

Feature Review

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Conservation of Rare Medicinal Plant Resources and Artificial Replacement Cultivation Pathways of *Anoetochilus roxburghii*

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Abstract *Anoetochilus roxburghii* is an important rare medicinal orchid in China, with medicinal, health-promoting, edible, and ornamental value. It is rich in various active components, including kinsenoside, flavonoids, polysaccharides, phenolic acids, and nucleosides, and shows broad pharmacological activities such as hepatoprotective, hypoglycemic, anti-inflammatory, antioxidant, and immunomodulatory effects. However, long-term overharvesting, habitat destruction, slow growth, and weak natural propagation have led to the continuous decline of wild resources, seriously restricting sustainable industrial development. Artificial replacement cultivation has become an important approach to relieving resource pressure, ensuring raw material supply, and promoting industrial development. This study discusses the significance of wild resource conservation of *A. roxburghii* and analyzes key technical pathways for artificial replacement cultivation, including tissue culture and rapid propagation, optimization of artificial cultivation models, precise environmental regulation, active-component formation patterns, and construction of a whole-process quality control system. Meanwhile, it summarizes development pathways for standardized production system construction, coordinated resource conservation and industrial development, industrial chain extension, and high-value utilization. It also analyzes current problems, including insufficient utilization efficiency of superior germplasm, unstable quality of artificially cultivated materials, and an incomplete standardized industrial system, and proposes optimization strategies such as strengthening superior germplasm innovation, improving whole-process quality control, promoting standardized production, and advancing scientific and technological innovation. In the future, wild resource conservation and artificial replacement cultivation should be promoted collaboratively, with scientific and technological innovation driving high-quality seedling propagation, quality improvement, and industrial upgrading, thereby achieving coordinated development of resource conservation, artificial cultivation, and high-quality industrial development of *A. roxburghii*, and providing a theoretical basis and practical reference for the sustainable utilization of rare medicinal plant resources.

Keywords *Anoetochilus roxburghii*; Artificial replacement cultivation; Germplasm resource conservation; Quality control; Standardized production

1 Introduction

Anoetochilus roxburghii, also known as Jinxianlian, is widely recognized in Asia as an important medicinal and edible plant and is also valued as an ornamental species. Phytochemical studies indicate that it contains polysaccharides, flavonoids, glycosides, alkaloids, organic acids, steroids, triterpenes, volatile compounds, and the characteristic active constituent kinsenoside, which together underpin its broad medicinal value (Hou et al., 2025). Pharmacological and clinical-use reports show that this species has been used for diabetes, hyperlipidemia, liver disease, inflammatory disorders, cancers, chronic hepatitis B, hyperuricemia, and related conditions, with reported activities including antidiabetic, hepatoprotective, antioxidant, anti-inflammatory, immunomodulatory, renal-protective, and antineoplastic effects (Wang et al., 2022). In addition to medicinal use, *A. roxburghii* has entered food, nutraceutical, cosmetic, and functional health-product markets, and has been developed into soups, beverages, jelly, face masks, soap, and other products, reflecting a continuing expansion from traditional herbal use toward diversified industrial applications (Wang et al., 2018). Patent mining further shows that current technological development is concentrated in pharmaceutical preparations and food products, especially downstream applications such as anti-inflammatory, anti-infective, analgesic, and antipyretic products, while companies remain the main research and development actors in this field (Shi et al., 2023). At the same time,