Outline

• The ripening process in blackberry
• Blackberry harvest management
• Postharvest handling
• Blackberry storage conditions
• Blackberry postharvest problems
The Ripening Process

• Blackberries grow in size and weight during ripening
  – 35-45 days from flowering to ripe fruit
  – 85% of fruit size is gained during last days before harvest
  – Color changes from green to red to black
The Ripening Process

• Changes in fruit quality during ripening:
  – Flavors and sugars increase
  – Fruit softens and loosens from recepticle
  – Acids decrease
Maturity Indices

- Fruit color
- Gloss of fruit
- Ease of detachment from pedicel
- Fruit chemistry
Quality Indices

• Appearance
  – Fully black color
  – Proper stage for market (glossy or dull)
Quality Indices

• Size and shape
  – Consistent for cultivar
  – Uniform
• Fully turgid (firm)
Quality Indices

• Flavor
  – Soluble solids (sugars)
    – usually 9-12° Brix
  – Titratable acidity
  – Flavor volatiles
Quality Indices

- Freedom from defects
  - Fruit injury
  - Fruit decay
  - Calyces (caps)
  - Sunscald
The Ripening Process

- Blackberry quality does not improve after harvest
Blackberry Harvest

• Blackberries for fresh market are hand-harvested
• Machine harvest is possible for processing-quality fruit
Blackberry Harvest

• Harvest stages
  – Shiny black
    • Berries are less sweet
    • Berries are firmer; best stage for handling and shipping
  – Dull black
    • Sweeter berries
    • Softer fruit, reduced shelf life
    • Only for local sales
Blackberry Harvest

• Harvest at least twice per week
• Harvest in morning when fruit is cool and full of water (turgid)
• Handle carefully during harvest
• Gently place berries no more than 2 inches deep in harvest or sales containers
• Cool the fruit as soon as possible after harvest
Postharvest Handling

FRESH PRODUCE

IS ALIVE

LOSES MOISTURE

BREATHES

RELEAS ES HEAT

CAN EVEN DIE

CAN GET SICK
Postharvest Handling

• Blackberries may be held in cold storage for 2 to 14 days, depending on:
  – Cultivar (berry firmness)
  – Ripeness stage
  – Careful handling

• Ideal cold storage conditions:
  – Temperature: -0.5 - 0°C (31.1-32°F)
  – Relative humidity: >90%
Postharvest Handling

- Precooling is critical, to remove field heat in advance of longer term storage
  - Cool to 5°C within 4 hours
Postharvest Handling
<table>
<thead>
<tr>
<th>Temperature (°C (°F))</th>
<th>Respiration Rate (ml CO₂/kg*hr)</th>
<th>Heat Production (kcal/metric ton/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 °C (32 °F)</td>
<td>11</td>
<td>1342</td>
</tr>
<tr>
<td>10 °C (50 °F)</td>
<td>31</td>
<td>3782</td>
</tr>
<tr>
<td>20 °C (68 °F)</td>
<td>78</td>
<td>9516</td>
</tr>
</tbody>
</table>
Postharvest Sensitivities

• Blackberries are not sensitive to chilling damage

• Ethylene issues
  – Ethylene production: 0.1-1.0 µl/kg*hr at 5°C
  – Blackberries do not respond to ethylene by stimulation of ripening processes
Controlled Atmosphere

• Modified atmosphere conditions
  – Carbon dioxide: 15-20%
  – Oxygen: 5-10%

• Benefits of controlled atmosphere
  – Reduced decay
  – Reduced respiration, reduce softening, longer postharvest life

• Whole pallet covers and consumer packages used for CA
Postharvest Handling

• Berries for processing
  – Process as soon as possible (within 24 hours)
  – Freeze berries for long term storage
    • IQF (individual quick frozen)
    • Bulk pack
Blackberry Postharvest Problems

• Physiological disorders
  – Red drupelet disorder
  – Shriveling/water loss
  – Leakage
  – CA related disorders

• Pathological disorders
Physiological Disorders

- Red drupelet disorder
  - Causes include heat stress, rain on fruit, sunburn
  - Susceptible cultivars: Shawnee, Choctaw, Tupi, Kiowa, Chester, Loch Ness, Kuraka
  - Reduced problems with shift trellis
  - Precool fruit, then sort while cold
Physiological Disorders

• Shrivelings/water loss
  – Loss of water from fruit
  – Store under proper relative humidity – 90-95%
  – Store a proper temperature
  – Package in plastic clamshells
Physiological Disorders

• Leakage
  – Physiological breakdown of fruit
  – Harvest at proper stage
  – Store under proper conditions
  – Use pads in plastic clamshell packaging
Physiological Disorders

• CA related disorders
  – Exposure of fruit to <2% oxygen and/or >25% carbon dioxide
  – Off flavors
  – Brown discoloration in fruit
Pathological Disorders

• Managing postharvest fruit rots in the field
  – Disease resistant cultivars
  – Maintain correct crop nutrition
  – Irrigate only as needed
  – Avoid overhead irrigation
  – Preharvest control of diseases and insects
  – Harvest at the proper stage of maturity
Pathological Disorders

• Managing postharvest fruit rots postharvest
  – Maintain good sanitation in packing areas
  – Prompt cooling of fruit
  – Storage at lowest possible safe temperature
  – Prevent physical injury to fruit
  – Shipment under high carbon dioxide
  – Keep infected fruit out of packages
Pathological Disorders

• Botrytis rot
  – Most common postharvest rot
  – Gray or white rot of fruit
Pathological Disorders

• Botrytis rot
  – Disease management during fruit production is critical
  – Watch for infected fruit during harvest, and remove
Any Questions?