Webinars

- Minimal costs
- Time
- Current topics
Fresh Produce Executive Forum

Webinar Series

- Jim Gorny, Trevor Suslow, initiated a Microbial Food Safety Series
  - Nov 20, 2008: Fresh Produce Microbial Pathogen Testing: Program Components & Considerations
  - Jan 12, 2009: Update on Irradiation

- Fresh-cut Products Series
  - Target retailers and food service operators
  - Critically examine shelf-life and quality
  - Convince the buyers

Produce Facts

- Harvest indices
- Quality indices
- Temperature and RH
- Freezing point/damage
- Respiration rates
- Ethylene production
- Effects of ethylene
- Effects of modified atmospheres
- Physiological disorders
- Postharvest diseases
- Mechanical injury
- PHOTOS

140

Fruits

Vegetables

Flowers
Postharvest Handling Challenges: Fresh-cut Veggie Tray

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http://postharvest.ucdavis.edu

Broccoli florets, Sugar snap peas, Celery sticks, Baby carrots, and Grape tomatoes
"Fresh-cut produce" is defined as any fresh fruit or vegetable or any combination thereof that has been physically altered from its original form, but remains in a fresh state. Regardless of commodity, it has been trimmed, peeled, washed and cut into 100% usable product that is subsequently bagged or prepackaged to offer consumers high nutrition, convenience and value while still maintaining freshness.

- Minimally Processed
- Lightly Processed
- Partially Processed
- Pre-prepared
- Fresh Processed
- Pre-cut
- Value-added
<table>
<thead>
<tr>
<th>Products</th>
<th>Potential post-cutting storage life at 2-5°C (36-41°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VEGETABLES</strong></td>
<td>Days</td>
</tr>
<tr>
<td>Baby carrots, peeled onions, peeled garlic</td>
<td>&gt;21</td>
</tr>
<tr>
<td>Lettuce salads, lettuce separated leaves, lettuce mixes, spinach leaves, peeled potatoes</td>
<td>14-18</td>
</tr>
<tr>
<td>Broccoli &amp; cauliflower florets, shredded cabbage, lettuce and broccoli, celery &amp; carrot sticks</td>
<td>10-14</td>
</tr>
<tr>
<td>Pepper and tomato dices, cucumber slices, squash slices, mushroom slices, jicama sticks</td>
<td>4-9</td>
</tr>
<tr>
<td><strong>FRUITS</strong></td>
<td></td>
</tr>
<tr>
<td>Apple wedges, pineapple chunks, pomegranate arils, kiwi slices</td>
<td>10-14</td>
</tr>
<tr>
<td>Strawberry slices, melon &amp; mango cubes, citrus segments, peach &amp; pear wedges, grape berries</td>
<td>2-9</td>
</tr>
</tbody>
</table>
Vegetable trays
- want 18 day shelf-life

Products in tray and compatibility issues
- raw material sourcing and handling before prepare
- shelf-life of individual products in tray varies
  - temperature; 5°C too low for grape tomatoes
  - modified atmospheres—not good for all products in tray

Postharvest compatibility
- ✓ Temperature
- ✓ Relative humidity
- ✓ Ethylene
- ✓ Odors

Postharvest compatibility Fresh-cut
- ✓ Temperature
- ✓ Modified Atmospheres
Vegetable Party Trays

A. Quality Evaluations
DAYS 0, 6, 9, 12, 15, 18, 21
• Overall Visual Quality (9-1)
• Discoloration (scored 1-5)
• Decay/Mold (Scored 1-5)
• Aroma typical (5 to 1)
• Off Odor (Scored 1-5)
• Off Flavor (Scored 1-5)

B. Composition
DAYS 0, 6, 12, 18
• Sugar (mg/g FW; spectrophotometry; all vegetables)
• Vitamin C (mg/100g FW; HPLC tomato, broccoli, carrot)
• Ammonia (µg/g FW; HPLC broccoli, snap peas)
• Acetaldehyde (nL/g FW; GC, all vegetables)
• Ethanol (nL/g FW; GC, all vegetables)

C. Color data (Test 2)
DAYS 0, 6, 12, 18
• L*a*b* color values, chroma, hue

D. Respiration rates
Atmospheres at 5°C
A = 3%O₂ + 7%CO₂
B = 3%O₂ + 12%CO₂
C = 3%O₂ + 18%CO₂
D = 10%O₂ + 12%CO₂
E = Air (21% O₂)
Grape tomatoes & postharvest handing

- High flavor quality, high market demand
- Common component of vegetable trays
- Susceptible to water loss
- Temperature recommendations?
  - ‘Produce Facts’: Not below 10°C
  - Reality 5°C for 3 weeks
18 days at 5°C (41°F)

Good quality, near ripe grape tomatoes will tolerate 5°C for about 18 days
Grape tomatoes show typical chilling symptoms when transferred

Initial + 5d 20°C

20d 5°C + 5d 20°C

Cantwell and Ara, 2006
Grape Tomato Quality Changes
Test#1 and #2

Raw material quality is key

- Considerable variability in ripeness and quality
- Main defects are increased dehydration (sunken areas, shrivel) and decay
- Not much difference in quality changes among the 5 atmospheres
- By 15 days, slight changes in aroma, off-odor and off-flavors

Variations in ripeness and condition when received
Vegetable Party Trays

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D. Respiration rates

Atmospheres at 5°C
A = 3%O2 + 7%CO2
B= 3%O2 + 12%CO2
C= 3%O2 + 18%CO2
D= 10%O2 +12%CO2
E = Air (21% O2)
18 days at 5°C (41°F)

A  B  C  D  E
3+7 3+12 3+18 10+12 Air

BENEFICIAL
18 days at 5°C (41°F)

A  3+7  
B  3+12 
C  3+18 
D  10+12 
E  Air 

DAMAGING
Conclusions

- **Reduce shelf-life expectations**
  - Products incompatible
  - 18D too long; 12D maximum

- **Raw material quality critical**
  - Sourcing tomatoes and peas most problematic
  - Grape tomatoes too variable in maturity and quality
  - Sugar snap peas too variable in quality and condition
  - Minimize storage before preparing vegetable tray

- **Compromise atmosphere-tolerable atmospheres**
  - 3%O2 +7%CO2 or 10%O2 +12%CO2
  - Broccoli and celery benefited
  - Grape tomatoes and carrots tolerant
  - Sugar peas slightly damaged