Competitive Advantages of Pueraria Lobata Extract Products and Outlook for Future Market Development

Pueraria lobata extract is a standardized functional raw material enriched with core active ingredients such as puerarin, total flavonoids and daidzein. It is produced from high-quality edible and medicinal pueraria lobata through physical separation, green extraction, purification and refining processes, and is widely used in health food, functional food, pharmaceuticals, cosmetics and special medical food. As a classic medicinal and edible homologous natural functional ingredient, it has established a long-standing presence in high-demand sectors including cardiovascular and cerebrovascular care, liver protection and alcohol detoxification, menopausal regulation, and anti-aging and beauty care. Its competitive advantages cover all dimensions: raw material resources, technical processes, efficacy applications, industrial policies and quality standards. Relying on upgraded health consumption, expanded consumer demand and technological iteration, it will achieve high-quality growth in the future and become a highly competitive core category in the fields of natural health preservation and modernization of traditional Chinese medicine.

I. Core Competitive Advantages: Building an Industrial Moat with Multi-Dimensional Barriers

(I) Resource and Raw Material Advantages: Stable Supply and Controllable Authentic Quality

China boasts abundant cultivated and wild pueraria lobata resources with a thousand-year application history. Widely distributed producing areas ensure sufficient raw material supply and a foundation for large-scale cultivation, forming a stable and controllable raw material supply system independent of imports, effectively avoiding risks such as raw material supply disruption, price surges and supply chain interruptions. China's core pueraria lobata producing areas are concentrated in Guangxi, Jiangxi, Hunan, Hubei, Yunnan, Sichuan and other regions, mostly planted in mountainous and hilly areas with selenium-rich soil. Featuring an excellent ecological environment and low application of pesticides and chemical fertilizers, the produced pueraria lobata has high active ingredient content and low impurities, complying with green and healthy raw material standards.

In 2024, the national planting area of pueraria lobata exceeded 670,000 mu with an annual output of over 680,000 tons, among which the top three producing areas of Guangxi, Jiangxi and Hunan accounted for more than 82% of the total output. The raw materials are of outstanding quality with stable content of core ingredients puerarin and total flavonoids, far higher than those in ordinary producing areas. Leading industry enterprises have established GAP-standardized planting bases, implementing unified

breeding, standardized cultivation, scheduled harvesting and centralized processing, strictly controlling heavy metals, pesticide residues and microbial indicators to guarantee raw material purity and activity from the source. Meanwhile, pueraria lobata can be comprehensively utilized in its entirety: pueraria residue can be processed into dietary fiber, feed and organic fertilizer, realizing resource recycling, reducing comprehensive production costs and enhancing the profit margin of the industrial chain.

(II) Technical and Technological Advantages: Whole-Chain Upgrading and Differentiated Quality

The industry has formed a mature system where traditional extraction processes coexist with modern green technologies. Leading enterprises have built profound barriers relying on patented technologies, achieving comprehensive leadership in product purity, activity and stability. Mainstream processes have gradually upgraded from traditional water extraction and alcohol extraction to green technologies such as low-temperature countercurrent extraction, supercritical CO_2 extraction, enzymatic hydrolysis-membrane separation combination and microwave-assisted extraction. The extraction efficiency has increased by more than 40%, the retention rate of active ingredients has been greatly improved, and solvent residue is close to zero, complying with the dual-carbon strategy and food safety requirements.

In the purification link, high-speed countercurrent chromatography and preparative high-performance liquid chromatography have achieved industrial application, with a 100% qualification rate of total flavonoids in food-grade pueraria lobata extract, and the purity of puerarin in pharmaceutical-grade products can reach over 98%, with minimal batch differences. Aiming at the pain points of easy inactivation of active ingredients and low bioavailability, stabilization technologies such as microcapsule embedding, nano-encapsulation and liposome encapsulation are widely applied, extending the shelf life of products at room temperature to more than 24 months and broadening application scenarios. Some enterprises have deployed bioengineering R&D to optimize efficient extraction pathways, further increasing the production capacity of high-end products, reducing production costs and widening the quality gap with ordinary products.

(III) Efficacy and Application Advantages: Precise Targeting and Full-Scenario Coverage

The core efficacy of pueraria lobata extract has been verified by numerous pharmacological experiments and clinical practices, with a clear mechanism of action, strong targeting, mild properties and minimal toxic and side effects, suitable for all age groups. Its core components puerarin and total flavonoids can resist oxidation, scavenge free radicals, improve blood circulation, protect the cardiovascular and cerebrovascular systems, assist in regulating blood lipids and blood sugar, protect the liver and relieve intoxication, alleviate female menopausal discomfort, nourish the skin and resist aging. It integrates multiple efficacies including chronic disease care, daily health preservation and beauty care, meeting the

diverse needs of middle-aged and elderly health conditioning, workplace population liver protection, female beauty and anti-aging, and sub-health population consolidation and maintenance.

Application scenarios cover all fields, penetrating daily consumption and professional health care:

- **Health Food Sector**: Made into capsules, tablets, oral liquids, powders and gummies, focusing on cardiovascular and cerebrovascular care, liver protection and menopausal regulation. It is an essential product for health-conscious people, accounting for over 60% of domestic applications in this field in 2024 with steady annual sales growth.
- **Functional Food Sector**: Added to beverages, meal replacements, pastries, candies, tea drinks and dried noodles to create daily healthy foods, complying with the consumption trend of natural and additive-free products, and the market scale continues to expand.
- **Pharmaceutical and Special Medical Food Sector**: As an API, it is used in the production of drugs related to cardiovascular, cerebrovascular and liver diseases. Meanwhile, special medical foods and dietary supplements are developed to assist in chronic disease intervention and postoperative conditioning, with steadily increasing market demand.
- **Cosmetics and Personal Care Sector**: Relying on antioxidant, anti-aging, brightening and soothing effects, it is applied in face creams, essences, facial masks and body care products, complying with the clean beauty trend and becoming an emerging growth track.

(IV) Industrial and Policy Advantages: Cluster Formation and Policy Dividends

The domestic pueraria lobata extract industry has formed a large-scale cluster effect. A large number of leading enterprises have gathered in Guangxi, Hunan, Jiangxi, Shaanxi and other regions, forming a full industrial chain layout of "planting base + R&D and extraction + finished product production + channel sales". Industry concentration continues to rise; leading enterprises, relying on advantages in production capacity, technology and customer resources, lead the standardized development of the industry, eliminate small and medium-sized inferior production capacities and optimize the industrial ecosystem.

Favorable policies continue to emerge: pueraria lobata is included in the national medicinal and edible homologous catalogue, aligning with the national orientation of the large health industry and the revitalization and development of traditional Chinese medicine, and covered by multiple health support policies. The state continuously standardizes industry standards for plant extracts, strictly controls product quality and promotional compliance, accelerates industry reshuffle and supports the development of high-quality enterprises. After the entry into force of the RCEP trade agreement, export tariffs have been reduced and trade processes simplified, promoting domestic pueraria lobata extract to enter Southeast Asia, Japan, South Korea, Europe and the United States, broadening market space.

(V) Quality and Standard Advantages: Complete Compliance and Strong Credibility

The industry has established a sound quality control system, with active ingredient content, heavy metals, solvent residues, microorganisms and moisture as core quality control indicators, divided into four grades: food grade, health product grade, cosmetic grade and pharmaceutical grade to meet different scenario needs. Leading enterprises strictly implement national standards, synchronize with international pharmacopoeia standards such as the US USP and EU EP, and strictly control the limits of harmful substances; heavy metal residues in pharmaceutical-grade products are far lower than national standard limits.

Mainstream enterprises have obtained authoritative certifications such as GMP, HACCP, ISO22000 and organic product certification, with full-process product traceability and high batch stability. China has gradually taken the lead in improving industry standards for pueraria lobata extract, promoting the integration of domestic and international standards, enhancing the international voice of domestic products, getting rid of low-price competition, and the average export price of high-end products rises year by year.

II. Current Market Status: Steady Expansion of Scale and Continuous Optimization of Pattern

(I) Market Scale: Steady Global Growth with Leading Domestic Growth Rate

Globally, the continuous surge in sub-health, chronic disease and health-conscious consumer groups has driven the explosive demand for natural plant health products, and the pueraria lobata extract market maintains steady growth. The global market scale was approximately 740 million US dollars in 2023, expected to reach 1.2 billion US dollars in 2030, with a compound annual growth rate of over 7% from 2024 to 2030.

The domestic market growth rate far exceeds the global level: the domestic pueraria lobata extract market scale was about 1.87 billion yuan in 2023, rising to over 2.2 billion yuan in 2024, a year-on-year increase of over 13%; it is expected to exceed 2.6 billion yuan in 2025, with a compound annual growth rate maintained at 10%-13% from 2025 to 2030. Among them, health food is the core application scenario, functional food and cosmetics have the fastest growth rates, and the proportion of pharmaceutical raw materials continues to rise.

(II) Competitive Pattern: Leading Agglomeration and Hierarchical Competition

The industry presents a pattern of leading concentration and hierarchical competition. Leading enterprises occupy the high-end market and bulk orders relying on full industrial chain, patented technology and brand advantages, with continuously increasing market share. Leading enterprises have

a production capacity of over 100 tons, with products covering high-end markets at home and abroad, and export share accounting for more than 60%. Small and medium-sized enterprises focus on segmented tracks, specializing in organic certification, customized purity and niche scenario products to achieve differentiated breakthroughs. Cross-border enterprises continue to enter the market: food giants, health product brands and biotechnology companies cut into the track through cooperation and mergers and acquisitions, intensifying market competition while promoting industrial innovation and upgrading.

(III) Export Pattern: Diversified Markets with Considerable Increment

In 2024, the export value of domestic pueraria lobata extract grew steadily with rising export volume, mainly exported to developed countries and regions such as Japan, South Korea, the United States and the European Union, and demand in emerging markets such as Southeast Asia grew rapidly. Relying on cost and quality advantages, domestic pueraria lobata extract continues to enhance its competitiveness in the international market, with the proportion of high-end boutique exports increasing year by year, becoming a new engine for export growth.

III. Future Market Development Outlook (2025-2030)

(I) Technology Development Trends: Greenization, High-Endification and Intellectualization

In the future, industrial technology will upgrade towards green efficiency, high-end refinement and intelligent management and control. Green extraction technologies will fully replace traditional processes, and low-pollution, high-activity processes such as supercritical CO_2 extraction and membrane separation will be greatly popularized, complying with environmental protection production requirements. The popularization of high-purity monomer preparation and targeted delivery technologies will improve product bioavailability, strengthen efficacy implementation, and promote the volume expansion of pharmaceutical-grade and special medical-grade products.

Cutting-edge bioengineering technologies will achieve industrial breakthroughs, further improving extraction efficiency and reducing raw material loss. AI and Internet of Things technologies will be applied to production management and control, online monitoring of component content and optimization of extraction parameters to realize intelligent and standardized production, improving product consistency and production efficiency. Leading enterprises will accelerate the construction of smart factories, leading the transformation of industrial production models.

(II) Application Scenario Expansion: Refinement, Diversification and Dailyization

Products will extend refinedly from the traditional health preservation track to all groups and multiple

scenarios. Customized compound products will be developed for segmented groups such as middle-aged and elderly chronic disease care, workplace population liver protection, female menopausal regulation, initial anti-aging, fitness population health preservation and sub-health group consolidation. Product forms will upgrade towards portability and snacking, with the proportion of gummies, ready-to-drink beverages, portable powders and chewable tablets continuously increasing, weakening the health product attribute and integrating into daily diet.

Applications in catering, baking and meal replacement fields will accelerate, launching staple foods, beverages and pastries added with pueraria lobata extract to create new categories of healthy catering. Emerging scenarios such as pet health, sports nutrition and precise skin care will gradually land, opening up a new incremental market and further broadening industrial boundaries.

(III) Industrial Pattern Evolution: Clustering, Globalization and Closed-Loop Development

The industrial cluster effect will be further released, with coordinated development of southern raw material bases and northern processing bases, forming a full industrial chain closed loop of "raw material planting - extraction and refining - finished product processing - by-product utilization". Industry concentration will continue to rise, inferior small and medium-sized production capacities will accelerate clearance, and leading enterprises will consolidate advantages through technological patents, brand building and overseas layout, promoting the industry to shift from price competition to value competition.

The globalization process will accelerate: leading enterprises will shift from raw material export to finished product export, brand output and overseas factory construction, breaking through trade barriers and increasing international market share. Promote Chinese pueraria lobata extract standards to the world, enhance international discourse power, and realize the transformation from "Chinese raw materials" to "Chinese standards and Chinese brands".

(IV) Growth Drivers: Resonance of Demand, Technology and Policy

The global base of sub-health and chronic disease groups continues to expand, the concept of health consumption is deeply rooted in people's hearts, and natural, side-effect-free functional ingredients have become the first choice of consumers, with rigid demand supporting long-term market growth. Health consumption sinks, demand in third- and fourth-tier cities and county markets releases, opening up incremental space. Technological iteration reduces costs, improves quality, broadens application scenarios and activates potential demand.

The state continuously supports the large health and traditional Chinese medicine industries, standardizes industrial development, and relaxes policies on medicinal and edible substances, helping products enter the common food sector. Trade agreements such as RCEP continue to exert force, reducing

export costs and expanding overseas markets. Multiple favorable factors superimpose to promote the long-term and steady growth of the pueraria lobata extract market.

IV. Core Challenges and Countermeasures

(I) Core Challenges

1. **Severe Homogeneous Competition**: Overcapacity in the mid-to-low end, most small and medium-sized enterprises have low product purity, no patents and no characteristics, falling into vicious low-price competition and compressing industrial profit margins.
2. **Raw Material Fluctuation Risks**: Affected by climate, planting area and harvesting standards, the price and quality of pueraria lobata raw materials fluctuate, affecting production stability and product consistency.
3. **Stringent International Barriers**: Europe, the United States, Japan and South Korea have strict standards for solvent residues, heavy metals and active ingredients of imported plant extracts, with high certification costs and long cycles, restricting exports of small and medium-sized enterprises.
4. **Non-Standard Efficacy Promotion**: Some enterprises exaggerate efficacy and conduct false publicity, triggering a consumer trust crisis and affecting the overall industry reputation.

(II) Countermeasures

1. **Raw Material End**: Expand GAP-standardized planting bases, implement order agriculture to stabilize raw material supply and quality; establish a raw material classification system, strictly control pesticide residues and heavy metals, and support a traceability system; optimize efficient extraction technologies to reduce raw material loss.
2. **Technology End**: Increase R&D investment, overcome high-purity and high-stability technologies to build patent barriers; develop compound formulas and customized products to avoid homogeneous competition; deepen industry-university-research cooperation and accelerate the transformation of scientific research achievements.
3. **Market End**: Standardize efficacy promotion and establish credibility based on clinical data; expand emerging markets and optimize export structure; strengthen brand building, enhance product added value and take the high-end route.
4. **Compliance End**: Strictly implement domestic and international quality standards and promote international certification; participate in the formulation of industry standards to promote industrial standardization; strictly control product quality, eliminate false publicity and maintain industry reputation.

V. Future Summary

With core advantages of controllable resources, mature technology, precise efficacy, wide application and favorable policies, pueraria lobata extract firmly occupies the core position in the natural health preservation and medicinal-edible homologous track, with a solid market foundation and sufficient growth momentum. Driven by the improvement of national health awareness, consumption upgrading, technological iteration and regulatory standardization, the industry will bid farewell to extensive growth and enter a new stage of high-end, green, intelligent and global development.

As the world's core producer and consumer of pueraria lobata extract, China has full industrial chain advantages. In the future, enterprises need to focus on technological innovation, product segmentation, brand building and compliant operation, seize market opportunities, solve problems such as homogeneity and export barriers, and promote high-quality industrial development. Pueraria lobata extract is not only expected to become a pillar category of the large health industry, but also can help national health management, inherit traditional Chinese medicine culture, and achieve a win-win situation of commercial and social values.