The North Carolina Apple Industry

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Major Peach Producing Areas

Major Apple Producing Areas

NORTH CAROLINA CENTER FOR GEOGRAPHIC INFORMATION & ANALYSIS

August 1997
The North Carolina Apple Industry

- Approximately 8,000 acres, $20 million farm gate value
- Marketed through retail, local and regional wholesale markets, and Farmer’s Markets in addition to a significant processing industry
- Major Varieties:
  - Rome
  - Golden Delicious
  - Gala
  - Red Delicious
  - Fuji
  - Pink Lady
  - Granny Smith
The North Carolina Apple Industry (cont.)

- Average tree density is 136 trees/acre
- Most prominent rootstocks being planted:
  - M.7
  - M.26
  - M.9 size
  - MM.111 or 106
BARBER ORCHARD
A PRIVATE RESIDENTIAL COMMUNITY
Allan Henderson, Grower, Packer, Broker and Processor of Fresh Slices
Things You Would Never Hear a Southerner Say

- Duct tape won't fix that.
- We don't keep firearms in this house.
- Honey, did you mail that donation to Greenpeace?
- We're vegetarians.
- Give me the small bag of pork rinds.
- Deer heads detract from the decor.
- I believe you cooked those green beans too long.
SmartFresh Facilities for Retail Apple Markets

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What is SmartFresh™

- MCP – 1- methylcyclopropene
- Very close chemistry to ethylene
- Attaches to the sites where ethylene normally binds, making the fruit insensitive to ethylene
1-MCP Research
Conducted in the late 1980’s- early 1990’s
History of SmartFresh™

1993 – Patent filed by NCSU for MCP
1996 – Patent Issued
1999 – Floral registration approved
1999 – Rohm and Haas acquired patent rights to MCP
1999 – AgroFresh was formed to “develop and commercialize” MCP
2002 – SmartFresh™ approved for edible crops
What SmartFresh™ Does for Apples

- Helps maintain fruit flesh firmness
- Slows acidity decrease
- Eliminates scald
- Reduces greasiness
How are Apples Treated With SmartFresh™?

- Apples must be treated within 3-7 days of harvest
- Treatment period is 24 hours then apples returned to cold storage
- Room that apples are treated in must be airtight
- Treatment concentration is 1 ppm
  - 30 seconds in one year
  - 1 bad apple in 2,000 barrels (100 qt.- 2.5 bu)
  - 1 cent in $10,000
- Leaves no detectable residue
### GINGER GOLD

<table>
<thead>
<tr>
<th>Starch Index</th>
<th>Target Mean Firmness (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale 1-6</td>
<td>Scale 1-8</td>
</tr>
<tr>
<td>2.0 - 3.5</td>
<td>1.5 - 3.0</td>
</tr>
<tr>
<td></td>
<td>(Standard Deviation)</td>
</tr>
<tr>
<td></td>
<td>17.0 (1.45)</td>
</tr>
</tbody>
</table>

**Handling**

SmartFresh™ technology application prior to the start of color change may delay green color loss.

See notes on "Apple Management Practices"

### GALA

<table>
<thead>
<tr>
<th>Starch Index</th>
<th>Target Mean Firmness (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale 1-6</td>
<td>Scale 1-8</td>
</tr>
<tr>
<td>2.5 - 4.5</td>
<td>3.0 - 6.0</td>
</tr>
<tr>
<td></td>
<td>(Standard Deviation)</td>
</tr>
<tr>
<td></td>
<td>16.0 (1.45)</td>
</tr>
</tbody>
</table>

**Maximum harvest to application interval (days)**

7

### ROME

<table>
<thead>
<tr>
<th>Starch Index</th>
<th>Target Mean Firmness (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale 1-8</td>
<td>(Standard Deviation)</td>
</tr>
<tr>
<td>2.5 - 6.0</td>
<td>19.0 (1.7)</td>
</tr>
</tbody>
</table>

**Maximum harvest to application interval (days)**

7
Red Delicious

Flesh Firmness (lbs)

Days After Treatment

Without MCP
With MCP
With Ethrel
With Ethrel and MCP
Romes

Flesh Firmness (lbs) vs. Days After Treatment

- Red line: Without MCP
- Yellow line: With MCP

Days After Treatment:
- 0
- 30
- 60

Flesh Firmness (lbs):
- 0
- 5
- 10
- 15
- 20

Note:
- * indicates significant difference
Harvest Maturity

40 days after harvest with 7 days at room temperature

<table>
<thead>
<tr>
<th></th>
<th>H1</th>
<th>H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flesh Firmness (lbs)</td>
<td>18.3</td>
<td>18.8</td>
</tr>
<tr>
<td>Starch Index (1-8)</td>
<td>3.9</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Days After Harvest that Treatment was Applied
Harvest Maturity

Flesh Firmness (lbs)
- H1: 15.8
- H2: 14.6
- H3: 14.0

Starch Index (1-8)
- H1: 2.8
- H2: 4.5
- H3: 6.0

40 days after harvest with 7 days at room temperature
Harvest Maturity

Flesh Firmness (lbs)  H1  H2
20.0  18.5

Starch Index (1-8)  4.0  5.3

40 days after harvest with 7 days at room temperature
1. Ensure that you have the correct number of SmartFresh SmartTabs for the treatment.

2. Fill the space or room where the application will be made with the fruits or vegetables to be treated.

3. Open the SmartFresh Activator Kit. Leave the container with the Activator Solution inside the foam block. Remove the cap from the container.

Confirm that the container has a small hole to allow SmartFresh technology to be released into the treatment space.

4. Always place the TWO BLUE ACTIVATOR TABLETS in the inverted container cap.

5. Add the correct number of SmartFresh SmartTabs into the inverted container cap (as per the label requirement).

6. Peel open the foil seal on the Activator Solution container.

7. Place all the tablets into the container with the Activator Solution.

Place the cap back on the container.

8. Place the foam block with the container on a stable, level surface inside the container or room to be treated.

9. Close the treatment room doors tightly and ensure that they remain closed during the entire treatment period.

IMPORTANT: Before adding the tablets to the liquid, make sure you are ready to complete steps 7, 8 and 9 quickly, since the product will start to release in 5 minutes.

DO NOT OPEN THE DOORS BEFORE THE APPLICATION HAS FINISHED.
Price of 10 SmartFresh SmartTabs is $320. Will treat up to 25 bins of apples (approx. $0.72/bu)
PVC Pipe and a Pallet Cover

6 - 10 ft 1” pipe
8 -3 way fittings

Cost: $33.30 plus a pallet cover
2010 SmartFresh Grower Trials

- Growers were provided a 2 bin sampling chamber and SmartFresh Tabs for 10 runs
- Worked with 3 growers
- Growers harvested fruit at their own determined harvest date
- Fruit samples were collected before and after treatment
- Fruit were stored at room temperature after treatment for 30 days before measuring maturity parameters
<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Untreated After 30 days (lbs)</th>
<th>Treated After 30 Days (lbs)</th>
<th>Treatment Difference (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ginger Gold</td>
<td>9.9 b</td>
<td>17.5 a</td>
<td>7.6</td>
</tr>
<tr>
<td>Gala</td>
<td>8.4 b/9.1 b</td>
<td>12.3 a/15.2 a</td>
<td>3.9/6.1</td>
</tr>
<tr>
<td>HoneyCrisp</td>
<td>15.3</td>
<td>15.2</td>
<td>-</td>
</tr>
<tr>
<td>Jonagold</td>
<td>9.0 b</td>
<td>15.8 a</td>
<td>6.8</td>
</tr>
<tr>
<td>Red Delicious</td>
<td>7.4 b</td>
<td>13.4 a</td>
<td>6.0</td>
</tr>
<tr>
<td>Golden Delicious</td>
<td>11.5 b</td>
<td>16.1 b</td>
<td>6.6</td>
</tr>
<tr>
<td>Mutsu</td>
<td>9.7 b</td>
<td>15.2 a</td>
<td>5.5</td>
</tr>
<tr>
<td>Stayman</td>
<td>8.7 b</td>
<td>13.0 a</td>
<td>4.3</td>
</tr>
<tr>
<td>Rome</td>
<td>12.1 b</td>
<td>15.3 a</td>
<td>3.2</td>
</tr>
</tbody>
</table>
SmartFresh Conclusions

- SmartFresh can be an effective postharvest management tool
- SmartFresh will maintain apple firmness and flavor for a longer period of time.
- SmartFresh is strongly encouraged on some cultivars when:
  - Apples will be held for more than 30-40 days
  - Storage temperatures may be less than ideal
- Can improvise for a facility to treat apples
- Apples should be treated as soon after harvest as possible, and preferably within 3 days
- Effectiveness varies with variety, and in the SE possibly year to year variation on some varieties
- SmartFresh does not correct harvest errors or substitute for proper orchard management