Peach Postharvest Management and Consumer Satisfaction

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Increasing Consumption of Specialty Crops by Enhancing their Quality & Safety

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Goals of the Project

• Help producers remove postharvest handling impediments that keep consistently great tasting fruits and vegetables from being marketed

• Consumers increase consumption of fruits and vegetables
  – increased sales
  – increased economic viability of produce industry
  – improved consumer health
Project Coordination

• Two project directors (California & Florida)
• Six objectives
• Each objective had one team leader from the University of California and one from the University of Florida
• Some PIs worked on multiple objectives
• Monthly team leader meetings
• Monthly objective teleconferences (some objectives)
Fruits Studied

- Blueberries and strawberries
- Melons (mainly muskmelons)
- Pears
- Tomatoes
- Peaches
Consumer Behavior and Attitudes

• How does flavor, as affected by harvest and postharvest practices, influence consumer behavior and attitudes regarding fruit consumption?
Consumers purchasing frequency of peaches.

- **Weekly:** 11.1%
- **2-3 times per month:** 43.5%
- **A few times a year:** 23.3%
- **I do not buy peaches at the supermarket:** 13.9%
- **I do not buy peaches at all:** 8.2%
Percent of the combined rankings of the reasons why consumers purchase peaches.
Percent of the combined rankings for consumers’ three highest priorities when selecting peaches to purchase.
Percent of the combined rankings for consumers’ three highest preferences for peach attributes.

**Most Important Attributes in Peaches**

- **The right aroma**: Combined Rankings (%) = 16.0
- **Tangy**: Combined Rankings (%) = 2.0
- **Crispy or crunchy**: Combined Rankings (%) = 3.0
- **Juicy**: Combined Rankings (%) = 27.0
- **Sweet**: Combined Rankings (%) = 30.0
- **Firm**: Combined Rankings (%) = 6.0
- **Soft**: Combined Rankings (%) = 5.0
- **The right color**: Combined Rankings (%) = 4.0
Percent of the combined rankings for consumers’ three most common reasons for dissatisfaction with peaches.
Percent of the combined rankings for consumers’ two most important attributes to improve in peaches.
Consumers answered the question “has the amount of fresh peaches you buy changed in the last few years”.

- About the same, no change: 66.2%
- I buy more now: 21.2%
- I buy less now: 12.6%
How much more, per pound, consumers would be willing to pay for reliably better tasting peaches.

- 31.0% would pay $0.25 more
- 21.7% would pay $0.50 more
- 31.5% would pay $0.75 more
- 10.0% would pay $1.00 more
- 5.7% would not pay any more
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 Ground color hue Blossom end
(-0.85**) (-0.88**) firmness (-0.91**)

Blossom end Ground color Cheek hue Cheek firmness
(-0.82**) Lightness (-0.88**) (-0.90**) (-0.83**)

Cheek chroma Cheek firmness Cheek firmness Blossom end
(-0.82**) (-0.81**) (-0.90**) firmness (-0.79**)

SSC:TA (0.80**) Blossom end Blossom end hue Ground color hue
(-0.75**) (-0.87**) (-0.70**)

TA (-0.77*) Ethylene pH (0.65**)

* and ** indicate significance at the 5% and 1% levels, respectively.
Optimum harvest maturity corresponds to maximum taste and storage quality (adequate shelf life)
Harvest 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 ability of the fruit to ripen properly can be compromised
  - More susceptible to chilling injury (internal breakdown)
  – **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 all change

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

**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
Best Maturity Indices for Harvesting

For varieties with 100% red color, fruit **firmness** is the next best maturity criteria (Brovelli et al., 1998)

- Firmness at harvest is very well correlated with consumer satisfaction after storage/shipping
- Of course, SSC must be acceptable

http://msue.anr.msu.edu/news/monitoring_peach_and_nectarine_ripening
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/)
Results for a local Peach calibration done at UC Davis

Non-destructive measurement on whole fruit.

NIRVANA brand optical instrument (purchased and will be released this year by Felix Instruments)
Bruising

• Avoiding bruising is extremely important to both consumers and receivers
• How to harvest & handle riper peaches without increasing bruising?
  – Grow firmer varieties that resist bruising
  – New packaging concept for tree-ripe fruit
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 packing line and shipped 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)
Melting Flesh and Nonmelting Flesh Peaches Have Different Softening Patterns
Technological Approaches for Delivering Riper Fruit

• Develop and test improved supply chain capabilities to deliver fruit with enhanced eating quality characteristics based on consumer sensory preferences.
Hammock Pack Shipping System

Clamshell package or corrugated master container

Suspended tray
Can We Deliver Ripening Fruit to Consumers?

Volume-pack (left)  Hammock pack (right)

On Arrival: Sacramento, CA to Atlanta, GA
Commercial Pear Hammock Pack Progress Diagram

Packing in Sacramento, CA

Monitoring samples during ripening progress

Cooling down with rest of production

Road transportation

Consumer Demonstration in Waycross, GA

Selling Hammock Pack Pears in Waycross, GA

Monitoring samples during shipment to Atlanta, GA
# Cost Comparison

## 44 lb. Tightfill Corrugated Boxes

<table>
<thead>
<tr>
<th>Product Cost</th>
<th>Transportation Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case</strong></td>
<td><strong>Weekly</strong></td>
</tr>
<tr>
<td><strong>Pack</strong></td>
<td><strong>Unit</strong></td>
</tr>
<tr>
<td>90 fruit/case</td>
<td>717</td>
</tr>
</tbody>
</table>

## 25 lb. Hammock Pack RPC's 2-Layer

<table>
<thead>
<tr>
<th>Product Cost</th>
<th>Transportation Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case</strong></td>
<td><strong>Weekly</strong></td>
</tr>
<tr>
<td><strong>Pack</strong></td>
<td><strong>Unit</strong></td>
</tr>
<tr>
<td>48 fruit/case</td>
<td>1,344</td>
</tr>
</tbody>
</table>

**Weekly**

**Volume**

**In LBS**

- 64,500

**Annual**

**Volume**

**In LBS**

- 3,354,000

Courtesy of The Kroger Company
# Bartlett Pear Sales Impacts

## Table of Bartlett Pear Sales Impacts

<table>
<thead>
<tr>
<th>Location</th>
<th>Current Retail Dollars</th>
<th>Previous Retail Dollars</th>
<th>Change %</th>
<th>Scanned Movement %</th>
<th>Gross Margin %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savannah (418)</td>
<td>$2,294</td>
<td>$1,684</td>
<td>36.2%</td>
<td>4.8%</td>
<td>39.6%</td>
</tr>
<tr>
<td>Waycross (439)</td>
<td>$1,347</td>
<td>$787</td>
<td>71.2%</td>
<td>1.6%</td>
<td>107.7%</td>
</tr>
<tr>
<td>Bluffton (499)</td>
<td>$4,517</td>
<td>$4,280</td>
<td>5.5%</td>
<td>-19.6%</td>
<td>-7.6%</td>
</tr>
<tr>
<td>Average</td>
<td>$2,719</td>
<td>$2,250</td>
<td>20.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Store (404)</td>
<td>$1,842</td>
<td>$1,823</td>
<td>1.0%</td>
<td>-16.8%</td>
<td>-17.6%</td>
</tr>
<tr>
<td>Control Store (957)</td>
<td>$1,042</td>
<td>$903</td>
<td>15.4%</td>
<td>-8.6%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Control Store (335)</td>
<td>$1,864</td>
<td>$2,626</td>
<td>-29.0%</td>
<td>-39.1%</td>
<td>-49.5%</td>
</tr>
<tr>
<td>Average</td>
<td>$1,583</td>
<td>$1,784</td>
<td>-11.3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bartlett Pears - All Divisions**

<table>
<thead>
<tr>
<th>Divisions</th>
<th>Retail Dollars</th>
<th>Change %</th>
<th>Scanned Movement %</th>
<th>Gross Margin %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$218,849</td>
<td>17.3%</td>
<td>-6.2%</td>
<td>10.8%</td>
</tr>
</tbody>
</table>

Courtesy of The Kroger Company
Thank you for your attention!

Questions?