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‘Yan Xia’: A Novel Cultivar of *Xanthoceras sorbifolium* Bunge with Ornamental Value

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Yellow-horn (*Xanthoceras sorbifolium* Bunge), a valuable plant native to China, is a member of the family Sapindaceae. It is mainly distributed in North China, with a cultivation history of more than 1000 years (Ma et al., 2020). The species can be a tree or shrub, depending on the site conditions. Most trees are tall arbors with a round or spreading crown. Yellow-horn is characterized by a long period of blooming and a high number of flowers. The seed oil is highly valuable for cooking, and as a medicine and biofuel (Ruan et al., 2016; Shen et al., 2019). Yellow-horn is considered an ideal tree species with ecological, economic, and ornamental value. During recent years, yellow-horn has garnered attention and has been widely planted (Wang et al., 2019). Thirty-five varieties of yellow-horn have been certified by the National Forestry and Grassland Administration. ‘Yan Xia’ was successfully cultivated in July 2016. It can be grown in North China because of its cold- and drought-resistant nature. ‘Yan Xia’ has a greater number of petals than other varieties of yellow-horn. The color of petals changes throughout the blooming period. ‘Yan Xia’ is taller and has a longer florescence than other varieties; it has a crucial role in urban greening and gardening. Furthermore, the leaves and flowers of ‘Yan Xia’ can be used to produce tea. There are various medicinal components in the branches, leaves, and flowers of ‘Yan Xia’. The cultivar can also be cultivated to serve as a carbon sink, as well as for soil and water conservation.

Origin

‘Yan Xia’ is a new cultivar obtained from yellow-horn. ‘Yan’ is derived from the name of its discoverer by Dr. Yan Ao. ‘Xia’ means “summer” in Chinese. In July 2015, a team led by Dr. Ao discovered the maternal parent plant in an orchard in Chifeng City, Inner Mongolia Autonomous Region. The cultivar was maintained vegetatively through grafting. The branches were collected and grafted onto 1-year-old yellow-horn rootstock in a testing ground in Dongying City, Shandong Province. In July 2016, the branches of the surviving grafted plantlets were collected, and second-generation grafted plantlets were cultivated. A 90% survival rate was attained in consecutive grafting experiments. All grafted plantlets flowered in 2016. ‘Yan Xia’ displayed the same traits as the maternal parent, indicating the traits are genetically stable (Ao, 2016a).

Plant Characteristics

‘Yan Xia’ is expected to be propagated in North China. It can reach a mature height of 2 to 7 m. It has racemose inflorescences, and the flowers bloom before or at the same time as leaf sprouting (Fig. 1A). Normally, each flower has ≈20 petals. The petals are twisted and curled, and are of various sizes. The petals near the outer edges of flowers are wide and large; those near the center are narrow and small. The pistil, stamens, and golden hornlike appendages mutate into petals, making ‘Yan Xia’ a nonfruiting cultivar (Fig. 2A) (Ao, 2016b). The sacs on the inner small petals are derived from yellow anthers filled with pollen. The color of the petals changes gradually as the flowers mature. During the early blossom period, the petals are yellow at their base and white above. The base turns purplish red during the full-bloom stage (Fig. 2B). The cultivar bears no fruit, and this helps the plant to conserve nutrients. Normally, ‘Yan Xia’ grows taller, with a wider crown and longer blooming period than other varieties of yellow-horn. In Chengde City, Hebei Province, ‘Yan Xia’ begins to blossom in early May, which usually lasts for 25 d. Consequently, ‘Yan Xia’ is an attractive choice for urban afforestation in northern China.

The leaves of ‘Yan Xia’ are obovate and slightly curled, with gradually pointed apices and cuneate bases. The imparipinnate leaves are serrated, and are dark green on the adaxial side and light green on the abaxial side (Fig. 1B).

Table 1 shows the distinctiveness of ‘Yan Xia’ by comparing it with ‘Sen Miao’, a common variety of yellow-horn.

Fig. 1. Morphological characteristics of ‘Yan Xia’: (**A**) racemose inflorescences and (**B**) imparipinnate leaves.

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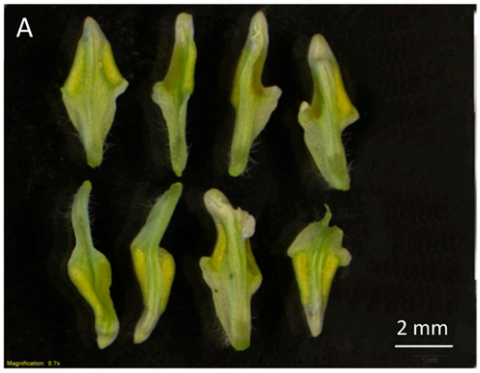

Fig. 2. Morphological characters of 'Yan Xia' under a microscope: (**A**) petaloid stamens and (**B**) flowers in different blossom periods.

Table 1. Different characteristics of 'Yan Xia' and 'Sen Miao'.

Characteristic	Yan Xia	Sen Miao
Petal number	≈20	5
Petal shape	Rolled up and crowded irregularly; petals are wide and large near the outer edge and narrow and small at the center	Explanate
Pistil	Petalody	Ovary coated with gray hairs
Stamen	Mutate into small petals in the center of the corolla with long sacs filled with pollen	8 stamens
Fruit	Unfruitful	Fruitful, spherical capsule

Dissemination of the Cultivar

'Yan Xia' shows strong resistance to drought and cold. It prefers sunshine, dry terrain, and thick, neutral to slightly alkaline soil with good drainage. Scarification is of importance for seedlings to avoid root rot. The cultivar is appropriate for propagation in China from Liaoning in the east to Xinjiang in the west, and from Inner Mongolia in the north to Henan in the south. It is distributed between latitude 28°34′–47°20′ N and longitude 73°20′–120°25′ E, and is mainly restricted to the continental and monsoon climate zones. The average annual temperature range is 3.3 to 15.6 °C. The minimum and maximum temperatures are –36.4 and 38.9 °C, respectively. The annual average rainfall ranges from 43 to 969 mm, and the frost-free period is 120 to 233 d.

Grafting and cutting are suitable for the propagation of 'Yan Xia'. Stem grafting or bud grafting of 'Yan Xia' is generally conducted in early spring or summer using 1-year-old yellow-horn seedlings as rootstock. The roots are more suitable for cutting than the branches. The rooting rate of softwood was greater than that of hardwood.

A planting density of 2 × 3 m is recommended for large plantlets. Spring is suitable for transplanting large plantlets. It is important to protect the roots during transplantation. Application of sufficient amounts of organic base fertilizers is recommended. Topdressing is of importance; it should be applied in early spring before sprouting (nitrogen fertilizer), during florescence to promote bud initiation and flower opening (nitrogen and phosphate fertilizers), and in autumn before October (phosphate and potash fertilizers). The fertilization rate depends on soil fertility and plant growth.

Cultivation and weeding should be conducted two to three times during the growing season. Irrigation is necessary during drought, and before flowering and soil freezing. During the rainy season, drainage is necessary to avoid root rot.

Pruning and trimming should be conducted ideally during the dormancy period. The overcrowded branches, overlapping branches, crossing branches, thin branches, and branches infected with pests and diseases should be pruned.

Availability

Small samples of 'Yan Xia' are available commercially from Beijing Forestry University. Requests for cuttings for research purposes may be addressed to Dr. Yan Ao (e-mail: aoyan316@163.com).

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