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‘Dazhuang’: A New *Paphiopedilum* Cultivar

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Paphiopedilum, a high ornamental orchid genus primarily found in tropical Asia and Pacific Islands (Cribb 1998; Liu et al. 2009), is valued for its vibrant flowers, long blooming period, and unique lip structures resembling sacs or helmets (Zhang et al. 2024). However, habitat destruction due to human activities has threatened its survival, leading to the inclusion of all wild species in the Convention on International Trade in Endangered Species Appendix I, which prohibits international trade (Zeng et al. 2012, 2013). Researchers at the South China Botanical Garden (SCBG) have developed more than 100 new *Paphiopedilum* cultivars, such as SCBG Xia, SCBG Lvfeicui, SCBG Zijun, Yu Yin, and Yuan Chun (Fan et al. 2023; Zhang et al. 2022), among others, to reduce overharvesting and promote sustainable utilization. These efforts reflect SCBG’s commitment to orchid conservation and align with sustainable horticultural practices.

We developed a new hybrid *Paphiopedilum* cultivar, Dazhuang. It was created by crossing *P.* ‘SCBG Miracle’ and *P. callosum*. Compared with its parents, ‘Dazhuang’ exhibits several notable improvements, including larger blooms and a more prominent synsepal, and each individual flower maintains its aesthetic appeal for ∼42 d, showcasing exceptional ornamental value.

Origin

Parents. The female plant was ‘SCBG Miracle’ ‘K-1’, a hybrid orchid selected and registered by Songjun Zeng in 2013. For the hybridization experiments conducted in Apr 2016 and Apr 2017, a superior ‘K-1’ plant was chosen for its vigorous growth. The male plant was *P. callosum* ‘Y-1’, a native species belonging to the genus *Paphiopedilum*. In 2005, five specimens of *P. callosum* were imported from the Zhongsheng Garden in Dongguan, Guangdong, and maintained at SCBG for phenotypic observation. ‘Y-1’ was selected as the male parent for the hybridization process in 2016 and 2017 for its robust growth and pure flower coloration.

Breeding process. On 15 Apr 2016 and 15 Apr 2017, artificial pollination was performed using fresh pollen from the male parent, *P. callosum* ‘Y-1’, to fertilize the female parent, *P.* ‘SCBG Miracle’ ‘K-1’. The seed pods were harvested ∼10 months post-pollination at an immature stage. After disinfecting the seed pods, the seeds were extracted and underwent aseptic sowing on the culture medium. In Apr 2018 and Apr 2019, 1000 F_1 seedlings were obtained respectively, and the F_1 generation hybrid plants bloomed for the first time in Apr 2021 and Apr 2022, respectively. From 2021 to 2022, multisite trials were conducted in the greenhouse at SCBG and the Foshan Sanshui Base of Guangzhou Architectural Landscape Co., Ltd. This new cultivar has been developed through hybridization, sowing, single plant selection, and tissue culture propagation. This cultivar’s phenotype meets the breeding objectives with vigorous growth and strong adaptability and has been named Dazhuang.

Description

In 2021, 300 plants of ‘Dazhuang’ and its parents were cultivated in the greenhouse of SCBG. A subset of 30 plants was randomly selected for analysis of 20 morphological traits, with three replicates (10 plants each) (Table 1). Flower color was rated based on the Royal Horticultural Society (RHS) color chart, and data were analyzed with one-way analysis of variance in SPSS 25.0 (IBM Corporation, Armonk, NY, USA).

From the overall morphological characteristics of the Dazhuang cultivar, its plant height is between its parents but greater plant and leaf widths. The plant is more dwarf and robust, with longer, thicker flower stems (Fig. 1). ‘Dazhuang’ flowers differ notably from its parents. Specifically, the middle sepal of ‘Dazhuang’ is longer (7.0 ± 1.8 cm) and wider (8.2 ± 2.1 cm) than its parents (Table 1; Figs. 1, 2A and 2B). The size of the petals is also larger and wider than that of the parents (Figs. 1, 2C and 2D). The lip width of the ‘Dazhuang’ plant is also greater than that of its parents (Table 1; Fig. 2E). The synsepal, positioned behind the lip, has a width comparable to the middle sepal (length: 5.8 ± 1.3 cm, width: 7.5 ± 1.7 cm); this feature is particularly notable because its width is 3.1 and 5.0 times greater than that of the female and male parents, respectively (Table 1; Figs. 2F and G). In terms of flowering duration, ‘Dazhuang’ (42.0 ± 4.0 d) exhibits a notably longer flowering period compared with ‘SCBG Miracle’ (33.0 ± 2.5 d) and *P. callosum* (35.0 ± 2.0 d) (Table 1).

The ‘Dazhuang’ differs in color from its parents (Figs. 1 and 2). Its middle sepal features a white margin (RHS NN155D) with greyish olive green veins (RHS NN137A) transitioning to

Table 1. Morphological traits of its parents ‘SCBG Miracle’ and *Paphiopedilum callosum* and new cultivar Dazhuang.

Trait	‘SCBG Miracle’	*P. callosum*	‘Dazhuang’
Plant height (cm)	12.1 ± 1.2	8.5 ± 1.4	11.0 ± 2.1
Plant width (cm)	20.7 ± 2.8	24.0 ± 3.1	32.3 ± 4.6
Scape length (cm)	23.7 ± 2.2	18.4 ± 0.8	33.2 ± 3.7
Scape thick (cm)	3.8 ± 0.8	3.2 ± 0.4	4.1 ± 1.1
No. of flowers per plant	1.0 ± 0.0	1.1 ± 0.1	1.0 ± 0.0
Flower transverse diameter (cm)	11.1 ± 0.8	6.3 ± 1.2	13.5 ± 2.7
Flower longitudinal diameter (cm)	9.7 ± 0.5	8.1 ± 0.8	12.8 ± 1.9
Middle sepal length (cm)	5.3 ± 0.5	4.1 ± 0.6	7.0 ± 1.8
Middle sepal width (cm)	7.1 ± 0.2	4.5 ± 1.1	8.2 ± 2.1
Petal length (cm)	6.2 ± 0.4	5.4 ± 1.2	7.5 ± 1.4
Petal width (cm)	1.7 ± 0.2	1.5 ± 0.4	2.3 ± 0.9
Lip length (cm)	5.2 ± 0.5	3.9 ± 0.8	6.0 ± 1.4
Lip width (cm)	2.9 ± 0.2	2.1 ± 0.7	3.3 ± 0.8
Synsepal length (cm)	3.6 ± 0.2	2.4 ± 0.8	5.8 ± 1.3
Synsepal width (cm)	2.4 ± 0.4	1.5 ± 0.6	7.5 ± 1.7
No. of leaves per plant	6.7 ± 1.5	6.0 ± 0.1	6.0 ± 1.1
Leaf length (cm)	15.6 ± 0.8	13.0 ± 1.8	15.0 ± 2.3
Leaf width (cm)	3.2 ± 0.9	2.7 ± 1.1	5.4 ± 1.1
Leaf thickness (mm)	0.9 ± 0.1	0.7 ± 0.1	1.1 ± 0.2
Flowering period (day)	33.0 ± 2.5	35.0 ± 2.0	42.0 ± 4.0

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Fig. 1. New cultivar Dazhuang and its parents. From left to right are 'SCBG Miracle' (female parent), *Paphiopedilum callosum* (male parent), and 'Dazhuang'.

dark purple veins (RHS N79A), which is different from the *P. callosum*. 'SCBG Miracle' has a dark red halo (RHS 59A) on the upper-middle section, which 'Dazhuang' lacks. The petals of the 'Dazhuang' have greyish olive green veins (RHS NN137A), which is different from the moderate olive green veins (RHS 146A) of 'SCBG Miracle' and the green veins (RHS 143A) of *P. callosum*. The upper part is all light purple, with 'Dazhuang' being RHS N77B, 'SCBG Miracle' RHS N77D, and *P. callosum* RHS N81D. The lip of 'Dazhuang' is dark red (RHS 187A), which is significantly different from the deep red (RHS N77A) of 'SCBG Miracle' and the moderate yellowish brown (RHS N199C) of *P. callosum*. The synsepal of 'Dazhuang' extends from greyish olive green veins (RHS NN137A) to purple veins (RHS N79A), whereas its parents have only limited dark purple veins (RHS N79A) or pure greyish olive veins (RHS NN137A). Overall, the coloration of 'Dazhuang' is closer to the female parent and more distinct from the male parent.

In summary, 'Dazhuang' exhibits a number of differences from its parents. Among the most prominent characteristics are the plant's width, shape, and synsepal size, and its extended flowering period. Overall, 'Dazhuang' demonstrates exceptional growth and floral attributes, making it a notable addition to the genus.

Cultivation Methods

The method of Zhang et al. (2022) for nonsymbiotic seed germination and cultivation was followed. In brief, after collecting the 10-month-old immature pods and conducting surface disinfection, the seeds were extracted and placed in the germination medium for cultivation. After 65 d of seed germination, the protoplast spheres were transferred to the same medium for differentiation. They were then placed on the medium for root formation and promoting seedling growth. Before transplantation, the culture bottles needed to be cultivated in a greenhouse environment for 1 to 2 weeks to adapt to the environment. The transplanted seedlings were managed according to standard watering and fertilization procedures. The cultivation conditions included a temperature of 25 ± 5 °C and a light intensity of 30 to 40 $\mu mol \cdot m^{-2} \cdot s^{-1}$, with 12 h of light provided daily. It is recommended to use a mixture of Zhijin stone and soaked pine bark mixture (volume ratio 1:1) (Northridge Enterprise Co., Ltd., Taipei, Republic of China) as the cultivation substrate and cultivate in a greenhouse with a water curtain cooling system.

Applications

'Dazhuang' is a superior cultivar with vigorous growth and strong adaptability to environmental conditions. Notably, 'Dazhuang' features large, showy flowers with a distinct synsepale and an extended blooming duration. Due to these advantageous traits, 'Dazhuang' is recommended as an outstanding *Paphiopedilum* variety for home gardening.

Availability

Inquiries about research or request for plant materials can be made to Prof. Songjun Zeng (zengsongjun@scib.ac.cn) at the SCBG of the Chinese Academy of Sciences.

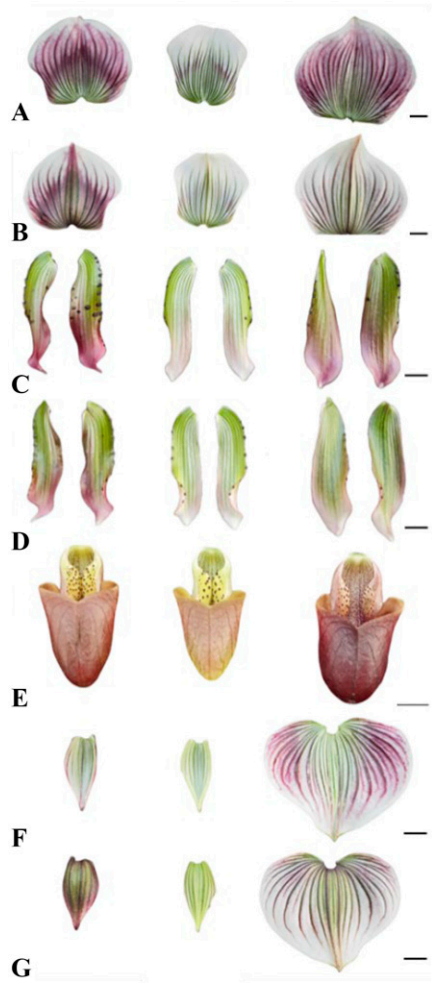

Fig. 2. The flower anatomic structure comparison of new cultivar Dazhuang and its parents. The middle sepal obverse (**A**) and reverse (**B**); petal obverse (**C**) and reverse (**D**); lip (**E**), synsepal obverse (**F**) and reverse (**G**); from left to right are 'SCBG Miracle', *Paphiopedilum callosum*, and 'Dazhuang'. The bar represents 1 cm.

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