

A Blackcurrant (*Ribes nigrum* L.) Cultivar: Danjianghei

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Keywords. breeding, pomology, small-berry cultivar

Blackcurrant (*Ribes nigrum* L.), a member of the Saxifragaceae family, is a perennial deciduous shrub. Seeds, leaves, and fruits contain a large number of bioactive substances, which have high nutritional value and medicinal health functions. They can be widely used as natural resources in the food and pharmaceutical industries (Huo et al. 2011). Blackcurrant is mainly distributed in Heilongjiang, Jilin, Inner Mongolia, Xinjiang, Qinghai, and other places in China. In the alpine region of Heilongjiang Province, the climate is cold, with a large temperature difference between day and night, sufficient sunlight, fertile soil, and high organic matter content, which is conducive to the accumulation of nutrients in the fruit (Zhu et al. 2022). At the same time, blackcurrant has become one of the characteristic and advantageous shrub species in Heilongjiang Province. The breeding and cultivation research on blackcurrant in this province is in its infancy, therefore the germplasm resources are relatively scarce. Currently, there are less than 10 cultivars available in production. Blackcurrant generally has shortcomings such as weak resistance to powdery mildew and poor cold resistance. Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences has bred four blackcurrant cultivars, ‘Zaofeng’, ‘Heifeng’, ‘Hanfeng’, and ‘Wanfeng’, through hybridization and selection that are used in production. ‘Danjianghei’ (Heilongjiang Provincial Crop Variety Approval Committee 2012046) is a new cultivar approved (registered) by Heilongjiang Provincial Crop Variety Approval Committee in 2012. ‘Danjianghei’ has a large fruit size, high yield, good quality, and resistance to blackcurrant disease characters.

Origin

‘Danjianghei’ was derived from a cross of ‘Heifeng’ × ‘Muxuan94-7-12’ (pedigree shown

in Fig. 1). The male parent ‘Muxuan94-7-12’ was derived from a cross between ‘Mujiao82-6-4’ and ‘Mushi85-11-1’. ‘Mujiao82-6-4’ was derived from a cross between ‘Zaofeng’ and ‘Liangyehoupi’. ‘Mushi85-11-1’ was selected from seedlings produced by open pollination of ‘Kanghanbaopi’.

In 1995, W. Zhou pollinated ‘Heifeng’ with the pollen of ‘Muxuan94-7-12’ and obtained 1750 seeds. The seeds were sown in the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences in May 1996, and the 42 grown seedlings were labeled Muyu95-4-1 to 42. Field selection was conducted during their fruit-bearing period from 1999 to 2001. ‘Muyu95-4-33’ exhibited the characteristics of disease resistance, large fruit, high yield, and excellent quality. In 2002, the comprehensive traits of the fruit and tree resistance were further observed after cutting propagation. In 2004, it was selected for the cultivar comparison nursery and entered the remote observation. From 2007 to 2011, ‘Muyu95-4-33’ passed the regional test and production test at Hailin (lat. 44.3°N, long. 129.2°E), Shangzhi (lat. 44.8°N, long. 128.7°E), Jiamusi (lat. 47.0°N, long. 130.7°E), and Mudanjiang (lat. 44.4°N, long. 129.5°E). In Mar 2012, it was registered and named ‘Danjianghei’ by the Heilongjiang Provincial Crop Variety Approval Committee.

Description

‘Danjianghei’ has a semiopen growth habit, strong tree vigor, and a large plant cluster

(5-year-old shrub height: 146 cm, crown diameter: 154 cm). The annual branch is yellowish brown, and the perennial branch is grayish brown, with the medium formation ability of the basal branch. The foliage is dark green. The flower is hermaphrodite, with purple-red at the beginning and pink-white in full bloom. There are two to three inflorescences per bud. The fruit is black and round, the flesh is light-green, and the seed is brown (Fig. 2). Fruit set after self-pollination was 54.3% compared with 76.8% open pollination, so planting of other cultivars for cross-pollination should not be necessary. It has a medium degree of cold resistance and is suitable for cultivation and development in the eastern and southern parts of Heilongjiang Province and other regions with similar climates. It is recommended to bury the plant in soil over winter to prevent the branches from drying out. Fold the branches together, press them down to one side, and cover them with soil. In Heilongjiang, the general buried soil thickness is ~10 cm, and it can be buried tightly without gaps. In the spring of the next year, the soil is removed manually, and the branches should be righted in time. Generally, hardwood cuttings are used for propagation. ‘Danjianghei’ exhibits good adaptability to the plains and piedmont regions in Heilongjiang Province, China. No diseases or pests were observed on ‘Danjianghei’ during the evaluation period.

Table 1 presents the berry ripening period of ‘Danjianghei’, ‘Heifeng’, and ‘Öjebyn’ at the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences (lat. 44.4°N, long. 129.5°E) during 2009–11. The estimated ripening period (50% ripe berry) of ‘Danjianghei’, ‘Heifeng’, and ‘Öjebyn’ ranged from 12 Jul to 18 Jul, from 15 Jul to 20 Jul, and from 14 Jul to 19 Jul, respectively. The maturity of ‘Danjianghei’ was 2 to 3 d earlier than that of ‘Heifeng’ and ‘Öjebyn’.

From 2009 to 2011, the yield evaluation of ‘Danjianghei’ at Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences was conducted with 30 clumps (an adjacent planting of two clonally propagated

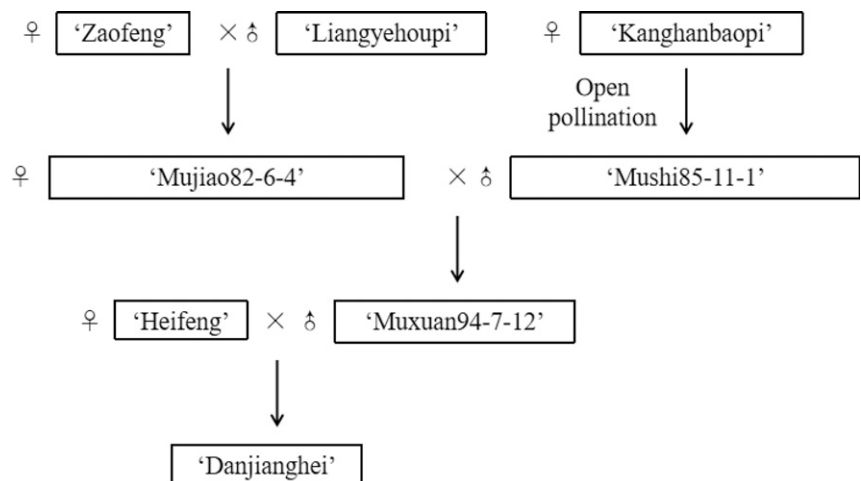


Fig. 1. Pedigree of ‘Danjianghei’ blackcurrant.

Received for publication 9 Apr 2024. Accepted for publication 21 May 2024.

Published online 5 Jul 2024.

This research was supported by the National Key R&D Program (Project No. 2022YFD1600501) and Scientific Research Business Expenses in Heilongjiang Province (Project No. CZKYF2024-1-B023). H.G. is the corresponding author. E-mail: shgaohongna@163.com.

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Fig. 2. Inflorescence (A), fruitlet (B), mature berry (C), and clump (D) of ‘Danjianghei’ blackcurrant.

Table 1. Berry ripening period and yield of ‘Danjianghei’, ‘Heifeng’, and ‘Öjebyn’ blackcurrants grown at the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences during 2009–11.

Cultivars	Country of origin	50% Berry ripening date range (3-yr avg) ⁱ	Yield (kg/clump), mean ± SD ⁱⁱ			
			2009 (3 yr old)	2010 (4 yr old)	2011 (5 yr old)	3-yr avg
Danjianghei	China	12 Jul–18 Jul (15 Jul)	2.61 ± 0.20	3.38 ± 0.42	4.54 ± 0.16	3.51 ± 0.86
Heifeng	China	15 Jul–20 Jul (17 Jul)	2.02 ± 0.19	2.56 ± 0.29	3.62 ± 0.30	2.73 ± 0.73
Öjebyn	Sweden	14 Jul–19 Jul (16 Jul)	1.25 ± 0.22	2.10 ± 0.31	3.25 ± 0.18	2.20 ± 0.76

ⁱ Three years of observation (2009–11) are included in the date range.

ⁱⁱ Thirty individual clumps per cultivar.

plants grown from cuttings; the spacing between plants was 20 cm; Fig. 2) under a cultivation density of 8000 plants (4000 clumps)/ha (in-row spacing between clumps: 1 m; spacing between rows: 2.5 m). In the experiment, ‘Heifeng’ and ‘Öjebyn’ cultivars were planted. The soil type of test plots was Chinese mollisols, and the climate type was US Department of Agriculture zone 4a. Thirty of organic fertilizer per hectare was applied every autumn. Irrigation time and frequency were flexibly arranged according to soil moisture. The mature shrub required regular pruning; each clump retained about ten 1-year-old branches, five to seven 2-year-old branches, four or five 3-year-old branches, and one or two 4-year-old branches; branches that were more than 5 years old were removed. The average yield of 3-, 4-, and 5-year-old plants of ‘Danjianghei’ was 2.61, 3.38, and 4.54 kg/clump, respectively, whereas

that of ‘Heifeng’ was 2.02, 2.56, and 3.62 kg/clump, respectively. The 3-year average yield of ‘Danjianghei’ (3.51 kg/clump) was 28.57% and 59.55% higher than that of ‘Heifeng’ (2.73 kg/clump) and ‘Öjebyn’ (2.20 kg/clump), respectively. At a cultivation density of 8000 plants/ha, plants of ‘Danjianghei’ propagated from hardwood cuttings bear berries for the first time in the second year and have a yield of more than 4 kg of berries/clump in the fifth year. The yield performance of ‘Danjianghei’ in the long term (>10 years) remains to be investigated further.

The berry traits are presented in Table 2. The average berry size of ‘Danjianghei’ was large (1.52 × 1.50 cm), with an average weight of 2.02 g and a maximum weight of 2.90 g, whereas the average berry size of ‘Heifeng’ and ‘Öjebyn’ were small (1.27 × 1.24 and 1.19 × 1.17 cm), with an average

Table 2. Fruit size and chemistry parameters of ‘Danjianghei’, ‘Heifeng’, and ‘Öjebyn’ blackcurrants grown at the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences during 2009–11.

Characteristic	Danjianghei (n = 30)	Heifeng (n = 30)	Öjebyn (n = 30)
Weight (g), mean ± SD	2.02 ± 0.26	0.84 ± 0.23	0.75 ± 0.20
Vertical diameter (cm), mean ± SD	1.52 ± 0.35	1.27 ± 0.21	1.19 ± 0.16
Horizontal diameter (cm), mean ± SD	1.50 ± 0.42	1.24 ± 0.17	1.17 ± 0.23
Soluble solid (°Brix) ⁱ	13.96 ± 1.11	13.16 ± 1.20	14.0 ± 1.40
Acidity (%) ⁱ	2.78 ± 0.21	2.01 ± 0.20	2.56 ± 0.18

ⁱ Soluble solids and acidity were determined from three fruit mixture samples with 10 replicates per fruit mixture sample and a total of 30 fruits per cultivar.

weight of 0.84 and 0.75 g, a maximum weight of 1.90 and 1.00 g. The average weight of ‘Danjianghei’ (2.02 g) was larger than that of ‘Gofert’ (≈1.17 g) and ‘Polares’ (≈0.62 g) (Pluta and Żurawicz, 2014, 2015). ‘Danjianghei’ is a large-fruit-type blackcurrant. Total soluble solids (TSS) and titratable acidity (TA) were determined by using a pocket Brix-acidity meter (PAL-BX/ACID7; Atago Corp., Tokyo, Japan). ‘Danjianghei’ (13.96 °Brix; 2.78%) showed greater TSS and TA than ‘Heifeng’ (13.16 °Brix; 2.01%). TSS of ‘Danjianghei’ was similar to that of ‘Öjebyn’. TA of ‘Danjianghei’ was greater than ‘Öjebyn’. These fine qualities in combination with a high yield indicate the excellent value of ‘Danjianghei’ for the food industry.

Taken together, ‘Danjianghei’ is the desirable substitute for the ‘Heifeng’ in northeastern China, with great commercial value in fruit markets in China. It may be a candidate cultivar or breeding material in other berry-producing areas in the world.

Availability

‘Danjianghei’ was authorized by the Heilongjiang Provincial Crop Variety Approval Committee in Mar 2012, under certificate number 2012046. The cultivar is owned and propagated by the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences, Mudanjiang, China. Growers may request information about how to obtain propagules by contacting the corresponding author (shgaohongna@163.com). This published genetic material has been deposited at the Mudanjiang Branch of Heilongjiang Academy of Agricultural Sciences, and it is available for research purposes, including the development and commercialization of new cultivars.

References Cited

- Huo, J., Z. Li, D. Qin. 2011. Review of nutritional ingredients and health protective function of blackcurrant fruit and its prospect in industrial development (In Chinese). *J Northeast Agric Univ.* 42(2):139–144. <https://doi.org/10.19720/j.cnki.issn.1005-9369.2011.02.027>.
- Pluta S, Żurawicz E. 2014. ‘Gofert’ blackcurrant. *HortScience.* 49:513–515. <https://doi.org/10.21273/HORTSCI.49.4.513>.
- Pluta S, Żurawicz E. 2015. ‘Polares’ blackcurrant. *HortScience.* 50:1582–1584. <https://doi.org/10.21273/HORTSCI.50.7.1096>.
- Zhu C, Zhang L, Gao Y, Qin D, Huo J. 2022. Two novel blue honeysuckle (*Lonicera caerulea* L.) cultivars: Lanjingling and Wulan. *HortScience.* 57:1145–1147. <https://doi.org/10.21273/HORTSCI116674-22>.