Harvesting Stonefruit

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Maturity

• Optimum harvest maturity corresponds to maximum taste and storage quality (adequate shelf life)
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“An apple is an excellent thing...until you have tried a peach.”

- George du Maurier (1834-1896)
Maturity

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Maturity

• Harvest maturity determines a fruit’s postharvest potential:
  – **Too early** = poor flavor potential, and greater susceptibility to physiological disorders, abrasion injury and water loss

arrow The fruit’s ability to ripen properly can be compromised

  – **Too late** = greater susceptibility to bruising and decay; possible off-flavor
Maturity Indices

• Size (minimum diameter)
  – Peaches may begin ripening before they reach full size
• Ground color development (green to yellow)
• Softening first occurs at the blossom end
• Location on tree: top and outside fruit normally mature first
• Also, internal color, soluble solids content (SSC), acidity and SSC/acidity ratio

http://www.prima.com
Best Maturity Indices for Harvesting

1. Ground color has been found to be the most reliable nondestructive maturity index and the most easily understood by pickers (Kao et al. 2012)
   - the best ground color at harvest varies by variety and intended market, so workers should be shown examples before harvest commences

2. For varieties with 100% red color, fruit firmness is the next best maturity criteria (Brovelli et al., 1998)
   - Workers must be trained to subjectively recognize the max-min firmness range desired
   - Objectively measured by a penetrometer with a 5/16” tip
Ground Color is used as a maturity/ripeness index for stone fruits.
Maturity and Ripeness Stages of Nectarines

1. Immature
2. Mature-green
3. Partially-ripe
4. Ripe
The most significant harvest maturity indices for some Florida nonmelting flesh (NMF) and melting flesh (MF) peach varieties based on sensory evaluation of ripe fruit (Brovelli, et al., 1998).

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<td>SSC:TA (0.80**)</td>
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<td>Ground color hue</td>
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</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>TA (-0.77*)</td>
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<td>pH (0.65**)</td>
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  - (0.80*)
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Melting Flesh vs Nonmelting Flesh

- Melting flesh varieties need to be harvested before ripening gets substantially underway because excessive softening limits their shelf life.
- Nonmelting flesh varieties can be harvested at a riper stage and still be firm enough to withstand handling:
  - = higher SSC (Brix, sugar) and lower acidity
  - = better color and more peach flavor
  - = less susceptibility to internal breakdown (chilling injury)
Melting Flesh vs Nonmelting Flesh

• Let’s say that 8 lbs is the minimum firmness/maximum maturity that can be run over your packingline without incurring bruising

➤ An 8-lb nonmelting flesh peach is a much riper fruit than an 8-lb melting flesh peach

• (Actual bruising thresholds actually vary substantially and therefore must be determined for each variety)
Best Maturity for Direct Market *versus* Refrigerated Handling

(Sherry Kao PhD dissertation research)

MF Cultivars

‘Flordaprince’

‘TropicBeauty’

NMF Cultivars

‘Gulfking’

‘UFSun’
• 100 Tagged marker fruit per variety were monitored in 2007 and 2008

• All fruit >2½ inch diameter were randomly harvested when 50%, 70%, and 90% of the marker fruit reached commercial harvest stage (based on ground color break)

• Collect a population of peaches with a broad range of maturity stages
Maturity Index – Ground Color

- Non-destructive
- Traditional
- Correlates with flesh firmness

(Dewiche and Baumgardner 1985; Long and Webb, 1973)
Sorted into “Maturity Groups” (MG) by Ground Color
Storage Conditions

- 7 days at 68°F
- 14 days at 32°F then 7 days at 68°F

Images of peaches under different storage conditions.
Potential Maturity Indices Measured

Non-Destructive:
- Ground color change (a*)
- Size (diameter or weight)

Destructive:
- Flesh firmness
- Soluble solids content (SSC)
- Titratable acidity (TA)
- SSC/TA
- Total sugar
- Flesh color change (a*)

Peel blush can obscure ground color

95%  20%

(Dewiche and Baumgardner 1985; Crisosto 1994)
Potential Maturity Indices Measured

Non-Destructive:
- Ground color change
- Size (diameter or weight)
- Peel blush or change
- Total sugar

Destructive:
- Flesh firmness
- Soluble solids content (SSC)
- Titratable acidity (TA)
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- Flesh color change (a*)

Potential Maturity Indices Measured

95%  20%

Peel blush or change may obscure ground color change
### Proposed Minimum Quality Criteria for Commercial Peaches

<table>
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<tr>
<th>Quality</th>
<th>Commercial Harvest Maturity</th>
<th>‘Ready-To-Eat’ Stage</th>
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<tbody>
<tr>
<td>Fresh Weight</td>
<td>≥ 90g</td>
<td></td>
</tr>
<tr>
<td>Diameter</td>
<td>≥ 2.25”</td>
<td></td>
</tr>
<tr>
<td>Flesh Firmness</td>
<td>MF - 9-10lbf F + S NMF - 6 lbf S - 3 lbf F</td>
<td>3 lbf</td>
</tr>
<tr>
<td>TA</td>
<td></td>
<td>≤ 0.8%</td>
</tr>
<tr>
<td>SSC</td>
<td></td>
<td>≥ 10%</td>
</tr>
<tr>
<td>SSC/TA</td>
<td></td>
<td>≥ 15</td>
</tr>
</tbody>
</table>

*F = Fresh Consumption  S = Storage/Shipping*

(Beckman and Krewer 1999; Malakou and Nanos 2005; Metheney et al., 2002; Rouse et al., 2004; Williamson and Sargent 1999)
Quality Indices

• High SSC is the most important attribute for high consumer acceptance

• Fruit acidity, SSC:acidity ratio and phenolic content are also important for consumer acceptance

• Fruit below 6-8 lbf are more acceptable to consumers than firmer fruit

(from Crisosto, Mitcham & Kader, “Nectarine & Peach: Recommendations for Maintaining Postharvest Quality” http://postharvest.ucdavis.edu/PFfruits/NectarinePeach/)
Ground color doesn’t relate to SSC

'Gulfking' 08 - Initial Ground Color vs SSC Determined after 7 Days at 20C for 3 Harvests
## Optimum Harvest Maturities For All Cultivars

### Storage at 20 °C for 7 Days

<table>
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<tr>
<th>Cultivar</th>
<th>Year 2007</th>
<th>Year 2008</th>
<th>Common MG</th>
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<tr>
<td>MF ‘Flordaprince’</td>
<td>MG 5-10</td>
<td>MG &lt; 0 to 20</td>
<td>MG 5-10</td>
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<tr>
<td>MF ‘TropicBeauty’</td>
<td>MG 0 to 10</td>
<td>MG 5-20</td>
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<td>MG 0 to 15</td>
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*NMF – Harvest at more advanced stages than MF*

### Storage at 0 °C for 14 Days + 20 °C for 7 Days

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<td>MF ‘Flordaprince’</td>
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*Low Temp Storage - Harvest at less mature stages*

*(Numbers indicate ground color: negative numbers are green; positive numbers are more yellow)*
Peach Harvesting Practices

• Hand harvest (ladders)
  – maturity selection
  – avoidance of defective fruit
  – avoidance of injuries

• Picked into buckets or bags (usually collected into field bins unless tree ripe)

• Multiple pickings of fruit within a fairly narrow maturity range
Harvest Quality Control

• Train workers to recognize maturity criteria
• Incorporate grading (avoidance/removal of defective fruit) into the harvest operation
  – difficult when pickers are paid by quantity picked
• Supervision is critical
Harvest Quality Control

• Train workers to minimize fruit injury
  – gentle fruit removal from the tree
  – no dropping fruit into buckets and bags
  – avoid overfilling buckets, bags and bins
  – avoid bumping picking bags against limbs and ladders, etc.
  – carefully transfer fruit into bins (pour, don’t drop)

• Supervision is critical
Harvest Quality Control
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• Equipment maintenance
  – Harvesting buckets and bags: regular cleaning; repair or replace sharp edges
  – Field bins: routed edges and smooth inside surfaces (plastic liners reduce vibration damage during transport to packinghouse)

• Sanitation & worker hygiene
  – No drops collected
  – No hands on ladder rungs (avoid soil transfer)
Thank you for your attention!

Questions?
Additional Resources

• “Southeastern Peach Growers Handbook”
  (http://www.ent.uga.edu/peach/peachhbk/toc.htm)
  – contains chapters on “Harvesting and Handling Peaches” and “Postharvest Decay.”

• “How to Determine Peach Ripeness” – video by Dr. Desmond Layne, Clemson University
  (http://www.youtube.com/watch?v=l5aU7QqBBgw&feature=related)