‘Yi Honglian’ Flowering Crabapple

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Crabapple is one of the most important ornamental small trees and shrubs, and includes all wild species of the genus *Malus* and its horticultural cultivars (fruit diameter ≤ 5 cm). Most are highly valued due to their range of flower colors (purple, red, pink, white, etc.) as well as colorful fruits (primarily purple, red, pink, orange, yellow, and green), and wide range of growth habits (columnar, fastigate, upright, spreading, drooping, and weeping) (UPOV, 2003; Wyman, 1955). In addition, crabapples show strong environmental adaptability including drought resistance, cold resistance, saline alkali tolerance, and barren resistance. Crabapples have been widely cultivated in China’s landscape and gardens, and are popular worldwide (Fan et al., 2019; Zhou et al., 2019).

There are nearly 1200 flowering crabapple cultivars, with about 100 commonly supplied in today’s global market (Fiala, 1994). However, less than 5% of these cultivars are semi-double or double pedicels flowers, such as the outstanding ‘Van Eseltine’ (pink doubles), ‘Kelsey’ (red doubles), and ‘Sparkler’ (red-purple semidoubles). In recent years, new semidouble and double flowering cultivars including *M.* ‘Chunmei Donghong’ (Wang et al., 2021), *M.* ‘Xiang He’ (Hu et al., 2021), *M.* ‘Feng hong Ni chang’ (Fan et al., 2019), *M.* ‘Fen Balei’ (Zhou et al., 2019), *M.* ‘Yangzhi Yu’ (Jiang et al., 2020), and *M.* ‘Zi Dieer’ (Zhou et al., 2020), have been released into the U.S. market.

Origin

In Fall 2011, a batch of mixed hybrid seeds (about 8000) was collected from nine crabapple cultivars (Purple Prince, Indian Summer, Red Jade, Harvest Gold, Donald Wyman, Sugar Tyme, *Malus* $\times$ *zumi* Calocarpa, Qian Cengjin, and *M.* Cinderella) at the National Crabapple Germplasm Genetic Center (Yangzhou, Jiangsu, China, lat. 32°42′N, long. 119°55′E). The seed goes through the following process: first, to soften seed coats, seeds were soaked in warm water (40 to 45 °C) for 4 h. Second, to break seed dormancy, seeds were placed in a sandy medium, wrapped in gauze, and then stored outdoors for 1 month in a brick pond at -5 to -10 °C. In Spring 2012, they were sown in a seedbed containing sandy loam (width, 1.5 m; length, 50 m; depth 8.0–10.0 cm). Water once every 3 d. After germination and growing for 1 year, seedlings were transplanted into the field with a 10.0 cm $\times$ 10.0 cm spacing. In Spring 2014, an individual plant with double and nonfading red-purple flowers shaped was observed and selected for further evaluation. After 2 years of successive observations (2015–16), we found that the tree shape, flower type, and color of single plant were stable, and then it was named ‘Yi Honglian’ (The name of an ancient Chinese poem). This plant was propagated by budding to *M. hupehensis* seedling rootstocks from 2014 through 2017. More than 50 budded

seedlings were produced. After 2 years of continuous observation, we found that all budded plants produced the same blossom type, confirming the phenotypic characteristics and stability of ‘Yi Honglian’. During 5 years of successive observations, the grafted seedlings grew vigorously and were not only resistant to of 37 to 40 °C in Jiangsu, but also to insect pests (apple aphids and spider mites).

Description

Among existing double-flowered crabapple germplasm, *M.* ‘Yi Honglian’ most resembles *M.* ‘Zi Dieer’—they were bred from the same batch of mixed hybrid seeds and we compared phenotypic attributes (Table 1), morphological evaluation, and all colors reference of ‘Yi Honglian’ according to the guidelines for conducting DUS, the Royal Horticultural Society color chart, respectively (RHS, 2007; UPOV, 2003). The characteristics of ‘Yi Honglian’ are as follows.

Habit. The tree shape is drooping, it reaches ≈ 2.5 m in height, with a 1.0 m spread at 3 years old (Fig. 1A).

Flowers. Flowers are large (3.5–6.0 cm in diameter). The inflorescence type is umbellate, with red buds and double petals (about 15). The flower type is shallow cup, the petals are oval, the arrangement is overlapping, and the veins are prominent. The front edge of the petals is red (N66C) (Fig. 1B), the front center color is red (N66B), the front base color is white (NN155C), and the back color is red purple (67C).

Foliage. The new leaves are green, 6.2–7.0 cm long, 3.3–4.1 cm wide, with length-width ratio about 1.8, and short petioles (1.9–2.7 cm). The edge of the leaf is round and serrated, and the surface is green and semiglossy with anthocyanin coloring to a medium degree. The leaves all shed in early September, and the color when falling off is yellow-green.

Fruit. The fruit setting of ‘Yi Honglian’ is medium. The fruits are ellipsoid, with long pedicel. After the fruit color is changed, which predominant color is brownish (50A), and the fruit size is small (vertical diameter, 1.74 cm; horizontal diameter, 1.94 cm), with weakly glossy exocarp and sometimes present sepals (Fig. 1C). Fruits persist for about 5 months.

Propagation and Cultivation

The variety likes abundant light, and grows best in sandy loam with flat terrain,

Received for publication 15 Nov. 2021. Accepted for publication 15 Nov. 2021.

Published online 25 January 2022.

This project is funded by Modern agriculture project of Yangzhou Science and Technology Bureau (YZ2019037).

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Table 1. Comparisons of flower and fruit traits from *M.* ‘Yi Honglian’ and *M.* ‘Zi Dieer’.

Taxa	<i>M.</i> ‘Yi Honglian’	<i>M.</i> ‘Zi Dieer’
Petals/flower	15–20	15–26
Flower bud color	Red	Red
Petal color	Red (N66C)	Red-purple (N57C)
Corolla shape	Shallow cup	Deep cup
Petal shape	Oval	Elliptical
Fruit color	Brownish	Red

Fig. 1. Phenotypic characteristics of (A) habit, (B) flowers, and (C) fruits of 'Yi Honglian' crabapple.

deep soil layer, loose, fertile, and good drainage. The main propagation method is grafting propagation, which is suitable for planting in the south of central Inner Mongolia to the north of central Fujian Province.

Availability

'Yi Honglian' is available through Nanjing Forestry University and Yangzhou Crabapple Horticulture Limited Company (<http://flowering-crabapple.njfu.edu.cn>).

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