using organic fertilizer as the basis, applying chemical fertilizers appropriately, and reasonably supplementing medium and trace elements should be followed, while avoiding excessive nitrogen application or overfertilization that may cause excessive vegetative growth and soil degradation. Meanwhile, measures such as deep plowing and soil exposure, high-ridge cultivation, application of well-decomposed organic fertilizer, crop rotation and intercropping, use of microbial fertilizers, and construction of drainage systems should be adopted to improve soil structure and rhizosphere microecology, alleviate continuous cropping obstacles, reduce the risk of soil-borne diseases, and provide a favorable environment for peimine accumulation and medicinal quality stability.

In the future, the development of the *F. thunbergii* industry should shift from a single yield-oriented approach toward the coordinated improvement of yield and quality. When evaluating cultivation effects, attention should be paid not only to yield per unit area, single-bulb weight, and commercial appearance, but also to dry matter content, contents of active constituents such as peimine and peiminine, incidence of pests and diseases, pesticide residues, heavy metal safety, and environmental parameters of the production area. By establishing an evaluation model integrating "environmental factors-growth indicators-yield indicators-quality indicators," the comprehensive effects of different cultivation environments and management measures on the overall quality of *F. thunbergii* can be more accurately reflected. Future research should further strengthen studies on the physiological and molecular mechanisms by which cultivation environment regulates peimine biosynthesis, and clarify the effects of light, temperature, water, fertilizer, soil microecology, and environmental stress on peimine metabolic pathways. Meanwhile, the application of digital monitoring, precise water and fertilizer management, facility cultivation, ecological cultivation, and quality traceability technologies in *F. thunbergii* production should be promoted. Through the integration of basic research and production practice, high-quality and high-yield cultivation patterns suitable for different production areas can be gradually established, thereby promoting the standardized, green, and high-quality development of the *F. thunbergii* industry.

Conflict of Interest Disclosure

The authors affirm that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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