Measures to Minimize Chilling Injury of Citrus Fruit

Chilling Injury

Why?
Several incidents were reported in 1998-1999 and in 1999-2000 seasons

What is Chilling Injury?
- Peel tissue collapse
- 4-6 weeks in cold storage
- Low storage temperature (37-42 F)
- Reduced by waxing

Chilling Injury vs. Pitting

Chilling Injury
- Peel tissue collapse
- Develops in 4-6 weeks in storage
- Enhanced under low temp.
- Reduced by waxing

Postharvest Pitting
- Oil gland targeted
- Develops in 2-4 days
- Promoted/enhanced by high temperature
- Caused by wax application

Chill injury
Postharvest pitting

Chill injury
Factors Effecting Chill Injury

- Susceptible vs. Less Susceptible
  - Time of Season
    - Early / late — Jan - March
  - Position on Canopy
    - Exterior — Interior
  - Exposure to sun

Varies from season to season

Control of Chilling injury

- Fungicides application
- Intermittent warming
- High humidity
- Low oxygen and high carbon dioxide
- Dipping fruit in chemicals
- Sealing in polyethylene film

Control of Chilling Injury

Shipping and storage temperature is critical to control of chilling injury

% Chilling & Pitting of White Grapefruit Coated with Shellac

% of fruit in treatment

% Chilling injury of white vs. red grapefruit (Carnauba + 15 weeks)
**Recommended Temperature for Grapefruit:**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Effect</th>
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<tbody>
<tr>
<td>45-50°F</td>
<td>&gt; 50°F enhances pitting</td>
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<tr>
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<td>&lt;42°F increases chilling injury</td>
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**Control of Chilling Injury**

- Wax application reduces chilling injury
- Shellac = Polyethylene > Carnauba wax

**Effect of TBZ/IMZ and Waxes on Chill Injury of Grapefruit Stored 14 weeks at 37°F**

<table>
<thead>
<tr>
<th>Chilling Injury (% of fruit in treatment)</th>
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<tr>
<td>Water</td>
</tr>
<tr>
<td>Shellac</td>
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**Effect of TBZ and Waxes on Chilling Injury of Grapefruit Stored 12 wks at 37°F**

<table>
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<th>Chilling Injury (% of fruit in treatment)</th>
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**Conclusion**

- Temp and wax are the two important factors in controlling chilling injury
- Shellac
  - better control of chill injury
  - less severe postharvest pitting
- Carnauba
  - less control of chill injury
  - less severe postharvest pitting
- Optimal temp with proper wax is the best means for controlling chilling injury