

# Blueberry

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**Scientific Name and Introduction:** Blueberries (*Vaccinium sp.*) are a member of the heath family (Ericaceae), grown as a perennial crop. Blueberries have a blue to blue-black epidermis or skin that is covered by a waxy bloom, giving the fruit a light blue appearance. The flesh is creamy-white to green in color and juicy. Blueberries of commercial importance include the lowbush (*V. angustifolium* Ait.), Northern (*V. corymbosum* L.), Southern (hybrids of *V. corymbosum*, *V. ashei*, *V. darrowi* Camp.) highbush, and rabbiteye (*V. ashei* Reade). Lowbush blueberries are much smaller (<1 g) than highbush types and are prized for use in processed products such as pie and pastry fillings, pancakes, muffins, jams, and sauces. Northern highbush berries are grown primarily in the northern tier of the U.S. and require 600 to 1000 h of chilling below 7 °C (44.6 °F) (Pritts, 1992). Southern highbush berries require fewer chill hours and can lose fruit to frost damage if grown in areas where Spring temperatures drop to < 0 °C (32 °F) during bloom and early fruit set. Rabbiteye blueberries are hardy only in the southern U.S. or where Winter temperatures remain above 10 °C (50 °F). These berries often have a gritty mouth feel from seeds and stone cells, lack a well-developed calyx, but have a longer shelf-life and more pigment than highbush berries.

**Quality Characteristics and Criteria:** High quality blueberries are free of injury, decay, and sunscald, are fully blue in color with little or no red at the stem end, and appear, as well as feel, turgid.

**Horticultural Maturity Indices:** For fresh market, fruit should be fully blue and firm.

**Grades, Sizes and Packaging:** Highbush blueberries are graded as U.S. No. 1 or unclassified. Size can be used in connection with the grade: extra large, < 90 berries/cup (250 ml); large, 90 to 129 berries/cup; medium, 130 to 189 berries/cup; small, 190 to 250 berries/cup (USDA-AMS, 1966). Blueberries are packaged as 2 or 1 pint units, usually in polyethylene or polystyrene ventilated clamshells, and sold as 12-unit trays.

**Pre-cooling Conditions:** Blueberries for fresh market should be forced-air cooled to < 10 °C (50 °F), graded, then maintained under refrigeration at 0 to 3 °C (32 to 37.4 °F) within an hour after harvest to remove field heat and extend storage-life. Pre-cooling to 5 °C (41 °F) can cause condensation problems in lowbush blueberries when packed at ambient temperatures, but should be incorporated when delays between picking and packing exceed 21 h (Jackson et al., 1999).

**Optimum Storage Conditions:** Blueberries should be held at -0.5 to 0 °C (31.1 to 32 °F) with > 90% RH, for up to 2 weeks for lowbush, northern and southern highbush (Jackson et al., 1999; Perkins-Veazie et al., 1995) and up to 4 weeks for rabbiteye (Miller et al., 1988).

**Controlled Atmosphere (CA) Considerations:** Rabbiteye, highbush, and lowbush blueberries benefit from 10 to 15% CO<sub>2</sub> + 1 to 10% O<sub>2</sub> when held at or below 5 °C (41 °F; Smittle and Miller, 1988; Prange et al., 1995). Firmness and TA were maintained and decay decreased, with a shelf-life up to 6 weeks.

**Retail Outlet Display Conditions:** Blueberries should be stored and displayed under refrigeration with temperatures as close to 0 °C (32 °F) as possible.

**Chilling Sensitivity:** Blueberries are not known to be chilling sensitive.

**Ethylene Production and Sensitivity:** Stimulation of *Botrytis cinerea* (gray mold) growth can occur on blueberries in the presence of ethylene. Ethylene production ranges from 0.5 to 2  $\mu\text{L kg}^{-1} \text{h}^{-1}$  for Northern highbush, varying with year and cultivar (Suzuki et al., 1997), to 10  $\mu\text{L kg}^{-1} \text{h}^{-1}$  for rabbiteye blueberry (El-Agamy et al., 1982)

**Respiration Rates:**

Temperature	mg CO <sub>2</sub> kg <sup>-1</sup> h <sup>-1</sup>
0 °C	2 to 10
4 to 5 °C	9 to 12
10 °C	23 to 35
15 to 16 °C	34 to 62
20 to 21 °C	52 to 87
25 to 27 °C	78 to 124

To get mL kg<sup>-1</sup> h<sup>-1</sup>, divide the mg kg<sup>-1</sup> h<sup>-1</sup> rate by 2.0 at 0 °C (32 °F), 1.9 at 10 °C (50 °F), and 1.8 at 20 °C (68 °F). To calculate heat production, multiply mg kg<sup>-1</sup> h<sup>-1</sup> by 220 to get BTU per ton per day or by 61 to get kcal per metric ton per day.

**Physiological Disorders:** The major disorders are shrivel (water loss), sunscald and fruit cracking.

**Postharvest Pathology:** Blueberries are susceptible to *Botrytis cinerea* (gray mold), anthracnose (ripe rot; *Colletotrichum gloeosporioides*) (Milholland, 1995). At temperatures above 10 °C (50 °F), *Rhizopus stolonifer* can grow readily in fruit packs.

**Quarantine Issues:** Blueberry maggot (*Rhagoletis mendax* Curran) is the primary postharvest pest limiting shipments of unfumigated blueberries to Canada and states west of the Rockies. Methyl bromide is currently the only USDA-approved method of postharvest control. Plum cucurlico (*Conotrachelus nenuphar*) (Herbst) and blueberry maggot are quarantine pests for shipments to Japan (Guy Hallman, USDA-ARS, Weslaco, Texas; personal communication).

**Suitability as Fresh-cut Product:** Can be incorporated into fruit cups and prepared fruit trays.

**Special Considerations:** Bruising through improper handling or mechanical harvesting reduces the storage-life of fresh fruit. Mechanical harvesting can reduce fruit storage-life by half compared to hand-harvesting.

**References:**

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