

‘Jiang Luopao’: A *Nelumbo* Cultivar with Deep Purple-red and Bowl-shaped Flowers

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Nelumbo Adans., widely known as lotus, is an important genus of perennial aquatic plants with considerable ornamental value (Du et al., 2018). There are only two species: *Nelumbo nucifera* Gaertn. and *Nelumbo lutea* Willd. *Nelumbo nucifera*, which is widely distributed in Asia and Oceania, has diverse flower colors, including red, pink, and white, and its flower forms include single, semidouble, double, duplicate layered, and thousand petaled. *Nelumbo lutea* is native to North America and the Caribbean, and is characterized by yellow flowers, with fewer than 30 petals. More than 2000 germplasms of *Nelumbo* spp. exist in Asia, where the lotus has been widely cultivated for more than 3000 years (Zhang et al., 2011, 2019).

With the aim of creating new cultivars with attractive flowers, interspecific hybridization of lotus plants has been used extensively (Shi et al., 2018). In recent years, cultivars with red flowers have been receiving increasing attention in Asian markets. After years of selection from the progeny of interspecific hybrids, we obtained a cultivar, *Nelumbo* ‘Jiang Luopao’, with deep purple-red, double-layered flowers. Moreover, the deep purple-red staminal appendages are unique to the lotus

germplasm. In 2020, the new cultivar was officially authorized under the protection of the Ministry of Agriculture and Rural Affairs of China (CNA20183363.1).

Origin

The female parent of ‘Jiang Luopao’ is ‘Mrs. Perry D. Slocum’, which is a well-known interspecific hybrid with multicolored and semidouble flowers first grown in 1964 (*N. lutea* × *N. ‘Rosea Plena’*) (Slocum, 2005). After several years of seedling selection, we obtained ‘Jiang Luopao’

from the third-generation seedlings of ‘Mrs. Perry D. Slocum’ by open pollination at the National Lotus Germplasm Repository of the Institute of Botany, Jiangsu Province, and Chinese Academy of Sciences. In Summer 2017, the individuals with attractive flowers and purple-red stamen appendages were selected, from which plants were propagated by rhizomes. The morphological characteristics were investigated throughout 2018 and 2019. For its excellent performance and stable genetic traits, the cultivar was named ‘Jiang Luopao’ in July 2019. As a control, the purple-red cultivar ‘Zhongguohong Beijing’ was chosen for the comparison trial (Fig. 1).

Description

The description of floral color is based on the Royal Horticultural Society (RHS) Color Chart (Royal Horticultural Society, 2015). The ornamental traits were assessed between 8:00 and 10:00 AM when the flowers were fully open. The new cultivar and its control cultivar were planted in ponds for open-field cultivation.

‘Jiang Luopao’ is a medium-size cultivar (Figs. 1 and 2), with upright flowers that protrude well above their standing leaves. The flowering period lasts about 2 months, from mid-June to August in Nanjing, Jiangsu Province. The deep purple-red flower buds are nearly spherical in shape. The flowers are double layered, and each flower has 98 to 139 petals, arranged compactly in a bowl shape. The entire petal contains a deep purple-red pigment, and the upper and base of the petals are RHS 60C and RHS 58A, respectively, with clear dorsal



Fig. 1. Flower phenotype of (A) *Nelumbo* ‘Mrs. Perry D. Slocum’, (B) *Nelumbo* ‘Jiang Luopao’, and (C) *Nelumbo* ‘Zhongguohong Beijing’.



Fig. 2. Horticultural traits of *Nelumbo* ‘Jiang Luopao’. (A) Plants. (B) Flower bud. (C) First-day flower, top side. (D) Third-day flower. (E) Second-day flower, lateral side. (F) Second-day flower, top side. (G) Pistil and stamen. (H) Structure of flowers, abaxial view. (I) Structure of flowers, adaxial view. (J) Seedpod.

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Table 1. Flower features of *Nelumbo* ‘Jiang Luopao’ and the comparison cultivar *Nelumbo* ‘Zhongguohong Beijing’.

<i>Nelumbo</i> characteristic	<i>Nelumbo</i> ‘Jiang Luopao’	<i>Nelumbo</i> ‘Zhongguohong Beijing’
Petiole with prickles	Few	Many
Flower bud shape	Ball-like	Oval conical
Flower form	Double	Single
Flower shape	Bowl shaped	Cup shaped
Petal shape	Obovate	Obovate-lanceolate
Petal coloration	Upper, red-purple (RHS 60C); base, red-purple (RHS 58A)	Upper, red-purple (RHS 59D); base, yellow (RHS 5D)
Dorsal veins on petal	Clear	Clear
Stamens	Partially petaloid	Normal
Color of staminal appendage	Purplish red	White
Seedpod shape	Oblate	Turbinal
Color of lateral surface of seedpod	Yellow-green (RHS N144A)	Yellow-green (RHS N144D)
Top surface of seedpod	Protruding	Flat

RHS = Royal Horticultural Society (2015).

Table 2. Plant characteristics of *Nelumbo* ‘Jiang Luopao’ and the comparison cultivar *Nelumbo* ‘Zhongguohong Beijing’ grown in an open field during Summer 2018 and Summer 2019 in Nanjing, China.

Yr and cultivar	Petiole length (cm)	Leaf blade size		Pedicel length (cm)	Flower size, diam (cm)	No. of petals	Maximum petal size		No. of stamens	No. of carpels
		Length (cm)	Width (cm)				Length (cm)	Width (cm)		
July 2018										
Jiang Luopao	53.7 ± 5.5	33.5 ± 3.8	27.8 ± 5.1	64.3 ± 5.0	11.8 ± 1.0	101.0 ± 3.2 a	7.3 ± 0.4 a	5.3 ± 0.5 a	200.0 ± 18.0 a	16.7 ± 4.7
Zhongguohong Beijing	54.7 ± 3.2	38.2 ± 1.3	33.7 ± 1.5	65.7 ± 3.5	15.0 ± 2.6	19.0 ± 3.6 b	11.1 ± 0.6 b	6.5 ± 0.6 b	270.0 ± 12.5 b	20.0 ± 2.0
July 2019										
Jiang Luopao	57.0 ± 4.0	33.5 ± 4.4	27.7 ± 4.7	65.3 ± 3.2	12.0 ± 1.0	132.0 ± 7.0 a	7.5 ± 0.5 a	4.6 ± 0.4 a	174.7 ± 8.1 a	16.3 ± 3.5
Zhongguohong Beijing	62.3 ± 5.1	35.5 ± 4.9	28.2 ± 2.3	72.3 ± 6.8	15.7 ± 3.8	19.7 ± 2.1 b	11.2 ± 0.6 b	6.5 ± 0.5 b	264.3 ± 8.6 b	19.3 ± 2.3

Different letters indicate significant differences among the treatments according to Duncan’s multiple range test ($P < 0.05$).

veins on their surfaces (Table 1). At the top of the stamens, their appendages are conspicuous for their deep purple-red color and long oval shape. The pistils develop normally, and each flower has about 11 to 19 carpels. Seed production is low because of the high percentage of seed abortion. The seedpod is yellow-green and oblate in shape, and the top surface protrudes. The underground rhizome expands to an average size and is tubular in shape.

Performance

‘Jiang Luopao’ and its comparison cultivar ‘Zhongguohong Beijing’ were cultivated under the same test conditions in 2018 and 2019. By mid-April, healthy rhizomes with at least one terminal bud were selected for the comparison test. These rhizomes were planted in ponds (1.5 m in length × 1.0 m in width). Each pond was filled with 30 to 35 cm of fertile silt. Ample irrigation water was provided, and a depth of 5 to 10 cm of water was maintained above the surface throughout the entire growing season. During the peak blooming period, the morphological characteristics were measured, including petiole length, leaf size, pedicel length, flower diameter, tepal number, maximum tepal size, stamen number, and carpel number (Table 2). Five replications of each cultivar were used for data collection. Statistical analysis was performed using Duncan’s multiple range test ($P < 0.05$).

‘Jiang Luopao’ and the comparative cultivar had similar plant size, and the petiole length, pedicel length, leaf size, and flower diameters showed no significant differences

(Table 2). However, the petioles of ‘Jiang Luopao’ had fewer prickles than the comparison cultivar. The shape of the flower bud of the new cultivar is ball-like, in contrast to the oval conical shape of ‘Zhongguohong Beijing’. In terms of flower-related characteristics, ‘Jiang Luopao’ has double and bowl-shaped flowers, whereas ‘Zhongguohong Beijing’ has single and cup-shaped flowers. The petal number of ‘Jiang Luopao’ was up to 140—that is, about 120 petals more than ‘Zhongguohong Beijing’. The outer petals of the comparison cultivar are obovate-lanceolate in shape, whereas ‘Jiang Luopao’ has obovate petals ≈3.7 to 3.8 cm shorter in width. Moreover, the stamens of ‘Jiang Luopao’ are partially petaloid, and there are fewer stamens (70–90) than ‘Zhongguohong Beijing’. As with most traditional cultivars, Zhongguohong Beijing has white staminal appendages, in contrast to the purple-red appendages of the new cultivar. In addition, ‘Jiang Luopao’ has oblate seedpods, which protrude at the top surface. In contrast, the seedpods of ‘Zhongguohong Beijing’ are turbinal, and the top surface is flat.

‘Jiang Luopao’ is characterized by a unique combination of flower characteristics, including a deep purple-red color and bowl-shaped flowers, making it a unique new addition to the novel *Nelumbo* cultivar. ‘Jiang Luopao’ showed outstanding performance in both ponds and pots. As with other cultivars, ‘Jiang Luopao’ can be propagated by rhizomes and is suitable for cultivating in sunny and warm temperate regions. In Nanjing, when the

aboveground plant parts have withered, the rhizomes are maintained in silt for overwintering and remain dormant throughout the winter.

Availability

Additional information on ‘Jiang Luopao’ is available by contacting the corresponding author, Dongrui Yao, at the Institute of Botany, Jiangsu Province and Chinese Academy of Sciences.

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