

‘Chahua Nv’ Flowering Crabapple

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Crabapple is a woody ornamental plant in *Malus* (Rosaceae) that is mainly distributed in the Northern Temperate Zone across Eurasia and North America (Li 1999). They are cultivated for their attractive growth habit, spring blossom, decorative small fruits (diameters ≤ 5 cm) (Dirr 2010), and rich cultural heritage.

Malus includes less than 40 species (Li 1999; Rehder 1940), whereas nearly 1200 *Malus* cultivars were bred by a long period of crossbreeding and natural selection in Europe and the United States from the 18th century to the end of the 20th century (Fiala 1994).

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Since then, the breeding of new *Malus* cultivars has slowed in North America. Conversely, it is gradually emerging in China. In 2013, the ornamental apple (*Malus* Mill) was officially included in China’s new plant cultivars protection list. So far, 69 new *Malus* cultivars have been authorized in China. However, of all known crabapple cultivars, less than 10% have double or semi-double flowers (Zhang et al. 2021), and white double-flower cultivars are particularly rare. Most double-flower cultivars are pink or red, including ‘Van Eseltine’ (pink flowers), ‘Fenghong Nichang’ (pink flowers) (Fan et al. 2019), ‘Er Qiao’ (pink flowers) (Yang et al. 2022), ‘Fen Balei’ (pink flowers) (Zhou et al. 2019), ‘Xiang He’ (pink flowers) (Hu et al. 2021), and ‘Kelsey’ (red flowers). We report a new white double-flower crabapple cultivar, Chahua Nv.

Origin

In Fall 2011, seeds of nine *Malus* cultivars (Calocapa, Cinzam, Donald Wyman, Hargozam, Indian Summer, Purple Prince, Qianceng Jin, Red Jade, and Sutyzam) were collected at the National Crabapple Germplasm Genetic Center (Yangzhou City, lat.

32°42’N, long. 119°55’E, hardiness zone 8). After cold stratification for 2 weeks, they were sown on raised beds (“raised bed” means that the soil level in the bed is higher than the surrounding soil) in the field in Spring 2012. In 2015, an individual plant was selected for further evaluation based on its highly symmetrical double flowers (12–16 white petals). Because its flower was similar to the camellia flower, we named it ‘Chahua Nv’ (the Chinese pinyin for camellia is Chahua and that for “girl” is Nv). From 2015 to 2018, four generations of ‘Chahua Nv’ bud-grafted seedlings with *M. hupehensis* seedlings as rootstock were propagated, resulting in more than 200 individual plants. After 7 years of successive observations (2016–22), the characteristics of ‘Chahua Nv’ have been determined to be stable and are reproduced true to type in successive generations. Additionally, this cultivar exhibited favorable horticultural traits, including strong growth, adaptability to high temperatures, and notable resistance to common insect pests and diseases.

Description

The distinct characteristics of ‘Chahua Nv’ are white flower petals in a double, highly symmetrical arrangement. The specific characteristics of ‘Chahua Nv’ are described here.

Habit. This cultivar had an upright columnar growth habit (Fig. 1A) and brownish-green branches. The original tree had a height of 3.5 m and a width of 1.6 m after 9 years.

Foliage. The leaves are alternate and ovate (length, 6.2–8.8 cm; width, 2.8–4.0 cm), with an acuminate apex and serrated margins (Fig. 1E). The leaf blade is unlobed, green (RHS-137A), and moderately glossy adaxially. The petiole is 0.8 to 1.6 cm.

Flower. The initial bloom (10% flowers open) of ‘Chahua Nv’ was in early April in Yangzhou, Jiangsu, China, which is considered midseason flowering among existing crabapple cultivars. Floral characteristics were stable every year, without noticeable variation (Fig. 1B). Each umbel inflorescence has four to six flowers (Fig. 1C). Corollas have a deep cup shape, and each flower has 12 to 16 circular petals that look like camellia flower (a highly symmetrical and overlapping arrangement) (Fig. 1D). Flowers have a medium size (4.0–4.5 cm in diameter), with four to eight pistils and 21 to 45 stamens. Flower buds are pink (RHS-62D) (Royal Horticultural Society 2007). The petal color of the outer side, marginal zone, middle zone, and basal zone of the inner side are white (RHS-NN155D) at the full flowering stage (Fig. 1D). Petal surfaces have prominent veins. Pedicels are erect, glabrous, and 2 to 3.5 cm in length.

Fruit. ‘Chahua Nv’ had few fruits. The mature pomes are pale yellow (RHS-12D), glossy without being waxy, and have a light yellow flesh (Fig. 1F). Fruits are oblate and relatively small (transverse diameter, 1.1–2.0 cm) without persistent sepals. The fruit persists until late October in Yangzhou, Jiangsu, China.

Among existing double-flowered crabapple cultivars, Chahua Nv most resembles Yangzhi

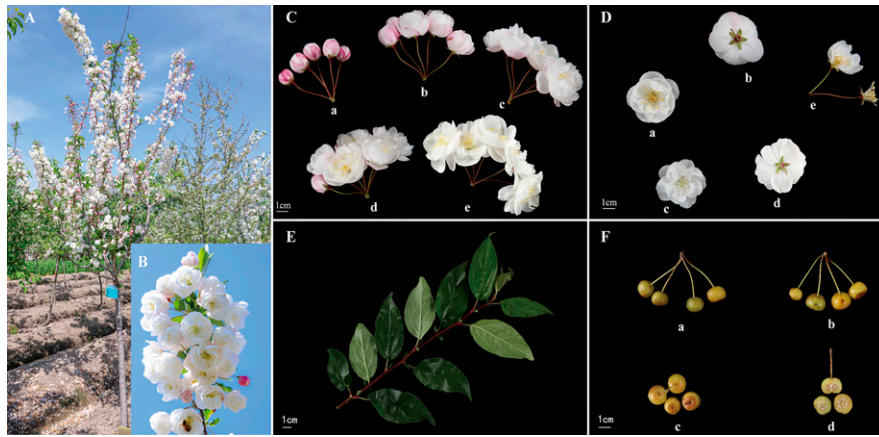


Fig. 1. Phenotypic characteristics of 'Chahua Nv'. (A) The original tree at the beginning of flowering stage. (B) Flowering branch with flowers at full bloom. (C) The different flowering stage of 'Chahua Nv': (a and b) flower bud stage; (c) initial flowering stage; (d) full flowering stage; and (e) final flowering stage. (D) Flowering petal dynamics: (a) front view of blooming flower; (b) back view of blooming flower; (c) front view of mature flower; (d) back view of mature flower; and (e) section view of blooming flower. (E) Leaves. (F) Mature fruits: (a) back view of infructescence; (b) front view of infructescence; (c) polar view of fruits; and (d) section view of fruits.

Table 1. Comparison of phenotypic characteristics between *M.* 'Chahua Nv' and *M.* 'Yangzhi Yu'.

Traits	'Yangzhi Yu'	'Chahua Nv'
Tree: habit	Upright	Upright
Flower type	Double (15–20 petals)	Double (12–16 petals)
Flower diameter (cm)	4.5 ± 0.3 a	4.3 ± 0.2 a
Petal: shape	Elliptical	Circular
Petal: color of inner side	White (RHS-NN155D)	White (RHS-NN155D)
Petal: color of outer side	Red purple (RHS-62C)	White (RHS-NN155D)
Leaf: color	Yellow-green (138B)	Green (137A)
Leaf: apex	Caudate	Acuminate
Leaf: shape	Elliptical	Ovate
Leaf: length (cm)	7.6 ± 0.5 a	7.5 ± 1.3 a
Leaf: width (cm)	3.5 ± 0.5 a	3.4 ± 0.6 a
Petiole length (cm)	3.0 ± 0.4 a	1.2 ± 0.4 b
Fruit: shape	Globose	Oblate
Fruit: color	Yellow-green (RHS-153B)	Pale yellow (RHS-12D)

Bold indicates distinguished difference between two cultivars.

Data are expressed as the mean ± SD (n = 30).

Different lowercase letters indicate significant differences at $P \leq 0.05$ between two cultivars based on the least significant difference test with SPSS Statistic 26.0 (IBM Corp., Armonk, NY, USA).

Yu (Jiang et al. 2020). These two cultivars display similar tree habits and flower types (Table 1). However, 'Yangzhi Yu' has light pinkish double flowers that are significantly different than those of 'Chahua Nv'. The petal color of the outer side of 'Yangzhi Yu' is red-purple (RHS-62C), whereas 'Chahua Nv' is white (NN155D) (Table 1). Additionally, the two cultivars have a distinctive leaf apex and fruit shape. The leaf apex of 'Yangzhi Yu' is caudate, and the fruit shape is globose; those of 'Chahua Nv' are acuminate and oblate (Table 1).

'Chahua Nv' has a symmetrical double-flower type and has important commercial value in the ornamental market.

Cultivation

The most popular propagation method for 'Chahua Nv' is bud grafting using *M. hupehensis* as rootstock from August to September in Jiangsu. Usually, rootstocks ranging from 5 to 25 mm in diameter are used for budding. This process requires inserting a bud from the scion

plant into a T-shape cut in the bark of the rootstock (Alley 1977). Budding tape is used to secure the scion bud while the bud union heals. The graft is allowed to be exposed to air until March of the following year by removing the budding tape. The top part of the seedling rootstock is removed after growth from the bud occurs. Additionally, this cultivar likes full sun, flat land, and loose, loamy, well-drained sandy soil. It has strong resistance to pests and diseases.

Availability

'Chahua Nv' is available from Nanjing Forestry University and Yangzhou Crabapple Horticulture Limited Company (e-mail: crabapple yangzhou@yeah.net).

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