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‘Qihuan Zi’: A New *Iris sanguinea* Cultivar

Lijuan Fan, Wangbin Ye, Haijing Fu, Ruiyang Zhao, Gongfa Shi, Rutong Lv, Lei Yan, Zhuowen Li, and Ling Wang

College of Landscape Architecture, Northeast Forestry University, Harbin 150040, China

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Irises have high ornamental values because of their decorative flowers and the elegance of their elongated leaves (Roguz et al., 2020; Xu et al., 2017). For example, *Iris sanguinea* has a blue flower color that offers great potential for landscaping. It also has strong disease resistance, and is cold and moisture tolerant (Bi et al., 2011; Shang and Wang, 2014). Thus, it could be widely used for gardening and landscaping in northeastern China. These factors have encouraged the development and release of new iris cultivars. Recently, new cultivars with various flower colors have been developed and released by crossing *I. sanguinea* with *I. sanguinea* f. *albiflora*, which has a white flower. These include cultivars NEFU-1 (Qi et al., 2020), Zi Meiren (Chen et al., 2019), and White Skirt (Wang et al., 2019).

We developed a new cultivar, Qihuan Zi, via a cross between *I. sanguine* and *I. sanguinea* f. *albiflora*. The flower of ‘Qihuan Zi’ is multicolored, which is obviously different from both parents and previously released genotypes.

Origin

In 2003, the seeds of *I. sanguine* and *I. sanguinea* f. *albiflora* were obtained from Shenyang Botanical Garden, Shenyang, China, and were sown at the Maoershan Experimental Forest Nursery, Northeast Forestry University, Harbin, China. Hybrid seeds were collected via open pollination between both genotypes in 2004. The hybrid plants were then propagated asexually annually in the same nursery under the same conditions for the next 10 years.

The features of these hybrid progeny plants did not change drastically from year to year between 2004 and 2013. In 2013, an exceptional individual among the progenies was identified, which was propagated asexually and the offspring were found to have stable traits. When compared with its two parents, the individual had much larger flowers and unique light-purple petals [Royal Horticultural Society (RHS) 77C] (Fig. 1). The flower colors of *I. sanguine* and *I. sanguinea* f. *albiflora* are blue-violet (RHS N88A) and white (RHS N155C), respectively. This unique individual plant was propagated asexually and the progenies were grown in the same nursery in 2014 and 2017. From 2017 to 2020, field trials were conducted in the same nursery to monitor phenotypic stability, and data were collected for phenotypic analysis. We found that the progenies were phenotypically stable and consistent (Table 1).

In 2020, the new cultivar was named ‘Qihuan Zi’ and was officially authorized by the American Iris Society with accession no. 21-0388.

Description

From 2017 to 2020, 30 plants of *I. sanguine*, *I. sanguine* f. *albiflora*, and cv. Qihuan Zi were planted in an experimental field at the Northeast Forestry University’s cold perennial flower germplasm resource nursery for phenotypic investigation and data collection. The experimental field was set up in a randomized complete block design with 10 plants of each cultivar per block for three blocks (replicates) and a 20- × 20-cm spacing. The following morphological traits were recorded: flower diameter, flower color, plant height, leaf length, leaf width, leaf length/width ratio, bract length and width, bract length/width ratio, inner perianth length, inner perianth width, inner perianth length/width ratio, outer perianth length, outer perianth width, outer perianth length/width ratio, flowering period and fruiting period. Flower colors were recorded according to the RHS Color Chart (Royal Horticultural Society, 2007). Data were analyzed using SPSS 22.0 (Lenovo, Beijing, China) and Duncan’s one-way analysis of variance.

The plant height of ‘Qihuan Zi’ was ≈66.21 ± 0.14 cm, which was significantly taller than that of the two parents, *I. sanguinea* (62.07 ± 0.08 cm) and *I. sanguinea* f. *albiflora* (60.56 ± 0.24 cm) (Table 1). ‘Qihuan Zi’ has significantly shorter but wider leaves than its two parents, so that its leaf length/width ratio was significantly less than that of its two parents (Table 1). Similarly, ‘Qihuan Zi’ has significantly shorter but wider bracts and inner and outer perianths than its two parents, leading to significantly smaller length/width ratios of bract, and inner and outer perianths in ‘Qihuan Zi’ than its parents (Table 1). The inner (ovate) and outer (obovate) perianth shapes are similar among the three genotypes (Table 1). However, the flower diameter and perianth color of ‘Qihuan Zi’ differs from that of its parents. The flower diameter of ‘Qihuan Zi’ is 8.69 ± 0.01 cm, which is significantly larger than *I. sanguinea* (6.44 ± 0.01 cm) and *I. sanguinea* f. *albiflora* (6.46 ± 0.01 cm) (Table 1). There are more than three flower colors in ‘Qihuan Zi’ and *I. sanguinea*, whereas only two flower colors are in *I. sanguinea* f. *albiflora* (Table 1). The colors of the outer and inner perianths of ‘Qihuan Zi’ are purple (RHS 77A) with a blue-purple (RHS 87A) in the center and light purple (RHS 77C), respectively, whereas the perianth colors of *I. sanguine* and *I. sanguinea* f. *albiflora* are blue-violet (RHS N88A) and white (RHS N155C), respectively (Fig. 1). In comparison with the violet-blue (RHS N92C) anthers of *I. sanguine* and white (RHS 155A) anthers of

Fig. 1. The flower anatomic structures of ‘Qihuan Zi’ (**A**), and its parents *Iris sanguinea* (**B**) and *I. sanguinea* f. *albiflora* (**C**), showing their outer perianths, inner perianths, style arms, and filaments and anther.

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L.W. is the corresponding author. E-mail: wanglinghlj@126.com.

Table 1. Morphological traits of 'Qihuan Zi' and its parents *Iris sanguinea* and *Iris sanguinea* f. *albiflora*.

Traits[z]	Qihuan Zi	*I. sanguinea*	*I. sanguinea* f. *albiflora*
Plant height (cm)	66.21 ± 0.14 a[y]	62.07 ± 0.08 b	60.56 ± 0.24 c
Leaf length (cm)	50.90 ± 0.01 c	57.55 ± 0.04 b	57.81 ± 0.01 a
Leaf width (cm)	1.09 ± 0.02 a	1.00 ± 0.01 b	0.96 ± 0.01 c
Leaf length/width	46.67 ± 0.46 c	57.44 ± 0.19 b	60.3 ± 0.12 a
Bract length (cm)	5.88 ± 0.01 c	6.14 ± 0.03 a	6.11 ± 0.01 a
Bract width (cm)	1.15 ± 0.02 a	1.04 ± 0.01 a	1.00 ± 0.01 c
Bract length/width	5.15 ± 0.04 c	5.97 ± 0.01 b	6.11 ± 0.01 a
Flower diameter (cm)	8.69 ± 0.01 a	6.44 ± 0.01 c	6.46 ± 0.01 b
Inner perianth length (cm)	4.49 ± 0.01 b	4.65 ± 0.04 a	4.65 ± 0.03 a
Inner perianth width (cm)	2.38 ± 0.01 a	1.49 ± 0.02 b	1.47 ± 0.01 b
Inner perianth length/width	2.01 ± 0.01 b	3.07 ± 0.04 a	3.11 ± 0.04 a
Inner perianth shape	Ovate	Ovate	Ovate
Outer perianth length (cm)	5.86 ± 0.02 a	5.13 ± 0.08 b	4.87 ± 0.08 c
Outer perianth width (cm)	4.12 ± 0.02 a	2.36 ± 0.04 b	2.39 ± 0.16 b
Outer perianth length/width	1.42 ± 0.01 b	2.23 ± 0.08 a	2.17 ± 0.07 a
Outer perianth shape	Obovate	Obovate	Obovate
Flower, no. of colors	>3	>3	Two
Flower, bud color	Pink–purple, white	Blue–purple	White
Flowering period	5 June–25 June	5 June–25 June	5 June–25 June
Fruiting period	10 Aug.–20 Sept.	10 Aug.–20 Sept.	10 Aug.–20 Sept.

[z]Data were collected from 2018 to 2020 and were analyzed by using SPSS 22.0 (Lenovo, China).
[y]Means followed by different letters in the same row are significantly different ($P < 0.05$).

I. sanguinea f. *albiflora*, the anthers of 'Qihuan Zi' are light purple (RHS 75C). The styles of 'Qihuan Zi' are white (RHS 155D), with a blue-purple (RHS 87A) center and veins, whereas those of *I. sanguine* and *I. sanguinea* f. *albiflora* are blue-violet (RHS N88A) and white (RHS N155C), respectively. The flower bud color of 'Qihuan Zi' is pink-purple (RHS 76B) at the upper part and white (RHS N155D) at the base, whereas the flower buds of their parents are blue-purple (RHS 87A) and white (RHS N155C), respectively (Table 1). Nonetheless, 'Qihuan Zi' has the same flowering and fruiting period as its two parents.

In summary, the primary distinctions between 'Qihuan Zi' and its parents are flower color, flower size, and perianth color, with 'Qihuan Zi' being more colorful and having significantly larger blooms than its parents. These unique characteristics make 'Qihuan Zi' an attractive ornamental cultivar.

Cultivation Techniques

'Qihuan Zi' grows well in Northeast China and can survive in the field during the winter in Harbin, China. It is suitable for growth on loam or light-clay soil under full sunlight. It can be propagated asexually via division with a 30- × 30-cm plant spacing in spring, summer, or early Fall. It requires regular irrigation and little management after planting.

Landscape Applications

'Qihuan Zi' is of great ornamental value and can be used as cut flowers or for urban landscaping as ornamental plants in North and Northeast China.

Availability

Inquiries about research or request for 'Qihuan Zi' plant materials can be made to Dr. Ling Wang (e-mail: wanglinghlj@126.com) at the College of Landscape Architecture, Northeast Forestry University, Harbin, China.

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