Three Main Problems

- **Bleaching**
- **Botrytis Decay**
- **Stem Browning**

Use of SO₂ to Control Decay

<table>
<thead>
<tr>
<th>Time</th>
<th>Total Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>700 – 1,250 ppm</td>
</tr>
<tr>
<td></td>
<td>Forced air cooling</td>
</tr>
<tr>
<td>Storage</td>
<td>1,250 – 2,000 ppm</td>
</tr>
<tr>
<td></td>
<td>Not scrubbed</td>
</tr>
<tr>
<td></td>
<td>(2 – 5 ppm)</td>
</tr>
</tbody>
</table>

Concentration x Time

- At least 100 CT
  - 100 ppm per hour
  - 200 ppm per 30 min
  - 400 ppm per 15 min

---


0.2-1.5% Water Loss During Harvest and Packing

2.0% Critical Threshold

Table Grape Cultivars

- Thompson Seedless
- Perlette
- Sagramone
- Calmeria
- Autumn Royal
- Fantasy Seedless
- Beauty Seedless
- Marroo Seedless
- Flame Seedless
- Crimson Seedless
- Ruby Seedless
- Red Globe

Table Grape Maturity

- All varieties of table grapes must not test less than 16.5% SSC, or less than 20:1 SSC:TA. Except as provided below.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Soluble Solids</th>
<th>Sugar Acid Ratio</th>
<th>Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Thompson Seedless</td>
<td>17.6%</td>
<td>20:1</td>
<td>15%</td>
</tr>
<tr>
<td>**Thompson Seedless</td>
<td>16.5%</td>
<td>20:1</td>
<td>15%</td>
</tr>
<tr>
<td>Flame Seedless/Ruby Seedless</td>
<td>16.5%</td>
<td>20:1</td>
<td>No</td>
</tr>
<tr>
<td>Italia</td>
<td>16.5%</td>
<td>20:1</td>
<td>No</td>
</tr>
<tr>
<td>Superior Seedless/Perlette</td>
<td>16.5%</td>
<td>20:1</td>
<td>15%</td>
</tr>
</tbody>
</table>

*Varieties grown north and west of the San Gorgonio Pass.
**Varieties grown south and east of the San Gorgonio Pass.
Postharvest Handling of Table Grapes

1. Carrying Lugs to Avenue Packer
2. Trimming, Cleaning, and Sorting Fruit
3. Packing Fruit into Shipping Lugs
4. Packer Inspection
5. Initial SO2 Fumigation FAC/SO2 Pads
6. Forced Air Cooling (FAC)

i.) Storage

Periodic Refumigation

Storage

SO2 Pad

SO2 Pad

Soil

Harvest Preparation

- Treat avenues to prevent dust
- Withhold irrigation
- Level soil
- Remove high cover crops
- Prune some long canes; remove some leaves

Avenue Pack

- Loading Pallets into Refrigerated Truck/Van
- Unloading at Terminal
- Recooling & Holding

Retail Distribution
Avenue Pack
Field Pickers

- Selecting
- Harvesting

- Carrying lugs, Totes

Avenue Pack
Field Pickers

- Trimming
Filed Packing table grapes in styrofoam boxes

- Trimming
- Inspecting
- Packing
- Lidding

Avenue Pack

Field Pickers

Table Grape Containers/Packaging

- New corrugated types

Table Grape Containers/Packaging
Stacked Boxes of Table Grapes Awaiting Transport for Cooling and SO₂ Fumigation

- Palletization (pallet squeeze)
- Unitization (netting or strapping)

Table Grapes Temperature Management Requirements

- Delayed cooling: ≤ 4 hours
- Fast Cooling Temperature: ≤ 6 - 8 hours

Table Grapes Temperature Management Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>0.5 - 0°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>90 - 95%</td>
</tr>
<tr>
<td>Air Flow</td>
<td>20-40 cfm/ton</td>
</tr>
</tbody>
</table>
## Composition of mature kiwifruit

<table>
<thead>
<tr>
<th>Fruit Component</th>
<th>Fruit Content (g/100 g fresh weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solids</td>
<td>16 – 42</td>
</tr>
<tr>
<td>Soluble solids</td>
<td>14 – 32</td>
</tr>
<tr>
<td>Total sugars</td>
<td>7.5 – 13</td>
</tr>
<tr>
<td>Reducing sugars</td>
<td>0 – 10</td>
</tr>
<tr>
<td>Organic acid (as citric)</td>
<td>0.6 – 1.6</td>
</tr>
<tr>
<td>Pectin</td>
<td>0.3 – 1.1</td>
</tr>
<tr>
<td>Protein</td>
<td>0.5 – 1.5</td>
</tr>
<tr>
<td>Lipids</td>
<td>0.3 – 1.9</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>1.1 – 2.9</td>
</tr>
<tr>
<td>Minerals (ash)</td>
<td>0.3 – 0.4</td>
</tr>
<tr>
<td>Calcium</td>
<td>35 – 40</td>
</tr>
<tr>
<td>Magnesium</td>
<td>14 – 37</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>140 – 190</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>20 – 40</td>
</tr>
<tr>
<td>Potassium</td>
<td>220 – 300</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>80 – 300</td>
</tr>
</tbody>
</table>

## Kiwifruit Postharvest Handling Tips

- Minimum Maturity (6.5% SSC).
- Maximum Maturity (<14 pounds).
- Consumer Quality (>12.5% RSSC).
- Disease Management (gray mold).
- Ethylene (5-10ppB).
- Temperature Management (32°F & 90% RH).
- Controlled Atmosphere.
CURRENT MATURITY INDEX: 6.2%

WHEN CAN WE START HARVESTING?

Kiwi

<table>
<thead>
<tr>
<th>Harvest</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature</td>
<td>Ripe</td>
</tr>
<tr>
<td>Starch</td>
<td>SSC = 6.5%</td>
</tr>
<tr>
<td>Sugars</td>
<td>SSC = 15%</td>
</tr>
</tbody>
</table>

Can we predict RSSC?
Kiwifruit internal breakdown measured during storage at 32°F (2000)
Kiwifruit

- Minimum Maturity (6.5% SSC)
- Maximum Maturity (14 pounds)
- Consumer Quality (>12.5% RSSC)
- Disease Management
- Ethylene (5-10ppB)
- Temperature Management (32°F & 90% RH)
- Controlled Atmosphere

Pre-Ripening Temperature Effect on Ripening

Short cold storage can overcome ethylene needs (e.g., Kiwifruit and European pears).