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‘Ningxiu Xuezi’: A New Early- and Long-flowering Hydrangea Cultivar

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Hydrangea [*Hydrangea macrophylla* (Thunb.) Ser.], also known as bigleaf hydrangea, belongs to the family Hydrangeaceae. Because of its high ornamental value, wide application in gardens, and popularity among gardeners, it has been called as one of the world’s three major garden plants in recent years (Feng et al. 2024; Mao et al. 2024). The hydrangea features a long flowering period, abundant flower colors, and plump flower shapes. The color of the sterile florets of some cultivars will vary from pink to blue, purple, or blue-purple depending on the low soil pH and abundant aluminum in soil, being hailed as the ‘Princess of Flowers’ (Chen et al. 2022; Feng et al. 2024; Mao et al. 2024). The four most common and widely used hydrangea species in the flower trade are *H. macrophylla*, *H. arborescens*, *H. paniculata*, and *H. quercifolia* (Qi et al. 2022; Wu et al. 2021). Most cultivars originated from the variation screening or intraspecific hybridization of these four species. Ornamental and commercial values of hydrangea cultivars can be ascertained based on their inflorescence type, height, size, and the morphology of sterile flowers. Along with the diversification in these characteristics, many cultivars were introduced to the market (Tränkner et al. 2020; Yuan et al. 2023). Although there are more than 1000 cultivars of *H. macrophylla*, the growth habits, flower features, and disease susceptibilities of many cultivars are similar (Uemachi et al. 2014). Previous breeding has focused on developing new cultivars for marketing as potted plants (Khaing et al. 2016). Today, the breeding of hydrangea has turned to focus on the flowering period (early flowering, duration of flowering period, and repeated flowering), adaptability (cold tolerance, drought tolerance, and disease resistance), and landscape application (for flower border and flower sea) to meet adaptability under different environmental conditions and variable consumer demands (Jennings et al. 2024; Liu et al. 2024).

H. macrophylla ‘Ningxiu Xuezi’ features a spherical inflorescence with serrated sepals. Specially, it has an early flowering period (in early April in Nanjing, China), a long ornamental period from April to July, and a delicate and elegant flower color. Its unique morphological characteristics and relatively long flowering period endow it with remarkable advantages in landscape application. It can be combined and planted with perennial plants to establish a layered flower border, meeting the increasing market demands.

Origin

Ningxiu Xuezi is a novel cultivar of ornamental hydrangea bred by intraspecific hybridization of *H. macrophylla*. The female parent is ‘Hortmoc’, which has a spherical inflorescence with sterile florets in pink or blue (the color depends on soil pH and Al^{3+} content). The male parent is ‘Bailmer’, known as Endless Summer™ in the worldwide market, which has spherical inflorescences and can keep on blooming on new branches, with sepals in pink, blue, or purple (the color depends on soil pH and Al^{3+} content).

Artificial pollination was conducted at the Jiangsu Provincial Crop Germplasm Resources Nursery (Woody Flowers), Jiangsu Academy of Agricultural Sciences (JAAS), Nanjing, Jiangsu, China (lat. 32°02′N, long. 118°52′E) from May to Jun 2019. The hybrid seeds were harvested from November to December for sowing. The germinated seedlings were transplanted into 12-hole seedling trays in the greenhouse during Feb 2020. In April, they were moved into 1-gallon containers and positioned in an outdoor shaded area. By Apr 2021, the hybrids began bloomed. Among them, individual plants with excellent traits including big sterile flowers, early blooming, soft and elegant flower colors, and numerous of flowers were selected. From 2021 to 2023, three generations of the selected hybrid lines were continuously propagated by cuttings. Meanwhile, continuous observation and comparison was conducted during the flowering period within these years to determine whether their ornamental traits were stable and consistent.

Description

The remarkable features of ‘Ningxiu Xuezi’ are its early flowering time, large sterile florets, and the flower color (which is white initially but with green speckles in the late stage). It resembles the existing white-flowered cultivar Blushing Bride. The latter’s unique characteristic is that the sepal edges of the sterile flowers are whole, whereas the former’s have many serrations. The shape of the leaf base of ‘Ningxiu Xuezi’ is obtuse-rounded, but that of ‘Blushing Bride’ is acute. When comparing the flowering habits, being not similar to ‘Blushing Bride’ blooming on both new and old branches, ‘Ningxiu Xuezi’ blooms only on old branches; however, the flower buds formed in the previous year bloom successively over a long period, lasting until mid-July. It makes its flowering period longer than that of ‘Blushing Bride’, in which the first wave of flowering ends in June (Table 1; Fig. 1). The specific features of ‘Ningxiu Xuezi’ are as follows.

Habit. ‘Ningxiu Xuezi’ is a deciduous, semierect shrub. The 3-year-old seedlings are ~0.8 to 1.2 m in height. The stems are light green with few or no lenticels, and there is no anthocyanin coloration at the stem nodes. The internodes measure 5.0 to 9.0 cm in length and are smooth.

Foliage. The leaves are oval to oblong, ranging from 9.5 to 14.1 cm long and 5.5 to 7.7 cm wide. They are smooth, leathery, and middle-green in color (RHS Green Group 138A). The leaves have a middle-length tip,

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Table 1. Comparison of morphological characteristics of *Hydrangea macrophylla* 'Ningxiu Xuezi' and 'Blushing Bride'.

Comparison characteristics	'Ningxiu Xuezi'	'Blushing Bride'
Sepals of sterile flower	Serration	Entire
Leaf base shape	Obtuse-rounded	Acute
Blooming time	Early	Normal
Flowering period	Long	Normal
Flowering habits	Old branches	Both new and old branches

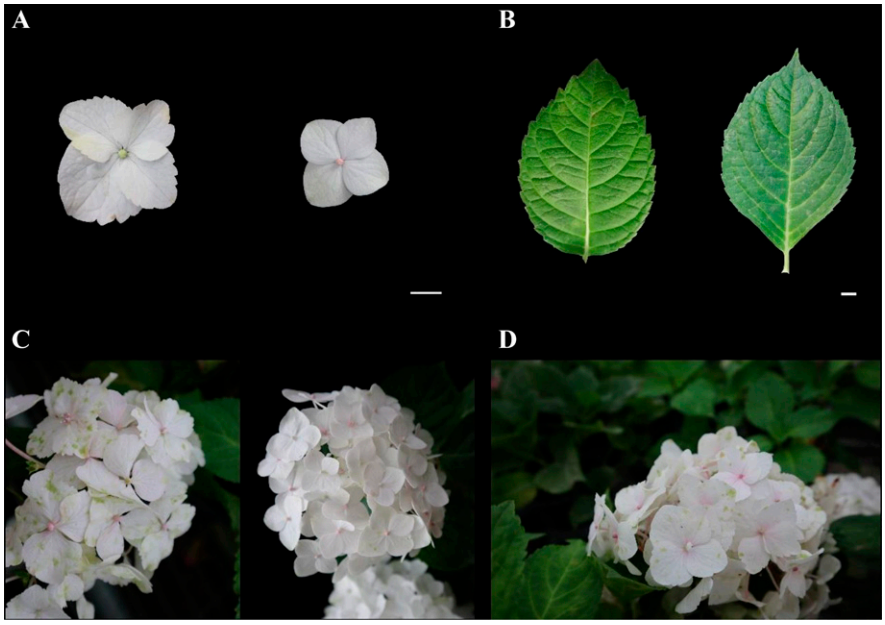

Fig. 1. A comparison of the morphology of sterile flowers, leaves, and inflorescences between 'Ningxiu Xuezi' and 'Blushing Bride'. (**A**) sepals of sterile flower, serration ('Ningxiu Xuezi', left); (**B**) leaf base shape, obtuse-rounded ('Ningxiu Xuezi', left); (**C**) green spots appeared on the sepals of sterile flowers of 'Ningxiu Xuezi' in the late blooming stage (left); (**D**) blooming inflorescence of 'Ningxiu Xuezi'. Bar = 1 cm. Photos were taken at the Jiangsu Provincial Crop Germplasm Resources Nursery (Woody Flowers), Jiangsu Academy of Agricultural Sciences, Nanjing, Jiangsu, China on 8 May 2023.

an obtuse round base, and moderately serrated margins.

Flower. When fully open, the spherical inflorescence is 8.4 to 16.1 cm high and 10.1 to 20.1 cm wide. The average diameter of the sterile flowers is 5.8 to 6.3 cm, while that of the 'Blushing Bride' is 3.5 to 4.0 cm. The sepals of the sterile flowers have notches on the edges. This cultivar inherits the color change characteristics of the female parent 'Hortmoc'. The primary color of the sterile flower is green (RHS Yellow-Green Group 149C) in the early stage, and it is white (RHS White Group 155C) with green spots in the later stage. It begins to bloom in early April in Nanjing and can last until mid-July, showing early and long flowering.

Cultivation

'Ningxiu Xuezi' prefers a semishaded environment. The appropriate soil type is loose, fertile, and well-drained sandy loam. During the growth period, fertilizers should be applied sparingly and regularly. After flowering, nitrogen fertilizers should be primarily used to stimulate branching. After September, when flower buds begin to differentiate, primarily phosphorus and potassium fertilizers should be employed. After the flowers fade, the remaining flowers should be promptly removed to encourage new branches. When the new branches reach 8 to 10 cm, topping is recommended to promote next year's blooms. The primary propagation method is through cuttings, which should be done in late May to early June or late August to early September.

Availability

JAAS has applied for a new plant cultivar right for 'Ningxiu Xuezi' (application no.: 20231767). This cultivar can be obtained from the Flower Innovation Team of the Institute of Leisure Agriculture, JAAS.

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