Competitive Advantages of Ginkgo Biloba Extract Products and Prospects for Future Market Development

Ginkgo biloba extract (EGB) is a standardized functional raw material produced by isolating and enriching core active ingredients such as flavonol glycosides, terpene lactones (ginkgolides A/B/C, bilobalide), and biflavones from the leaves of *Ginkgo biloba L.* via physical, chemical, or biological methods. It is widely applied in pharmaceuticals, health products, food, cosmetics, and other fields. Its R&D and commercialization serve as a typical paradigm for the transformation of medicinal and edible homologous resources from traditional empirical applications to modern high value-added industries. With competitive advantages encompassing traditional heritage, technical barriers, industrial clusters, and policy dividends, EGB is poised for high-quality development alongside the upgrading of health consumption, technological iteration, and population aging, becoming one of the benchmark products for the modernization and internationalization of traditional Chinese medicine (TCM).

I. Core Competitive Advantages: Building an Industrial Moat through Multi-dimensional Barriers

(I) Resource and Raw Material Advantages: A Globally Monopolistic Supply Base

1. **Outstanding resource endowment**: As the native habitat and main producer of ginkgo globally, China has a ginkgo planting area exceeding 500,000 hectares, with major production clusters in Pizhou (Jiangsu), Tancheng (Shandong), Changxing (Zhejiang), and Hanzhong (Shaanxi). In 2024, Pizhou alone boasted 360,000 mu of ginkgo plantations, with an annual output of over 80,000 tons of dried ginkgo leaves. Boasting a sufficient raw material supply and significant cost advantages, China accounts for over 95% of the global raw material supply, forming a resource monopoly barrier characterized by **"China pricing, global supply"**.
2. **Superior raw material quality**: The authentic ginkgo leaves from core producing areas such as Jiangsu and Shandong contain significantly higher levels of active ingredients (flavonol glycosides, terpene lactones) than the international average. The coverage rate of dedicated high-activity varieties has risen to 28%, with ginkgolide B content reaching over 0.8%, providing high-quality source support for the R&D of high-purity products and high-end market layout.
3. **Collaborative utilization of by-products**: Relying on the ginkgo industry foundation, collaborative development of ginkgo leaves, fruits, and wood is realized. Deep processing of ginkgo fruits and production of feed from ginkgo leaf extraction residues improve raw material utilization and industrial added value, further reducing production costs and forming an industrial advantage of resource recycling.

(II) Technical and Technological Advantages: Full-chain Technical Barriers

1. **Mature iteration of extraction processes**: A synergistic system of traditional solvent methods and green advanced technologies has been established. Supercritical CO_2 extraction, enzymatic hydrolysis-membrane separation integration, microwave/ultrasonic-assisted extraction, and other technologies are widely adopted. The extraction rate of flavonol glycosides has increased by over 40% compared with traditional processes, extraction time shortened by over 50%, and solvent residue greatly reduced, aligning with the trend of green production.
2. **Breakthroughs in purification technologies**: Simulated moving bed chromatography, high-speed countercurrent chromatography, preparative HPLC, and other technologies have achieved industrial application. The purity of pharmaceutical-grade flavonol glycosides reaches over 98%, terpene lactones over 95%, and recovery rate up to 92%. Some leading enterprises have realized mass production of ginkgolide B with a purity exceeding 98%, breaking the bottleneck of large-scale preparation of high-purity monomers.
3. **Leading stabilization technologies**: Microcapsule embedding, liposomes, nano-embedding, and other technologies solve the pain points of EGB active ingredients, such as easy oxidation, poor stability, and low bioavailability. The storage stability at room temperature has been extended from 8 months to over 24 months, expanding application scenarios in food, cosmetics, and other fields, and enhancing product shelf life and efficacy.
4. **Layout of synthetic biology**: Research teams including the Chinese Academy of Sciences have discovered GbCYP90J6, a key enzyme for ginkgo biflavone synthesis, and successfully achieved the *de novo* synthesis of amentoflavone in engineered *Escherichia coli* with a yield of 4.75 mg/L, significantly higher than plant extraction efficiency. Meanwhile, key genes for terpene lactone biosynthesis have been cloned, gradually reducing dependence on natural raw materials, mitigating raw material fluctuation risks, and providing a new path for high-end product R&D.

(III) Efficacy and Application Advantages: Empowering Value across Multiple Scenarios

1. **Clear and diverse efficacy**: Verified by modern pharmacology and clinical research, EGB exerts core effects including improving microcirculation, anti-oxidation, anti-inflammation, neuroprotection, and anti-aging. Flavonol glycosides scavenge free radicals and protect vascular endothelium, while terpene lactones inhibit platelet aggregation and improve cerebral blood supply. Notably, ginkgolide B has been proven to extend the median survival time of aged mice, ameliorate metabolic disorders, and reduce inflammatory factor levels, showing great potential in neurodegenerative diseases and anti-aging, making it an irreplaceable natural raw material for cardiovascular, cerebrovascular, and neural health.
2. **Full coverage of application scenarios**:
    - **Pharmaceutical field**: Used for the treatment and adjuvant therapy of stroke sequelae, dementia,

acute and chronic cerebral insufficiency, peripheral vascular occlusion, and other diseases. In 2024, the procurement volume in the pharmaceutical sector reached 3,200 tons, a year-on-year increase of 24.5%, serving as a core natural medicine for clinical chronic disease management.

- **Health products field**: A mainstream ingredient in dietary supplements for cognitive improvement, cardiovascular and cerebrovascular care, and anti-aging. The annual sales growth rate on e-commerce platforms has exceeded 28% for three consecutive years, meeting the health needs of the elderly and sub-healthy populations.
- **Food field**: As a natural antioxidant and functional raw material, it is applied in middle-aged and elderly functional beverages, brain-health meal replacements, healthy snacks, etc., replacing chemical synthetic additives and conforming to the "natural, healthy" consumption trend.
- **Cosmetics field**: As an anti-oxidant, anti-aging, and repairing raw material, it is used in high-end creams, essences, and eye care products to improve skin dullness and delay aging. Its market share is rising year by year, making it a popular raw material in the natural beauty sector.

3. **Unleashed potential of medicinal and edible homology**: Ginkgo leaves have been included in the *Pharmacopoeia of the People's Republic of China*, meeting the core requirement of medicinal and edible substances that are "traditionally used as food and listed in the pharmacopoeia". With the dynamic update of the medicinal and edible substance catalog, restrictions on its application in ordinary food are gradually relaxed, laying a policy foundation for market boundary expansion [7].

(IV) Industrial and Policy Advantages: Superposed Development Dividends

1. **Significant industrial cluster effect**: Major producing areas such as Jiangsu, Shandong, Zhejiang, and Shaanxi have formed a collaborative R&D model of "research institutions + enterprises + planting bases". The industry's CR10 rose from 48.5% in 2023 to 53.2%, with leading enterprises continuously highlighting advantages in technology, capacity, and channels, forming a large-scale and intensive industrial development pattern.
2. **Sustained favorable policies**: EGB is incorporated into the *Healthy China 2030 Blueprint*, *Implementation Plan for Major Projects of TCM Revitalization and Development*, and *14th Five-Year Plan for TCM Development*, which explicitly support the standardization and internationalization of EGB. The 2025 edition of the *Chinese Pharmacopoeia* implements the strictest testing standards to regulate industrial development. The RCEP agreement reduces tariffs on trade with Japan and South Korea, facilitating export trade and providing multiple policy supports for the industry.
3. **Improved international recognition**: China's EGB exports account for over 60% of the global total. It has obtained FDA GRAS certification in the US, been approved as a botanical drug raw material by the EU and included in relevant pharmacopoeia standards, and Japan and South Korea have improved health product raw material standards for EGB. Global market access barriers are gradually eliminated, and the

international influence of Chinese products continues to rise [5].

(V) Quality and Standard Advantages: Enhanced Global Discourse Power

1. **Comprehensive quality system**: A quality control index system centered on flavonol glycosides, terpene lactones, ginkgolic acids, moisture, and heavy metals has been established, with clear grading standards for food-grade, pharmaceutical-grade, and cosmetic-grade products. The limit of ginkgolic acids in pharmaceutical-grade products is strictly controlled within 5 ppm (1 ppm for some enterprises). Personalized quality evaluation methods are developed based on producing area differences to ensure batch consistency.
2. **Participation in international standards**: China takes the lead in participating in the formulation of global EGB quality standards, promoting full alignment between the *Chinese Pharmacopoeia* standards and USP (United States Pharmacopeia) and EP (European Pharmacopoeia) standards. Products of leading enterprises have obtained international certifications such as GMP, EU CEP, HACCP, and ISO22000. The average export price in 2024 increased by over 60% compared with five years ago, gradually grasping the global market quality discourse power. Notably, Yangtze River Pharmaceutical Group took the lead in obtaining EU GMP certification for EGB and its preparations, leading the industry's international development.

II. Current Market Status: Scale Expansion and Pattern Optimization

(I) Market Scale: Steady Growth and Unleashed Potential

1. **Global market**: In 2024, the global EGB market scale reached approximately 7.8 billion yuan, with China accounting for about 52%, making it the world's largest producer and consumer. Driven by population aging, surging demand for neural health, and international market expansion, the global scale is projected to exceed 13 billion yuan by 2030, with a CAGR of about 8.5%–10.5%, and China will continue to be the core growth driver.
2. **Chinese market**: The domestic market scale reached 4.06 billion yuan in 2024 and is expected to hit 4.52 billion yuan in 2025. The pharmaceutical sector accounts for 55% as the core application scenario, while the health products market reached 1.62 billion yuan, a year-on-year increase of 25.3% with strong growth momentum. The food and cosmetics sectors are accelerating growth, becoming new growth poles.
3. **Segmented track growth**: The CAGR of neural health care products reaches 16.8%, anti-aging cosmetic raw materials 19.2%, and cardiovascular and cerebrovascular prescription drug raw materials 8.3%. Emerging scenarios grow significantly, with ginkgolide B-related products leading the industry in growth rate.

(II) Competitive Landscape: Hierarchical Competition and Head Concentration

1. **Dominance of leading enterprises**: The top three enterprises (Yangtze River Pharmaceutical Group, Conba, Luye Pharma) hold approximately 38% of the market share, building core barriers through technological patents, production capacity, customer binding, and full-industry-chain layout. Relying on international layout and quality advantages, Yangtze River Pharmaceutical Group is the industry leader, and its ginkgo biloba tablet-related processes and technologies have won the Second Prize of the National Science and Technology Progress Award.
2. **Differentiated breakthroughs of small and medium-sized enterprises**: Focusing on organic certification, customized extracts, and segmented application scenarios (e.g., pet neural health, precision anti-aging), they avoid low-end homogeneous competition and achieve "specialized, refined, distinctive, and innovative" development. Some enterprises specialize in R&D of high-purity monomers, forming differentiated competitive advantages.
3. **Entry of cross-border enterprises**: TCM groups, functional food brands, and biotechnology companies are accelerating their layout, entering the market through technical cooperation, mergers and acquisitions, promoting technological integration and business model innovation, intensifying market competition while boosting overall industrial innovation vitality.

(III) Export Pattern: Diversified Markets with Prominent Potential

1. **Stable core markets**: Japan, South Korea, the US, and the EU are the main export markets, accounting for over 70% of global exports. The EU and the US are core high-end product export markets with strong demand for high-purity EGB, and Chinese products occupy core market shares by virtue of quality and cost advantages.
2. **Expansion of emerging markets**: Emerging markets in Southeast Asia, Latin America, and Africa are growing rapidly. In the first half of 2025, China's export volume to RCEP member countries increased by 31.2% year-on-year. With the upgrading of health consumption and rising recognition of TCM in these regions, they have become new export growth poles for the industry.

III. Future Market Development Prospects (2025–2030)

(I) Technological Development Trends: High-end, Green, and Intelligent

1. **High-end orientation**: The proportion of high-purity monomers (ginkgolides B/K/M, biflavones), targeted preparations, and compound synergistic products will continue to rise. Synthetic biology technology will gradually achieve industrial mass production. Around 2028, the large-scale bottleneck of ginkgo biflavone and ginkgolide B biosynthesis is expected to be broken, greatly reducing the production cost of high-end products and driving high-end market expansion. The popularization of nano-targeted delivery technology

will further enhance product bioavailability and expand applications in the treatment of neurodegenerative diseases.

2. **Green orientation**: Green technologies such as enzymatic hydrolysis-membrane separation integration, low-temperature countercurrent extraction, and vacuum freeze-drying will fully replace traditional solvent methods, realizing "high-efficiency, energy-saving, and environmentally friendly" production, reducing pollutant emissions, and promoting the sustainable development of the full industrial chain, aligning with the global "dual carbon" strategy and green consumption trend.
3. **Intelligent orientation**: AI and IoT technologies will be applied to extraction process optimization and supply chain management. Online near-infrared spectroscopy (NIR) monitoring and intelligent control systems will be popularized, realizing intelligent control of the entire production process and improving production efficiency and product quality consistency. Leading enterprises will gradually build smart factories, driving the upgrading of the industry's production model.

(II) Application Scenario Expansion: Diversified and Precise

1. **Deepening in the pharmaceutical field**: Beyond the traditional cardiovascular and cerebrovascular sector, research on EGB in the treatment of neurodegenerative diseases such as Alzheimer's and Parkinson's continues to advance. Ginkgolide B-related preparations are expected to obtain new indications, becoming a new core growth point. Meanwhile, applications in diabetic retinopathy, peripheral neuropathy, and other fields will gradually expand, further increasing the pharmaceutical market share.
2. **Burst of emerging scenarios**: Applications in pet health (neuroprotection, joint care), precision medicine, high-end medical beauty, and other fields are accelerating. Among them, the sales of pet neural health products increased by 187% year-on-year, becoming a popular track. EGB is compounded with probiotics, vitamins, and other ingredients to develop personalized health products adapting to the needs of different populations.
3. **Precise product layout**: Dedicated products are developed for the elderly (cardiovascular and cerebrovascular care, cognitive improvement), sub-healthy populations (anti-fatigue, anti-oxidation), and sensitive skin populations (skin repair). Differentiated products are launched based on raw material component differences in core producing areas, enhancing product competitiveness and market adaptability.

(III) Industrial Pattern Evolution: Globalized, Clustered, and Closed-loop

1. **Deepened globalization**: Leading enterprises will accelerate overseas layout, breaking trade barriers through technical cooperation, overseas factories, and mergers of local enterprises, promoting the internationalization of Chinese standards and enhancing global market discourse power. Meanwhile, efforts will be intensified to build overseas brands, transforming from "raw material export" to "preparation + brand export" and expanding the international influence of Chinese EGB. Leading enterprises such as

Yangtze River Pharmaceutical Group have exported preparations to 29 countries and regions, leading the industry's internationalization process.

2. **Upgraded clustering**: The synergistic effect of the East China manufacturing cluster (Jiangsu, Zhejiang) and North China/Northwest raw material bases (Shandong, Shaanxi) will be unleashed. The central and western regions will accelerate the construction of high-quality ginkgo planting bases, forming a regional collaborative pattern of "raw material-processing-application" and improving overall industrial efficiency and competitiveness.
3. **Full-industry-chain closed loop**: A closed-loop ecosystem of "planting-GAP bases-extraction-application-by-product utilization" will be constructed, and blockchain technology will be adopted to realize full-process product traceability and ensure quality and safety. Meanwhile, in-depth industry-university-research integration will be promoted to accelerate the transformation of technological achievements, realizing efficient resource utilization and maximized industrial value.

(IV) Growth Drivers: Three-wheel Drive of Demand, Technology, and Policy

1. **Upgraded consumption demand**: The global demand for "natural, additive-free, medicinal and edible homologous" products continues to rise. Population aging drives rigid growth in cardiovascular, cerebrovascular, and neural health demand, and consumer demand for natural anti-aging products surges. With clear efficacy and safety, EGB is gradually replacing some chemical synthetic products, leading to continuous market expansion.
2. **Continuous technological breakthroughs**: Iterations of extraction, purification, stabilization, synthetic biology, and other technologies reduce production costs, improve product quality, solve pain points of traditional extracts, support high-end markets and new scenario expansion, and provide technical support for industrial growth.
3. **Sustained policy empowerment**: Policies such as TCM modernization, Healthy China 2030, and RCEP promote market access and trade facilitation. The dynamic update of the medicinal and edible substance catalog further broadens market boundaries, and standardized regulation forces high-quality industrial development, providing sustained growth momentum for the industry.

IV. Challenges and Countermeasures

(I) Core Challenges

1. **Raw material fluctuation risks**: Affected by climate, harvest period, and planting management level, ginkgo leaf prices fluctuate greatly annually. The content of active ingredients in raw materials from different producing areas and batches is inconsistent, and heavy metals and pesticide residues occur occasionally, affecting production stability and product quality consistency. Meanwhile, natural raw material supply is restricted by planting cycles, making it difficult to quickly respond to short-term

explosive market demand.

2. **Homogeneous competition**: Overcapacity in the low-end market, with most small and medium-sized enterprises focusing on basic extracts lacking technological innovation and differentiation. Fierce price competition compresses the overall industry profit margin. Core technologies for high-end products still partially rely on imports, and insufficient refinement fails to meet the personalized needs of the high-end market.

Stricter international barriers**: The EU and the US impose increasingly stringent requirements on botanical drug registration, solvent residue, heavy metals, and pesticide residue limits. Export certification is costly and time-consuming, restricting exports for some small and medium-sized enterprises with inadequate compliance capacity. Meanwhile, global competition in the plant extract market intensifies, with similar products such as silymarin and salvia miltiorrhiza extract forming substitutions in some fields and diverting market demand.

3. **Insufficient efficacy verification**: The efficacy of EGB in new fields such as neurodegenerative diseases and anti-aging lacks large-scale human clinical trial evidence, limiting its application and market promotion in the high-end pharmaceutical sector. Irregular efficacy publicity by some enterprises undermines the overall industrial credibility.

(II) Countermeasures

1. **Raw material end**: Expand the scale of GAP standardized planting bases, promote organic planting and standardized harvesting, and establish a raw material quality grading system. Adopt futures hedging to address price fluctuations, strengthen raw material quality traceability and full-process testing to ensure stable raw material quality. Meanwhile, accelerate the industrialization of synthetic biology technology to reduce dependence on natural raw materials and alleviate supply pressure.
2. **Technical end**: Increase R&D investment, focus on high-end technologies such as high-purity monomers, synthetic biology, and targeted delivery, break core technical bottlenecks, and build patent barriers. Promote refined and differentiated product development, develop customized products for different application scenarios to avoid low-end homogeneous competition. Strengthen industry-university-research collaboration, accelerate the transformation of technological achievements, and improve the overall industrial technical level.
3. **Market end**: Expand emerging markets such as Southeast Asia and Latin America, optimize export channels, proactively align with international regulatory standards, improve compliance capacity, and break trade barriers. Transform from raw material suppliers to solution providers, strengthen brand building and market promotion, and enhance product added value. Standardize efficacy publicity, strengthen product efficacy persuasion based on clinical data, and improve industrial credibility.
4. **Compliance end**: Improve the quality control system, strictly abide by the *Chinese Pharmacopoeia* and international pharmacopoeia standards, and promote products to obtain international certifications such as

GMP, CEP, and FDA GRAS. Conduct large-scale human clinical trials to improve evidence-based medical evidence for new efficacies. Participate in industrial standard formulation to promote standardized and high-quality industrial development.

V. Future Summary

Relying on five core advantages—resource endowment, technical barriers, efficacy value, industrial clusters, and policy dividends—EGB has become a core functional raw material in the grand health industry, occupying an irreplaceable position in the global cardiovascular, cerebrovascular, and neural health sectors. Over the next 5–10 years, with technological iteration, consumption upgrading, policy empowerment, and global expansion, its market scale will continue to expand, application scenarios will be fully extended, and the industry will evolve toward high-end, green, intelligent, and globalized development.

As the global core of EGB R&D and production, China must continuously strengthen technological innovation, focus on breaking through synthetic biology and high-purity monomer preparation technologies, improve the quality standard system, and build a full-industry-chain closed loop. Seizing the growth opportunities of Healthy China and the global plant extract market, China will promote the transformation of EGB from "Chinese raw materials" to "Chinese standards, Chinese brands, and global markets", solve problems such as homogeneity and international barriers, achieve dual breakthroughs in high-quality industrial development and global layout, and boost the modernization and internationalization of TCM.