



2013 Pitahaya Production Seminar & Field Day

**August 23, 2013
San Marcos, CA**



Pitahaya or Dragon Fruit Production in California: A Research Update

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Overview

- Background
- Pitahaya production worldwide
- Why pitahaya research?
- Current research efforts at UC
- Results to Date
- What next?

The Pitahaya

- Also known as Strawberry Pear, Dragon Fruit in South East Asia, Pitahaya in Mexico and Pitaya in Central America
- Native to tropical America, range from Southern Mexico to Northern South America
- Taken by the french to South East Asia at the turn of the 19th century

Pitahaya Types

- Several species of *Hylocereus* identified, but there is uncertainty about proper identification
- Differentiated by stem & fruit characteristics (bracts, shape and fruit color - skin and flesh)
- Two commonly available in CA:
 - *Hylocereus undatus* (red skin, white flesh)
 - *Hylocereus* sp. (primarily red skin & red flesh)
- Many *Hylocereus* hybrids (several skin and flesh colors combinations, from white to deep magenta or dark red)
- *Selenicereus megalanthus* - Yellow or Colombian, yellow, thorny skin and white, translucent flesh

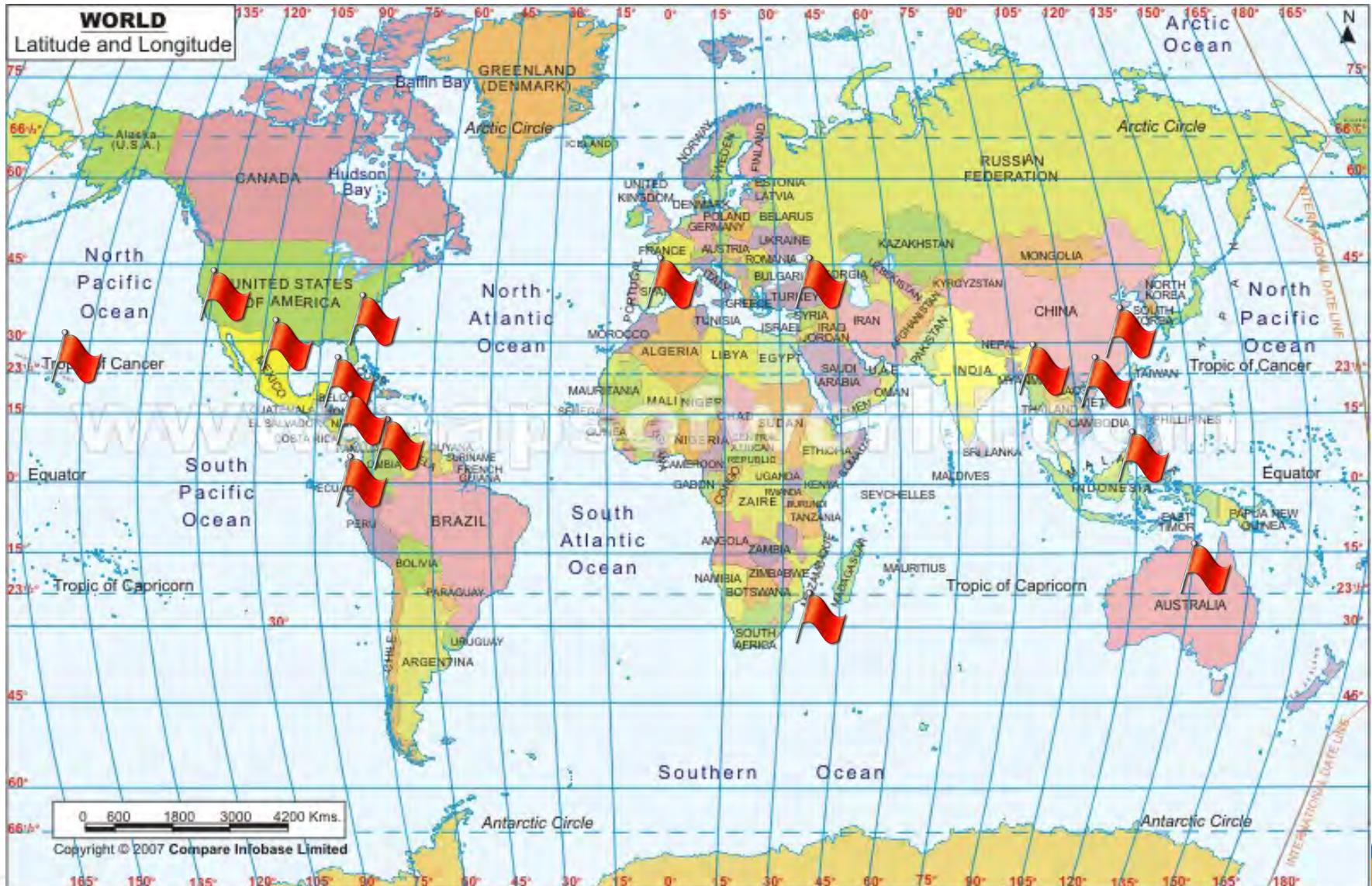
Why Pitahayas?

- 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)
 - Relatively high antioxidant activity when compared to other subtropical fruits
- Makes great landscape plant - fruiting cactus, water efficient, very adaptable

Fruit Uses

- Used in refreshments in Central America
- Red flesh used as colorant in the processed food industry (Snapples, Sobe, Pitaya+)
- Consumed fresh, as a desert item in the US, Canada, and Europe
 - Sliced in salads or cut in half and served chilled, with flesh eaten with spoon
- Used for decoration – Southeast Asia, US
- Great potential for value added products (chips, chewy bars, wine, yarn dye, etc.)

Dragonfruit Production



Pitahayas in California



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U.S. Production

- US production is limited, but acreage increasing rapidly (300 - 600Has.)
 - California (100 - 200 acres.)
 - Florida (~ 400+ Acres)
 - Hawaii (~200 Acres)
 - Mostly white fleshed varieties used for fresh consumption or for décor/garnish
- Market is turning red...Pink/Red fleshed varieties becoming more popular
- Red fleshed varieties sell at higher price

Central & South America

- Nicaragua is main producer of *Hylocereus* sp. (red flesh) in Central America
 - 1000-1200 Hectares planted under various
 - Fresh fruit exported to Canada and Europe (APRONOT) & pulp exported to US and Japan
- Colombia top producer of yellow pitahaya (*S. megalanthus*)
- Ecuador also producing both *Hylocereus* sp. and *S. megalanthus*
- Backyard/small scale production in Guatemala, El Salvador, Honduras, Costa Rica

Nicaraguan Production



Colombian Pitahaya (*Selenicereus megalanthus*)



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Asia, Africa, Australia

- Vietnam main producer of *Hylocereus undatus* in South East Asia (Est. 40,000 Has)
 - Predominantly white flesh fruit, but converting to red flesh
 - Export based industry targeting the US, China & Europe
 - Fruit exported to the US must be irradiated – very costly!
- Thailand (~ 3000 Has.), Malaysia (~500 Has.), Indonesia, Taiwan and the Philippines also becoming important producers
- Israel (~100-200 Has.) has been significant producer/shipper to the European Union
- South Africa and Australia increasing production

Commercial Varieties?

- Several species & up to 70 different clones available in Southern California – No performance data
- Five clones grown commercially in Nicaragua (Orejona, Rosa, Cebra, Lisa, San Ignacio)
- Several clones promoted as “superior” but no replicated research data available
- Improved, proprietary varieties available from Israel, Taiwan and private breeders in US
- Lack of reliable information about varieties a major challenge for commercial production and main reason for our research project

Ongoing Research Efforts

- Evaluate varieties for commercial production under field conditions in California
 - Concentrate on self-fruitful varieties with good yield, fruit & flavor characteristics
- Determine irrigation requirements (MVP Farms in Fillmore & UC-SCREC in Irvine)
- Evaluate promising varieties in controlled environment MVP Farms in Fillmore & UC-SCREC
- Develop Pest and Post harvest management information and strategies

Varieties Under Study

- Cebra (Nic)
- Rosa (Nic)
- Orejona (Nic)
- Lisa (Nic)
- Sin Espinas (Nic)
- San Ignacio (Nic)
- Mexicana (Mex)
- Colombiana (SD/Col)
- Valdivia Roja (Mex)
- Bien Hoa Red (SD)
- Bien Hoa White (SD)
- Delight (SD)
- American Beauty (FL)
- Haley's Comet (FL)
- Physical Graffiti (FL)
- Vietnamese Giant (FL)
- Yellow Dragon (FL/Col)
- Seoul Kitchen (FL)
- Armando (Nic)
- El Grullo (Mex)

Results to Date

- Most varieties in trial adapted well to growing conditions at SCREC
- Most selections set fruit **WITHOUT** hand pollination (Pollinated by bees & other insects)
- Most varieties in trial produce well **WITHOUT** shade, some would benefit from it.
- Fruit size & quality good, good marketable yields but results **NOT FINAL** yet!

Results to Date

- Sin Espinas, Lisa, Physical Graffiti, Delight, American Beauty and Bien Hoa Red rated highest in external appearance
- American Beauty, Bien Hoa Red, Physical Graffiti, Delight, Sin Espinas and Lisa rated highest in flavor when panelists could see flesh color
- Bien Hoa Red, American Beauty, Physical Graffiti, Sin Espinas and Lisa rated highest in flavor in a blind test
- Post-harvest work ongoing

Pitahaya Guide





Ave Wt. (grams): 468
Brix Score: 15.75
Mkt. Wt./Plant (grams): 8746
Days to Harvest: 46
Origin/Source: Nicaragua

Cebra



Ave. Wt. (grams): 384
Brix Score: 16.05
Mkt. Wt./Plant (grams): 7217
Days to Harvest: 45
Origin/Source: Nicaragua

Rosa



Ave. Wt. (grams): 438
Brix Score: 15.78
Mkt. Wt./Plant (grams): 4598
Days to Harvest: 45
Origin/Source: Nicaragua

Orejona



Ave. Wt. (grams): 465
Brix Score: 17.02
Mkt. Wt./Plant (grams): 13319
Days to Harvest: 44
Origin/Source: Nicaragua

Lisa



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Ave. Wt. (grams): 393
Brix Score: 16.5
Mkt. Wt./Plant (grams): 3527
Days to Harvest: 43
Origin/Source: Nicaragua

Sin Espinas



Ave. Wt. (grams): 552
Brix Score: 15.6
Mkt. Wt./Plant (grams): 12712
Days to Harvest: 48
Origin/Source: Nicaragua

San Ignacio



Ave. Wt. (grams): 495
Brix Score: 14.04
Mkt. Wt./Plant (grams): 9165
Days to Harvest: 40
Origin/Source: Nicaragua

Mexicana



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Ave. Wt. (grams): <200
Brix Score: 20.90
Mkt. Wt./Plant (grams): 0
Days to Harvest: 150-180
Origin/Source: SD/Col.

Colombiana



Ave. Wt. (grams): 250
Brix Score: 17.9
Mkt. Wt./Plant (grams): 8588
Days to Harvest: 40
Origin/Source: Mexico

Valdivia Roja



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Ave. Wt. (grams): 360
Brix Score: 18.9
Mkt. Wt./Plant (grams): 1477
Days to Harvest: 41
Origin/Source: San Diego

Bien Hoa Red



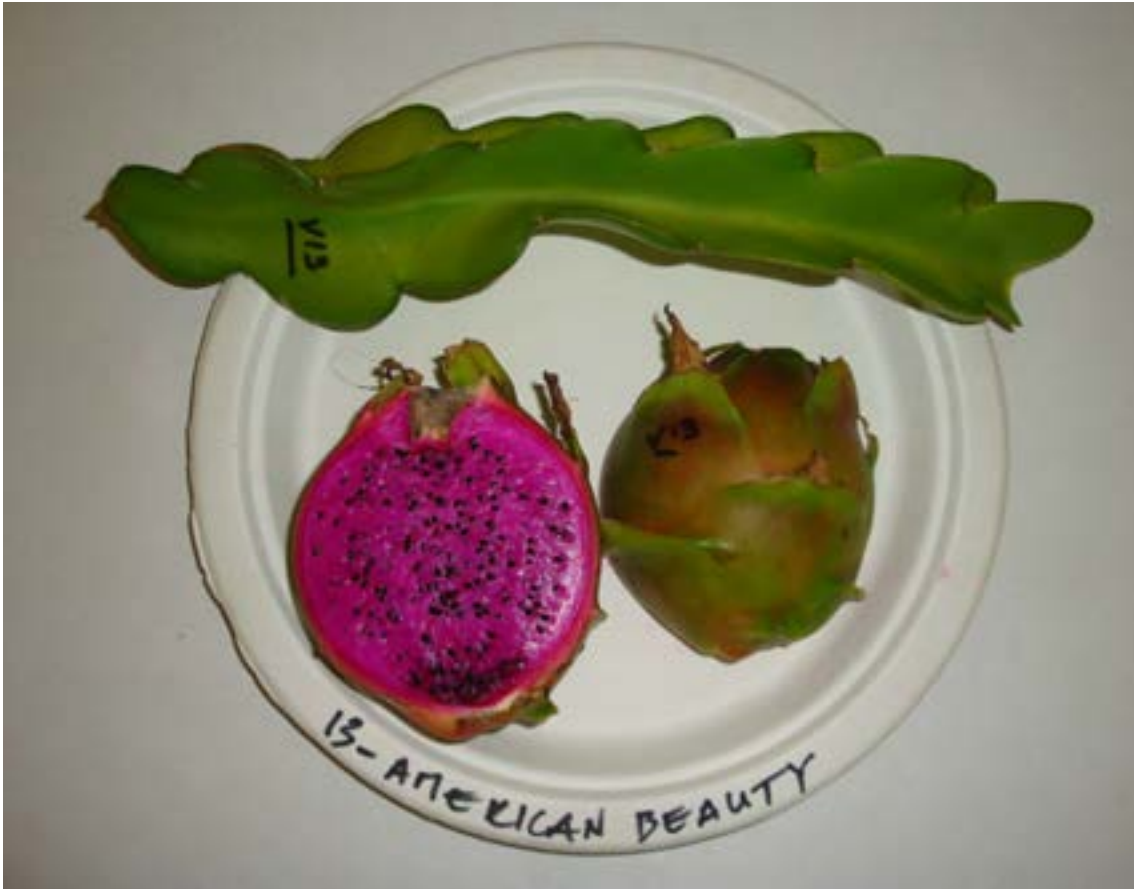
Ave. Wt. (grams): 388
Brix Score: 11.85
Mkt. Wt./Plant (grams): 7394
Days to Harvest: 37
Origin/Source: San Diego

Bien Hoa White



Ave. Wt. (grams): 371
Brix Score: 18.08
Mkt. Wt./Plant (grams): 14931
Days to Harvest: 41
Origin/Source: San Diego

Delight



Ave. Wt. (grams): 380
Brix Score: 18.51
Mkt. Wt./Plant (grams): 5566
Days to Harvest: 43
Origin/Source: Florida

American Beauty



Ave. Wt. (grams): 482
Brix Score: 16.7
Mkt. Wt./Plant (grams): 5979
Days to Harvest: 38
Origin/Source: Florida

Haley's Comet



Ave. Wt. (grams): 374
Brix Score: 17.93
Mkt. Wt/Plant (grams): 23429
Days to Harvest: 40
Origin: Florida

Physical Graffiti



Ave. Wt. (grams): 338
Brix Score: 15.6
Mkt. Wt./Plant (grams): 6511
Days to Harvest: 41
Origin/Source: Florida

Vietnamese Giant



Ave. Wt. (grams): <200
Brix Score: 21.15
Mkt. Wt./Plant (grams): 0
Days to Harvest: 150-180
Origin: Florida/Colombia

Yellow Dragon

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Ave. Wt. (grams): 518
Brix Score: 12.18
Mkt. Wt./Plant (grams): 15379
Days to Harvest: 41
Origin/Source: Florida

Seoul Kitchen



Ave. Wt. (grams): 390.5
Brix Score: 16.11
Mkt. Wt./Plant (grams): 4881
Days to Harvest: 41
Origin/Source: Nicaragua

Armando

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Ave. Wt. (grams):
Brix Score:
Mkt. Wt./Plant (grams):
Days to Harvest:
Origin/Source: Mexico

Results to Date

- Recently completed DNA work confirmed suspicions about various cultivars:
 - Bien Hoa Red and American Beauty considered the same
 - Delight, Haley's Comet and Physical Graffiti are very closely related
 - Seoul Kitchen, Vietnamese Giant, Bien Hoa White and Mexicana very closely related
 - Yellow Dragon and Colombiana considered the same
 - Lisa, Rosa, Cebra could considered the same
 - Armando and San Ignacio related but not same as other Nicaraguan varieties
 - Sin Espinas unique & diferent from other Nicaraguans
 - Valdivia Roja unique, closely related to El Grullo (new entry)
- Variety selection determined by your personal preferences and intended use

Several Others Cultivars Under Observation



Pitahaya / Dragon Fruit Research - Results to Date

Variety/Origin	Color Skin/Flesh	Cold Hardiness	Heat Tolerance	Avg. Wt. (grams)	Brix Score	Mkt Wt/Plant (grams)	Days to Harvest
1. Cebra (Nic.)	R/R	3.5	3.5	468	15.75	8746	46
2. Rosa (Nic.)	R/R	3.5	3.5	384	16.05	7217	45
3. Orejona (Nic.)	R/R	3.25	3.75	438	15.78	4598	45
4. Lisa (Nic.)	R/R	3.75	4	465	17.02	13319	44
5. Sin Espinas (Nic.)	P/R	2.25	2.75	393	16.5	3527	43
6. San Ignacio (Nic.)	R/R	3.75	4	552	15.6	12712	48
7. Mexicana (Mex.)	P/W	3.25	3	495	14.04	9165	40
8. Colombiana (SD-Col.)	Y/W	1	1	< 200	20.90	0	150-180
9. Valdivia Roja (Mex.)	R/R	5	4.5	250	17.9	8588	40
10. Bien Hoa Red (SD)	GR/F	1.75	1.75	360	18.9	1477	41
11. Bien Hoa White (SD)	P/W	2.5	2.5	388	11.85	7394	37
12. Delight (SD)	R/PW	3	3.5	371	18.08	14931	41
13. American Beauty (FL)	GR/F	2.75	2.5	380	18.51	5566	43
14. Haley's Comet (FL)	R/F	4.5	4.25	482	16.7	5979	38
15. Physical Graffiti (FL)	R/P	4.5	4.5	374	17.93	23429	40
16. Vietnamese Giant (FL)	PR/W	3.25	3.25	338	15.6	6511	41
17. Yellow Dragon (FL-Col.)	Y/W	1	1	< 200	21.15	0	150-180
18. Seoul Kitchen (FL)	PR/W	4	4	518	12.18	15379	41
19. Armando (Nic.)	R/R	4	4	390.5	16.11	4881	41

Several Others Cultivars Under Observation



Results to Date



The End...Questions??

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