

industry value and facilitate the transition of the *Phalaenopsis* sector from traditional production toward a high-value, innovation-driven industry.

7 Conclusion

Flower color and morphological traits jointly determine the ornamental value, consumer preference, and market competitiveness of *Phalaenopsis*. On the one hand, the wide spectrum of flower colors—from pure white and soft pastel tones to highly saturated red, purple, and yellow, as well as complex bicolor or spotted patterns—provides diverse visual choices and emotional expressions for consumers, directly influencing first impressions and purchase intention. On the other hand, morphological traits—including flower size and fullness, petal and sepal morphology, labellum structure and pattern, inflorescence length and curvature, branching ability, flower number and arrangement, and overall plant architecture—not only affect aesthetic perception but also determine display performance, transportability, and application scenarios (e.g., potted plants, cut flowers, and long-term indoor decoration). In modern commercial horticulture, these traits are no longer merely static ornamental attributes; instead, they function as integrative indicators linking genetics, environment, and cultivation management, and serve as key tools for branding, product differentiation, and value enhancement. Overall, flower color and morphology constitute the core phenotypic basis for *Phalaenopsis* breeding, production planning, and marketing strategies, and are essential for sustaining industry vitality and innovation capacity.

Variation in flower color and morphological traits provides the foundation for market segmentation and diversified product development in *Phalaenopsis*. Differences in hue, brightness, and pattern enable breeders and enterprises to target specific consumer groups and cultural contexts—for example, white and light-colored cultivars are preferred in minimalist or Nordic-style settings, whereas bright red, purple, or golden cultivars are favored in festive and gift markets. Morphological variation further refines product positioning: large, round flowers with pendulous inflorescences are suitable for high-end display environments (e.g., hotel lobbies); compact plants with multiple spikes and medium-sized flowers are ideal for home and office decoration; while miniature and multifloral cultivars meet the preferences of younger consumers for small, refined, and easily arranged plants. At the production level, trait variation is also closely associated with cost control and supply chain efficiency. Cultivars with stable color expression, uniform morphology, and strong adaptability can reduce production risks and losses, whereas those with extended flowering duration and superior postharvest performance improve inventory turnover and facilitate long-distance distribution. Therefore, effective identification, utilization, and regulation of trait variation not only support the development of distinctive products and brands, but also promote deeper integration of the *Phalaenopsis* industry with diverse consumption scenarios such as home gardening, urban greening, and cultural-creative horticulture.

To fully exploit trait variation and promote the sustainable development of the *Phalaenopsis* industry, future efforts should focus on the coordinated advancement of breeding innovation, standardized production, and market-oriented strategies. In breeding, it is essential to integrate conventional hybridization with molecular-assisted selection and genomic technologies, systematically incorporating elite germplasm with novel colors, patterns, and morphologies while simultaneously improving stress tolerance, flowering stability, and postharvest longevity, thereby achieving the coordinated optimization of ornamental and production traits. In cultivation management, standardized and digitalized systems for regulating light, temperature, nutrition, and plant growth regulators should be established, alongside the adoption of intelligent production technologies (e.g., environmental control, phenotyping, and decision-support systems) to stabilize trait expression, reduce quality variation, and enhance production efficiency. From a market and industry perspective, stronger collaboration among breeders, propagators, producers, distributors, and retailers is required to design product portfolios based on seasons, holidays, and application scenarios, and to develop recognizable product lines and brands centered on clear trait profiles. Meanwhile, incorporating consumer preference research and aesthetic trends into breeding objectives, expanding applications in cultural, educational, and therapeutic contexts, and strengthening international cooperation and intellectual property protection for new cultivars will further enhance the global competitiveness, cultural influence, and long-term resilience of the *Phalaenopsis* industry.