

‘Senmao 7’ Northern Highbush Blueberry

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Additional index words. *Vaccinium corymbosum*, fruit breeding, cultivars

‘Senmao 7’ (CNPVP 20180209) is a new northern highbush blueberry (*Vaccinium corymbosum* L.) cultivar jointly developed by Dalian University and Dalian Senmao Modern Agriculture Co., Ltd., Dalian, China. ‘Senmao 7’ is a mid-to-late-season cultivar that is suitable for the fresh market. It has the characteristics of large fruit size, small dry picking scar, good firmness, sweet taste, and good flavor. The plant is vigorous and is recommended for harvest either by machine or hand. It can be planted commercially in the high-chilling areas of northern China (800–1000 h, <7.2 °C), and offers enhanced opportunities to compete in the local late-maturing fresh berry market.

Origin

Highbush blueberries are native to North America, with the first cultivars bred from wild *Vaccinium* species at the beginning of the 20th century (Song and Hancock, 2011). Since then, the breeding of highbush blueberries has progressed and entered a stage of rapid development. As the main producer of blueberry in Asia, China has 27 provinces, municipalities, and autonomous regions where blueberries are cultivated on a large scale (Li et al., 2018). In 2017, the cultivation area reached 31,210 ha and the total output was 114,905 tons (Brazelton et al., 2017).

The cultivation of blueberry in China started in the mid-1980s and was popularized in the early 21st century. However, with the continuous expansion of blueberry planting areas in China, bush decline and poor adaptability have become a significant problem hindering the development of the blueberry industry. Therefore, in the current developmental stage of the blueberry industry in China, there is an urgent need to develop new cultivars that are adapted to local production.

‘Senmao 7’ was selected from seedlings produced by open-pollination of ‘Lateblue’. ‘Lateblue’ derived from a cross of ‘Herbert’ × ‘Coville’ released by the U.S. Department of Agriculture and the New Jersey Agricultural Experiment Station (Scott et al., 1968). The fruit of ‘Lateblue’ is medium to large, the picking scar is slightly wet, and the berry ripens very late, factors not conducive to market promotion and economic income. Therefore, it was of interest to the industry to breed new cultivars with earlier maturity to replace ‘Lateblue’ to meet the market demand.

In July 2008, H. Wang collected open-pollinated seed of the blueberry cultivar ‘Lateblue’ from the experimental nursery of the Modern Agricultural Research Institute of Dalian University. In Spring 2009, 30 seedlings were grown out at Dalian Senmao Modern Agriculture Co., Ltd., and in Spring 2010, the seedlings were moved to the experimental station of Dalian Pushilan Agricultural Technology Co., Ltd. In July 2013, G. Xu evaluated and selected from these progenies. Among them, a selection subsequently named ‘SMN-461’ showed excellent performance with vigorous plant growth, large fruit size, small dry picking scar, good firmness, thick fruit wax, high sweetness, low acidity, a good sugar-acid ratio, and good flavor. In 2014, 10 clonally propagated plants each of ‘SMN-461’ and ‘Lateblue’ were planted in

the Jinzhou District, Dalian for observation and evaluation. Subsequently, three randomly selected plants each of ‘SMN-461’ and ‘Lateblue’ were evaluated from 2015 to 2017 for three consecutive years. In Dec. 2018, this selection was certificated by the Plant Cultivar Rights Certificate of the National Forestry and Prairie Bureau and was named ‘Senmao 7’.

Description

In this experiment, a single-factor randomized design was used. Three plants each of the same age with no pests or diseases were selected as test plants for ‘Senmao 7’ and ‘Lateblue’ and tagged for experimental observation and evaluation. From 2017 to 2019, the plant yield, bloom, and ripening dates were observed and measured (Table 1), and the plant growth habit, flower type and color, and fruit cluster density were evaluated subjectively. The comparison showed that the yield of ‘Senmao 7’ was ≈20% higher than that of the control cultivar ‘Lateblue’. The blooming and ripening dates of ‘Senmao 7’ were earlier than ‘Lateblue’. Across 2017 to 2019, the estimated date for 50% ripe fruit for ‘Senmao 7’ ranged from 6 July to 13 July and averaged 9 July. This date was 7 d earlier than the 50% ripeness estimated for ‘Lateblue’ (which exhibited a similar 50% ripe range). Observations indicated that ‘Senmao 7’ was a vigorous plant with a spreading growth habit, whereas ‘Lateblue’ was upright. The flower shape of ‘Senmao 7’ was urceolate, and the corolla was large, milky white, with no ridges (Fig. 1). The fruit cluster density of ‘Senmao 7’ was tighter than that of ‘Lateblue’ (Fig. 2), and the average number of clusters per branch of ‘Senmao 7’ was 20% more than that of ‘Lateblue’.

From 2017 to 2019, the numerical rating data of clonally propagated plants of ‘Senmao 7’ and ‘Lateblue’ were collected during the fruit harvest period, including berry size, color, picking scar, firmness, soluble solids (°Brix), and titratable acidity (% citric acid) (Table 2). Berry size was determined by weighing 30 berries of each cultivar and calculating the average berry weight. The results showed that the berries of ‘Senmao 7’ were ≈1.7-times larger than ‘Lateblue’. The average berry size of ‘Senmao 7’ was 1.93 cm × 1.95 cm, the average berry weight was 3.41 g, and the maximum berry



Fig. 1. Flowers of ‘Senmao 7’ northern highbush blueberry.

Received for publication 2 Oct. 2020. Accepted for publication 9 Nov. 2020.

Published online 18 December 2020.

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Table 1. Yield values and fruit ripening dates of ‘Senmao 7’ and ‘Lateblue’, 2017–19.

Cultivars	Yield (kg/plant ± SD)				50% fruit ripening date (date range)
	2017 (4 yr old) ^z	2018 (5 yr old) ^z	2019 (6 yr old) ^z	3-yr avg	3-yr avg
Senmao 7	4.5 ± 0.7	2.9 ± 1.2	3.7 ± 0.3	3.7 ± 0.2	9 July (6 July to 13 July)
Lateblue	3.4 ± 0.5	2.3 ± 0.4	3.3 ± 0.5	3.0 ± 0.3	16 July (13 July to 21 July)

^zThe age of the test plants for 2017–19.

Table 2. Fruit quality attributes (± SD) of ‘Senmao 7’ and ‘Lateblue’ (the age range of the tested plants was 4 to 6 years old), 2017–19.

Cultivars	Berry wt (g) ^z	Scar (1–9) ^y	Firmness (N) ^x	Soluble solids (°Brix) ^w	Titrateable acidity (% citric acid) ^w
Senmao 7	3.41 ± 0.5	7.4 ± 0.3	3.2 ± 0.3	13.2 ± 0.3	0.24 ± 0.08
Lateblue	2.05 ± 0.3	6.1 ± 0.2	2.9 ± 0.2	11.3 ± 0.4	0.32 ± 0.07

^zAverage berry weight from 30 berries sampled.

^y1 = worst, 9 = best.

^xThe firmness was measured Newton as the force value (kg) of 1 cm², with an average of 30 intact fruits.

^wSoluble solids and titrateable acidity were determined using one blended cup of sample fruit.



Fig. 2. Fruit of ‘Senmao 7’ northern highbush blueberry.

weight observed was 4.36 g. The fruit of ‘Lateblue’ was 0.95 cm × 0.97 cm, the average berry weight was 2.05 g, and the maximum berry weight was 2.42 g. We took 30 berries from each cultivar and used the Royal Horticultural Society Color Chart for fruit color determination. The results showed that the berry color of ‘Senmao 7’ was dark blue, and ‘Lateblue’ was light blue (103-C vs. 101-C measured value); however, it was observed that ‘Senmao 7’ berries were covered with a thick wax layer when ripe, whereas ‘Lateblue’ berries had a thinner layer. For picking scar, ‘Senmao 7’ showed a better score than ‘Lateblue’ (7.4 vs. 6.1). The picking scar of ‘Senmao 7’ was small and dry, whereas the scar of ‘Lateblue’ was large and slightly wet. Berry firmness measurements were performed on 30 berries samples by using the GY-4 Digital

Fruit Sclerometer (Edburg Instruments Corp, Zhejiang, China). The comparison showed that ‘Senmao 7’ had a better firmness than ‘Lateblue’ (3.2 vs. 2.9 N). Soluble solids and titrateable acidity were determined using Pocket Brix-Acidity Meter (Blueberry) (PAL-BXIACID7; Atago Corp., Tokyo, Japan). The measurements showed that the soluble solids levels of ‘Senmao 7’ were higher than ‘Lateblue’ (13.2 vs. 11.28 °Brix), and its titrateable acidity was lower than ‘Lateblue’ (0.24 vs. 0.32% citric acid).

The prominent attributes of ‘Senmao 7’ are high plant vigor, large fruit size, small dry picking scar, good firmness, and a long storage period after picking. ‘Senmao 7’ is a mid-to-late-season cultivar that matures more than a week earlier than the ‘Lateblue’ and has commercial potential for the late-ripening blueberry market. ‘Senmao 7’ is recommended for machine or hand harvest and requires cross-pollination for maximum yields. It is expected that ‘Senmao 7’ will perform well in Dalian, Liaoning Province and produce good economic returns in other northern areas with high-chilling conditions (800–1000 h, <7.2 °C). No disease symptoms were observed on ‘Senmao 7’ during the evaluation period.

Availability

‘Senmao 7’ was authorized by the National Forestry and Prairie Bureau in Dec. 2018, under Certificate number 20180209. The cultivar is

owned by Dalian University and Dalian Senmao Modern Agriculture Co., Ltd., Dalian, China. Propagation rights have been offered to Dalian Senmao Modern Agriculture Co., Ltd. Growers may request information on how to obtain propagules by contacting H. Wang and G. Xu, Modern Agricultural Research Institute at Dalian University, No. 10 Xuefu Street, Dalian Economic and Technological Development Zone. The genetic material of this published has been deposited in Dalian Senmao Modern Agriculture Co., Ltd., where it is available for research purposes, including the development and commercialization of new cultivars.

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