Raw Material Quality & Integrity

Fresh Cut Products Workshop
September 13-15, 2011
Jeanna Kilmer
Food Safety Manager
Chiquita Brands/Fresh Express

Supply Chain - Seed to Shelf

Influencers of Raw Product Quality

Influenced by Raw Product Quality

What is Raw Product Quality?

- Well-defined & clear attributes – Is raw material in specification?
- Quantifiable -
- Clearly communicated & documented expectations

Why is Raw Product Quality so Important?

- Impact on Fresh-Cut shelf life, freshness & consistency
- Customer Expectations
- Consumer Satisfaction
- Brand Loyalty & Protection

Attribute Importance

Fresh >80%
Tastes great 80%
Healthy >75%
Great fresh taste >75%
Attribute A >75%
Attribute B >75%
Attribute C 75%
Attribute D >65%
Attribute E >55%
Attribute F >45%

100% Compliance = Freshness Guaranteed

Consumers want freshness every time!

Focus On Execution

Quality Impact

Consumer Impact

70 Identified Important Parameters
20 Highly Important Parameters
10 Critical Parameters
Operational Focus and Measurements Linked to Consumer Quality
FRESHNESS At Shelf
Raw Product Standards Equal Freshness

- Raw Product Compliance
- Atmospheric levels
- Cut to cool
- Time
- Moisture

Raw Product Quality Compliance

- Raw Product specification compliance is critical
- Address / quality issues early in the supply chain

What influences Raw Product Quality?

Growing

- Field/Growing conditions
  - Variety
  - Weather/Season
  - Plant Nutrition
  - Irrigation
  - Field spacing
- Watch-outs! -Seasonal Transitions
  - Leafy Greens – tipburn, epidermal peel, mildew, insect damage, seeders, bruising, etc.

Harvesting

- Harvest management
  - Minimize damage
  - Cutting Tools
  - Container size/shape/material/fill
- Cut to Cool time
- Specifications
- Watch-outs! Field Coring and MA

Transport

- Transportation
  - Field to Cooler
  - Time
  - Circulation is key
  - Cooler to Factory
  - Temperature/Air Flow
  - Time
  - Minimize physical damage

Time and Temperature

“Cut to Cool”

Age at Use

34° ~ 38°
Receipt at Fresh-Cut Processor

- How do you know the Raw Product Quality received is what you expected/purchased?
  - Inspection sampling plan
  - Don’t be afraid to ‘just say no’
  - Business & Customer needs – what to do if you need to ‘just say maybe’ – always assess risk and quality first

Raw Material Quality Evaluation

- Cut to Cool
- Age at use
- Specification
- Cold Chain Compliance

Quality Attributes

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>Variety</td>
</tr>
<tr>
<td>Season</td>
<td>Firmness</td>
</tr>
<tr>
<td>Firmness</td>
<td>Color</td>
</tr>
<tr>
<td>Brix</td>
<td>Physical damage</td>
</tr>
<tr>
<td>Titratable acidity</td>
<td></td>
</tr>
<tr>
<td>Physiological disorders</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>Flavor</td>
<td></td>
</tr>
</tbody>
</table>

Impact of raw product quality on fresh-cut fruit quality
Quality Defects (Mildew)

Downy Mildew - Grows in the underside of the leaf
- Favors moist ambient condition near dew point
- Rain
- Fog
- Cool days

Powdery Mildew - Thrives in warm, dry conditions

Quality Defects (Tipburn)

- Warm weather producing rapid growth
- High humidity/warm nights
- Fog
- High light intensity
- Insufficient water absorption

Lettuce Quality Defects

Fringe Burn
- Wind
- Sun burn
- Year round

Epidermal Peel
- Separation of the epidermis due to cold nights.

Harvest Selection Process - Maturity

Romaine – Days to Harvest
- Yuma – 100 days
- Huron Spring-110 days
- Salinas - 60 days (summer)
- Huron Fall – 60 days

“Optimum” Maturity vs. Younger Product

Optimum Maturity - Committed to Heart
- ~ 1 week from Optimum Maturity (Committed to Heart, still open)

Optimum Maturity vs. Younger Product

Harvested after heart was fully developed
Harvested before heart was fully developed
Optimum Maturity and Product Bruising Affects

Yellow product – bruising less noticeable
Very green product (younger) – bruising more noticeable

No heart = No different color tone = Higher bruising levels

Summary: How to achieve raw product quality

- Define your expectations - can drive specifications
- Know your supplier – routine inspections are key
- Monitor conditions during growing and through supply chain – use indicators to forecast
- Cold chain management
- Supply chain speed
- Trust...but verify
- Protect your ingredients
- Handle with care

Questions??

Jeanna Kilmer
Food Safety Manager
Chiquita Brands International
jkilmer@chiquita.com
831-262-1807