



Figure 3 Screening of *Phalaenopsis* protocorms carrying PhCHS5 and PhF3'5'H after transformations (Adopted from Lou et al., 2023)

Image caption: (a) PhCHS5-transgenic *Phalaenopsis* protocorms; The image on the right is a close-focus image of the image on the left (b) Confirmation of the transformation of *Phalaenopsis* protocorms with PhCHS5 by PCR for Kan gene; M stands for marker, 1–10 stands for transformation seedlings; (c) PhF3'5'H-transgenic *Phalaenopsis* protocorms (Adopted from Lou et al., 2023)

## 4 Case Analysis of *Phalaenopsis*

### 4.1 Comparison of flower color and morphological traits among typical cultivars

In commercial *Phalaenopsis* production, significant variation exists among cultivars in flower color, pattern, floral morphology, and plant architecture. These differences collectively form the basis of varietal diversity and serve as key criteria for product grading and market segmentation (Hsu et al., 2022; Iiyama et al., 2024). Comparative analyses of representative commercial cultivars indicate that flower color and morphological traits are typically expressed as relatively stable trait combinations, which together define the ornamental style and commercial attributes of each cultivar. Standard large-flowered white cultivars are generally characterized by broad petals, symmetrical arrangement, and pure coloration, conveying a sense of elegance and formality suitable for high-end gift and wedding markets. *Phalaenopsis* Sogo Yukidian 'V3' is a representative example, featuring large flowers, a pure white perianth, strong structural integrity, and velvety petals, reflecting a classic and refined aesthetic.

In contrast, pink and purple-red cultivars often exhibit higher color saturation and stronger visual impact, making them more suitable for festive retail markets and prominent display settings. Bicolored and patterned cultivars further enhance individuality. For instance, 'Frigdaas Oxford' displays a yellow base color with red-purple patterns, and its thick, waxy petals not only enhance pattern visibility but also improve durability during transport and display (Han et al., 2025). In hybrid populations such as *P. intermedia* (*P. aphrodite* × *P. equestris*), offspring exhibit wide segregation in both flower size and color, ranging from small, vividly colored flowers to medium-sized pure white flowers (Hsu et al., 2022; Iiyama et al., 2024). This demonstrates that the diversity