

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 juicy and creamy white to green in color. Blueberries of commercial importance include the lowbush (*V. angustifolium* Ait.), northern (*V. corymbosum* L.), southern highbush (hybrids of *V. corymbosum*, *V. ashei*, and *V. darrowi* Camp.), and rabbiteye (*V. ashei* Reade). Lowbush blueberries are much smaller (less than 1 g) than highbush types and are prized for their 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 United States and require 600 to 1,000 h of chilling below 7 °C (45 °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 below 0 °C (32 °F) during bloom and early fruit set. Rabbiteye blueberries are hardy only in the Southern United States or where winter temperatures remain above 10 °C (50 °F). These berries often have a gritty mouth feel from seeds and stone cells and 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. They are fully blue in color, with little or no red at the stem end, and appear and 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 are unclassified. Size can be used in connection with grade: extra large is fewer than 90 berries per cup (250 mL), large is 90 to 129 berries per cup, medium is 130 to 189 berries per cup, and small is 190 to 250 berries per cup (AMS 1966). Blueberries are packaged as 1- or 2-pint units, usually in polyethylene or polystyrene-ventilated clamshells, and sold as 12-unit trays.

Precooling Conditions

Blueberries for fresh market should be forced-air cooled to under 10 °C (50 °F), graded, then maintained under refrigeration at 0 to 3 °C (32 to 37 °F) within an hour after harvest to remove field heat and extend storage life. Precooling 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 to 32 °F) and at above 90% RH for up to 2 weeks for lowbush, northern highbush, and southern highbush (Perkins-Veazie et al. 1995, Jackson et al. 1999) 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% CO₂ + 1 to 10% O₂ when held at or below 5 °C (41 °F) (Smittle and Miller 1988, Prange et al. 1995). Firmness and total acidity were maintained and decay decreased with a shelf-life up to 6 weeks.

Retail Outlet Display Considerations

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

Botrytis cinerea (gray mold) growth can be stimulated on blueberries in the presence of ethylene. Ethylene production ranges from 0.5 to 2 μL kg⁻¹ h⁻¹ for northern highbush, varying with year and cultivar (Suzuki et al. 1997), to 10 μL kg⁻¹ h⁻¹ for rabbiteye blueberry (El-Agamy et al. 1982)

Respiration Rates

Temperature	mg CO ₂ kg ⁻¹ h ⁻¹
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⁻¹ h⁻¹, divide the mg kg⁻¹ h⁻¹ 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⁻¹ h⁻¹ by 220 to get BTU per ton per day or by 61 to get kcal per tonne 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) and 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, 2000, personal communication).

Suitability as Fresh-Cut Product

Fruit can be incorporated into fruit cups and prepared fruit trays.

Special Considerations

Bruising caused by improper handling or mechanical harvesting reduces the storage life of fresh fruit. Mechanical harvesting can reduce fruit storage life by half compared with hand harvesting.

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Acknowledgments

Some of the information included was from the Produce Marketing Association's "Fresh Produce Manual" and the University of California, Davis, website "Fresh Produce Facts" at http://postharvest.ucdavis.edu/produce_information.

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