China's Position and Core Advantages in the Global Milk Thistle Extract Supply Chain

I. Core Position in the Global Supply Chain: Unrivaled Dominance in Raw Material Supply and Production Capacity

China has emerged as the **core hub and undisputed leader** in the global milk thistle extract powder supply chain. Leveraging its fully integrated industrial chain layout and large-scale advantages, China firmly holds the dominant power in global supply, with its core position reflected in three key dimensions:

1. **World's Largest Raw Material Supplier**: Bolstered by the unique climatic endowments of core production regions in northwest China (including Yili in Xinjiang, Jiuquan in Gansu, and Chifeng in Inner Mongolia) — featuring annual sunshine duration of ≥2,800 hours and a day-night temperature difference of ≥12℃ — China's milk thistle cultivation area has stabilized at over 12,400 hectares (2023 data), with an annual raw material supply of approximately 23,000 tons. This meets more than 95% of the world's production demand and accounts for over 92% of the global raw material supply, forming a supply pattern where "the global milk thistle industry looks to China". Notably, the Yili production base in Xinjiang, with an annual sunshine duration of over 3,200 hours and a day-night temperature difference of around 18℃, produces milk thistle seeds with an average silybin content of 2.3%-2.8% — more than 27% higher than the international average of 1.8%-2.2% — laying a solid foundation for high-quality raw materials.
2. **Global Leadership in Processing Capacity and Export Scale**: A well-established industrial cluster featuring "cultivation in the northwest, advanced processing in coastal areas, and global distribution" has taken shape in China. Core processing bases in Panjin (Liaoning) and Nantong (Jiangsu) aggregate 56 upstream and downstream enterprises, undertaking over 85% of international orders worldwide. In 2023, the export value of China's milk thistle extract powder saw a year-on-year increase of 23.7%, with high-end products produced via supercritical CO_2 extraction accounting for 61.8% of the total export value. China ranks first in the world in both export volume and value, with its products sold to more than 40 countries and regions across Europe, America, Southeast Asia and beyond.
3. **End-to-End Control of the Fully Integrated Industrial Chain**: China has built a vertically integrated industrial chain ecosystem covering germplasm breeding, standardized cultivation, primary processing, advanced extraction, formulation R&D, and global sales. This has broken the traditional pattern of "raw material export - overseas deep processing - high-price re-import", and China is gradually transforming from a "major raw material exporter" to a "powerhouse of high-value-added products", gaining the potential to set prices and formulate rules in the global supply chain.

II. Core Competitive Advantages: Building Unreplicable Supply Chain Barriers Through Multi-Dimensional Strengths

1 . Raw Material Sector: Resource Endowments + Standardized Systems, Consolidating the Foundation of Supply

◘ **Unreplicable Geographical Resource Barriers**: Milk thistle has stringent growth requirements and only thrives in arid and semi-arid regions with high sunshine and large temperature differences. Northwest China is one of the world's few high-quality suitable growing areas, with the three core producing regions (Xinjiang, Gansu, and Inner Mongolia) contributing 87.3% of the national output, forming a geographically concentrated supply pattern. Other countries find it difficult to replicate China's advantages in raw material quality and scale.

◘ **Large-Scale and Standardized Supply System**: After more than 30 years of industrial accumulation, China has established a mature system of "germplasm optimization - standardized cultivation - intensive primary processing". Through the "enterprise + cooperative + grower" order-based model, the whole-process standardized control of raw materials is realized, with the raw material cost fluctuation of self-owned bases controlled within 15% — far lower than the 41% price volatility in the international market — ensuring supply chain stability and cost competitiveness. Meanwhile, research institutions such as the Liaoning Academy of Agricultural Sciences and Jilin Agricultural University have bred high-yield and high-activity varieties including "Jiyou No.1" and "Mengji No.2", with a per-mu yield of 120-150 kg, over 30% higher than ordinary varieties, further improving the efficiency of raw material supply.

◘ **Differentiated Advantages of High-Quality Raw Materials**: The silybin content of raw materials from core producing regions is significantly higher than the international average, providing a solid foundation for the production of high-purity extract powder. This directly reduces the difficulty and cost proportion of extraction processes, improves the quality of end products, and forms a virtuous cycle of "high-quality raw materials - high-purity products - high market premium".

2. Technology Sector: Diverse Processes + Innovative Breakthroughs, Constructing a Technological Moat

2.1. **Diversified Extraction Technology Matrix Adapting to Global Market Demands**: China has developed a diversified technological system covering traditional solvent extraction, ultrasonic-assisted extraction, supercritical CO_2 extraction, and macroporous resin purification integration technology, meeting the demands of different purity levels and cost requirements. The core technological advantages are as follows:

- **Macroporous resin purification integration technology**: The mainstream technology for the mid-to-high-end market, with a stable silybin recovery rate of 92.4% and product purity of 85%-90%. A leading enterprise in Jiangsu reduced its unit production cost by 17% after adopting this

technology and now holds over 35% of the global order share for this product category.

- **Ultrasonic-assisted extraction technology**: Improves extraction efficiency by 11.8 percentage points and shortens the production cycle by 62.5% compared with traditional processes. It controls the production cost of 80% purity products at a medium-to-low level in the industry, with a market penetration rate of 42%, accurately meeting the raw material demands of China's health food and cosmetics industries.
- **Supercritical CO_2 extraction technology**: The representative of high-end processes, producing products with a purity of ≥95% and solvent residue ≤5 ppm, fully complying with the pharmacopoeial standards of Europe and the United States. Nine domestic enterprises have realized its large-scale application; in 2024, the export value of such products accounted for 61.8% of the total export value, with the unit price 2-3 times higher than conventional products, creating a significant premium space.

2.2. Formulation Technology Innovation Breaking Overseas Monopoly: Microencapsulation technology can increase the bioavailability of silymarin by 2.3 times, and silybin phospholipid complexes can improve bioavailability by 40%-60%. These innovations have successfully broken the technological monopoly of overseas enterprises in the high-end formulation field, providing solid technical support for the export of high-value-added products and the expansion of the domestic terminal market.

2.3 Intelligent Upgrading of Processes Improving Efficiency and Consistency: Leading enterprises have taken the lead in promoting the intelligent transformation of AI+PAT (Process Analytical Technology). By optimizing process parameters, the comprehensive energy consumption has been reduced by more than 20%, and the batch consistency qualification rate has been raised to 99.9%. Meanwhile, relying on continuous chromatographic separation technology, China has made a breakthrough in the preparation technology of silybin with a purity of over 98.5%, further reducing the production cost by 15%-20% and continuously expanding its technological leading edge.

3. Industrial Sector: Cluster Effect + Full-Chain Supporting Capabilities, Enhancing Supply Chain Efficiency

3.1 Industrial Cluster Development Reducing Comprehensive Costs: An industrial cluster pattern of "raw material cultivation and crude extraction in Xinjiang and Gansu, advanced processing in Panjin (Liaoning) and Nantong (Jiangsu)" has been formed. Core regions aggregate high-quality upstream and downstream enterprises, realizing the efficient sharing of raw materials, technology, talents, logistics and other resources, and reducing the comprehensive operating cost by 20%-30% compared with decentralized layout. Among them, the Panjin Industrial Park has an annual output value of over RMB 8 billion and has become one of the world's largest processing and export bases for milk thistle extract.

3.2. **Full-Range Product Supply Meeting Customized Demands**: Relying on a sound fully integrated industrial chain supporting system, China can provide a full range of extract powder products with a purity of 30%-98%, with a delivery cycle over 30% shorter than that of overseas competitors. Meanwhile, customized R&D and production services are available according to customer needs, accurately adapting to the application requirements of multiple scenarios such as pharmaceuticals, health food, cosmetics, and pet health, significantly enhancing customer stickiness and cooperation stability.

3.3 **Vertically Integrated Layout Strengthening Risk Resistance Capacity**: Leading enterprises have fully realized the whole-chain layout of "cultivation - extraction - formulation - sales". By locking in core raw material supply through self-owned bases, improving product added value through advanced processing links, and expanding market channels through global distribution networks, they effectively hedge against supply chain risks such as raw material price fluctuations and international policy changes, ensure the stable and sustainable operation of the supply chain, and provide long-term and reliable supply guarantees for customers.

4 Compliance and Market Sector: Certification Breakthroughs + Precise Layout, Expanding the Global Market

4.1 **Full Coverage of International Certifications Breaking Market Access Barriers**: 12 domestic enterprises have obtained the US FDA New Dietary Ingredient (NDI) certification, and 8 have passed the EU GMP certification. China's products fully comply with the pharmacopoeial standards and regulatory requirements of mainstream markets such as Europe, America and Japan, successfully breaking the compliance barriers of the international market, laying a solid foundation for the export of high-end products, and enabling direct connection with the needs of global mid-to-high-end customers.

4.2 **Differentiated Market Strategy Boosting Global Market Share**: China adopts a differentiated market strategy of "high-end focus + cost-performance adaptation". For the European and American high-end markets, it mainly promotes supercritical CO_2 extraction products with a purity of ≥90%, maintaining a premium level 2-3 times that of conventional products; for emerging markets such as Southeast Asia and Africa, it launches cost-effective products, and relying on the RCEP tariff advantages, the export volume target to Southeast Asia in 2026 accounts for 28% of the total export volume; for the domestic market, it focuses on segmented scenarios such as people who stay up late, drink alcohol, and fatty liver patients, with online e-commerce sales maintaining a year-on-year growth rate of over 25% for three consecutive years. A dual-drive market pattern of "deep cultivation in the domestic market + breakthrough in the international market" has been built to continuously increase the global market share.

5 Standard and Brand Building Enhancing International Discourse Power:

China is actively promoting the transformation of domestic core technical standards into international reference standards, with the goal of internationalizing 2-3 standards by 2028, gradually seizing the initiative in formulating global industrial rules. Meanwhile, through overseas mergers and acquisitions and the establishment of European R&D centers, the R&D cycle of high-end formulations is shortened, and the proportion of terminal formulation exports is promoted (the target is to increase from the current 5% to 20% by 2030). China is gradually transforming from a "raw material supplier" to a "global liver health solution provider", further enhancing its discourse power in the global supply chain.

III. Conclusion: Consolidated Core Position and Promising Value Upgrading

Relying on four core advantages — raw material resources, technological processes, industrial clusters, and compliant market access — China has established an unshakable dominant position in the global milk thistle extract powder supply chain, accounting for over 92% of the global raw material supply and ranking first in the world in export scale. The end-to-end layout of the fully integrated industrial chain has built a strong supply chain barrier, enabling China to provide global customers with stable, high-quality, cost-effective product supply and customized services.

In the future, driven by continuous technological innovation, in-depth industrial upgrading, and precise market layout, China will further consolidate its global core position and realize the leap from "scale advantage" to "value advantage". It is expected that China's global market share will rise to over 95% by 2030, with the domestic market scale exceeding RMB 62 billion. China will become the technological innovation center, manufacturing center and market distribution center of the global milk thistle extract powder industry, providing high-quality and sustainable raw material guarantees and comprehensive solutions for the global liver health industry.