

Case Study

Open Access

Variation in Flower Color and Morphological Traits of *Phalaenopsis* and Its Application in Commercial Horticulture

Fangfang Ding ¹, Mengting Luo ² ✉¹ Zhejiang Qimei Ecological Agriculture Co., Ltd., Hangzhou, 311107, Zhejiang, China² Institute of Life Sciences, Jiyang College of Zhejiang A&F University, Zhuji, 311800, Zhejiang, China✉ Corresponding email: mengting.luo@jicaf.orgPlant Gene and Trait, 2026, Vol.17, No.2 doi: [10.5376/pgt.2026.17.0008](https://doi.org/10.5376/pgt.2026.17.0008)

Received: 21 Mar., 2026

Accepted: 17 Apr., 2026

Published: 28 Apr., 2026

Copyright © 2026 Ding and Luo, This is an open access article published under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Preferred citation for this article:Ding F.F., and Luo M.T., 2026, Variation in flower color and morphological traits of *phalaenopsis* and its application in commercial horticulture, Plant Gene and Trait, 17(2): 112-126 (doi: [10.5376/pgt.2026.17.0008](https://doi.org/10.5376/pgt.2026.17.0008))

Abstract *Phalaenopsis* is an important ornamental crop, and its flower color and morphological traits are key determinants of ornamental value and commercial application. This study systematically analyzes the variation characteristics of flower color (including solid, bicolor, and patterned types) and morphological traits (flower form, inflorescence, and plant architecture) in *Phalaenopsis*, and further elucidates their underlying mechanisms from genetic, environmental, and cultivation management perspectives. The results indicate that variation in flower color is primarily regulated by anthocyanin metabolism and its associated regulatory genes, whereas morphological traits are governed by complex polygenic interactions. Environmental factors such as light, temperature, and nutrient conditions significantly influence trait expression by modulating physiological processes and gene expression. Based on representative cultivar case studies, the study further demonstrates how trait combinations affect ornamental value and market positioning, and discusses their practical applications in cultivar selection and production management. In response to current challenges such as cultivar homogenization and insufficient trait stability, strategies emphasizing germplasm innovation and precise regulation are proposed. This study provides a theoretical basis for trait optimization and the advancement of commercial horticulture applications in *Phalaenopsis*.

Keywords *Phalaenopsis*; Flower color variation; Morphological traits; Commercial horticulture; Market positioning

1 Introduction

Phalaenopsis is one of the most important ornamental plants in the Orchidaceae and occupies a central position in the global floriculture industry, having long dominated the international orchid market (Badriah et al., 2024). Owing to its elegant floral form, extended blooming period, diverse coloration, and strong adaptability, it is widely used in both potted plant and cut-flower production systems, contributing substantial economic value to the floriculture industries of Asia, Europe, and North America (Bidarnamani et al., 2024). With the advancement of protected horticulture technologies and the refinement of tissue culture propagation systems, *Phalaenopsis* has achieved large-scale commercial production and has become a key commodity in greenhouse flower trade (Sevilleno et al., 2023). In China, the industry has developed rapidly in recent years, gradually expanding from festival-oriented consumption to applications in home gardening and landscape decoration.

The commercial value of *Phalaenopsis* is primarily determined by the combined effects of flower color and morphological traits, among which color, pattern, and floral form directly influence visual appeal and market positioning (Gawenda et al., 2012). Flower coloration exhibits a continuous spectrum ranging from white and cream to yellow, pink, and deep purple, often accompanied by complex patterns such as stripes, spots, and multicolored combinations, greatly enhancing product diversity (Badriah et al., 2024). Meanwhile, morphological traits, including flower diameter, floral shape, labellum structure, inflorescence arrangement, and plant architecture, not only determine ornamental quality but also directly affect product grading and application scenarios. For example, large-flowered cultivars with well-organized inflorescences are more suitable for high-end markets, whereas compact and multi-branching types are better adapted to home gardening. In addition, traits such as spike number, inflorescence orientation, and stem strength are closely associated with transport performance and display quality (Pramanik et al., 2022).