Pitahaya Production & Research in Southern California

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Overview

• Background
• Pitahaya production worldwide
• Current research efforts at UC
• Field observations & results to date
• Production and Marketing
Why Pitahaylas?

• Great potential as a new, water efficient crop for Southern California
• Increasing demand for new, healthy and exotic fruits
  • Current demand exceeds supply, current prices are high (retail @ $3-8/pound)
• Makes great landscape plant – fruiting cactus, water efficient, very adaptable
Pitahaya Species

• Several species of Hylocereus identified, but there is uncertainty about proper identification

• Two commonly available in CA:
  – *Hylocereus undatus* (red skin, white flesh)
  – *Hylocereus sp.* (red skin, red flesh)

• *Selenecereus megalanthus* (yellow skin, white, translucent flesh)
  – Reclassified as *Hylocereus megalanthus*
Fruit Uses

- Consumed fresh, as a desert item
- Used for refreshments
- Red flesh used as colorant in processed food industry
- Used for decoration
- Great potential for value added products
Dragonfruit Production

Source: Bill Gerlach/Melissa’s Specialty Produce
U.S. Production

- US production is limited, but acreage is increasing rapidly
  - California (400 - 500 acres.)
  - Florida (500 - 600 Acres)
  - Hawaii (100 - 200 Acres)
- Mostly white fleshe varieties used for fresh consumption or for décor/garnish
- Market is turning red...
- Pink/Red fleshe varieties becoming more popular
Research Efforts to Date

- Evaluated materials for commercial production in California
- Developed post harvest management, information and strategies
- Initiated genetic characterization of pitahaya accessions using AFLP markers
- Confirmed presence of Cactus Virus X (CVX) and screened pitahaya accessions for the virus
- Conducted Sensory evaluation of selected varieties of Pitahaya
<table>
<thead>
<tr>
<th>Variety/Origin</th>
<th>Color</th>
<th>Cold Hardiness</th>
<th>Heat Tolerance</th>
<th>Avg. Wt. (grams)</th>
<th>Brix Score</th>
<th>Mkt Wt/Plant (grams)</th>
<th>Days to Harvest</th>
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<tbody>
<tr>
<td>1. Cebra (Nic.)</td>
<td>R/R</td>
<td>3.5</td>
<td>3.5</td>
<td>468</td>
<td>15.75</td>
<td>8746</td>
<td>46</td>
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<tr>
<td>2. Rosa (Nic.)</td>
<td>R/R</td>
<td>3.5</td>
<td>3.5</td>
<td>384</td>
<td>16.05</td>
<td>7217</td>
<td>45</td>
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<td>3. Orejona (Nic.)</td>
<td>R/R</td>
<td>3.25</td>
<td>3.75</td>
<td>438</td>
<td>15.78</td>
<td>4598</td>
<td>45</td>
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<td>4. Lisa (Nic.)</td>
<td>R/R</td>
<td>3.75</td>
<td>4</td>
<td>465</td>
<td>17.02</td>
<td>13319</td>
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<td>5. Sin Espinas (Nic.)</td>
<td>P/R</td>
<td>2.25</td>
<td>2.75</td>
<td>393</td>
<td>16.5</td>
<td>3527</td>
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<tr>
<td>6. San Ignacio (Nic.)</td>
<td>R/R</td>
<td>3.75</td>
<td>4</td>
<td>552</td>
<td>15.6</td>
<td>12712</td>
<td>48</td>
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<td>7. Mexicana (Mex.)</td>
<td>P/W</td>
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<td>3</td>
<td>495</td>
<td>14.04</td>
<td>9165</td>
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<td>8. Colombiana (SD-Col.)</td>
<td>Y/W</td>
<td>1</td>
<td>1</td>
<td>&lt; 200</td>
<td>20.90</td>
<td>0</td>
<td>150-180</td>
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<td>9. Valdivia Roja (Mex.)</td>
<td>R/R</td>
<td>5</td>
<td>4.5</td>
<td>250</td>
<td>17.9</td>
<td>8588</td>
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<td>10. Bien Hoa Red (SD)</td>
<td>GR/F</td>
<td>1.75</td>
<td>1.75</td>
<td>360</td>
<td>18.9</td>
<td>1477</td>
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<tr>
<td>11. Bien Hoa White (SD)</td>
<td>P/W</td>
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<td>2.5</td>
<td>388</td>
<td>11.85</td>
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<td>12. Delight (SD)</td>
<td>R/PW</td>
<td>3</td>
<td>3.5</td>
<td>371</td>
<td>18.08</td>
<td>14931</td>
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<td>13. American Beauty (FL)</td>
<td>GR/F</td>
<td>2.75</td>
<td>2.5</td>
<td>380</td>
<td>18.51</td>
<td>5566</td>
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<td>14. Haley’s Comet (FL)</td>
<td>R/F</td>
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<td>4.25</td>
<td>482</td>
<td>16.7</td>
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<td>15. Physical Graffiti (FL)</td>
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<td>374</td>
<td>17.93</td>
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<td>16. Vietnamese Giant (FL)</td>
<td>PR/W</td>
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<td>3.25</td>
<td>338</td>
<td>15.6</td>
<td>6511</td>
<td>41</td>
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<tr>
<td>17. Yellow Dragon (FL-Col.)</td>
<td>Y/W</td>
<td>1</td>
<td>1</td>
<td>&lt; 200</td>
<td>21.15</td>
<td>0</td>
<td>150-180</td>
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<tr>
<td>18. Seoul Kitchen (FL)</td>
<td>PR/W</td>
<td>4</td>
<td>4</td>
<td>518</td>
<td>12.18</td>
<td>15379</td>
<td>41</td>
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<td>19. Armando (Nic.)</td>
<td>R/R</td>
<td>4</td>
<td>4</td>
<td>390.5</td>
<td>16.11</td>
<td>4881</td>
<td>41</td>
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<td>20. El Grullo (Mex.)*</td>
<td>R/R</td>
<td>4.5*</td>
<td>4.5*</td>
<td>489*</td>
<td>18.11*</td>
<td>U/K</td>
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</tr>
</tbody>
</table>
Research Results

• Most varieties adapted well to growing conditions in Southern California
  – Valdivia Roja, El Grullo, Physical Graffiti, Haley’s Comet and Lisa most tolerant to heat and cold

• Most selections set fruit WITHOUT hand pollination
  – Physical Graffiti, Seoul Kitchen, Delight, Lisa and San Ignacio top producing varieties
Research Results (cont.)

• Most varieties in trial produce well WITHOUT shade, some would benefit from it.
• Fruit size & quality very good, good marketable yields
  – Except for Colombiana/Yellow Dragon, all varieties produced fruit with good market weight
  – Colombiana/Yellow Dragon, Bien Hoa Red/American Beauty, Delight, Physical Graffity, Valdivia & El Grullo* had the highest brix scores
Fruit Production/Plant

1. Cebra (Nic.)
2. Rosa (Nic.)
3. Orejona (Nic.)
4. Lisa (Nic.)
5. Sin Espinas (Nic.)
6. San Ignacio (Nic.)
7. Mexicana (Mex.)
8. Colombiana (SD-Col.)
9. Valdivia Roja (Mex.)
10. Bien Hoa Red (SD)
11. Bien Hoa White (SD)
12. Delight (SD)
13. American Beauty (FL)
14. Haley's Comet (FL)
15. Vietnamese Giant (FL)
16. Yellow Dragon (FL-Col.)
17. Seoul Kitchen (FL)
18. Armando (Nic.)
19. El Grullo (Mex.)*
20. El Grullo (Mex.)

*marked with an asterisk.
Ongoing/Future Research

- Variety evaluation in Ventura and Riverside Counties
- Assess Pitahaya irrigation requirements under two trellis systems
- Evaluate Pitahaya response under shade/protected environments
- Assess fertility requirements in Southern California
- Monitor and catalogue pests and disease incidence
Site selection

• In general, pitahayas grow well where Hass avocados grow
  • Frost free tropical/subtropical environment
  • Survive freezing temperatures for short periods
• They adapt to various types of soils as long as drainage is not an issue
• They like soils high in organic matter
Propagation

• Cuttings is most preferred propagation method for commercial plantings
  – use mature wood
  – 12 to 18 inch cuttings are ideal if rooting them before planting, longer cuttings preferred if direct planting
  – May fruit after one year post transplant

• Seed germinates readily
  – great potential for breeding program
  – Slow grower, may take up to 6 years to fruit

• Grafting is possible, but benefits not quite clear yet!
Spacing and density

- Plant spacing depends on production system and trellis used:
  - 6 by 10 feet spacing common with single post trellis
    (726 plant/acre)
  - 4 by 6 observed in California & reported in Spain
    (1800 plant/acre)
  - 2 by 10 and 3 by 8 seen on wire trellis in commercial plantings and our field trials
Trellising

- Pitahayas need trellis or support structures
- Different types used in producing areas
  - Anything that can support a plant can be used
  - Live tutors used in Central America
  - Concrete posts used in Southeast Asia
- Single post, wire or wood trellis systems used by commercial growers in the US
Irrigation

- Pitahayas can survive with minimal water but they require an adequate amount of water for successful fruit production
- Excessive watering in poorly drained soils can be disastrous
- Dry periods are needed to induce bloom, must cut back water applied in the Spring
Pruning

- Pruning will depend on trellis/support system, variety, location, and desired plant structure

- Three basic strategies or goals for pruning:
  - Training: usually prune to encourage upright growth during first year
  - Sanitation: removal of dead or diseased stems
  - Thinning: to improve air circulation and exposure to sunlight
Fertilization

- Fertilizer requirements of pitahaya are not well understood yet.

- According to local growers, pitahayas respond quite well to foliar fertilization.
Flowering/fruited

• Flowering usually starts in the Spring, in late April and can go until October
• It takes about 20-21 days from bud break to bloom, and about 40 days from bloom to harvest
• Flowers bloom at night and remain viable for one night only
• Synchrony in flowering critical for natural cross pollination
Pollination

• Night blooming cactus, large flowers, some with strong scent
• Pollinized by moths and bats in Central America; mostly bees in Southern CA.
• Hand and cross pollination improves fruit set and fruit size considerably
Pest/diseases

• **Gophers, squirrels, and rabbits** can feed on and kill plants and be a significant problem.
• **Birds feed on fruits** - reduce marketable yield
• **Cactus scale** is a problem in the greenhouse but not in the field
• **Ants, aphids and snails** can cause problems, damage young shoots and flower buds
• No major diseases/pathogens identified yet (disease-like symptoms usually physiological)
• **Weeds** can be a problem, increase production costs
• **Cactus virus X** isolated from samples
Harvest/handling

- Harvest & handling are critical to preserve fruit internal quality and external appeal
- Must pay attention to variety differences when picking & storing
- Fruit usually harvested too late in SoCal
- Fruit stored at 10-12 degrees C and 85-90 % HR has a shelf life of 2-3 weeks (Cantwell)
Packing/marketing

• Few handlers/packers available in SoCal, may have to pack your own
• Most buyers want fruit commercially packed in 6, 10, and 20 lb. boxes.
• Market preference for red/colored flesh varieties, over $ 1.00 more per pound
• Most imports from Vietnam, Nicaragua, Florida and California appear on Reports
• Quality, flavor, local...our selling points!
Thank you!

Questions?