

Small (soft) Fruits



Mark Ritenour

Indian River Research and Education Center, Fort Pierce

Jeff Brecht

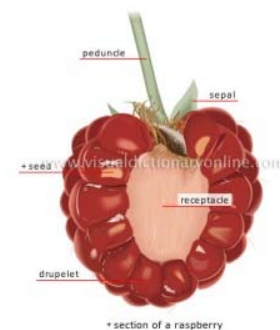
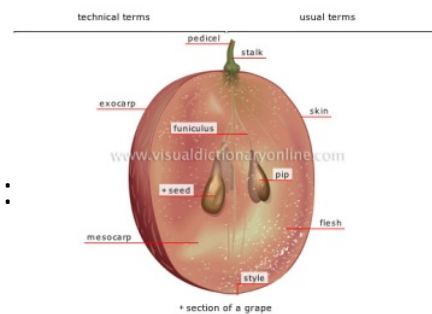
Horticultural Science Department, Gainesville



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Small Fruits - Include

- Grapes
- Berries:
 - Blueberry
 - climacteric
 - Cranberry
 - Currants
 - Elderberry
 - Gooseberry
- Aggregate fruits:
 - Strawberry
 - Blackberry
 - Dewberry
 - Huckleberry
 - Loganberry
 - Mulberry
 - Raspberry



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Composition

- Sugars:
 - Mostly fructose and glucose
 - Most berries = 5-8% sugars
 - Blueberries = 10-14% sugars
 - Grapes = 13-18% sugars
- **Blueberries** in particular have high levels of **antioxidants**



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Maturity & Quality Standards

- Grapes:
 - Soluble solids content (SSC)
 - Titratable acidity
 - Sugar:acid ratio
 - Color
- Strawberries:
 - Fruit color (>2/3 of the surface showing red or pink color)



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Optimum Temp & RH

- All are temperate-zone fruit
- Most can be stored near 32F (0C)
 - Cranberries should be stored at 36 to 40F (2 to 4C)
 - Below 36F, cranberries exhibit some chilling injury (rubbery texture & red flesh)
- Optimum RH for all is 90 to 95%
- Grape stem respiration may be 15 times greater than the berries



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Shelf Life

- **Grapes:**
 - Several cultivars can be stored for relatively long periods (1-6 months)
- **Berries:**
 - Most have very short shelf lives (tender and highly perishable)



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Shelf Life of Berries

- Blackberry: 2-3 d
- Blueberry: 2 w
- Boysenberry: 2-3 d
- Cranberry: 2-4 m
- Dewberry: 2-3 d
- Elderberry: 1-2 w
- Gooseberry 3-4 w
- Loganberry: 2-3 d
- Raspberry: 2-3 d
- Strawberry: 1-2 w



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MA or CA

- Strawberries: 15 to 20% CO₂ is useful.



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MA or CA

- Grapes:
 - Use of 2 - 5% O₂ + 1 - 5% CO₂ is not currently recommended
 - 10 - 15% CO₂ may help control gray mold
 - However, exposure to high CO₂ has also been reported to cause brown discoloration



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Decay Control

- *Botrytis cinerea* is a serious problem on both grapes and berries
- Other fungal pathogens can also be a problem
- SO₂ fumigation (every 7 to 10 days) used for grapes
 - Fruit residue levels must be kept below 10 ppm.
 - Most other horticultural commodities do not tolerate SO₂ (Lychee is an exception)
 - Beware of transporting with other commodities.



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Physiological Disorders

- Freezing injury
- Chilling injury of cranberries
- Carbon dioxide (>20% CO₂)
- Watery berry of grape – a preharvest disorder related to excessive N
 - Causes soft and watery berries with low sugars



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Physiological Disorders

- Internal browning in Thompson Seedless grapes
 - Due to long term storage senescence
- Stem browning of grapes
 - Often 2% water loss causes stem browning within 7 days
 - Delayed cooling greatly increases stem browning



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Postharvest Handling Selected Points

- Hand harvested or “pick-your-own” operations
- Grading and sorting often occurs in the field to minimize handling steps
- Cool quickly
 - 1 hr at field temperature (90F or 32C) may = 1 week at 32F (0C)
 - Forced air cooling is commonly used



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Accumulation at Cooling Facility



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Forced-air Cooling



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■ ■ ■ Postharvest Handling Selected Points

- Maintain the “cold chain” during packing, loading, shipping and retailing
 - Refrigerate loading docks to maintain temperature
- Center-load pallets onto trucks, leaving space between the walls and the pallets
 - Block the load to prevent it from shifting during transit
- Handle quickly at destination markets

