

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
 - ➔ 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



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

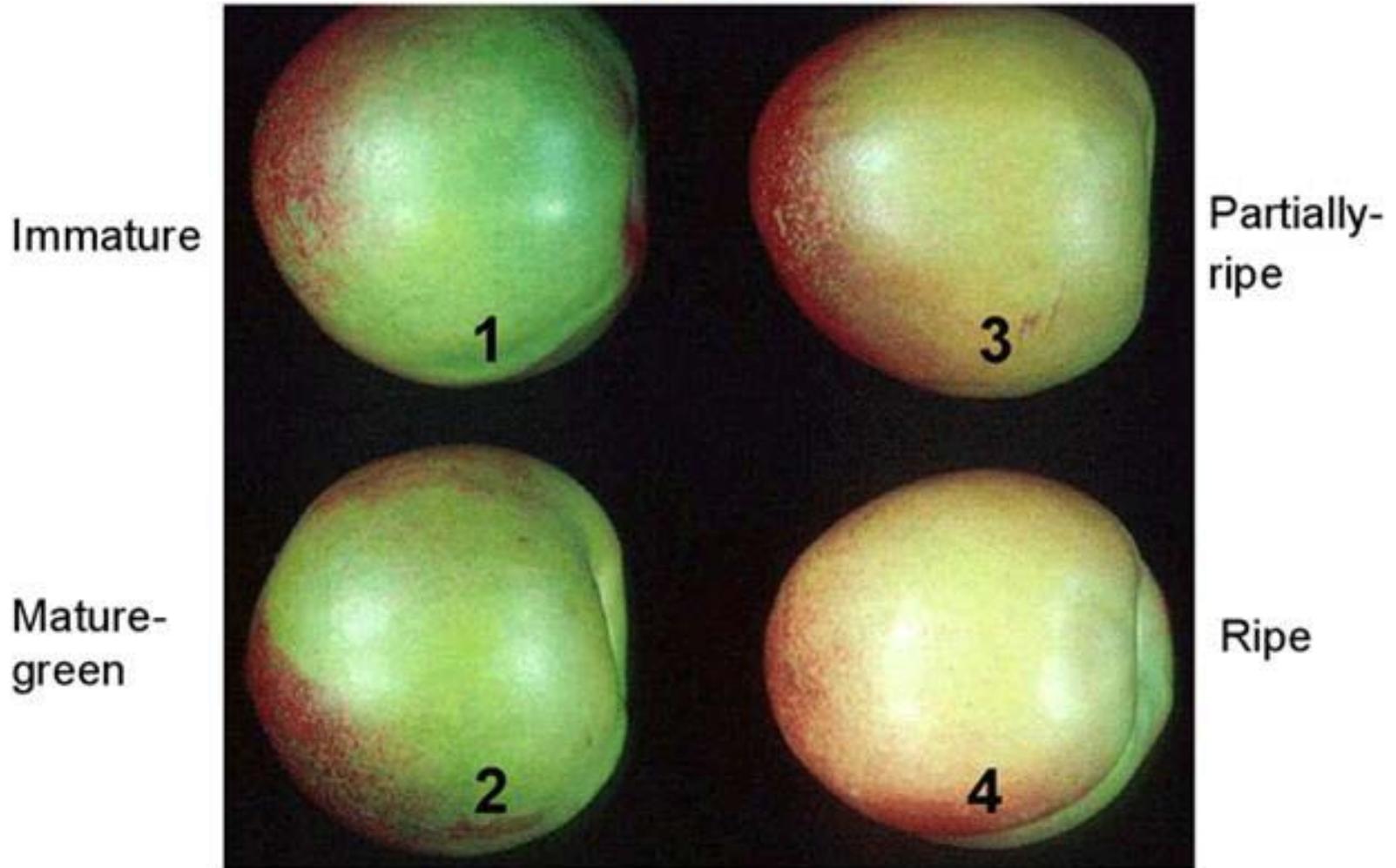


*Ground Color is used
as a maturity/ripeness
index for stone fruits*



Carlos Crisosto, UC Davis

Maturity and Ripeness Stages of Nectarines



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).

Oro A (NMF)	FL 90-20 (MF)	FL 86-28C (NMF)	TropicBeauty (MF)
Cheek firmness (-0.85**)	Ground color hue (-0.88**)	Blossom end firmness (-0.91**)	
Blossom end firmness (-0.82**)	Ground color Lightness (-0.88**)	Cheek hue (-0.90**)	Cheek firmness (-0.83**)
Cheek chroma (-0.82**)	Cheek firmness (-0.81**)	Cheek firmness (-0.90**)	Blossom end firmness (-0.79**)
SSC:TA (0.80**)	Blossom end firmness (-0.75**)	Blossom end hue (-0.87**)	Ground color hue (-0.70**)
TA (-0.77*)		Ethylene production (0.80*)	pH (0.65**)

* and ** indicate significance at the 5% and 1% levels, respectively.

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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'



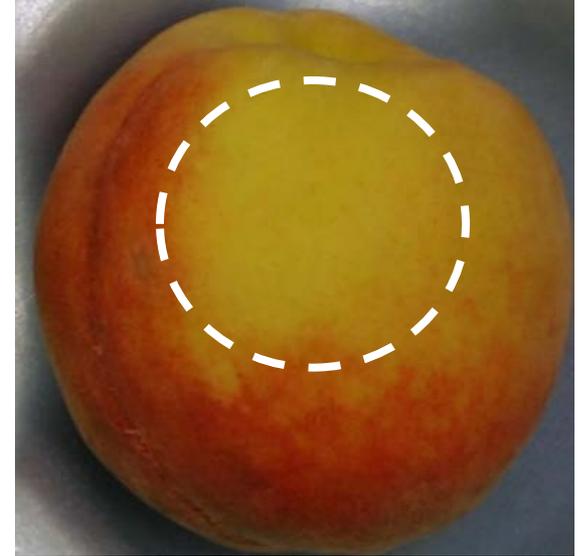
'UFSun'

- 100 Tagged marker fruit per variety were monitored in 2007 and 2008
- All fruit $>2\frac{1}{2}$ 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**



Potential Maturity Indices Measured

Non-Destructive:

- Ground color change (a^*)
- Size (diameter or weight)



95%



20%

Peel blush can obscure
ground color

Destructive:

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

Potential Maturity Indices Measured

Non-Destructive

- Ground color
- Size (diameter)



95%

Peel blush of
ground



- Firmness
- Solids content
- Acidity (TA)
- Color change (a^*)

Proposed Minimum Quality Criteria for Commercial Peaches

Quality	Commercial Harvest Maturity	'Ready-To-Eat' Stage
Fresh Weight	≥ 90g	
Diameter	≥ 2.25"	
Flesh Firmness	MF - 9-10lbf F + S NMF - 6 lbf S - 3 lbf F	3 lbf
TA		≤ 0.8%
SSC		≥ 10%
SSC/TA		≥ 15

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)

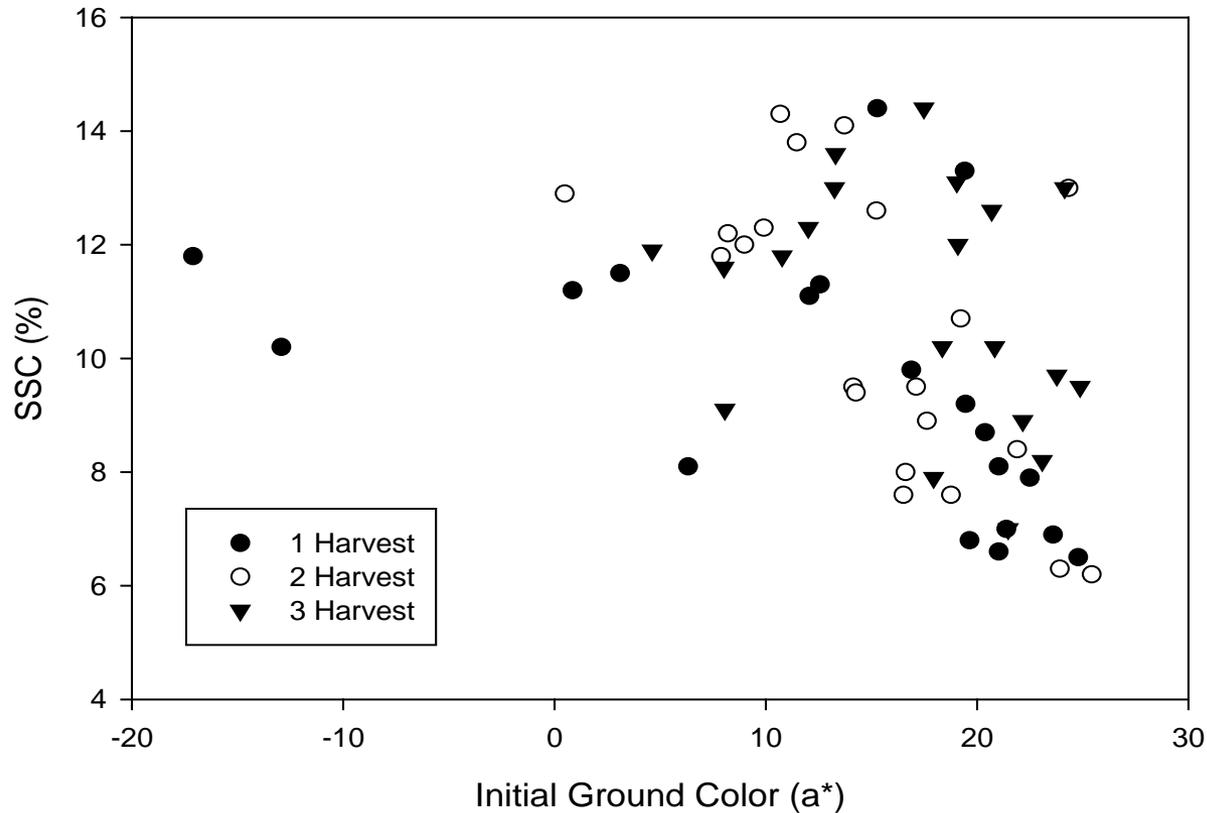
Quality Indices

- 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

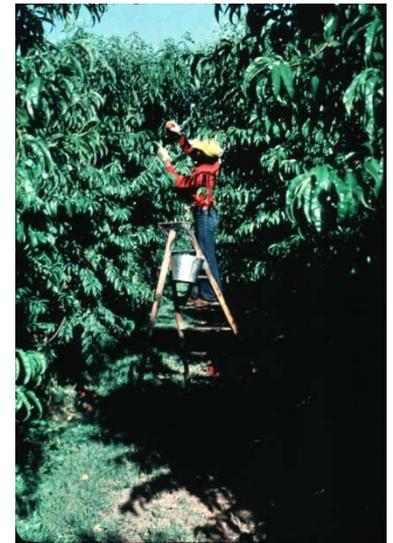
Storage at 20 °C for 7 Days			
Cultivar	Year 2007	Year 2008	Common MG
MF 'Flordaprince'	MG 5-10	MG < 0 to 20	MG 5-10
MF 'TropicBeauty'	MG 0 to 10	MG 5-20	MG 5-10
NMF 'UFSun'	NMF – Harvest at more advanced stages than MF		MG 15-20
NMF 'Gulfking'			MG 15-25

Storage at 0 °C for 14 Days + 20 °C for 7 Dats			
Cultivar	Year 2007	Year 2008	Common MG
MF 'Flordaprince'	MG -5 to 10	MG < 0 to 10	MG 0-10
MF 'TropicBeauty'	MG 0 to 10	MG < 0 to 10	MG 0-10
NMF 'UFSun'	MG 10-20	MG < 0 to 10	MG 10-15
NMF 'Gulfking'	MG 0 to 15	MG < 0 to 10	MG 0-10

*(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



Harvest Quality Control



Harvest Quality Control

- 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=I5aU7QqBBgw&feature=related>)