HortScience 60(2):233–234. 2025. https://doi.org/10.21273/HORTSCI18339-24

Hongzi Die: A New Flowering Crabapple Cultivar

Minghan Luo, Sijun Qin, Deguo Lyu, and Jiali He

College of Horticulture, Shenyang Agricultural University, Shenyang, Liaoning, 110866, People's Republic of China; and Key Lab of Fruit Quality Development and Regulation of Liaoning Province, Shenyang, Liaoning, 110866, People's Republic of China

Keywords. cultivar, *Malus* crabapple, seeding selection

Crabapple is a general term for some ornamental species of the genus *Malus* in the Rosaceae family. Under natural conditions, crabapple mostly grows in small trees or shrubs, with fruits of horticultural cultivars being less than 5 cm in diameter. China is the main genetic center of *Malus* and rich in ornamental crabapple resources, which has a long history of crabapple cultivation. As one of the traditional famous flowers of China, the flowers and leaves of crabapple are luxuriant and graceful, and are well known as the "national beauty" (Pang 2008). In the 18th century, some Chinese crabapple resources spread to Western countries and hybridized naturally with local *Malus* resources many times (Fiala 1994). Since the 1990s, breeding, cultivation, and evaluation of ornamental crabapple have been carried out in China (Guo et al. 2019). Through continuous artificial breeding and selection, more than 1200 crabapple varieties with stable characteristics and excellent ornamental performance have been selected (Zhou et al. 2018). Most varieties of crabapple have high ornamental and economic value due to their diversity of growth habits, various leaf colors, different flower shapes and colors, and various fruit shapes and colors. In addition, crabapples exhibit excellent landscape adaptability and tolerance to environmental stress such as cold, drought and poor soils, including alkaline and saline conditions. Therefore, most crabapples can be used for landscaping, gardening, tree pollination, and bonsai modeling (Guo et al. 2019).

In China, increasing numbers of new crabapple varieties with excellent ornamental performance have been introduced to the market through long-term hybridization and selection work; some of these include 'Yun Xiangrong' (Lu et al. 2023a), 'Yunjuan Yunshu' (Lu et al. 2023b), 'Hong Xia' (Hu et al. 2021), 'Yanyu Jiangnan' (Sun et al. 2023), and 'Xijiang Yue' (Feng et al. 2024). However, less than 10% of all known crabapple cultivars feature double or semidouble flowers (Xu et al. 2021). Here, we introduce a new semidouble flowered crabapple cultivar, Hongzi Die, which has excellent ornamental qualities and remarkable environmental adaptability.

Origin

Hongzi Die is a new cultivar of crabapple with the female parent 'Radiant'. In Autumn 2006, 8000 seeds of 'Radiant' were open-pollinated with *M. baccata* Borkh., *M. hupehensis* Borkh., 'Snowdrift', 'Royalty', 'Jiazi', 'Xuehua', and 'Xuehong', collected from the Ornamental Crabapple Resources Evaluation Nursery of Fruit Research Base in Shenyang Agricultural University (Shenyang, Liaoning, China). After stratification in moist sand medium at 0 to 4 °C for 40 d to break dormancy, the germinated seeds were planted in nursery plates containing plug seedling substrate in Mar 2007. After 40 d of careful management, seedlings (6 to 7 leaves, ≈8 cm tall) were transplanted to the base's nursery with a 35 cm × 50 cm spacing. In 2010, variant individual plants were observed in the flowering seedlings, among which a specific single plant with semidouble, a large number of flowers, and beautiful fruit was selected for further evaluation. After observation for 3 consecutive years (2011–14), it was found that specific traits, including flower shape and color, were stable. During Spring 2015–16, 50 asexual reproduction seedlings were propagated with the rootstock of *M. hupehensis* Borkh. All the grafted lines showed the same phenotypic traits, including plant habit, thorns, leaves, and flowers of the mother plant, confirming the phenotypic stability. Because the flowers of the superior line look like butterflies with red-purple color, we named it 'Hongzi Die' (the Chinese pinyin for butterfly is Die).

Description

The morphological traits of the cultivar Hongzi Die were compared with those of its female parent, 'Radiant' (Table 1), which had the same water and fertilizer management. There are some differences in flower shape, type, color, and diameter; leaf apex; fruit weight; and other characteristics between the two cultivars (Table 1). The specificity of 'Hongzi Die' is a semidouble flower with red-purple petals, a slight natural curl at the edges of the petals, and a spreading growth habit. 'Hongzi Die' has a high rate of fruiting, and the fruit is red. All colors were referenced to the Royal Horticultural Society (2015; RHS) Color Chart. The following details describe the specific properties of 'Hongzi Die'.

Habit. As shown in Table 1 and Fig. 1A, the tree shape of 'Hongzi Die' is open (Fig. 1A). The surface of the trunk bark is gray and

Table 1. Comparisons of the main morphological characteristics between *Malus* 'Radiant' and 'Hongzi Die'.

Characteristic	Radiant	Hongzi Die
Tree height (m)	6.33	5.38
Crown (m)	4.53	3.87
Ground diameter (cm)	15.37	10.52
Flower		
Shape	Shallow cup	Middle cup
Type	Single petal	Semidouble petal
Diameter (cm)	3.39–4.37	2.29–3.45
Petal		
Color	Red-purple (RHS-N74B)	Red-purple (RHS-67A)
Shape	Subcircular	Narrow ovate
Leaf		
Shape	Oval	Broad ovate
Color	Green (RHS-141C)	Green (RHS-139C)
Apex	Acuminate	Acuminate
Length (cm)	8.47–10.28	9.17–10.48
Width (cm)	4.12–5.46	4.79–6.52
Petiole length (cm)	1.82–3.57	2.83–3.92
Fruit		
Shape	Obconic	Nearly round
Color	Red (RHS-N30C)	Red (RHS-46C)
Horizontal diameter (cm)	1.34–1.52	1.83–2.23
Longitudinal diameter (cm)	1.47–1.81	1.93–2.47
Stalk length (cm)	2.70–3.18	2.57–3.61
Single fruit weight (g)	2.09–2.98	4.67–6.39

RHS = Royal Horticultural Society.

Received for publication 20 Nov 2024. Accepted for publication 9 Dec 2024.
Published online 20 Jan 2025.
This project was funded by the China Agriculture Research System (Grant No. CARS-27), and the Scientific Research Foundation of Talent Introduction of Shenyang Agricultural University (20153007).
J.H. is the corresponding author. E-mail: hejiali1017@163.com.

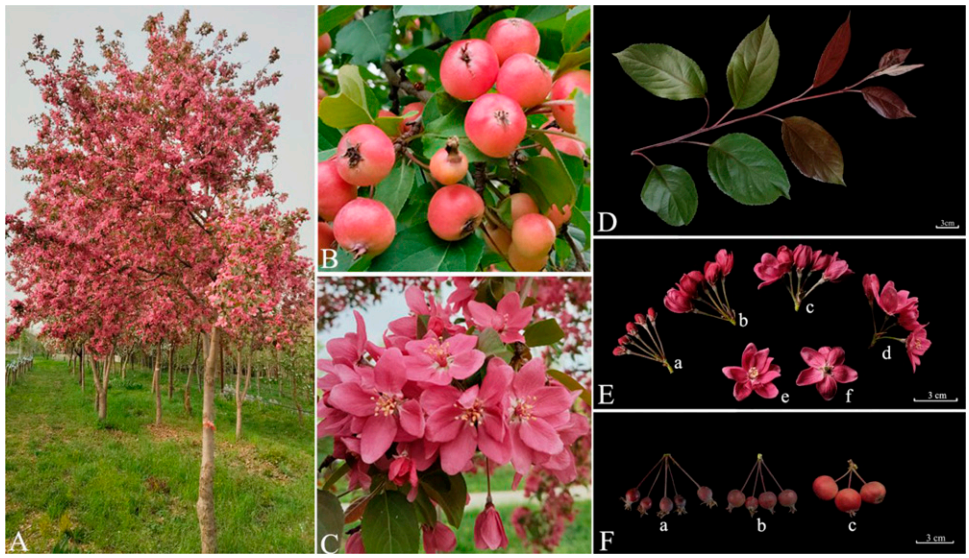

Fig. 1. The phenotypic characteristics of *Malus* 'Hongzi Die'. (**A**) The growth habit at the full-bloom stage. (**B**) The tree habit at the fruit maturity period stage. (**C**) The flowering branch with flowers at full bloom. (**D**) Current-growth branch. (**E**) The bloom stages of inflorescence: (**a**) initial color stage, (**b**) balloon stage, (**c**) full blossoming stage, (**d**) final blossoming stage, (**e**) front view of blooming flower, and (**f**) the back view of blooming flower. (**F**) The different growth stages of infructescence: (**a**) fruiting period, (**b**) development period, and (**c**) swelling period.

slightly smooth, and first-year branches are gray-purple (RHS-186C). It exhibits a medium growth rate and reaches a height of 5.38 m and crown width of 3.87 m at 8 years of age.

Foliage. The new expanding leaves are gray-purple (RHS-183B), and the mature leaves are ovate and dark green (RHS-139C) with a length of 9.17 to 10.48 cm and a width of 4.79 to 6.52 cm (Table 1). The mature leaves are glossy on the adaxial surface with serrated margins and an acuminate apex. The petiole length ranges from 2.83 to 3.92 cm (Fig. 1D).

Flower. The initial bloom of 'Hongzi Die' occurs in mid-April in Shenyang, China. The flower is semidouble, in an umbellate inflorescence with many red-green fluffiness in the calyx and red-green flower stalks (Fig. 1E–e, a). The flower has a medium cup pattern with a narrow oval and a slightly revolute petal margin. Each inflorescence has five to seven medium-sized flowers with an average diameter of 3.41 to 3.91 cm (Fig. 1C and E–e, f). The buds are red-purple (RHS-61B), the color of the front edge, center, and back of the petal are all dark red-purple (RHS-67A), and the base color of the petal is white (RHS-NN155B) in the RHS color charts.

Fruit. 'Hongzi Die' bears a large numbers of fruits. The fruit is nearly round with a yellow (RHS-14D) base color and a red color (RHS-46C) on the sunny side (Fig. 1B and F). The flesh is light yellow (RHS-4D) in color and slightly sweet. Fruits are small (horizontal diameter: 1.83–2.23 cm; average single fruit weight: 5.06 g) with persistent sepals. The fruit stalk is 2.57 to 3.61 cm long (Table 1).

Cultivation

'Hongzi Die' demonstrates environmental adaptability and is suitable for cultivation in cold regions with minimum annual temperatures as low as −25 °C. It grows well in full sun in fertile, sandy loam with adequate moisture. The main propagation method for 'Hongzi Die' is bud grafting using *M. baccata*, *M. prunifolia*, and *M. hupehensis* as rootstocks. Scion buds were collected from healthy first-year branches and grafted onto rootstocks at least 5 mm in diameter in spring. The buds and the rootstock were bound together with plastic film to prevent water loss. The survival rates are greater than 90%. 'Hongzi Die' exhibits a low rate of production difficulty and is highly adaptable to cold and drought. It is also relatively free of insect and disease susceptibility.

Availability

'Hongzi Die' is available from Shenyang Agricultural University.

References Cited

Feng L, Fan Y, Shen Y, Zhang W, Sun T, Fan J. 2024. 'Xijiang Yue' flowering crabapple. HortScience. 59(11):1588–1589. https://doi.org/10.21273/HORTSCI18031-24.

Fiala JL. 1994. Flowering crabapples: The genus *Malus*. Timber Press, Portland, OR, USA.

Guo L, Cao Y, Jian Q, Liu BY. 2019. Crabapple in China: Past, present and future. Acta Hortic. 1263:55–60. https://doi.org/10.17660/ActaHortic.2019.1263.6.

Hu DM, Xu JW, Wang LH, Dun XJ, Zhu SX, Yang J. 2021. Seven new crabapple cultivars such as 'Rui Qin'. J Nangjing Forestry Univ. 45(4):238–242. https://doi.org/10.12302/j.issn.1000-2006.202002022.

Lu XJ, Chen YX, Zhang WX, Zhang DL, Fan JJ, Zhou T, Sun TT. 2023a. 'Yun Xiangrong' flowering crabapple. HortScience. 58(5):557–558. https://doi.org/10.21273/HORTSCI17080-23.

Lu XJ, Chen YX, Zhang WX, Zhang DL, Zhou T, Fan JJ, Sun TT. 2023b. 'Yunjuan Yunshu' flowering crabapple. HortScience. 58(5):580–582. https://doi.org/10.21273/HORTSCI17061-22.

Pang SH. 2008. The study about crabapple garden planning (MA Thesis). Hebei Agricultural University, Baoding, Hebei China. https://doi.org/10.7666/d.y1307137.

Royal Horticultural Society. 2015. RHS colour chart. 6th ed. Royal Horticultural Society, London, UK.

Sun T, Chen Y, Zhang W, Zhou T, Fan J, Lu X. 2023. 'Yanyu Jiangnan' crabapple. HortScience. 58(5):588–589. https://doi.org/10.21273/HORTSCI17124-23.

Xu BJ, Chen YX, Zhang WX, Zhang DL. 2021. 'Luokeke Nüshi' crabapple. HortScience. 56(10):1289–1290. https://doi.org/10.21273/HORTSCI15989-21.

Zhou T, Sheng XC, Zhou DI, Fan J, Zhao MM, Zhang WX, Cao FL. 2018. Advances in the classification of crabapple cultivars. YuanYi XueBao. 45(2):380–396. https://doi.org/10.16420/j.issn.0513-353x.2017-0140.