

‘Heroine’: A Northern Highbush Blueberry with Early Maturity and Superior Storage Quality

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Blueberry is considered as a perishable fruit, even under conditions of proper storage, which are $\sim 4^{\circ}\text{C}$, and a relative humidity of 90% to 95%. Cold storage costs producers money and requires storage space to guarantee fruit quality and avoidance of spoilage (Li et al. 2021). Therefore, cultivar attributes of early maturity, superior firmness, and resistance to detrimental effects of transportation and storage are of significant importance to the blueberry industry.

‘Heroine’ (CNPVP 20190392) has been released by Dalian Senmao Modern Agriculture Co., Ltd. as an early-season, northernighbush blueberry (*Vaccinium corymbosum* L.) cultivar. The new cultivar has consistent yield, along with good flavor and good size for blueberry growers. In particular, the favorable attributes of heavy wax, uniform texture, small and dry picking scar, and high firmness (3.76 N) enhance the opportunities for it to successfully compete in the early-maturing and storage-capable blueberry fresh market. In comparison with other northernighbush cultivars, Heroine has similar chill-hour requirements allowing it to adapt to the high-chilling areas of northern China (600–1200 h, $<7.2^{\circ}\text{C}$). ‘Heroine’ has consistently displayed high vigor, good yield potential, and high fruit quality. It is expected to provide growers with a superior cultivar choice in northern China and other areas where blueberries with moderate to high chilling requirement are grown.

Origin

‘Heroine’ was selected from open-pollinated hybrid seedlings of ‘Big Bluegold’. ‘Big Bluegold’ is a medium-ripening variety chosen from seedlings of ‘Bluegold’. Bluegold is

also a midseason cultivar (Hicklenton et al. 2004).

In Jul 2010, H. Wang collected the open-pollinated seeds of ‘Big Bluegold’ in the blueberry germplasm resource nursery of Dalian Senmao Modern Agriculture Co., Ltd. (Xinshi Village, Huajia Street, Jinzhou new area, Dalian). In Spring 2011, 242 seedlings were produced. In Spring 2012, these seedlings were planted in a field trial at Dalian Pushilan Agricultural Technology Co., Ltd. (Shuangsheng Village, Changling Town, Zhuanghe City, Dalian, Liaoning Province) at a row spacing of 2.0 m with 1.0 m between plants.

The performance and characteristics of seedlings were determined for mature fruit when they first fruited in late Jun 2015. Of those seedlings, we found the seedling ultimately named ‘Heroine’ performed well and showed promise. It was propagated by tissue culture in 2015 and tissue culture-propagated seedlings observed continuously from Jun 2018 to Jun 2021. Through the comprehensive evaluation of the characters of excellent lines and clonal offspring, their characters, such as plant morphology, fruit characteristics, yield and fruit quality remained, stable in the 4 years. In Dec 2018, this selection won the Plant Variety Protection certificate of the State Forestry and Grassland Administration, and was named ‘Heroine’.

Description

In this evaluation, three plants of the same age without diseases or insect pests were selected as samples of ‘Heroine’ and ‘Big Bluegold’, and compared over 4 years. Morphological characteristics, plant yield, maturity (Table 1), and internal qualities of fruit were observed and measured (Table 2), and plant growth habits, berry cluster density, and berry flavor were subjectively evaluated. Berry attributes of size, firmness, and color, which are generally important for commercial blueberry ratings (NeSmith 2018), were higher for ‘Heroine’, whereas picking scar and flavor were comparable with commercial cultivar standards. Both cultivars have fruit cluster of high density, flat round

oblate fruit, and small and dry picking scar, producing excellent flavor and suitable for fresh market.

Berry size was determined by weighing 30 berries of each cultivar and calculating the average berry weight. The results showed that the berries of ‘Heroine’ were 1.47 times heavier than those of ‘Big Bluegold’. The average berry size of ‘Heroine’ was 1.41 cm \times 1.73 cm, with the maximum berry size reaching 2.2 cm, and the average berry weight was 2.94 g. The maximum weight observed was 4.36 g (Fig. 1). The fruit of ‘Big Bluegold’ was 1.45 cm \times 1.63 cm, the average berry weight was 2.0 g, and the maximum berry weight was 2.43 g. In addition, the average yields of ‘Heroine’ and ‘Big Bluegold’ were 3.85 and 3.90 (kg/plant), respectively.

We took 30 berries from each cultivar and used the Royal Horticultural Society Color Chart for fruit color determination. The berry color of ‘Heroine’ was light blue (101-B), and ‘Big Bluegold’ was medium blue (102-A), showing that ‘Heroine’ has the characteristic of a thick fruit wax deposit, which is an important and desirable goal for growers to preserve the waxy surface (Beaudry 1992).

Berry firmness measurements were performed on samples of 30 berries using the GY-4 Digital Fruit Sclerometer (Edburg Instruments Corp, Zhejiang, China). The comparison showed that ‘Heroine’ had better firmness than ‘Big Bluegold’ (3.76 vs. 2.23 N).

The picking scar of ‘Heroine’ is smaller than that of ‘Big Bluegold’ (0.21 vs. 0.24 cm), measured with vernier caliper. The size and dry picking scar are important quality attributes. Blueberry fruit do not form a true abscission zone. When the fruit is removed from the plant, both vascular and epidermal tissues rupture, leaving a wound that is an excellent entry point for decay organisms (Beaudry 1992).

Soluble solids content ($^{\circ}\text{Brix}$) and titratable acidity (% citric acid) were determined using Pocket Brix/Acidity Meter (Blueberry) (PAL-BXIACID7; Atago Corp., Tokyo, Japan) (Xu et al. 2021). The measurements showed that the soluble solids content levels of ‘Heroine’ were lower than ‘Big Bluegold’ (11.06 vs. 13.45 $^{\circ}\text{Brix}$), and its titratable acidity was higher than that of ‘Big Bluegold’ (0.31 vs. 0.20% citric acid).

Overall, good berry color, firmness, and small-dry picking scar are desirable traits for shipping and storage for fresh market (Carter et al. 2002), and based on these traits, ‘Heroine’ can be recommended for commercial planting.

Availability

‘Heroine’ was authorized by the National Forestry and Prairie Bureau in Dec 2018, under certificate number CNPVP20190392. The cultivar is owned by 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 at Dalian Senmao Modern Agriculture Co., Ltd., Xinshi Village, Huajia Street, Jinzhou

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Table 1. Yield values and fruit ripening dates of 'Heroine' and 'Big Bluegold', 2018–21.

Cultivar	Yield (kg/plant ± SD)				50% fruit ripening date (date range)	
	2018 (4-yr-old) ⁱ	2019 (5-yr-old)	2020 (6-yr-old)	2021 (7-yr-old)	4-yr avg	4-yr avg
Heroine	4.3 ± 0.5	2.9 ± 0.5	3.7 ± 1.0	4.5 ± 1.7	3.85 ± 0.62	25 Jun (23 Jun to 30 Jun)
Big Bluegold	3.4 ± 0.7	4.8 ± 0.6	3.1 ± 0.2	4.3 ± 0.8	3.90 ± 0.68	7 Jul (4 Jul to 13 Jul)

ⁱ The age of the test plants for 2018–2021.

Table 2. Fruit quality attributes (±SD) of 'Heroine' and 'Big Bluegold' (the age range of the tested plants was 4–7 years), 2018–21.

Cultivar	Berry wt (g) ⁱ	Scar (cm) ⁱⁱ	Firmness (N) ⁱⁱⁱ	Soluble solids (Brix) ^{iv}	Titrateable acidity (% citric acid) ^v	Color (1~9) ^v	Flavor (1~9) ^v
Heroine	2.94 ± 0.28	0.21 ± 0.03	3.76 ± 0.18	11.06 ± 0.30	0.31 ± 0.04	7.95 ± 0.21	8.00 ± 0.19
Big Bluegold	2.00 ± 0.12	0.24 ± 0.02	2.23 ± 0.15	13.45 ± 0.44	0.20 ± 0.04	7.40 ± 0.16	8.15 ± 0.18
(Ratio)	1.47		1.69				

ⁱ Average berry weight from 30 berries sampled.

ⁱⁱ The picking scar was measured by vernier caliper, with an average of 30 intact fruits.

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

^{iv} Soluble solids and titrateable acidity were determined using one blended cup of sample fruit.

^v 1 = worst, 9 = best.



Fig. 1. Fruit of 'Heroine' northern highbush blueberry.

New District, Dalian. The genetic material has been deposited at Dalian Senmao Modern Agriculture Co., Ltd., and is available for research purposes, including the development and commercialization of new cultivars.

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