Analysis on the Development Prospects of *Gynostemma pentaphyllum* Industry in Pingli County

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Abstract This study focuses on the *Gynostemma pentaphyllum* industry in Pingli County, Shaanxi Province. Through literature analysis and data statistics, it systematically reviews the current status of cultivation, processing, sales, and research & development of *G. pentaphyllum*, identifies core industrial development issues, and proposes sustainable development strategies based on policy, market, and technological trends. The research reveals that Pingli County has established a large-scale cultivation and primary processing system for *G. pentaphyllum*, but faces challenges including insufficient development of high value-added products and weak brand influence. Future industrial upgrading should be achieved through technological innovation, brand building, and industrial chain extension.

Key words Pingli County, *Gynostemma pentaphyllum*, Market prospects

0 Introduction

Since ancient times, plants have been recognized as valuable sources of natural medicines for treating various human diseases. Hundreds of plant species are extensively used as raw materials for herbal medicines in pharmaceuticals, cosmetics, and nutraceuticals[1]. *Gynostemma pentaphyllum* (Thunb.) Makino., a plant in the Cucurbitaceae family, is a traditional medicinal and edible plant in China, also known as "Qiyedan", "Wuyeshen", and "Biandishenggen". Characterized by cold nature and sweet taste, *G. pentaphyllum* exhibits multiple therapeutic effects including replenishing qi, calming nerves, clearing heat toxins, relieving coughs, eliminating phlegm, nourishing heart function, and enhancing vitality. It demonstrates capabilities in regulating blood lipids and pressure, preventing thrombosis and cardiovascular diseases, boosting immunity[2], as well as anti-cancer properties and hair care benefits[3]. The whole plant is medicinally valuable and uniquely contains ginsenosides[4] outside of the Araliaceae family's *Panax* genus, earning it the reputation of "Southern Ginseng"[5].

Based on Chen Shukun's 1995 classification system, Liu Shibiao adopted a broader species concept with appropriate taxonomic adjustments. Globally, there exist 2 subgenera, 2 sections, 17 species and 2 varieties. China contains 2 subgenera, 2 sections, 15 species and 2 varieties, of which 9 species and 2 varieties are endemic. Timor Island and Kalimantan Island each host one distinct species[6].

1 Development status of *G. pentaphyllum* in Pingli County

Located in the Qinba Mountain region, Pingli County serves as China's core production area for *G. pentaphyllum*, boasting rich germplasm resources with 9 wild species and 1 cultivated variety[7]. Designated as a national standardized cultivation demonstration zone in 2002, it passed national acceptance in 2004 and was certified as "China's *G. pentaphyllum* Origin". The county established the first provincial-level local standard in the country. In 2012, "Pingli *G. pentaphyllum*" obtained the "China Well-known Trademark" certification, and was included in Shaanxi's local characteristic food management system in 2019, significantly enhancing its market circulation channels[8].

1.1 Natural conditions and planting scale Pingli County is located in the southeastern part of Shaanxi Province, characterized by a subtropical humid climate with an annual average temperature of 15.2 ℃, annual precipitation of 1 100 mm, and soil pH values ranging from 5.5 to 6.5, making it highly suitable for *G. pentaphyllum* cultivation. As of 2024, the total cultivated area of *G. pentaphyllum* in the county reached 4 533.33 ha, including 3 333.33 ha of standardized planting bases and 366.67 ha of newly established demonstration gardens[9].

1.2 Processing and product development According to Qichacha Enterprise Database queries, there are currently 451 *G. pentaphyllum* processing enterprises, cooperatives, and research institutes in Pingli County, forming an initial "cultivation-primary processing-sales" industrial chain. Since 1993, processing technologies have continuously evolved for *Gynostemma* products ranging from pure *Gynostemma* tea and Longxu pure tea to herbal mixed tea (Fig. 1)[10]. Currently, a relatively comprehensive product distribution pattern has been established, spanning from primary products to deep-processed derivatives.

1.3 Market sales and brand development With the advancement of "Internet Plus" technology, Pingli *G. pentaphyllum* has leveraged its product advantages to establish an online (e-commerce platforms)-offline (supermarkets, pharmacies, specialty stores) integrated sales model[10]. Statistics show that online sales of Pingli *G. pentaphyllum* exceeded 300 million yuan in 2018[8]. In 2019, Pingli County was designated as a provincial-level agri-

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cultural product quality safety county, achieving an annual output of 13 800 t of tea beverages with production value reaching 1.5 billion yuan[8]. In August 2023, the Agricultural Brand Research Institute's official account released the list of Top China Geographical Indication Agricultural Products (Chinese Medicinal Materials) in 2022, with Pingli *G. pentaphyllum* ranking 8th nationally.

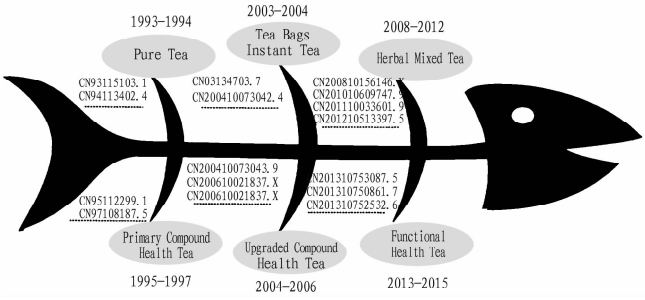

Fig. 1 Technological development pathway of *Gynostemma pentaphyllum* in Ankang City

2 Major challenges in industrial development

2.1 Incomplete standardized production system Despite possessing advanced cultivation techniques and approximately 3 333.33 ha of standardized planting bases, about 18.38% of cultivation areas still lack standardized management[9], potentially compromising the stability of active component content in *G. pentaphyllum*.

2.2 Low industrial added value and insufficient brand influence After years of development, while product structure has been optimized, Pingli County mainly produces primary processed products like *G. pentaphyllum* Longxu tea and leaf tea substitute, lacking deep processing capabilities and resulting in low industrial added value. Although Pingli *G. pentaphyllum* tea has obtained the "National Geographical Indication Protected Product" certification, its market recognition remains limited with insufficient market influence.

2.3 Weak brand protection awareness Despite achieving 8th position in the *List of Top China Geographical Indication Agricultural Products* (*Chinese Medicinal Materials*) in 2022, most similar products in the market are labeled as "Pingli *G. pentaphyllum*" without proper market access management mechanisms. This has resulted in uneven product quality, severely damaging brand image and eroding market share.

3 Analysis of industrial development prospects

3.1 Steady expansion of functional foods Listed in the National Health Commission's catalog of Chinese medicinal materials for health foods, Pingli *G. pentaphyllum* holds significant potential for developing healthcare products. According to the research statistics of DI Research, the global functional food market shows steady growth, reaching 1 088.61 billion yuan in 2024 and projected to attain 1 460.91 billion yuan by 2030, with a compound annual growth rate (CAGR) of 5.02% during 2024 – 2030. China's functional food market has maintained stable growth, reaching 352.3 billion yuan in 2023 with a 6% CAGR from 2016 to 2023. It is projected to reach 285.7 billion yuan by 2025 and surpass 485.8 billion yuan by 2029, indicating broad prospects for *G. pentaphyllum*-based health products.

3.2 Strong demand for rural characteristic tourism The *2024 Q3 Chinese Consumer Spending Intention Survey Report* by Lixin Data and China Association of Small and Medium Commercial Enterprises reveals that 41.9% of respondents have travel budgets for the next six months, with 67.4% allocating less than 10 000 yuan and 34.6% exceeding 5 000 yuan. Rural tourism experiences including cultural immersion and farmhouse visits account for 38.5% of destination preferences. Situated in the Qinba Mountains with 71.5% forest coverage, Pingli boasts abundant tourism resources as the primary origin of Nuwa culture, home to China's oldest Great Wall remnants, renowned tea production center, and the birthplace of Chinese *G. pentaphyllum*.

4 Recommendations

4.1 Strengthening standardized production and quality control It is necessary to establish *the Pingli G. pentaphyllum Whole Industry Chain Standard* to promote GAP cultivation and GMP processing certification. Simultaneously, it is necessary to develop a quality traceability platform implementing "one product, one code" system for full-process monitoring.

4.2 Promoting industrial chain upgrading It is necessary to enhance university collaborations to establish joint R&D centers focusing on developing *G. pentaphyllum* health foods and cosmetics, thereby increasing product added value and farmer incomes. It is necessary to develop a "*G. pentaphyllum* + Tourism" model[12] by constructing experiential processing parks.

4.3 Enhancing brand development It is necessary to strengthen brand management through establishing *the Pingli G. pentaphyllum Product Quality Standard*, improving market access mechanisms, and enhancing quality supervision.

5 Development prospects

5.1 Adhering to consumer-oriented strategy and closely following market demand trends The Pingli *G. pentaphyllum* industry should align with market trends through continuous improvement to ensure healthy development. According to CBN Data's *2024 New Healthy Consumption Trends Report*, consumers increasingly seek health-life balance through dietary adjustments, fitness innovations, and integration of traditional Chinese wellness with modern technology. For traditional Chinese wellness, respondents prefer herbal teas-favorable for promoting Pingli *G. pentaphyllum* tea, with potential to develop medicinal diets and health congee products. Regarding light healthy snacks, consumers prioritize nutritional value, suggesting development of *G. pentaphyllum* snack products like crispy biscuits[13].

5.2 Breaking the traditional production model and leveraging new quality productive forces New quality productive forces represent breakthroughs in conceptual innovation, factor composition, and developmental philosophy ("new"), while emphasizing high-quality advancement ("quality")[14]. The Pingli

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crucial measure to solve land use problems, optimize land resource allocation, improve the ecological environment, promote rural industrial development, and enhance farmers' living standards in the mountains. It is an important means and effective pathway to drive rural revitalization in mountainous areas, aiding in the achievement of all objectives of comprehensive rural revitalization.

In the implementation process of comprehensive land consolidation in mountainous areas, it is essential to conduct thorough and detailed consolidation suitability evaluations based on the characteristics of the target mountains, formulate scientific plans, ensure the operability of consolidation measures, and carry out differentiated consolidation tailored to local conditions. Attention must be paid to the fact that mountain land consolidation should not solely pursue quantity increase but should prioritize the improvement of quality post-consolidation. Consolidation should adopt a holistic perspective, integrate various resources, and emphasize integration with rural industrial development and ecological environment restoration to achieve sustainable utilization of land resources and coordinated socio-economic development in mountainous areas. Consolidation also requires strengthened policy support and guarantees, encouragement of multi-stakeholder participation, expansion of funding channels, and increased marketization.

Due to differences in natural endowments and economic development gaps among regions, the three case studies of comprehensive land consolidation in mountainous areas selected in this paper cannot encompass all possible consolidation measures. Future efforts should further strengthen research and practice on comprehensive land consolidation in mountainous areas, continuously improve consolidation models and mechanisms. By leveraging surveying, mapping, and geographic information technologies, it is necessary to provide full lifecycle technical support—from formulating consolidation plans to monitoring progress—enhancing consolidation effectiveness. This will offer more solid support for the comprehensive revitalization of mountainous villages and achieve sustainable socio-economic development in mountainous areas.

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