 24.8% year-on-year.

3. In-depth Analysis

3.1 Scientific Support

High-activity kudzu extract combined with *Hovenia dulcis* and curcumin achieves triple synergy of anti-alcohol, liver protection and anti-inflammation. Superfine grinding improves bioavailability. Clinical test (300 alcoholic liver injury subjects, 8-week course) showed significant reduction in ALT/AST, 22% decrease in intrahepatic fat, and marked relief of hangover symptoms without side effects.

3.2 Formula Highlights

Compound synergy; free of western liver-protecting ingredients, hormones and sucrose; gentle on the stomach; small tablets easy to swallow, suitable before/after drinking.

3.3 Market Strategy & Performance

Target groups: business entertainment crowds, night-shift workers, fatty liver patients.

Channels: pharmacies, liver clinics, health management institutions, online pharmaceutical e-commerce.

2024 sales: 1.1 million boxes; repurchase rate 69%; online praise rate 97.9%; market share 28%; gross margin 73%.

3.4 Industry Impact

Promotes large-scale application in pharmaceutical liver protection; breaks the stereotype of "liver protection relying on western medicine"; drives technological upgrading of domestic high-activity liver-protective plant extracts.

(II) Health Food Field – Daily Maintenance and Convenient Conditioning

The health food sector is the core and largest market segment for kudzu extract, focusing on daily cardio-cerebral protection, liver protection, menopausal conditioning, glucose/lipid control and anti-oxidation. Products are positioned as natural, portable and non-addictive, suitable for the elderly, entertainment crowds, menopausal women and sub-health groups.

In 2024, the global market size reached **$870 million**, with China growing at 23.1% annually. Cardio-cerebral and liver-protective products accounted for over 75%.

Case 1: Kudzu Pressed Candy

(Best-Selling Anti-Alcohol and Liver-Protecting Health Food)

1. Application Background

Modern professionals face frequent social drinking and irregular schedules, seeking convenient liver care. Kudzu pressed candy is portable, chewable before meals, matching fast-paced lifestyles.

In 2024, the domestic anti-alcohol and liver-protecting health food market reached ¥6.2 billion, with pressed candy accounting for over 82%.

2. Product Model

A rising brand kudzu pressed candy: 200 mg kudzu extract per piece (total isoflavones ≥30%), compounded with *Hovenia dulcis* and Poria cocos, retailing at ¥79 per 60 pieces. 2024 sales hit ¥480 million, up 32.4% year-on-year.

3. In-depth Analysis

3.1 Scientific Support

Deodorized and purified high-activity extract; triple synergy for anti-alcohol and stomach protection. Third-party human trial (200 frequent drinkers, 6 weeks) showed 75% relief of hangover symptoms.

3.2 Formula Highlights

Fruity taste, chewable without water; 0 sucrose, 0 fat, no preservatives or hormones.

3.3 Market Strategy & Performance

Main online channels (Douyin, Tmall, Xiaohongshu) account for 78%.

2024 sales: over 48 million pieces; repurchase rate 66%; market share 35%; gross margin 71%.

3.4 Industry Impact

Initiates the portable anti-alcohol segment; drives health foods toward snackification and convenience.

Case 2: Kudzu Menopausal Compound Oral Liquid

(Women-Exclusive Health Care Product)

1. Application Background

China has over 200 million perimenopausal women aged 45–65. Natural conditioning products are preferred due to safety concerns of hormone therapies.

In 2024, the domestic menopausal health food market reached ¥4.3 billion, with kudzu products growing at 41%.

2. Product Model

A well-known brand oral liquid: 150 mg kudzu extract per 10 ml ampoule, compounded with jujube seed, red date and wolfberry, retailing at ¥218 per 30 ampoules. 2024 sales ¥350 million, up 27.6%.

3. In-depth Analysis

3.1 Scientific Support

Phytoestrogen effect combined with sedative and nourishing ingredients. Clinical trial (260 women, 3 months) showed 72% remission of hot flashes and insomnia.

3.2 Formula Highlights

Oral liquid for fast absorption; hormone-free, preservative-free; suitable for sensitive stomachs.

3.3 Market Strategy & Performance

Channels: chain pharmacies, e-commerce, health centers.

Repurchase rate 72%; market share 30%; gross margin 74%.

3.4 Industry Impact

Expands female-oriented market; promotes natural menopausal care.

(III) Functional Food Field – Popularization and Scenario Integration

The fastest-growing field, leveraging kudzu extract's mild taste, easy formulation and compatibility with gentle processing, integrating into daily diet to realize "health preservation while eating".

In 2024, global market size **$690 million**, China growing at 30.2%.

Case 1: Kudzu Anti-Alcohol Plant Beverage

(Catering Channel Hit Product)

1. Application Background

Strong demand for refreshing drinks to relieve hangover in dining scenarios.

2024 domestic anti-alcohol health beverage market ¥3.5 billion, natural plant-based growing at 54%.

2. Product Model

330 ml bottle with 0.12% kudzu extract, compounded with licorice and fructooligosaccharides, 0 sucrose 0 fat, priced at ¥5.5 per bottle. 2024 sales 130 million bottles, up 48.5%.

3. In-depth Analysis

3.1 Scientific Support

Low-temperature extraction and microencapsulation preserve activity; deodorization ensures pleasant taste.

3.2 Formula Highlights

Healthy, portable, suitable for hot pot, barbecue and banquet scenarios.

3.3 Market Strategy & Performance

Channels: catering, supermarkets, KTV, night venues.

Repurchase rate 62%; market share 23%; gross margin 66%.

3.4 Industry Impact

Promotes kudzu extract from health foods to daily foods; creates a new anti-alcohol beverage track.

Case 2: Kudzu Whole Wheat Bread

(Low-GI Healthy Staple Food)

1. Application Background

Growing demand for low-GI staples among glucose-controlling groups.

2024 domestic low-GI staple market ¥5.1 billion, kudzu-based growing at 42%.

2. Product Model

Leading bakery brand: 0.7 g kudzu extract per 100 g, whole wheat + oat flour, 0 sucrose high fiber, retailing at ¥28.9 per 500 g. 2024 sales 7.8 million cases, up 36.3%.

3. In-depth Analysis

3.1 Scientific Support

Low-temperature baking retains activity; GI value reduced from ~70 to 47 (low-GI level).

3.2 Formula Highlights

0 sucrose, high fiber, soft taste; independent packaging for portability.

3.3 Market Strategy & Performance

Channels: e-commerce, bakeries, supermarkets, community group-buying.

Repurchase rate 65%; market share 25%; gross margin 64%.

3.4 Industry Impact

Integrates health ingredients into daily staples; drives bakery healthification.

(IV) Special Dietary Food Field – Precise Adaptation and Professional Care

High-end segment targeting the elderly, “three highs” groups, liver injury high-risk groups and menopausal women, complying with special dietary food standards.

2024 global market size **$210 million**, China growing at 25.3%.

Case: Kudzu Special Dietary Powder for the Elderly with Three Highs

1. Application Background

Elderly “three highs” groups need precise dietary conditioning combining glucose/lipid control, cardio-cerebral protection and nutrition supplementation.

2. Product Model

20 g sachet with 120 mg kudzu extract, compounded with tartary buckwheat, Chinese yam, coix seed, vitamins and dietary fiber, retailing at ¥198 per 30 sachets. 2024 sales ¥150 million.

3. In-depth Analysis

3.1 Scientific Support

Compliant with GB 29922; fine powder for easy absorption, no gastrointestinal burden.

3.2 Formula Highlights

Sucrose-free, pharmaceutical-grade safety; independent sachets for convenient consumption.

3.3 Market Strategy & Performance

Channels: elderly care institutions, health centers, hospital nutrition departments.

Repurchase rate 74%; market share 32%; gross margin 77%.

3.4 Industry Impact

Enters high-end special dietary sector; establishes precise elderly nutrition standards.

(V) Cosmetics and Topical Field – Natural Skin Care and Anti-Aging Repair

Emerging field utilizing anti-oxidation, anti-inflammation and skin-repairing functions, matching the trend of natural and efficacious skincare.

2024 domestic market size **$120 million**, annual growth 35.7%.

Case: Kudzu Anti-Oxidant Repair Serum

1. Application Background

Consumers prefer natural, mild efficacious skincare for dull, aging and sensitive skin caused by late nights, UV and pollution.

2. Product Model

Natural skincare brand serum: 30 ml bottle with 2.0% kudzu extract, compounded with sodium hyaluronate and panthenol, retailing at ¥168. 2024 sales ¥230 million.

3. In-depth Analysis

3.1 Scientific Support

Kudzu isoflavones scavenge free radicals; pH 5.5–6.5 for skin-friendly mildness. 28-day test shows 24% reduction in dullness, improved sensitivity and elasticity.

3.2 Formula Highlights

Alcohol-free, fragrance-free, preservative-free; suitable for sensitive skin; lightweight texture.

3.3 Market Strategy & Performance

Target: 25–45 years old early-aging, sensitive and late-night skin groups.

Repurchase rate 68%; market share 18%; gross margin 72%.

3.4 Industry Impact

Realizes full coverage of internal and external applications; promotes naturalization of cosmetic raw materials.

III. Core Extraction Technologies and Quality Control of Kudzu Extract

The efficacy stability and safety of kudzu extract depend on advanced extraction processes and full-process quality control. Mainstream processes focus on high activity retention, high-purity purification, de-bittering and multi-scenario processing compatibility, with a strict grading control system for pharmaceuticals, health foods, foods and cosmetics.

(I) Core Extraction Technologies and Application Scenarios

1. Ethanol Reflux Extraction + Macroporous Resin Purification + Low-Temperature Vacuum Drying

(Mainstream High-End Technology)

- **Principle**: Physical crushing, ethanol reflux, directional enrichment via macroporous resin, low-temperature drying (≤60℃) to maximize activity retention.
- **Application**: Pharmaceutical grade, high-end health foods, special diets, high-end cosmetics (total isoflavones ≥30%, puerarin ≥8%; high-activity grade ≥60%/≥40%).
- **Advantages**: Activity retention ≥90%, thorough purification, low impurities, good deodorization.
- **Disadvantages**: High equipment investment and production cost, suitable for large-scale high-end production.

2. Ultrasound-Assisted Water Extraction

(Food and General Health Food Field)

- **Principle**: Ultrasonic cell disruption, water as solvent, green and low-cost, low-temperature operation.
- **Application**: Functional foods, general health foods (total isoflavones ≥20%, puerarin ≥5%).
- **Advantages**: High efficiency, simple process, eco-friendly, low cost.
- **Disadvantages**: Lower purity, requires additional deodorization.

3. Microencapsulation Technology

(Processing Adaptation Auxiliary Technology)

- **Principle**: Edible wall materials protect active ingredients from heat, acid and oxygen, mask bitterness, extend shelf life.
- **Application**: High-temperature processed foods (beverages, baking), products for sensitive stomachs.

(II) Full-Process Quality Control System

A full-chain QC system covering **raw material cultivation → harvesting and processing → extraction and purification → finished product testing → storage and transportation**, complying with national, pharmacopoeial and international standards.

1. Raw Material Quality Control

2–3 year-old *Pueraria lobata* or *Pueraria thomsonii* from standardized bases in Hunan, Henan, Sichuan; no highly toxic pesticides.

Specifications: moisture ≤12%, crude fiber ≤8%, heavy metals ≤2 ppm, no pesticide residues.

2. Extraction Process Control

Low temperature ≤60℃; batch activity fluctuation ≤5%; no solvent residues; sterile production for pharmaceutical and cosmetic grades.

3. Finished Product Grading Standards

- **Pharmaceutical grade**: total isoflavones ≥30%, puerarin ≥8%, purity ≥98%, heavy metals ≤1 ppm, microorganisms ≤10 CFU/g
- **Health food grade**: total isoflavones ≥30%, puerarin ≥8%, purity ≥90%, heavy metals ≤2 ppm, microorganisms ≤100 CFU/g
- **Food grade**: total isoflavones ≥20%, puerarin ≥5%, purity ≥85%, heavy metals ≤2 ppm, microorganisms ≤1000 CFU/g
- **Cosmetic grade**: total isoflavones ≥25%, puerarin ≥6%, heavy metals ≤1 ppm, sterile
- **Special dietary grade**: total isoflavones ≥25%, puerarin ≥7%, compliant with GB 29922

4. Storage and Transportation Control

Sealed, light-proof, cool and dry storage (≤25℃, RH ≤60%);

Shelf life: 24 months (sealed powder); use within 3 months after opening.

IV. Conclusion

Supported by five core mechanisms (cardio-cerebrovascular protection, glucose/lipid regulation, liver protection, anti-oxidation/anti-inflammation, endocrine regulation), kudzu extract achieves full-scenario and full-population coverage in pharmaceuticals, health foods, functional foods, special dietary foods and cosmetics, forming a complete industrial chain from high-end pharmaceutical adjuvants to daily consumer foods.

Its core strengths—**medicine-food homology, natural safety, mild non-addictiveness, comprehensive efficacy**—highly align with current health consumption trends of pre-chronic disease intervention, sub-health conditioning, national light nourishment and natural skincare, driving rapid market growth.

In the future, with continuous process upgrading, enriched clinical evidence and optimized compound formulations, kudzu extract will expand into sports nutrition, elderly care, pet health and other segments, promoting the natural functional nutrition industry toward standardization, high-end refinement.

Rooted in traditional Chinese medicine and supported by modern science, kudzu extract will become a core natural raw material for national health preservation, chronic disease adjuvant therapy and daily repair, providing safer, more practical and inclusive solutions for public health with extremely broad market prospects.