Postharvest Handling
Challenges for Specialty Crops

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Consider briefly:

1. Adhere to basic handling principles
2. Improve temperature management; Cold Chain
3. Increased use of modified atmospheres
4. Control detrimental ethylene effects
5. Improve sensory & nutritional quality
6. Increased product diversity; value-added
7. Streamline handling and distribution
8. Ensure microbial food safety
10 Basic Postharvest Principles

1) Harvest at correct maturity
2) Reduce physical handling
3) Protect product from sun
4) Keep packingline simple and clean; ensure good worker hygiene
5) Select, classify, and pack carefully

There are no magic solutions
6) Align cartons, strap pallet
7) Cool as soon as possible
8) Know market and product requirements
9) Coordinate efficient & rapid handling
10) Train and compensate workers adequately
2. Improve Temperature management; Maintain cold chain

**Fresh Produce Deterioration**

- Metabolic changes: respiration, ethylene, texture, aroma, etc.
- Growth and development
- Transpiration
- Mechanical injury
- Physiological disorders
- Decay; microbial growth

Temperature Affects All Causes of Deterioration
Broccoli Shelf-life & Temperature

Storage temperature

Days (to initiate yellowing)

- 0: 32
- 2.5: 36
- 5: 41
- 7.5: 45
- 10: 50
- 12.5: 55
- 15: 59
- 20°C: 68°F

Temperature

Broccoli

Shelf-life

- lifelife
Chlorophyll, Carotenoids, Ascorbic Acid, Sugars

Limit of Salability

0°C (32°F), 10°C (50°F), 20°C (68°F)

Cantwell, unpublished
### Effect of Temperature on Deterioration

<table>
<thead>
<tr>
<th>Temp. °F</th>
<th>Temp. °C</th>
<th>$Q_{10}$</th>
<th>Relative Velocity of Deterioration</th>
<th>Relative Shelf-life</th>
<th>Daily Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>0</td>
<td>--</td>
<td>1.0</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>3.0</td>
<td>3.0</td>
<td>33</td>
<td>3</td>
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<tr>
<td>68</td>
<td>20</td>
<td>2.5</td>
<td>7.5</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>104</td>
<td>40</td>
<td>1.5</td>
<td>22.5</td>
<td>4</td>
<td>25</td>
</tr>
</tbody>
</table>

$Q_{10} =$ \text{rate of deterioration at T+10°} \\
\text{rate of deterioration at T}$
Non-Chilling Sensitive (Broccoli) versus Chilling Sensitive Products (Cucumber)

Shelf-life of cucumbers in relation to temperature

Sensitivity Exposure Time Temperature
Symptoms of chilling injury

• Surface pitting
• Water soaking
• Browning
• Necrosis
• Rots
• Poor flavor
• Poor ripening

Commonly chilling symptoms do not appear until the product is transferred from the colder to a warmer temperature.
Stored 15 days

36°F  2.5°C
36°F  2.5°C

45°F  7.5°C
45°F  7.5°C

55°F  12.5°C
55°F  12.5°C

68°F  20°C
68°F  20°C

68°F  20°C
68°F  20°C

68°F  20°C
Good morning, Marita. Is there someone there that could give us a possible explanation for the conditions we are seeing at this time on Chinese Eggplant? Thank you.

Thu 12/16/2004 12:37 PM
Hi Bill:
This looks like chilling injury to me. Please see the attached photo that includes Chinese eggplant and also the brief written summary of a storage experiment on 3 types of eggplants. Let me know if you have any questions.
The Postharvest Continuum

Table Grapes
Ideal vs Poor Postharvest Handling

Delay Before Cooling
6 hours Cooling
7 day Storage
7 day Transit

Cooled at 40°F, 75% RH
32°F, 95% RH, air at 0.5 mph
Stored at 32°F, 75% RH, air at 2 mph

Delay Before Cooling

% Water Loss

The Postharvest Continuum

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Commercial Cooling Methods

- Room Cooling
- Forced Air Cooling
- Vacuum Cooling
- Hydrocooling
- Icing
- Cooling in refrigerated transport

Product requirements
Scale appropriate technology
Conventional, Organic products
Microbial food safety issues