

Genetic Characterization of Pitahaya/Dragon Fruit Accessions in California

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Overview

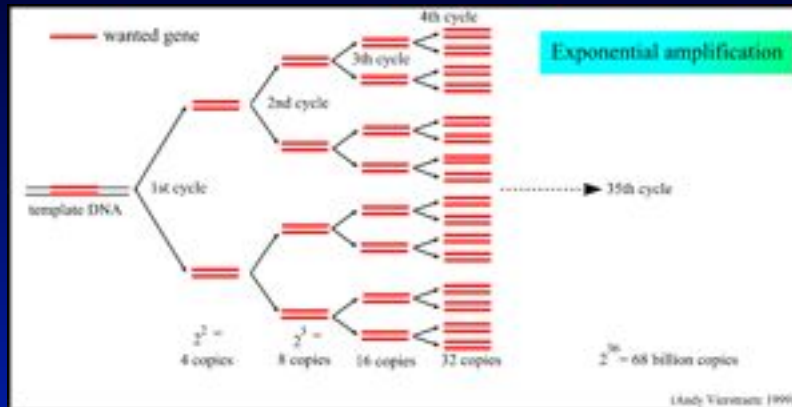
Molecular Biology 101

Research Progress

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Molecular Biology 101 PCR



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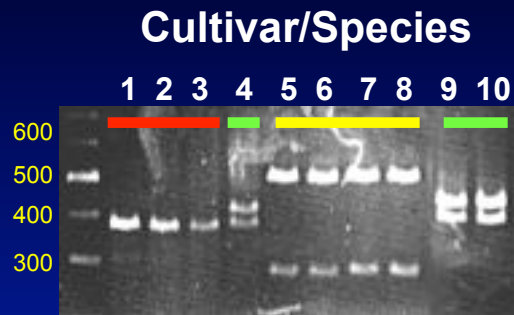
DNA sequence data

Cultivar/Species	DNA sequence
A	AGGGCTCTTCCAGAGAGGGCTCTTCCAGAG
B	AGGGCTCTTTCAGAGAGGGCTCTTCCAGAG
C	AGGGCTCTTCCAGAGAGGTCTCTTCCAGAG

↑ ↑

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Molecular Markers

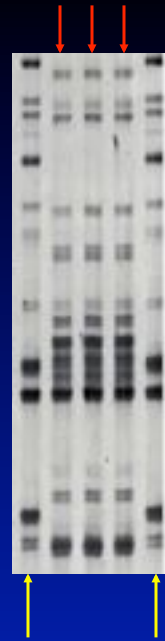


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Molecular Markers

Species/cultivar 1

Species/cultivar 2

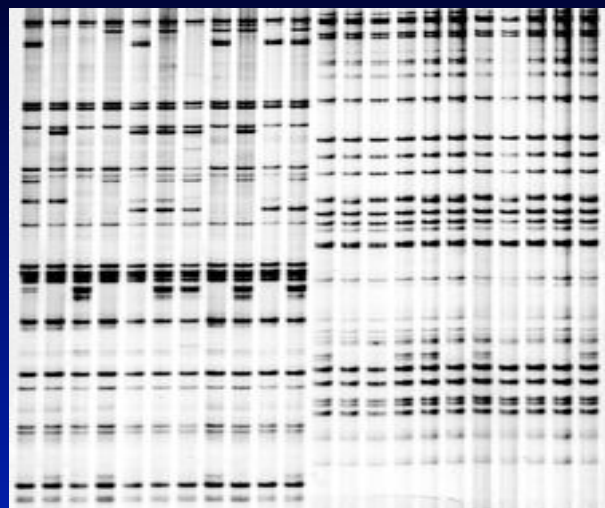


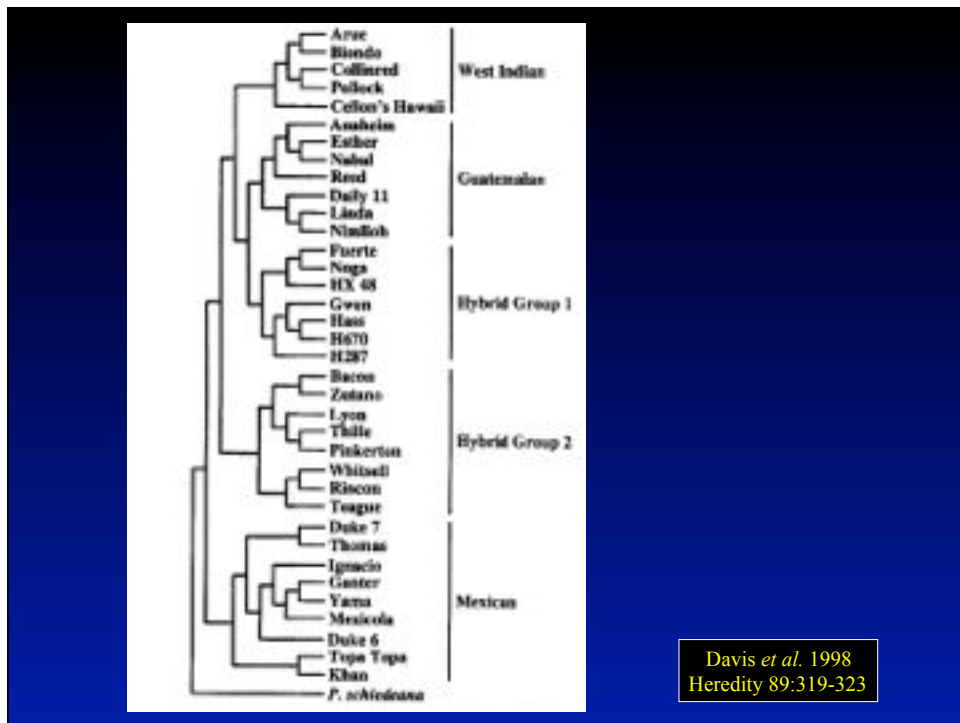
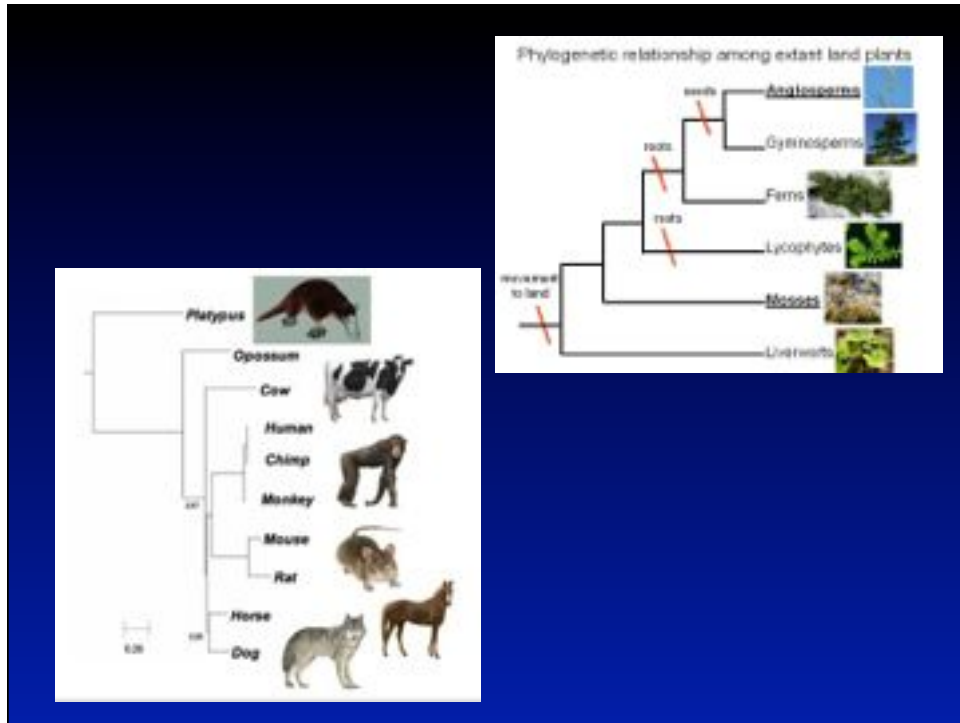
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Molecular Markers

Species/cultivar 1

Species/cultivar 2





Davis *et al.* 1998
Heredity 89:319-323

Genetic analysis of dragon fruit UC germplasm collection

**280 accessions: California, Florida, Nicaragua,
Mexico, and Columbia**

Ramiro Lobo/Tanizaki, Deborah Pagliacia/Georgios Vidalakis-UCR



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 yellow to deep magenta or dark red)
- *Selenicereus megalanthus* - Yellow or Colombian, yellow, thorny skin and white, translucent flesh

Commercial Varieties?

- Pitahaya hybridizes quite easily so large number of hybrids or clones produced by breeders
- Several clones promoted as “superior” but no replicated research data available
- Improved, proprietary varieties available from Israel, Taiwan and private breeders in US
- **Big challenge for commercial production is confusion and duplication on named varieties so DNA needed to clarify things**

The Problem

- “2-3 years into the trial when plants grew and started fruiting, we started noticing great variability among plants within the same variety and great similarities among plants from different varieties.”

Big challenge for commercial production is confusion and duplication on named varieties so DNA needed to clarify things

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) added late

Dragon Fruit Accessions

- **All accessions were collected from the South Coast Research and Extension Center**
- **The collection consists of 5 'species'**
 - *H. undatas*, *H. guatemalensis*, *H. costaricensis/polyrhizus*, *H. ocamponis*, *H. megalanthus*, + hybrids

Methods and Materials

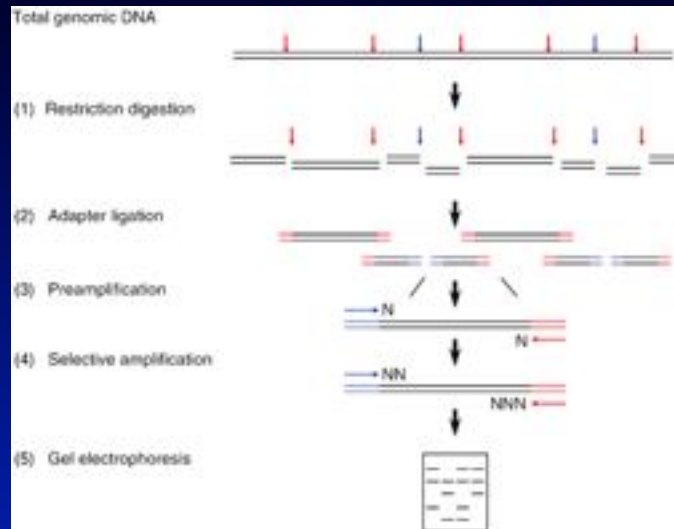
- **Actively growing shoots were sampled (278 plants)**
- **Surfaced sterilized using 70% ethanol**
- **DNA extracted using a Qiagen kit**

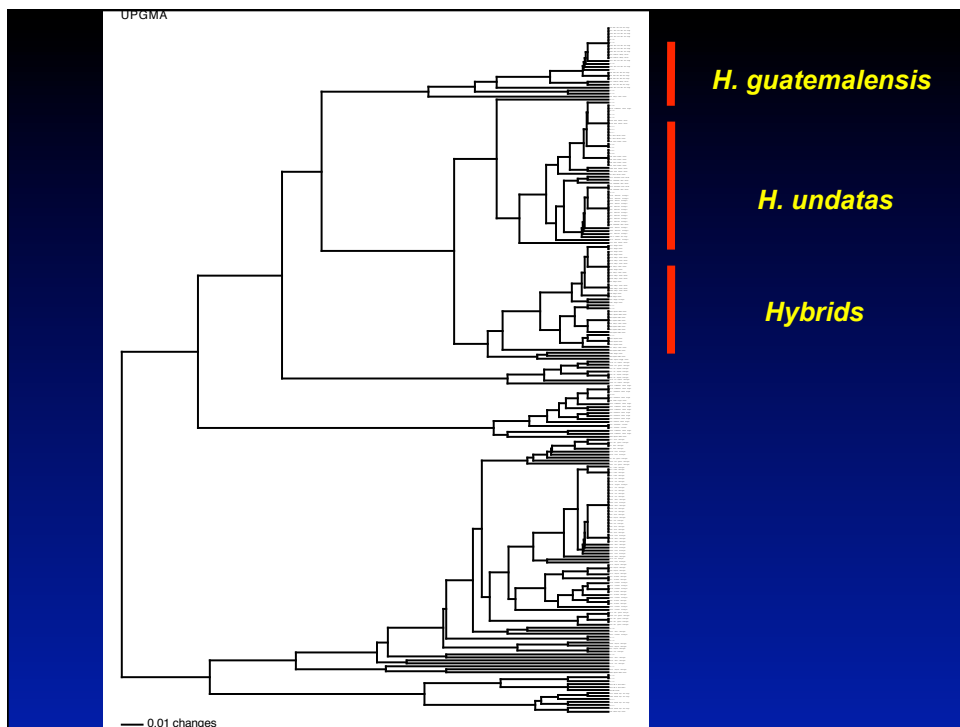
Methods and Materials

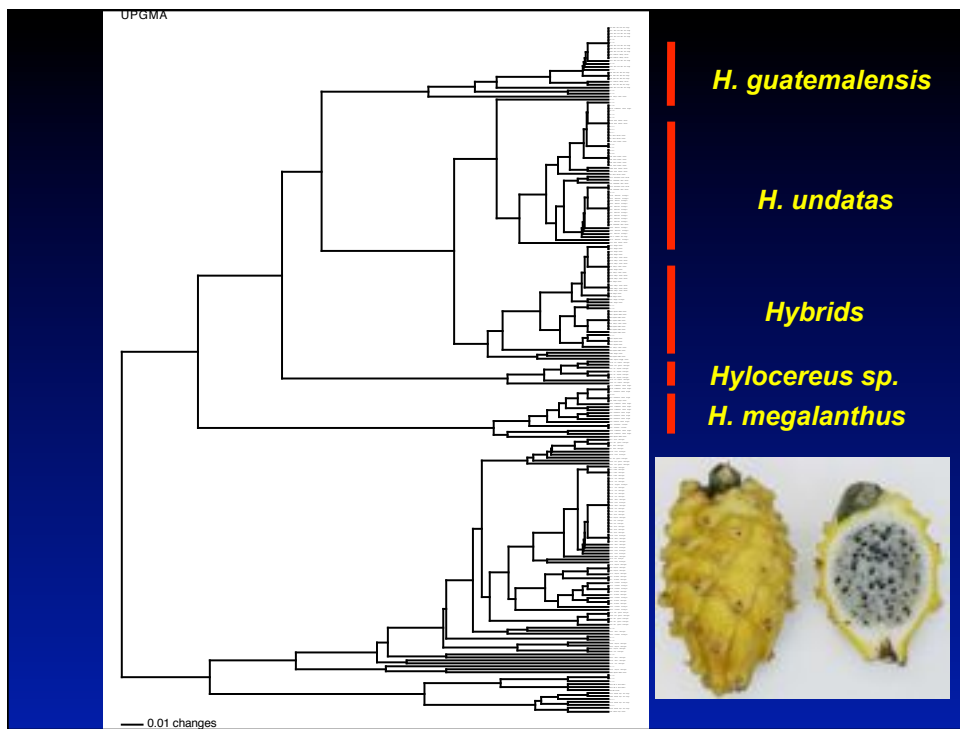
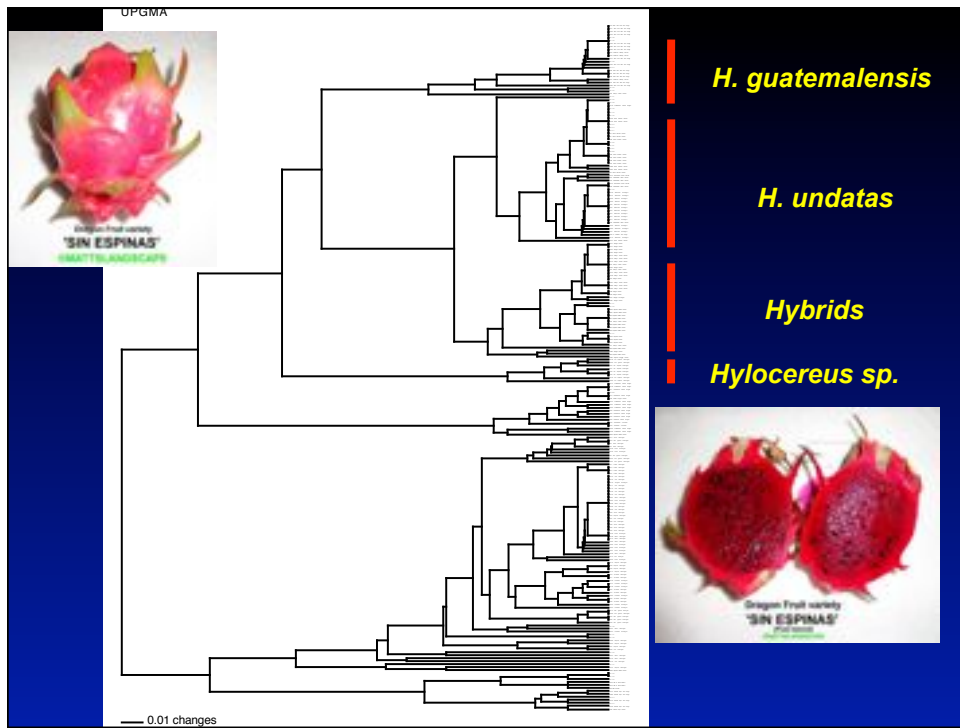
- **Accessions were genotyped using Amplified Fragment Length Polymorphism (AFLP) technique**

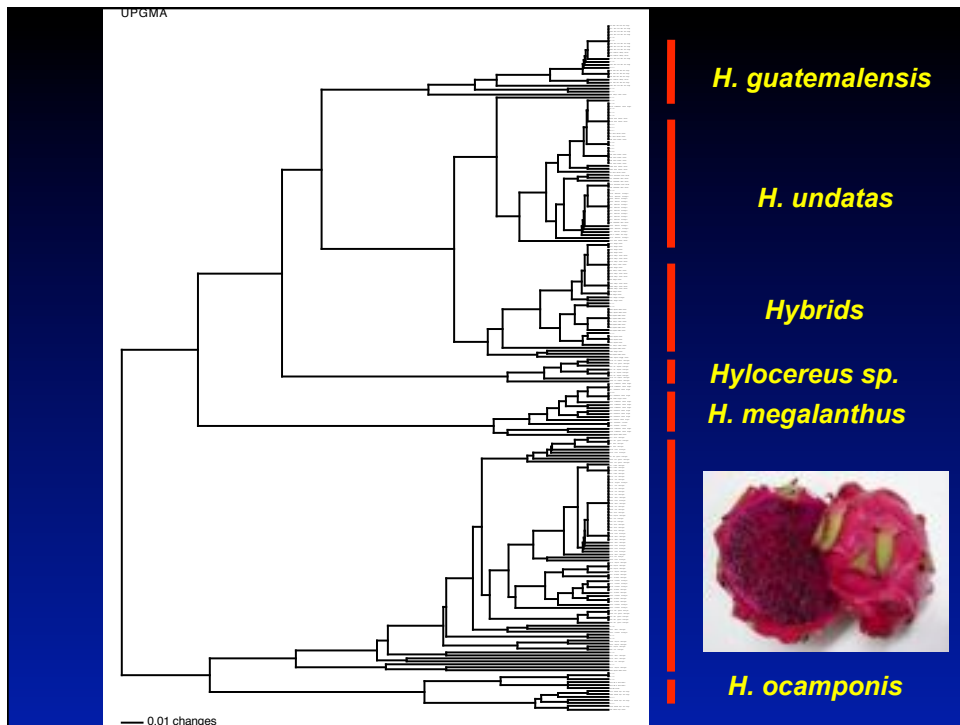
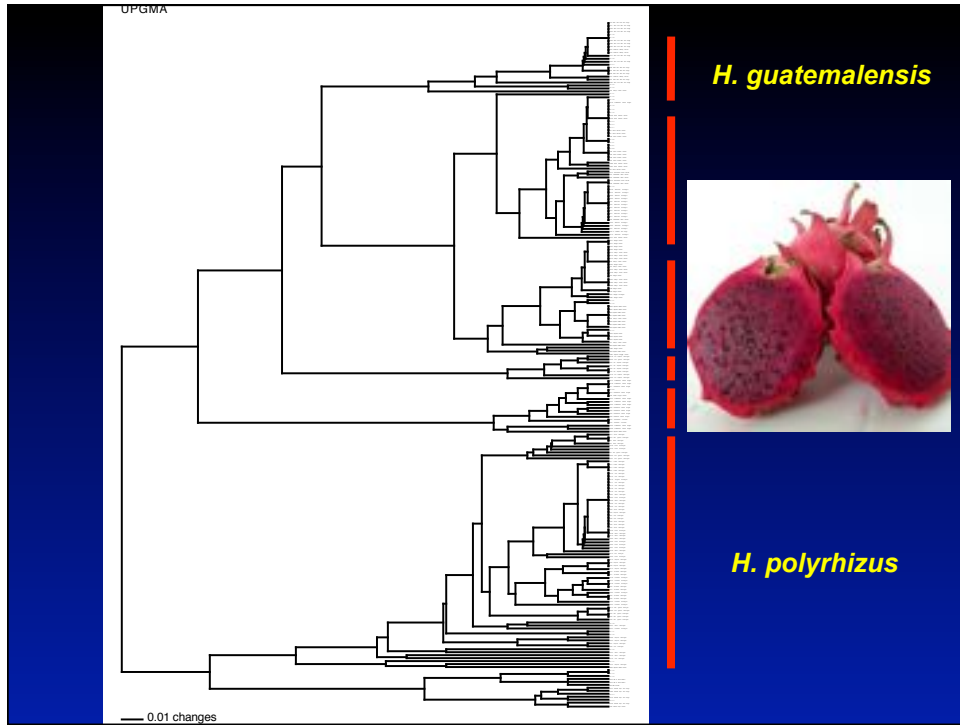


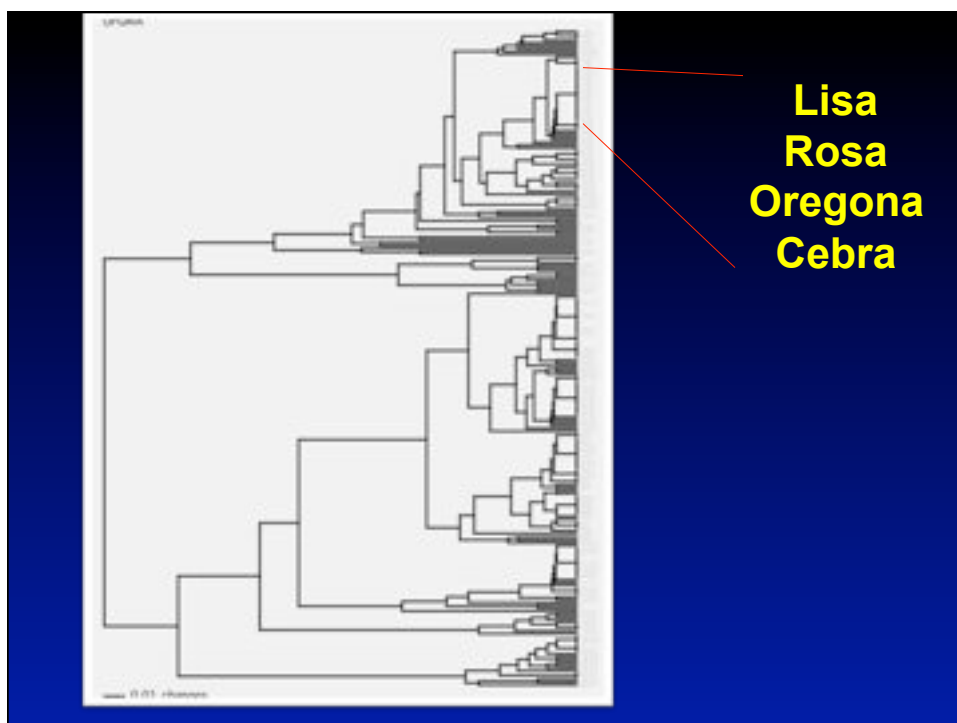
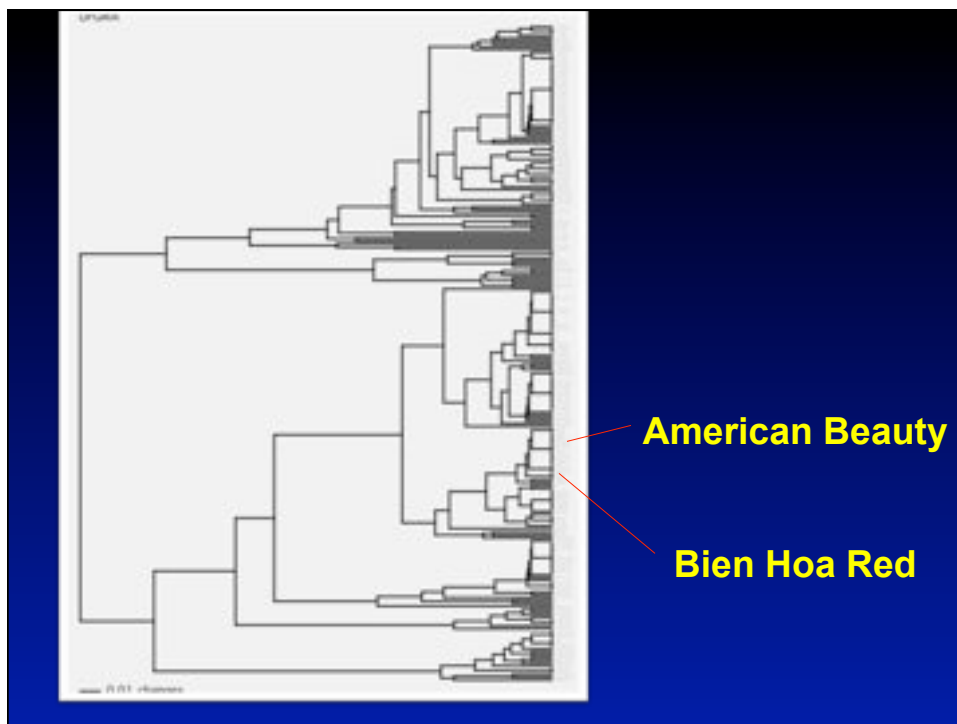
Methods and Materials AFLP











DNA Work Results

- Seoul Kitchen, Vietnamese Giant, Bien Hoa White and Mexicana - White fleshed varieties, closely related-grouped as *Hylocereus undatus*
- Bien Hoa Red and American Beauty – identical, grouped as *Hylocereus guatemalensis* species from Guatemala
- Delight, Haley's Comet and Physical Graffiti - very closely related hybrids
- Yellow Dragon and Colombiana – identical, grouped as *Hylocereus megalanthus* from Northern South America

DNA Work Results, Cont' d.

- All red-fleshed accessions originating from Nicaragua are very closely related. However, two clusters were found with Lisa, Rosa and Cebra in one cluster and Armando and San Ignacio in another. These accessions could be grouped under *Hylocereus costaricensis* or *Hylocereus polyrhizus*.
- Sin Espinas, originally from Nicaragua is the only thornless variety and appears to be different from other Nicaraguan accessions (putatively undescribed *Hylocereus sp.*)
- Valdivia Roja, El Grullo and other similarly looking accessions from Mexico are very closely related and could be grouped as *Hylocereus ocamponis*.

DNA Work Results, Cont' d

- DNA Analysis confirmed suspicions about duplication of entries among named varieties based on field observations and data collected from our field trials
- With the exception of Sin Espinas, all accessions cluster based on geographic origin and match the descriptions of species identified in those regions
- More work needed to identify specific markers for each of the species reported/identified in order to classify all accessions properly