

In the chrysanthemum research landscape, future directions include microbiome management and integration of molecular tools, but the near-term “green cultivation system” for Hangbaiju can be built with already-available practice: preventive microbial inoculation strategies, selective botanicals such as azadirachtin where appropriate, and bloom-stage trapping to protect product cleanliness. The 2015–2025 chrysanthemum review explicitly frames microbiome management and integrated approaches as priorities for sustainable protection (Chen et al., 2025).

In my judgment, the strongest sustainable pathway is one that respects Hangbaiju’s product identity: it is not a crop where “cosmetic damage” is acceptable, because the flower itself is consumed. Therefore, greens systems must protect both agronomic output and consumer confidence, and biological control fits best when it is implemented as a quality-protection strategy as much as a pest-suppression strategy (Cao et al., 2024).

8 Conclusion

Biological control in Hangbaiju cultivation is not a single technology but a portfolio of tools that can be matched to the crop’s most sensitive windows—especially the narrow harvest period and the bloom-stage quality constraints of an edible flower. Evidence from chrysanthemum and Hangbaiju-relevant studies shows that microbial-based measures can provide meaningful disease suppression when used preventively, botanical pesticides can achieve operationally relevant reductions of aphid populations under protected cultivation, and natural enemies can substantially suppress pests such as thrips when their life cycles are strategically targeted.

Integrated approaches generally outperform single methods in robustness. The strongest designs are layered: preventive microbial management for soil and early-season health, selective botanicals when rapid suppression is necessary, and bloom-stage non-spray measures such as attractant-baited trapping to protect “clean product” outcomes. The key future direction is to translate these strategies into standardized, farmer-friendly protocols that fit local labor constraints and preserve consumer trust in Hangbaiju as an edible, health-associated product.

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