Harvesting and Handling of Grapes

Production

Maturity

Table Grape Maturity

Harvest Preparation

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

Trimming

Transport to roadside

Packing

• Field Packing
• Shed Packing

Field packing
Arpaia - Table Grapes

Trimming & box filling

Palletizing & transport to cooler
0.2-1.5% water loss during picking and packing

Effect of sun exposure on grape temperature

Table grape stem condition after cooling delays (90°F/80% RH) + 6 days storage (32°F/80% RH)
Arpaia - Table Grapes

Shed packing

Placement of SO₂ pad

Table Grape Containers
- TKV (wood end)
- EPS Foam
- Returnable Plastic (RPC)
- Corrugated

Consumer Packaging
Table Grape Storage

- Pulp Temperature: -0.5 – 0°C
- Room Temperature: -1°C
- Relative Humidity = 95%
- Airflow: 20-40 cfm/ton during storage
- SO₂ fumigate weekly or use storage pads

Gray mold caused by *Botrytis cinerea*
Effect of temperature on decay development

Gray mold (caused by Botrytis cinerea) on Table Grapes

Modes of B. cinerea infection

1. Conidial infection of the style and ovules
2. Conidial infection of the stamens and/or petals
3. Fruit infection via the pedicel *
4. Conidial accumulation within the developing bunch
5. Conidial infection of fruit
6. Conidial accumulation on fruit and dispersal to insect or picking wounds

Goals of fumigation

- Initial fumigation to control surface infection
- Weekly fumigation to control spread of latent Botrytis infection (nesting)

Dosage Considerations

For SO₂ measured as ppm-hour

CT = average SO₂ concentration (ppm) x fumigation time (hours)

A CT of 100 ppm-hours kills both spores and mycelia of Botrytis cinera

SO₂ activity on Botrytis cinera mycelium
Initial Fumigation

- Prior Shed Packing
- After Packing
  - Injection into individual packages
  - During Forced Air Cooling (defrost afterwards)

Fumigation during cooling

- Efficient use of both cooling timing and SO₂ distribution throughout room
- Forced air ensure good penetration even to center boxes within pallet
- With good room design, should produce >80% penetration
- Measured as the room air CT product (conc x time)

Storage/Transit

- Room Fumigation (Passive)
  - Use higher air flows during initial fumigation
  - Good air circulation patterns necessary to insure good distribution
- Use of SO₂ pads – allows for slow release during storage or transit
  - Rate of gassing temperature dependent

Injection into individual package as compared to fumigation prior to packing

Berry bleaching from sulfur dioxide
High rates of SO₂ caused these early season ‘Thompson Seedless’ grapes to brown.

SO₂ expressed as c x t product in a one hour fumigation.
Grapes stored 10 days at room temperature before these pictures were taken.

**Damaged berries and SO₂ residues**

- SO₂ highly soluble in water
- Damaged berries will accumulate higher residues
- Good grading in field and during packing is very important
- Minimizing damage during handling

**SO₂ residues**

<table>
<thead>
<tr>
<th>Berry Damage</th>
<th>Thompson Seedless</th>
<th>Flame Seedless</th>
</tr>
</thead>
<tbody>
<tr>
<td>intact</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td>loose capstem</td>
<td>2.8</td>
<td>3.2</td>
</tr>
<tr>
<td>bruised</td>
<td>6.6</td>
<td>3.3</td>
</tr>
<tr>
<td>botrytis infected</td>
<td>10.8</td>
<td>17.9</td>
</tr>
<tr>
<td>split or crushed</td>
<td>23.6</td>
<td>16.5</td>
</tr>
</tbody>
</table>

**Monitoring SO₂ Concentration**

**Sulfur dioxide fumigation controls gray mold now—is an alternative needed?**

- Sulfur dioxide is not allowed on ‘organic’ grapes
- Sulfur dioxide can harm berry appearance and flavor
- Regulatory issues with transportation and storage, worker safety, residue limits in grapes, and its discharge to air

*Smilanick et al.*
Thanks for your attention

Thanks to J. Thompson, D. Luvisi, J. Smilanick for sharing parts of this presentation