‘NEFU-1’: A New *Iris sanguinea* Cultivar

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Iris, an ornamental genus, has more than 260 species that are widely distributed over the Northern Hemisphere (Kossak, 2012). *I. sanguinea* is native to China, Korea, Russia, Japan, and Mongolia, and it has strong resistance to diseases, pests, and cold (Bi et al., 2011; Fu, 2016; Shang and Wang, 2014). It is a valuable landscape species because of its large brightly colored flowers with a distinctive butterfly-like flower pattern. *I. sanguinea* has been widely cultivated in many countries (Zhao et al., 2000).

Wild genetic sources of *I. sanguinea* are abundant, but the flowers are mainly blue violet (RHS N88A) (Wang and Wang, 2017). Flower color has become one of the primary interests in *I. sanguinea* breeding. To develop new cultivars with unique flower colors, people often make crosses between *I. sanguinea* and *I. sanguinea* f. *albiflora*. *I. sanguinea* f. *albiflora* flowers are white. In the past 3 years, breeders have released several *I. sanguinea* cultivars such as ‘Bandie’ (Wang and Wang, 2017), ‘Forest Fairy’ (Kuwantai et al., 2018), and ‘Dream of the Butterfly’ (Zhao et al., 2018). In 2011, a new *I. sanguinea* cultivar was selected from the hybrids of *I. sanguinea* (flower color RHS N88A) × *I. sanguinea* f. *albiflora* (flower color RHS N155C) and designated as ‘NEFU-1’ in 2019. Compared with its progenitors, *I. sanguinea* and *I. sanguinea* f. *albiflora*,

‘NEFU-1’ has different colors between the inner perianth and outer perianth. ‘NEFU-1’ has a lilac inner perianth (RHS 84D) and a violet (RHS N87C) outer perianth.

Origin

‘NEFU-1’ is a new cultivar selected from hybrids of *I. sanguinea* × *I. sanguinea* f. *albiflora*. Native *I. sanguinea* and *I. sanguinea* f. *albiflora* plants were planted and grown at the Northeast Forestry University (NEFU) Mao-Er-Shan Experimental Forest Farm experimental nursery in 2003. In 2004, seeds produced through natural crossing were collected from native *I. sanguinea* and *I. sanguinea* f. *albiflora* plants growing in the NEFU Mao-Er-Shan Experimental Forest Farm experimental nursery in Harbin, China. Open-pollinated seeds were harvested in Fall 2006 and planted in Spring 2007 at the Maoershan experimental nursery of NEFU in China. In 2010, among the progenies, a unique plant was observed in the mixed population. The unique plant showed two colors different from those of *I. sanguinea* and *I. sanguinea* f. *albiflora* and distinctive from previous released *I. sanguinea* and *I. sanguinea* f. *albiflora* cultivars. The outer perianths had a white background covered with a violet color (RHS N87C); the color fades from the center to the edges of the perianth. The inner color of the perianths was lilac (RHS 84D) with violet (RHS N87C) veins. The plant was separated into several individuals, and the clones were propagated during the following 5 years at the same research nursery. The plants grew well with regular maintenance and management. By observing its field performance during three successive years (2015–18), a larger number of clone plants with stable and consistent morphological traits (especially flower color) were propagated. In 2019, the new cultivar was officially autho-

rized to be released as ‘NEFU-1’ by The American Iris Society with accession number 19-0166.

Description

From 2015 to 2018, the performance of newly planted ‘NEFU-1’, *I. sanguinea*, and *I. sanguinea* f. *albiflora* were evaluated in field trials at NEFU in Harbin, China. ‘NEFU-1’, *I. sanguinea*, and *I. sanguinea* f. *albiflora* were planted in a 50-m² nursery area of NEFU for data collection. Ninety plants each of ‘NEFU-1’, *I. sanguinea*, and *I. sanguinea* f. *albiflora* were arranged in a randomized experiment with three replications. A total of 30 plants (10 plants × 3 replications) were randomly assigned to collect data regarding the following morphological characteristics: flower diameter, flower color, plant height, leaf length, leaf width, leaf length/width ratio, bract length, bract 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, flower period, and fruit period. The data were analyzed using SPSS 22.0 software (Lenovo, Beijing, China) and Duncan’s one-way analysis of variance. The color references used are from the Royal Horticultural Society Color Chart (Royal Horticultural Society, 2007) and are designated as RHS.

The flower of ‘NEFU-1’ has three falls and three standards that are similar to that of *I. sanguinea* and *I. sanguinea* f. *albiflora*. Its plant height was 54.55 cm, which was shorter than that of both *I. sanguinea* (56.08 cm) and *I. sanguinea* f. *albiflora* (58.06 cm) (Table 1). Its leaf length was 50.93 cm, which was shorter than that of *I. sanguinea* and *I. sanguinea* f. *albiflora*, but the leaf width was greater than that of *I. sanguinea* and *I. sanguinea* f. *albiflora*, and the leaf length/width ratio was less than that of *I. sanguinea* and *I. sanguinea* f. *albiflora* (Table 1). The bract lengths were shorter than those of *I. sanguinea* and *I. sanguinea* f. *albiflora*, whereas the bract widths were wider than those of *I. sanguinea* and *I. sanguinea* f. *albiflora*. The ‘NEFU-1’ bract length/width ratio was less than that of *I. sanguinea* and *I. sanguinea* f. *albiflora* (Table 1). However, the ‘NEFU-1’ flower diameter was 9.77 cm, which was larger than that of both *I. sanguinea* (6.45 cm) and *I. sanguinea* f. *albiflora* (6.45 cm) (Table 1). The inner and outer perianths are wider than those of *I. sanguinea* and *I. sanguinea* f. *albiflora*, but the inner and outer perianth length/width ratios were less than those of both origins (Table 1).

The ‘NEFU-1’ flowers are very different from those of *I. sanguinea* and *I. sanguinea* f. *albiflora*. The ‘NEFU-1’ flower has different inner and outer perianth colors, which are unique to the previous release of *I. sanguinea* and *I. sanguinea* f. *albiflora* cultivars. The spoon-shape portion of the outer perianth, when completely drooping in full bloom, has a white background covered with a violet color (RHS N87C), and the violet color fades from the center to the edge. The yellow (RHS

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Table 1. Morphological traits of the new cultivar ‘NEFU-1’ and *I. sanguinea* and *I. sanguinea* f. *albiflora* were collected from 30 plants (10 plants × 3 replications) planted in a randomly designed nursery in Northeast Forestry University, Harbin, China, from 2015 to 2018.

Traits ^z	NEFU-1	<i>I. sanguinea</i>	<i>I. sanguinea</i> f. <i>albiflora</i>
Plant height (cm)	54.55 ± 0.66 b ^y	56.08 ± 0.33 ab	58.06 ± 1.5 a
Leaf length (cm)	50.93 ± 0.59 b	58.47 ± 0.19 a	57.60 ± 0.26 a
Leaf width (cm)	1.06 ± 0.03 a	0.99 ± 0.07 b	0.97 ± 0.01 b
Leaf length/width	47.94 ± 0.96 b	58.86 ± 0.45 a	59.61 ± 0.90 a
Bract length (cm)	5.88 ± 0.05 b	6.23 ± 0.03 a	6.14 ± 0.04 a
Bract width (cm)	1.14 ± 0.04 a	1.02 ± 0.01 b	1.02 ± 0.02 b
Bract length/width	5.15 ± 0.11 b	6.13 ± 0.10 a	6.05 ± 0.14 a
Flower diameter (cm)	9.77 ± 0.08 b	6.45 ± 0.03 a	6.45 ± 0.01 a
Inner perianth length (cm)	5.96 ± 0.04 a	4.55 ± 0.02 b	4.58 ± 0.08 b
Inner perianth width (cm)	2.40 ± 0.03 a	1.45 ± 0.04 b	1.48 ± 0.02 b
Inner perianth length/width	2.48 ± 0.03 b	3.14 ± 0.09 a	3.09 ± 0.09 a
Outer perianth length (cm)	7.12 ± 0.04 a	4.77 ± 0.04 b	4.87 ± 0.13 b
Outer perianth width (cm)	5.05 ± 0.04 a	1.76 ± 0.01 b	2.38 ± 0.31 b
Outer perianth length/width	1.41 ± 0.01 c	2.71 ± 0.01 a	2.11 ± 0.26 b
Flower period	5 June–25 June	5 June–25 June	5 June–25 June
Fruit period	10 Aug.–20 Sept.	10 Aug.–20 Sept.	10 Aug.–20 Sept.

^zData were collected in 2015–17 and analyzed using SPSS 22.0 (Lenovo, Beijing, China).

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

Fig. 1. Single flowers of ‘NEFU-1’ (A), *I. sanguinea* (B), and *I. sanguinea* f. *albiflora* (C) show differences in flower size, color, and shape. The flower of ‘NEFU-1’ has two colors, whereas *I. sanguinea* is blue violet and *I. sanguinea* f. *albiflora* is white.

23D) signal is surrounded by a reddish overlay and red (RHS 182A) veins at the base. The spoon-shape portion of the inner perianth droops at an almost 30° angle in full bloom. The color of the inner perianth is lilac (RHS 84D) with violet (RHS N87C) veins. This is in contrast to the inner and outer perianths of *I. sanguinea*, which are blue violet (RHS N88A), and the inner and outer perianths of *I. sanguinea* f. *albiflora*, which are white (RHS N155C) (Fig. 1). The color of the ‘NEFU-1’ anthers is similar to that of *I. sanguinea* (RHS N92C), whereas the color of the anthers of *I. sanguinea* f. *albiflora* is white (RHS 155A). The ‘NEFU-1’ styles are lilac (RHS 84D) with a blue violet (RHS 98C) tint to the midrib. This is in contrast to the styles of *I. sanguinea* and *I. sanguinea* f. *albiflora*, which were blue violet (RHS N88A) and white (RHS N155C), respectively. The ‘NEFU-1’ flowers from 5 June to 25 June and fruits from 10 Aug. to 20 Sept., similar to *I. sanguinea* and *I. sanguinea* f. *albiflora*.

The primary differences between ‘NEFU-1’ and *I. sanguinea* and *I. sanguinea* f. *albiflora* are the flower colors, flower diameters, and morphologies of the perianths. Compared with *I. sanguinea* and *I. sanguinea* f. *albiflora*, the inner and outer perianths of ‘NEFU-1’ flowers have different colors, and the entire flower is larger than that of other *I. sanguinea* cultivars. In full bloom, the spoon-shaped portion of the outer perianth completely droops and the spoon-shaped portion of inner perianth droops at an almost 30° angle. Therefore, these unique characteristics make ‘NEFU-1’ not only a valuable addition to the diverse *I. sanguinea* species for ornamental applications but also an excellent source of genetic material for further *Iris* breeding.

Cultivation Techniques

‘NEFU-1’ is suitable for growing in damp meadows and on sunny pond banks or hill-sides. ‘NEFU-1’ is also suited for growth in sandy loam or light clay that is rich in humus

and has good permeability for gas and water exchange. It can overwinter outside without protection in Harbin, China. Propagation of ‘NEFU-1’ can be accomplished during spring, summer, or early fall by division. A 40-cm × 40-cm plant spacing will provide for sufficient ventilation and light and aid management.

Habit and Application

‘NEFU-1’ prefers sunny and wet conditions during the growing season. It has good disease resistance and is especially suitable for landscaping. The flowers can be used for cut flowers and has tremendous potential for landscaping throughout northern China.

Availability

Questions concerning ‘NEFU-1’ and the research should be addressed to Dr. Ling Wang (E-mail: wanglinghlj@126.com) at the College of Landscape Architecture of Northeast Forestry University in Harbin, China.

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