‘Fenghong Nichang’ Flowering Crabapple

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Flowering crabapple is the broad-sense term for plants from the genus *Malus* (Rosaceae) that have a small fruit diameter (≤ 5 cm). They have colorful, attractive blossoms (purple, red, pink, white, etc.) as well as fruits of outstanding ornamental value of purple, red, pink, orange, yellow, and green, among others (Fiala, 1994). Because of their rich cultural heritage and strong environmental adaptability, flowering crabapples have been widely cultivated in our landscapes and gardens. In China, flowering crabapples, peonies, plum flowers, and orchids have been elected as the four greatest spring blossoms (Wang, 2010). Unlike some members in the rose family with mutation into double flowers, such as roses (Bendahmane et al., 2013; Dubois et al., 2010), flowering cherries (Zhou et al., 2008), and ornamental peaches (Cao et al., 2009; Fang et al., 2008; Werner et al., 2001), double-flowered mutations of flowering crabapples are rare, resulting in only a few double-flowered cultivars available in today's market. The book *Flowering Crabapple* by Fiala (1994) recorded nearly 1,200 flowering crabapple cultivars with less than 5% of them were semidouble or double-flowered. Most of these double-flowered cultivars were developed in North America,

including the outstanding ‘Branzam’ (rose type double-flowered), ‘Van Eseltine’ (pink doubles), and ‘Kelsey’ (red doubles). Woody ornamental plant breeding is extremely challenging and each new flowering crabapple cultivar took 10 or more years to be introduced. Although many professional and independent breeders are working on flowering crabapple breeding in the United States, China, and several other countries, the yield of new cultivars has been limited in recent years. There is still a scarcity of double-flowered flowering crabapples. In the past 20 years, only two new double-flowered flowering crabapple cultivars, ‘Spring Bride’ (Spongberg, 1996) and ‘Jarmin’ (Jarmin, 2003), were released into the U.S. market.

It is important to breed new flowering crabapple cultivars with multiple-layers of petals and novel flower shapes because these traits are rare and desirable. The emergence of new flower traits should increase the diversity and extend bloom duration of flowering crabapples. It is especially beneficial to establish special flowering crabapple collection gardens in China to bring more visitors. ‘Fenghong Nichang’ (Note: *Nichang* in Chinese refers to the elegant dress worn by a beautiful princess) is a new flowering crabapple cultivar released from the flowering crabapple breeding program of Nanjing Forestry University in Jiangsu, China. It is an excellent double-flowered flowering crabapple cultivar with three to five layers of wrinkled petals.

Origin

In Fall 2009, we collected more than 1,500 seeds of the *Malus halliana* in Henan

Province of China. Because *Malus* seeds need cold stratification, we placed these seeds under moisture sand at -5 to 10 °C until radicles emerged. We then sowed them on raising beds in the field in Spring 2010 at the National Crabapple Germplasm Genetic Center (Yangzhou, Jiangsu, China) (Table 1). From 1,251 seedlings in 2012, one double-flowered seedling was observed and selected for further evaluation. In 2013 and 2014, the plant consistently exhibited 15 to 25 petals per flower, and we named this individual plant ‘Fenghong Nichang’ (Fig. 1). From 2013 through 2015, we also budded it into the popular rootstock, *M. hupehensis*, seedlings for 3 consecutive years. In 2016 and 2017, 177 budded plants showed the same flowering characteristics. From 2014 to 2015, we also conducted regional experiments in Shandong and Anhui Provinces (Table 1). ‘Fenghong Nichang’ showed the same flowering characteristics in these places.

Malus halliana has a long cultivation history in China. It has showy blossoms, rich flower colors, and pendulous flowers. ‘Fenghong Nichang’ contained three to five times as many petals as its maternal parent, *M. halliana* (Table 1). The breeding and selection of ‘Fenghong Nichang’ took 8 years, and all budded plants retained their unique flowering features. The grafted seedlings grew vigorously, exhibited good adaptation to high temperatures, and had no serious pest and disease.

Description

The unique ornamental characteristics of the ‘Fenghong Nichang’ are double and pinkish flowers (Fig. 1A). Among the existing cultivars, the one that has the most similar traits to ‘Fenghong Nichang’ is ‘Van Eseltine’. ‘Van Eseltine’, the offspring of *M. xarnoldiana* and *M. spectabilis*, is an excellent cultivar with pinkish double flower, which is widely used in our landscapes and gardens. However, ‘Fenghong Nichang’ has 10 to 15 more petals per flower than ‘Van Eseltine’. In addition, the fruit color of ‘Fenghong Nichang’ is brown in autumn, whereas the fruit color of ‘Van Eseltine’ is yellow (Table 2).

Habit. The tree has reddish-brown branches and an upright spreading canopy, reaching a height of 4 m and a width of 1.8 m in 8 years.

Foliage. Foliage is green, leathery, elliptic (7.1–8.0 cm in length, 2.6–3.2 cm in width, with a length/width ratio of 2.5), short petiole (1.0–1.3 cm), no lobes, and a serrate margin. The adaxial leaf surface exhibits a showy glossy appearance (Fig. 1B). Leaf blades are green on the surface and moderately glossy. There is no special ornamental value in fall.

Flower. This cultivar has loaded flowers. Each umbel inflorescence has five flowers. Each flower has 15 to 25 wrinkled petals, and the corollas are deep cup-shaped. Petals are elliptical, overlapping, and have prominent venation. Flowers are large (3.5–6.0 cm in

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Table 1. Performance of *Malus* ‘Fenghong Nichang’ under various test sites with climate conditions.

Location	Climate condition (2013–18)			Grafting survival rate (%)	Is flower trait stable?
	Maximum temp (°C)	Minimum temp (°C)	Rainfall (mm)		
Yangzhou, Jiangsu Province (32.40N, 119.41E)	38	–6	1048	93.2%	Yes
Liaocheng, Shandong Province (36.45N, 115.98E)	37	–11	540	90.5%	Yes
Hefei, Anhui Province (31.82N, 117.22E)	37	–10	1035	92.0%	Yes

Climate condition data form National Meteorological information center (<http://data.cma.cn/>)

Fig. 1. Characteristics of flower, fruit, and foliage of ‘Fenghong Nichang’ crabapple.

Table 2. Comparisons of flower and fruit traits from *Malus* ‘Fenghong Nichang’, *M.* ‘Vans Eseltine’, and its maternal parent *M. halliana*.

Taxa	<i>M.</i> ‘Fenghong Nichang’	<i>M.</i> ‘Van Eseltine’	<i>M. halliana</i>
Petals/flower	15–25	10–15	5
Flower bud color	Dark pink	Dark pink	Dark red
Petal color	Reddish-purple (64B)	Reddish-purple (67D)	Pink
Wrinkled petal	Yes	No	No
Corolla shape	Cup	Saucer	Saucer
Petal shape	Elliptical	Ovate	Elliptical
Fruit color	Brown	Yellow	Brown

diameter) with petals held in a horizontal position, five pistils, and numerous stamens (usually 30) (Fig. 1C). Flower buds are dark pink (RHS-61B) (Royal Horticultural Society, 2007). At anthesis, the marginal area of the inner side of the petal is reddish-purple (RHS-N74C), the middle zone of the inner side is purple (RHS-75C), the basal zone of the inner side of the petal is reddish-purple (RHS-62D), and the color of the outer side is light pink (RHS-N74B). Sepals are uncurling, magenta in color, and glabrous. The time of beginning of flowering (10% open flowers) is early April in Jiangsu, China.

Fruit. The fruits are brown, ovoid, and relatively small in size (vertical diameter about 1.2 cm, horizontal diameter about 1.4 cm) (Fig. 1D). Calyx is abscised and the fruit stalks are low-hanging, reddish-brown, glabrous, and 2.5–4.0 cm in length. The predominant color in autumn is brownish (RHS-59A).

Cultivation and pest management. This cultivar prefers full sun, flat land, and a good depth of loose, rich, sandy soil with good drainage. It is suitable for planting in U.S. Department of Agriculture Cold Hardiness Zones 4 through 9. The plant is primarily propagated by budding with *M. hupehensis* as the rootstock. Buds should be greater than 0.5 cm in diameter for grafting. Scion buds from current year’s healthy hardwood branches should be used, and grafting should be performed from August to September. When grafting, buds need to be wrapped in plastic cover to prevent water loss, and the graft should be exposed to air until March of the following year by breaking or removing the plastic cover. Any sprouting from the rootstock plants should be removed in a timely manner. Compared with commonly used *M. micromalus* in China, ‘Fenghong Nichang’ has relatively stronger resistance to pests and diseases,

with a low rate of production difficulty. Damage to young tips and leaves caused by apple aphids, spider mites, and apple rust are rare. To prevent aphids, the surfaces of the leaves can be sprayed with 50% Pimiricarb wettable powder (Kesheng, Yancheng, Jiangsu) at 2000× dilution. To prevent spider mites, the surface of the leaves can be sprayed with 1.8% Abamectin emulsion (Kesheng, Yancheng, Jiangsu) at 1000× dilutions. Spraying the surface of the leaves with 20% Triadimefon emulsion (New Sun, Chengdu, Sichuan) at 2000× dilutions can prevent apple rust. Trunk borers have not been observed.

Availability

‘Fenghong Nichang’ is available through Nanjing Forestry University and Yangzhou Crabapple Horticulture Limited Company (<http://flowering-crabapple.njfu.edu.cn>).

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