

medicinal plant with pharmacological activities such as anti-tumor, anti-inflammatory, antiviral, antipyretic, and immunomodulatory effects. In clinical and folk applications, it is also known as a “plant antibiotic” (Zhu et al., 2020; Pang et al., 2024). At present, more than 140~150 compounds have been identified from *T. hemsleyanum*, especially flavonoids and polysaccharides. Related studies support its development and utilization in areas associated with fever, pneumonia, hepatitis, liver injury, and other diseases (Ji et al., 2020; Hu et al., 2021). Relevant reviews suggest that *T. hemsleyanum* has high economic and social value and is an important rare resource with promising prospects for the development of new drugs, functional foods, and health products (Wang et al., 2025).

Planting *T. hemsleyanum* in the understory spaces of bamboo forests, fruit forests, or broad-leaved forests can increase medicinal material income without substantially affecting the management of existing forest trees or fruit trees, thereby improving the comprehensive output per unit forestland area. For mountainous areas and regions rich in forestland resources, understory cultivation of *T. hemsleyanum* can transform idle or inefficiently used understory space into a sustainable management resource and enhance the economic returns of forestland management. Resource investigations in Zhejiang Province show that wild populations of *T. hemsleyanum* are scarce and endangered, while the artificial planting area has expanded rapidly with increasing market demand, reaching approximately 104.55 hm², with an expected output of about 173.91 t. This indicates a clear commercial driving force for artificial cultivation. From the broader experience of medicinal plant production, although medicinal plants are often considered “minor crops” in terms of production scale, their trade value is relatively high. They can provide important income sources for rural households and offer opportunities for farmers to shift from low-value crop management to diversified production (Mofokeng et al., 2022).

From the perspective of production input and income stability, understory cultivation can make use of natural shading conditions and reduce the cost of constructing artificial shading facilities. Understory litter and humus resources can also improve soil fertility to some extent and reduce part of the cost of soil improvement. Although *T. hemsleyanum* has a relatively long cultivation cycle, once a stable cultivation system is established, standardized management can improve survival rate and tuberous root yield, thereby generating relatively sustained returns. A profitability analysis of high-value medicinal plants in smallholder systems in South Africa showed that such cultivation generated positive net farm income, with a return on investment of 0.77 per growing period, indicating that the cultivation of high-value medicinal plants has certain profitability potential (Mbelebele et al., 2024). However, the economic benefits of understory cultivation of *T. hemsleyanum* do not depend solely on yield; they are also affected by seedling costs, management level, harvesting age, market price, medicinal material grade, and sales channels. Therefore, economic stability and sustainable resource utilization in understory cultivation of *T. hemsleyanum* should be improved through high-quality seedlings, ecological cultivation, quality control, contract sales, and origin-based brand building (Zhu et al., 2020; Pang et al., 2024).

7.3 Industrial promotion value of understory cultivation of *Tetrastigma hemsleyanum*

Understory ecological cultivation of *T. hemsleyanum* has strong industrial promotion value and is especially suitable for demonstration and application in regions with forestland resources, humid climates, and a foundation in Chinese medicinal herb cultivation. This model can integrate forestry resources, medicinal plant resources, and local specialty industries, forming a forest-medicine compound management pathway and providing a new option for agricultural transformation and understory economic development in mountainous areas. The rapid progress of phytochemical and pharmacological research on *T. hemsleyanum* also provides important support for its industrial development potential. Comprehensive studies have shown that *T. hemsleyanum* has broad pharmacological activities, including anti-tumor, antioxidant, anti-inflammatory, antiviral, hepatoprotective, immunomodulatory, and analgesic effects, and is considered a potential high-quality source for the development of new drugs and health products (Ji et al., 2020; Zhu et al., 2020; Hu et al., 2021).

From the perspective of industrial chain extension, understory cultivation of *T. hemsleyanum* can not only provide raw medicinal materials but also drive the development of related sectors such as seedling propagation, primary processing at the production site, quality testing, brand packaging, and functional product development. *T.*