

future of *D. officinale* seedling propagation lies in building standardized, data-driven technical systems that combine rapid propagation, clonal quality control, microbial regulation, bioreactor scaling, and intelligent greenhouse management, so that seedling production becomes more stable, economical, and suitable for large-scale medicinal cultivation.

Conflict of Interest Disclosure

The author affirms 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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