Cherry (Sweet)

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Scientific Name and Introduction: *Prunus avium* L., sweet cherry, is a stone fruit of the Rosaceae family. The edible portion consists of the outer layers of the mature ovary wall, the flesh (mesocarp) and the skin (exocarp). The pit (endocarp) encloses the seed. Numerous cultivars are grown commercially including Attika, Bing, Brooks, Burlat, Chelan, Lambert, Lapins, Rainier, Tieton, Skeena and Sweetheart. Sweet cherries are primarily grown in the western U.S. in California, Oregon and Washington State. Fruit harvest begins in California in May and continues through mid-August in Oregon and Washington State.

Quality Characteristics and Criteria: Premium sweet cherries have a bright, shiny appearance with fruit color ranging from dark red ('Bing'), red ('Sweetheart') or yellow with a red blush ('Rainier' and 'Royal Ann'). The appearance of the stem, green and free from brown discoloration, is also critical for marketing. Flavor is enhanced by high soluble solids and titratable acid content with a firm, juicy fruit texture.

Horticultural Maturity Indices: Fruit color is the most consistent and reliable maturity index. Different cultivars can be harvested at slightly different color stages. For example, 'Bing' cherries should be a mahogany red color rather than lighter red (immature) or purplish red (over-mature). 'Lambert' cherries can be harvested at a brighter, less dark red color while 'Van' cherries can be harvested at a darker red color compared to 'Bing' (Crisosto, 1991).

Grades, Sizes and Packaging: Grades include Washington No. 1 and 2, Northwest No. 1 and 2, and U.S. No. 1 and U.S. No. 2. Grades are based primarily on appearance, and the three grading systems differ in tolerance to defects. Sizes are typically expressed as row count and range from 9 to 12. Packages commonly are 20 lb cartons, although smaller units are becoming more available.

Pre-cooling Conditions: Sweet cherries should be cooled to < 5 ºC by 4 h after harvest. Room-, forced-air and hydro-cooling are all used to cool sweet cherry fruit. Of these, hydro-cooling is the most rapid and chlorine compounds can be added to the hydro-cooler water to reduce decay potential(Do et al., 1966).

Optimum Storage Conditions: Recommended conditions for storage of sweet cherries are -1 to 0 ºC with > 95% RH. Sweet cherries maintain good quality for 2 to 4 weeks under these conditions.

Controlled Atmosphere (CA) and Modified Atmosphere Packaging (MAP) Considerations: Reduction in the amounts of color change (darkening), acid and firmness loss, incidence of decay and stem browning are potential benefits of CA storage and MAP. The effectiveness of these technologies is determined in part by fruit quality at harvest. Fruit harvested at a more advanced stage of maturity (low acid, dark color, low firmness) will not realize as much benefit from CA or MAP. Optimal atmosphere conditions for CA range from 1 to 5% O_2 + 5 to 20% CO_2 (Chen, 1981; Mattheis et al., 1997; Patterson, 1982). For MAP, 5 to 10% O_2 + 5 to 15% CO_2 is effective when fruit temperature is maintained at 0 to 5 ºC (Mattheis and Reed, 1994; Meheriuk et al., 1995). Temperature control for MAP systems is critical as the risk of anaerobiosis increases as packaged fruit temperature increases.

Retail Outlet Display Considerations: Refrigeration during display is critical to reduce quality loss due to stem browning, shrivel and development of decay. Fruit should be held at 5 ºC or less to slow deterioration. Fruit should be refrigerated but not wetted as continuous moisture on the surface can cause

splitting.

Chilling Sensitivity: Sweet cherries are not sensitive to chilling temperatures and should be stored as cold as possible without freezing.

Ethylene Production and Sensitivity: Sweet cherries produce very low amounts of ethylene but will respond to exogenous or wound-induced ethylene with increased respiration and quality loss.

Respiration Rates:

Temperature	mg CO_2 kg^{-1} h^{-1}
0 °C	6 to 10
5 °C	16 to 28
10 °C	20 to 36
15 °C	28 to 64
20 °C	40 to 90

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 metric ton per day. Data are from Gerhardt et al. (1942), Micke et al. (1965), and Mattheis (1998).

Physiological Disorders: Pitting and bruising are common problems caused by harvest injury as well as rough postharvest handling (Facteau and Rowe, 1979; Thompson et al., 1997). Fruit pitting is a manifestation of subsurface damage that develops into sunken areas near the fruit surface. Bruising can occur from excess compression, drops or large impacts during harvest, transport or packing. Visual symptoms of pits and bruises often do not appear until well after the fruit has been packed, resulting in visible damage appearing in wholesale or retail markets. Sweet cherries are also prone to shrivel and water loss due to the lack of a well developed cuticle. Water loss can be minimized by prompt cooling and storage in a high RH environment. Stem browning is another potential physiological disorder. Stem browning can be minimized by proper temperature and RH management, however, packing procedures that scrape or injure stems create wounds that will brown. In addition to proper temperature management, use of chlorine dioxide in hydrocooler water can reduce development of stem browning (Roberts, 1989).

Postharvest Pathology: Fungal pathogens including *Penicillium expansum* (blue mold), *Botrytis cinerea* (gray mold), *Alternaria* sp., *Monilinia fructiocola* (brown rot), *Rhizopus stolonifer, Cladosporium* sp., and *Aspergillus niger* are the main causes of sweet cherry decay (Adaskaveg and Ogawa, 1994; Crisosto, 1991; Dugan and Roberts, 1997). Many of these pathogens infect fruit early in development and are present as quiescent infections at harvest (Dugan and Roberts, 1994). Fruit can also be infected via rain splits or wounds occurring at harvest or during packing. The use of postharvest sanitation as well as fungicides minimize postharvest decay (Willet et al., 1989). Low temperature storage, fungicide application and MAP with high CO_2 (5 to 20%) all slow pathogen growth (Brash et al., 1992; DeVries-Patterson et al., 1991; English and Gerhardt, 1942; Gerhardt et al., 1942; Gerhardt et al., 1956; Spotts et al., 1998).

Quarantine Issues: Fruit exported to Japan must be fumigated with methyl bromide to control codling moth larvae. Fruit shipped into California must be inspected and certified free from cherry fruit fly infestation.

Suitability as Fresh-cut Product: No current potential.

Special Considerations: Sweet cherries must be cooled promptly after harvest and low temperatures

maintained throughout packing, storage and transport. Low temperatures minimize quality loss as well as physiological and pathological disorders. Maintenance of low temperature is critical when using MAP systems to avoid anaerobic conditions and off-flavor development.

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