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‘Yi Xian Fen Zhuang’: An Ornamental *Lycoris longituba* Cultivar

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The genus *Lycoris* is a group of bulbous flowering plants belonging to the Amaryllidaceae family. It is native to Asia, specifically to China, Korea, and Japan (Meerow and Snijman 1998). Their natural habitat is moist, warm temperate woodlands, including forests, meadows, and hillsides (Hori et al. 2006; Ji and Meerow 2000). *Lycoris* is known for its stunning and showy flowers that have been cultivated for centuries and are commonly integrated into gardens and landscapes in Asia. It is also cultivated in various regions worldwide, including North America and Europe (Knox 2006). In addition, *Lycoris* bulbs contain abundant alkaloids with significant pharmacological activation, so they also are used in traditional Chinese medicine (Wang et al. 2017). In terms of biological properties, *Lycoris* is categorized into two main groups based on leaf-emergence timing: spring foliage and autumn foliage. The difference in leaf-out does not affect the natural flowering season, which is concentrated in summer, from July to September in China (Ji and Meerow 2000). When the plants bloom, the leafless stems emerge from the bulbs, culminating in an inflorescence at the top of each stem, typically comprising four to eight flowers. The leaves also possess ornamental qualities during winter and spring. According to the flower morphology and flowering time, they are known as spider lilies, hurricane lilies, and surprise lilies in English (Knox 2006). *Lycoris* flowers are colorful, with several main colors, such as red, yellow, white, pink, and some multicolor. For example, *Lycoris longituba* is distinguished by its spring-emerging leaves and is the earliest flowering species in the genus. Flowering stalks of ~60 cm in height arise in July and August, bearing a large cluster of trumpet-shaped, pure white flowers. The 3- to 5-cm-long perianth tube is one of its main features and the origin of its name. It is a fertile diploid and readily produces seed, facilitating the generation of offspring with novel ornamental traits (such as flower colors) through hybridization with other fertile species (Kurita and Hsu 1996). For example, we previously published the new *L. longituba* cultivar Yi Xian Chun Tao, which was selected from the *L. longituba* population and is distinguished by its pink buds and the pink tip of the white petal (Zhang et al. 2022). The new cultivars often provide more horticultural richness and have higher economic value when they are widely planted in gardens or used as cut flowers.

Origin and Development

In the natural habitat, natural hybridization events commonly happen in *Lycoris*, resulting in the emergence of numerous special individual plants or natural hybrid groups with different flower colors and shapes with high ornamental traits (Kurita and Hsu 1996). *Lycoris* is a special characteristic bulb flower native to East Asia, and our research team has been engaged in germplasm collection, breeding, and research of *Lycoris* for more than 20 years. At present, we have stored more than 400 germplasm resources and constructed the national and provincial *Lycoris* germplasm resource banks. In the breeding work of *Lycoris*, we are committed to breeding new and superior strains with high ornamental value, including novel colors, various flower shapes, and novel fragrances. For example, we previously published the new cultivars Yi Xian Chun Tao (Zhang et al. 2022) and E Huang Xiao Ran (Wang et al. 2023), which were excellent individuals selected from the natural populations of *L. longituba* and *L. straminea*, respectively. In this study, we observed an individual and several clones that have different flower traits compared with *L. longituba*. The flower shape is the same as *L. longituba*, which have a tubular flower and long flower tube, but the flower buds and tepals are pink-purple, which is different from the white *L. longituba*. In terms of their rich color, it has the value of popularization and application as a new variety. It was been registered on the website of the Royal General Bulb Growers’ Association (2021) (KAVB) (Edibulbcode: 89742) in 2021.

Description

The bulb is oval-shaped and covered with black skin, 6 to 9 cm in diameter. When it blooms in July, the flowering stem emerges from the base of the bulb, reaching a height of 65 to 80 cm. At the top of each flowering stem, it forms an umbel inflorescence with five to six pink-purple flowers (Fig. 1A), which distinguishes it from *L. longituba*, with its white flower buds and petals (Fig. 1B). As with the *L. longituba*, this new cultivar has tube-shaped flowers with long perianth tubes of 4 to 4.5 cm. The petals are 6 to 7 cm long and 1.5 to 2 cm wide. The edge of the petals is smooth, and the tips of the petals are slightly curled. The stamens are pink and shorter than the perianth. The stigma is deep rose-red, nearly equivalent in length to the petals. The color of the stamens and stigma was different from that of *L. longituba*, the stamens and stigma of which are white. The new cultivar Yi Xian Fen Zhuang is of the spring foliage type, characterized by a long leafless period from flowering to leaf emergence. When the leaves grow from spring to summer, they are parallel-sided and 2 to 3 cm wide. Compared with the white *L. longituba*, the new cultivar Yi Xian Fen Zhuang has a pink-purple to the deep rose-red color of flower buds, petals, stamens, and stigma, creating a colorful ornamental effect.

Propagation, Cultivation, and Application

Asexual reproduction has been commonly used to enlarge the number of bulbous flowers. Compared with sexual reproduction by

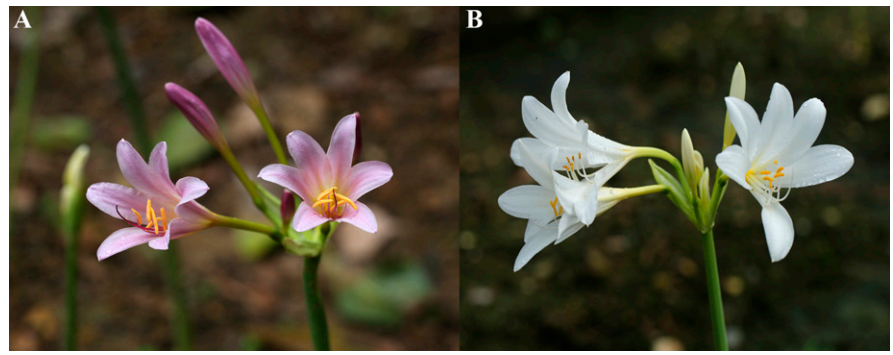

Fig. 1. Flower characteristics of (**A**) the new cultivar Yi Xian Fen Zhuang and (**B**) *Lycoris longituba*.

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seeds, asexual reproduction not only facilitates the preservation of stable ornamental traits but also shortens the development time of small bulbs, leading to earlier flowering (Ramawat and Merillon 2013). Cutting bulbs and plant tissue culture are the main methods for the asexual reproduction of *Lycoris* (Qing et al. 2007; Wang et al. 2023). In bulb cutting, it is necessary to choose a suitable season. In early autumn or spring, healthy and medium-sized bulbs of 'Yi Xian Fen Zhuang' are chosen, then the roots are removed, and a knife is used to cut the bulb base until two-thirds of the bulb height. The base is then evenly split into four to eight parts. The bulbs are kept slightly dry and planted in a loose, breathable substrate, maintaining the substrate's moisture content at 40% to 50%. Commonly, a bulb can yield 12 to 20 small bulbs at its base within 2 months. In contrast, one bulb can produce more small bulbs by plant tissue culture, although this requires more technologies, facilities, and cost. Key steps include explant disinfection, callus induction, and callus differentiation. Once an efficient plant tissue culture system is established, it significantly facilitates the rapid propagation of new cultivars.

The warm and suitable humid environment is good for the development and growth of *Lycoris*. Compared with other bulbous flowers, *Lycoris* is particularly easy to plant because of its tolerance of poor soil, drought, and lesser susceptibility to pests and diseases. Among the species, *L. longituba* is spring foliage, which generally exhibits greater hardiness than the autumn foliage type. When planted in the understory, deciduous broad-leaved forests are preferable, with suitable sunlight ranging between 50% to 70%. With its tall and straight stems, special flower shapes and colors, and summer flowering time, it is excellent to use as a cut flower and for flower border landscapes, rendering it a promising bulbous flower in the summer.

Availability

'Yi Xian Fen Zhuang' is available through Institute of Botany, Jiangsu Province and Chinese Academy of Sciences (Nanjing Botanical Garden Mem. Sun Yat-Sen). Contact Fengjiao Zhang (e-mail: zfjiao@yeah.net) for inquiries.

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