

‘Zi Mo Xian’: A New Summer Iris Induced by Heavy Ions

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Iris (*Iris domestica*) is the largest genus in the family Iridaceae, comprising ~300 species (Fan et al. 2021). Iris is strongly adaptable and known for its attractive and colorful flowers. It is widely used in landscaping or as cut flowers, and it is among the most popular ornamental plants worldwide (Yu et al. 2020; Zhang et al. 2020). In southern China, a few iris species bloom in summer (from the middle of June to the end of August). *Iris domestica* is native to China, blooms in summer, and exhibits a strong tolerance to drought, cold, and barren land (Zheng et al. 2017). Therefore, *I. domestica* is a potential species for creating a summer iris cultivar (Ruan et al. 2017; Xu et al. 2018). The new red–purple (RHS N74A) (Royal Horticultural Society 2015) summer iris cultivar Zi Mo Xian was induced by heavy ions in 2018. It was selected for further research in 2022. It exhibits big, showy flowers, strong resistance, and blooms from the middle of June to the end of July in Chongqing City in southwest China (Xu et al. 2021).

Origin

The *I. domestica* seedlings were collected from Suqian City, Jiangsu Province. In 2018, 360 seeds of *I. domestica* were treated with heavy ions (50 Gy, 100 Gy, 200 Gy, and 300 Gy), with 30 seeds for each treatment and three repetitions. The induced seeds were sowed in the middle of September at the Iris Germplasm Nursery at Yangtze Normal University. In 2019, all 82 surviving seedlings flowered. One promising seedling, ‘TB60’,

exhibited a big, novel red–purple flower. The asexual reproduction seedlings of ‘TB60’ were evaluated in the open experimental field at Yangtze Normal University until it was officially authorized for release as ‘Zi Mo Xian’ (no. 22-0302) by the American Iris Society in 2022.

Description

‘Zi Mo Xian’ and *I. domestica* were planted at the Iris Germplasm Nursery of the School of Advanced Agriculture and Bioengineering, Yangtze Normal University (temperature: –2 to 43 °C). ‘Zi Mo Xian’ and *I. domestica* were arranged in a randomized experiment using 30 plants (three replications with 10 plants in each replication). Data were collected from 2019 to 2021. We assessed morphological characteristics, including plant height, leaf length and width, flower diameter, inner perianth length and width, outer perianth length and width, flower period, and intraday flower opening and closing time. The data were analyzed using SPSS 22.0 software (IBM Corp., Armonk, NY).

The plant height of ‘Zi Mo Xian’ was 120.00 ± 1.34 cm, which is considerably taller than that of *I. domestica* (112.00 ± 1.82 cm). Its leaf length and leaf width were larger

than those of *I. domestica*. The leaf length and width of ‘Zi Mo Xian’ were smaller than those of *I. domestica*. Compared with *I. domestica*, ‘Zi Mo Xian’ had bigger flowers. The flower diameter of ‘Zi Mo Xian’ was 5.26 ± 0.02 cm, which is wider than that of *I. domestica* (4.58 ± 0.05 cm). Additionally, the inner perianth length, inner perianth width, outer perianth length, and outer perianth width of ‘Zi Mo Xian’ were larger than those of *I. domestica*. However, the standard length and width and fall length and width of ‘Zi Mo Xian’ were similar to those of *I. domestica* (Table 1).

‘Zi Mo Xian’ has an attractive red–purple (RHS N74A and 71B) perianth color, with brilliant green–yellow (RHS 5A) spots on the outer perianth center. In contrast, the perianth color of *I. domestica* is a strong orange (RHS N25B) (Figs. 1 and 2). The flowering period of ‘Zi Mo Xian’ extends from 15 Jun to 20 Jul, enriching the summer iris cultivation period in southern China. The single ‘Zi Mo



Fig. 1. Flower characteristics of *Iris domestica* (A) and ‘Zi Mo Xian’ (B).

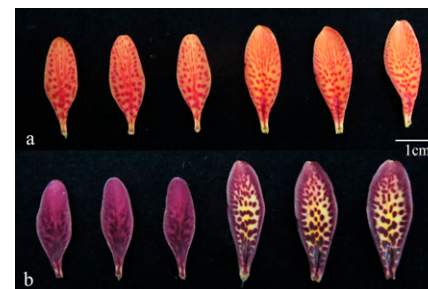


Fig. 2. Flower perianth of *Iris domestica* (A) and ‘Zi Mo Xian’ (B).

Table 1. Morphological traits of *I. domestica* and ‘Zi Mo Xian’.

Traits	<i>I. domestica</i>	Zi Mo Xian
Plant height (cm) ⁱ	112.00 ± 1.82 b ⁱⁱ	120.00 ± 1.34 a
Leaf length (cm)	43.50 ± 0.35 b	45.5 ± 0.17 a
Leaf width (cm)	4.19 ± 0.02 b	5.73 ± 0.04 a
Leaf length/width	10.38 ± 0.06 a	7.94 ± 0.04 b
Flower diameter (cm)	4.58 ± 0.05 b	5.26 ± 0.02 a
Inner perianth length (cm)	2.27 ± 0.03 b	2.39 ± 0.03 a
Inner perianth width (cm)	0.85 ± 0.01 b	0.94 ± 0.01 a
Inner perianth length/width	2.67 ± 0.05 a	2.55 ± 0.02 a
Outer perianth length (cm)	2.45 ± 0.02 b	2.63 ± 0.02 a
Outer perianth width (cm)	0.96 ± 0.01 b	1.04 ± 0.01 a
Outer perianth length/width	2.55 ± 0.02 a	2.53 ± 0.02 a
Flower period	8 Jun–18 Jul	15 Jun–20 Jul
Flower opening	8:30 AM	8:30 AM
Flower closure	6:00 PM	6:30 PM
Flowering time (cm)	9.5 ± 0.05 b	10.0 ± 0.05 a

ⁱ Data were collected during 2019 to 2021 and analyzed using SPSS 22.0 (Chongqing, China).

ⁱⁱ Means followed by different letters in the same row are significantly different ($P < 0.05$).

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Xian' flower opens at 8:30 AM and closes at 6:30 PM, lasting ~10 h, which is longer than that of *I. domestica* (which opens at 8:30 AM and closes at 6:00 PM, lasting ~9.5 h).

Reproduction and Use

The new cultivar Zi Mo Xian can be propagated by division (Bi et al. 2013) or tissue culture (Gao et al. 2020). 'Zi Mo Xian' has considerable potential for landscaping uses worldwide. It is attractive in gardens and urban landscaping and as a cut flower.

Availability

'Zi Mo Xian' is available for research or trials. Requests for cloned plant samples may be addressed to Dr. Gangjun Luo (e-mail: gangjunluo@163.com), School of Advanced Agriculture and Bioengineering, Yangtze Normal University, Fuling 408100, China.

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