Connecting the Dots: Raspberry Production Challenges

Miguel Ahumada, Sun Belle Inc.
Raspberry economics

- 2013 in Ventura
  - $187 million
  - #3 crop

- #3 berry in US per capita consumption

- Can be highly profitable
  - $20K–$60K typical profit per acre
  - Winter prices can be 3x more than summer
Challenges

- **High production cost**
  - $60K–$70K per 2-year crop cycle

- **Complex cropping system**
  - Multi-cycle production
  - Few varieties, adaptability issues
  - Fruit quality

- **Research and innovation still needed**
  - Trellising systems
  - Pest and Disease management
  - Fertigation, Substrate, Plastics/mulches

- **Mexico**
Mediterranean Climate

Cool Shoots – Warm Roots

Shoots 59°F – 68°F

Roots 75°F
Protected Culture

Wind
- Reduces plant growth and development
- Fruit damage: rubbing, abrasion, punctures

Rain/Humidity
- Increased fungus

Sun
- Sun burn, white drupelets
High Tunnel vs. Open Field

Higher productivity

Lower productivity
Yield: High Tunnel vs. Open Field

- **Field, Autumn Britten**
- **High Tunnel Autumn Britten**
- **Field Caroline**
- **High Tunnel Caroline**

Pounds/36 linear feet of row

Dates:
- 8/5/2009
- 8/15/2009
- 8/25/2009
- 9/4/2009
- 9/14/2009
- 9/24/2009
- 10/4/2009
- 10/14/2009
- 10/24/2009

Values:
- 8/5/2009: 0
- 8/15/2009: 0
- 8/25/2009: 0
- 9/4/2009: 40
- 9/14/2009: 58
- 9/24/2009: 99
- 10/4/2009: 106
- 10/14/2009: 0
- 10/24/2009: 0
Tunnel types

French Tunnel

Sidewalls and Doors
Rain shelters

Lower cost than tunnel  For windless areas
New Varieties

Public

- Diamond Jubilee – Berryworld Plus, UK
- Imara – Advanced Genetics, Netherlands
- Kwanza – Advanced Genetics, Netherlands
- Vintage – USDA ARS Oregon

Proprietary

- Adelita – Planasa
- Alicia – Driscoll’s
- Erika – Sun Belle (in Americas)

Others
Varieties

Adelita

Erika
## Leaf Height and Photosynthesis

<table>
<thead>
<tr>
<th>Leaf height aboveground (cm)²</th>
<th>Photosynthetic photon flux (µmol·m⁻²·s⁻¹)</th>
<th>Stomatal conductance (mmol·m⁻²·s⁻¹)</th>
<th>CO₂ assimilation (µmol·m⁻²·s⁻¹)</th>
<th>Leaf fluorescence (Fᵥ/Fₘ)</th>
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<tbody>
<tr>
<td>40</td>
<td>346.7 c</td>
<td>252.6 b</td>
<td>5.5 b</td>
<td>0.80 a</td>
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<td>857.5 a</td>
<td>329.7 a</td>
<td>5.3 b</td>
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<td>P</td>
<td>&lt;0.0001</td>
<td>0.0048</td>
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</table>

¹1 cm = 0.3937 inch.

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Carbon Dioxide Enrichment May Increase Yield of Field-grown Red Raspberry under High Tunnels

Mochizuki et al 2010
High Plant Density at 120 cm

Overcrowding in highly photosynthetic area
Plant Architecture & Flower Position

Sonsteby & Heide, 2009
Spur Blight

*Didymella applanata*  
Yield Loss
Botrytis

Flower abortion

Cane botrytis
Trellising Impacts Quality

- Fruit Quality
  - Size and Sugars
- Disease incidence
- Insect control
  - Spray penetration
- UV light damage
- Harvest Speed

- Yield
  - Fruit size
  - Fruit per laterals
  - Laterals per canes
  - Numbers of canes
Common Fruit Quality Issues

- Soft Fruit
- Rot
- Small Size
- Crumbly Fruit
- Overripe
- Insect damage
- White cells
“V” trellis variations

Narrow bed

Wide bed
“V” trellis variations

“T” posts V

Wide-bed
“V” trellis variations

Shift system pre bloom

Post bloom
New look to “V” trellis

Wide bed

More light
First and Second Harvest

1\textsuperscript{st} crop on primocane

2\textsuperscript{nd} crop on floricane
Alternative Treatments for 2nd crop

Cutback and Mow Down

Low Down and Cutback
Cutback height affects yield

Fig. 6
Flowering generally does not move fully to the base of the cane.

Carew et al. 2000
Cutback height affects yield

Percent yield

15%  1/4
40%  1/4
30%  1/4
15%  1/4
Fertigation

Predictability

Full control = max growth
Water use

- 3–5 acre foot per season
- 1 acre foot = 326,000 gallons
- 978,000 to 1,630,000 gallons
- Use evapotranspiration (ET) to monitoring plants use or other methods
- Education of irrigators
Soil Management: Cover Crops

- Add organic matter and N to soil
- Reduced pesticide and soil runoff in winter
- Reduced dust may reduce mites
- Reduced weeds

Cover crops may have many benefits
the end

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“We can not solve our problems with the same level of thinking that created them” — Albert Einstein

Questions?