Apple Maturity Update: Summary of 2016 Harvest and Storage Trials

Christopher Walsh
Kathleen Hunt and Brianne Redman
University of Maryland
Tara Baugher and Norma Young
Penn State Extension
New Varieties and New Rootstocks: When Should We Pick?
‘Coordinated-Ripening’ Hypothesis: Ethylene Turns on Ripening Related Genes
Ground Color and Surface Color for Honeycrisp Maturity? Eyes and Hand Tools?
Delta A Meter (ΔA)

- Non-destructive estimate of fruit chlorophyll
- Chlorophyll content is a widely used index of fruit maturity of Honeycrisp
- ΔA values decrease as fruit matures (1.6 – 0.0)
- Data are not affected by peel anthocyanin

Delta Absorbance (DA)
Fruit maturity meter
Starch Pattern Index (SPI) to Estimate Harvest Windows

- Dark color indicates starch
- Widely used
- Destructive and time consuming
- Counter-intuitive
Which of these measurements is our best predictor of maturity and quality?
Maturity Assessments: Objectives 1 & 2

- To track developments in physiological maturity, we measured starch pattern, firmness, soluble solids, fruit size, red color and ground color changes in eight ‘new’ apple varieties.
- Fruit were harvested by Drs Walsh and Baugher and taken to College Park to measure apple maturity and quality.
- Summaries of observations and measured values were posted weekly in Fruit Times.

http://agsci.psu.edu/frec/growing-season-information/apple-maturity-assessments
Tall-spindle trees were picked in these studies
Weekly Apple Maturity Assessments
August 5 to November 4, 2016

- Premier Honeycrisp - PA (cv. Slaybaugh)
- Honeycrisp - PA and MD
- Brookfield Gala - MD
- Crimson Crisp - MD
- Daybreak Fuji (cv. Rankin) - MD
- Aztec Fuji and Nagafu Fuji - MD
- Cripps Pink (a.k.a. Pink Lady) - MD

http://agsci.psu.edu/frec/growing-season-information/apple-maturity-assessments
Postharvest Lab in College Park: Premier (Left) and Honeycrisp (Right)
Summary - Early Varieties

- As expected, Premier Honeycrisp matured 3 weeks before Honeycrisp.
- Brookfield Gala ripened very quickly; fruits went from immature to overripe in seven to ten days.
- Daybreak Fuji was harvested before CrimsonCrisp.
- CrimsonCrisp was quite firm, but not ‘crisp’. It was prone to watercore but valuable for direct-market growers.
CrimsonCrisp, Daybreak Fuji and Nagafu Fuji

September 20, 2016
Water Core in CrimsonCrisp – Early September
(PRI Selection: No Honeycrisp in Its Pedigree)
Summary – Late Varieties

- Daybreak Fuji (cv. Rankin) was tree-ripe on September 20, before CrimsonCrisp
- Fuji selections had considerable damage to the peel
- Aztec and Nagafu Fuji were edible in early October, but continued to tree ripen without dropping for four weeks
- Cripps Pink (Pink Lady) was mature in late-October, about a week earlier than seen in prior years
Daybreak Fuji (Top)
Aztec Fuji (Center)
Nagafu Fuji (Bottom)

September 20, 2016
Sunburn and Russet on Fuji was severe in 2016
Late Season Apples: Maturity Pattern of Fuji and Cripps Pink
Aztec, Nagafu and Cripps Pink Starch Test

2016 Week 10 Harvest Data
Cripps Pink Starch Test
2016 Week 14 Harvest Data
Honeycrisp Maturity (Objective 3) Effects on Bitter Pit and Soft Scald

Robert Prange, Nova Scotia reported a maturity ‘sweet spot’ for reducing disorders in stored Honeycrisp. Green fruit were more prone to Bitter Pit, while riper fruit were susceptible to Soft Scald. Using the Delta A meter we segregated fruit from three harvests, stored them for more than 120 days and then evaluated the fruit for quality and storage disorders.
Delta A Meter (ΔA) and Preconditioning Factorial for HoneyCrisp Storage Studies

Objective 3.

- Sort HoneyCrisp and Premier HoneyCrisp into four ΔA categories
- Pre-condition apples after sorting at 0, 2, and 4 days at 20°C
- Evaluate apples after four months storage in air at 4°C
- Compare the effects of maturity and preconditioning on bitter pit and soft scald
Premier Honeycrisp Ground Color Storage Trial (Mid-January Evaluation)

<table>
<thead>
<tr>
<th>Delta A</th>
<th>Firmness (lb)</th>
<th>Sweetness (SSC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75 to 1.0</td>
<td>14.9</td>
<td>14.0</td>
</tr>
<tr>
<td>0.50 to 0.74</td>
<td>13.4</td>
<td>13.7</td>
</tr>
<tr>
<td>0.25 to 0.49</td>
<td>13.4</td>
<td>13.7</td>
</tr>
<tr>
<td>= 0.0 to 0.24</td>
<td>11.9</td>
<td>11.7</td>
</tr>
</tbody>
</table>

High Delta A = green

Low Delta A = yellow
## Premier Honeycrisp Ground Color Storage Trial (Mid-January Evaluation)

<table>
<thead>
<tr>
<th>Delta A</th>
<th>Peel browning (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75 to 1.0</td>
<td>40</td>
</tr>
<tr>
<td>0.50 to 0.74</td>
<td>33</td>
</tr>
<tr>
<td>0.25 to 0.49</td>
<td>25</td>
</tr>
<tr>
<td>0.0 to 0.24</td>
<td>65</td>
</tr>
</tbody>
</table>

**High Delta A = green**

**Low Delta A = yellow**
Visible Bitter Pit in green Honeycrisp:
Little pitting was noted in our storage trials
Summary - Objective 3

- Delta A values measured on the shade side of the fruit were used to pre-sort fruit quickly, and non-destructively
- Preconditioning before storage did not improve Premier Honeycrisp quality
- Tree-ripe Premier did not store as well as fruit with Delta A greater than 0.25
- HoneyCrisp fruit in our study had little bitter pit and soft scald after storage
Acknowledgements:

- State Horticultural Association of Pennsylvania
- Pennsylvania Apple Marketing Program
- Rice Fruit Company, Gardners, PA
- Slaybaugh’s Orchard, Adams County, PA
- Adams County Extension Program
- Amelia Loeb and Justine Beaulieu, University of Maryland, College Park, MD
- Bryan Butler and Doug Price, WMREC, Keedysville, MD
Granny Smith and Cripps Pink - 2015