Consumer Sensory Testing of Greening Affected Products

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Introduction

- Greening (HLB) has obvious effects on citrus production, tree health and fruit morphology
- Few reports address how greening affects juice flavor
- There is an information gap regarding juice quality and greening disease
  - Need to understand what impact (if any) this disease has on juice quality
Background

- Some research reports suggest HLB-affected fruit can have the following flavor characteristics:
  - Metallic
  - Bitter
  - Sour
  - Off-flavor termed “vile”
  - Low orange intensity

- Consumer panels can be effectively used to measure juice acceptability and differences in acceptability
Objectives

- Measure basic quality parameters of juice from greening-affected fruit
- Assess the consumer acceptability of greening-affected fruit, asymptomatic fruit from greening-affected trees, and control fruit
- Relate the consumer acceptability to chemical changes
Materials and Methods

- Fruit were harvested at 6 different dates by a researcher with expertise in HLB
  - 3 dates each for Hamlin and Valencia
  - Control (-/-), greening-affected fruit (+/+), and asymptomatic fruit from greening-affected trees (-/+)
  - Fruit were stored cold no longer than 24 hr, juiced by benchtop processing, QC-analyzed, frozen (-20C) until sensory analysis
Control Fruit (--)
Asymptomatic Fruit (-+)

Asymptomatic Fruit (Asymptomatic Fruit (--+))
Greening-Affected Fruit (++)
Materials and Methods

- For each of the 6 harvest dates, consumer panels evaluated the 3 juice treatments
  - N=100
  - Overall acceptability, sweetness, flavor
  - 9-point hedonic scale (1=dislike extremely, 9=like extremely)
  - Data collected via Compusense
- Significance was determined within each harvest using AOV
Material and Methods - 2009

- Valencia only
- 2 Harvests
  - April, May
- Same 3 treatments (--, -+, ++)
- All treatments pasteurized and left unpasteurized (195 F, 12 seconds)
- Frozen until sensory analysis
  - Sensory same as previous
  - Each harvest evaluated separately
Results – Overall Acceptability
Results - Flavor

The diagram shows the results of flavor tests for different varieties of oranges, categorized into three groups: =, ++, and +-.

The vertical axis represents the flavor score ranging from 0 to 8, while the horizontal axis lists the varieties: Hamlin 1, Hamlin 2, Hamlin 3, Valencia 1, Valencia 2, and Valencia 3.

Each variety is represented with different colored bars, indicating the flavor score associated with each variety.

- Hamlin 1 and Hamlin 3 are marked with 'a' on the bars, indicating a high flavor score.
- Valencia 1, Valencia 2, and Valencia 3 are marked with 'b' and 'c', indicating lower flavor scores.

The diagram visually compares the flavor profiles of these orange varieties, highlighting which ones are preferred based on the flavor assessment.
Results - Sweetness
Results - Brix

![Bar chart showing results for Hamlin 1, Hamlin 2, Hamlin 3, Valencia 1, Valencia 2, and Valencia 3. The chart compares the values using bars in shades of blue, yellow, and green.]
Results - Acidity
Results – Brix:Acid Ratio

![Bar Chart](chart.png)

- **Hamlin 1**: --
- **Hamlin 2**: ++
- **Hamlin 3**: ++
- **Valencia 1**: ++
- **Valencia 2**: ++
- **Valencia 3**: ++
Results 2009 – Overall Acceptability
Results 2009 - Sweetness
### Results 2009 – Comments on ++ Juices

<table>
<thead>
<tr>
<th>Harvest</th>
<th>Past.</th>
<th>Total</th>
<th>Not Sweet Enough</th>
<th>Too Sour or Acidic</th>
<th>Not Enough Flavor</th>
<th>Bitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>NP</td>
<td>85</td>
<td>26%</td>
<td>41%</td>
<td>20%</td>
<td>18%</td>
</tr>
<tr>
<td>May</td>
<td>P</td>
<td>74</td>
<td>16%</td>
<td>45%</td>
<td>30%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Conclusions

- Symptomatic fruit (+/+): produces poorer quality juice
  - Unlikely to reach processing stream with normal grading and typical sizing equipment
- Juice from asymptomatic fruit (-/+): is not consistently different from control juice
- Further research using typical processing plant procedures is needed to verify that greening disease will not have a detrimental effect on juice quality
Future Work

- Larger-scale extraction and pasteurization of juice samples to determine the effect of further processing on quality
- Blending scenarios to determine “threshold” level of greening-affected fruit to influence juice acceptability
- Further descriptive analysis of greening flavor in conjunction with chemical analysis