Genetic Characterization of Pitahaya/Dragon Fruit Accessions in California

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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

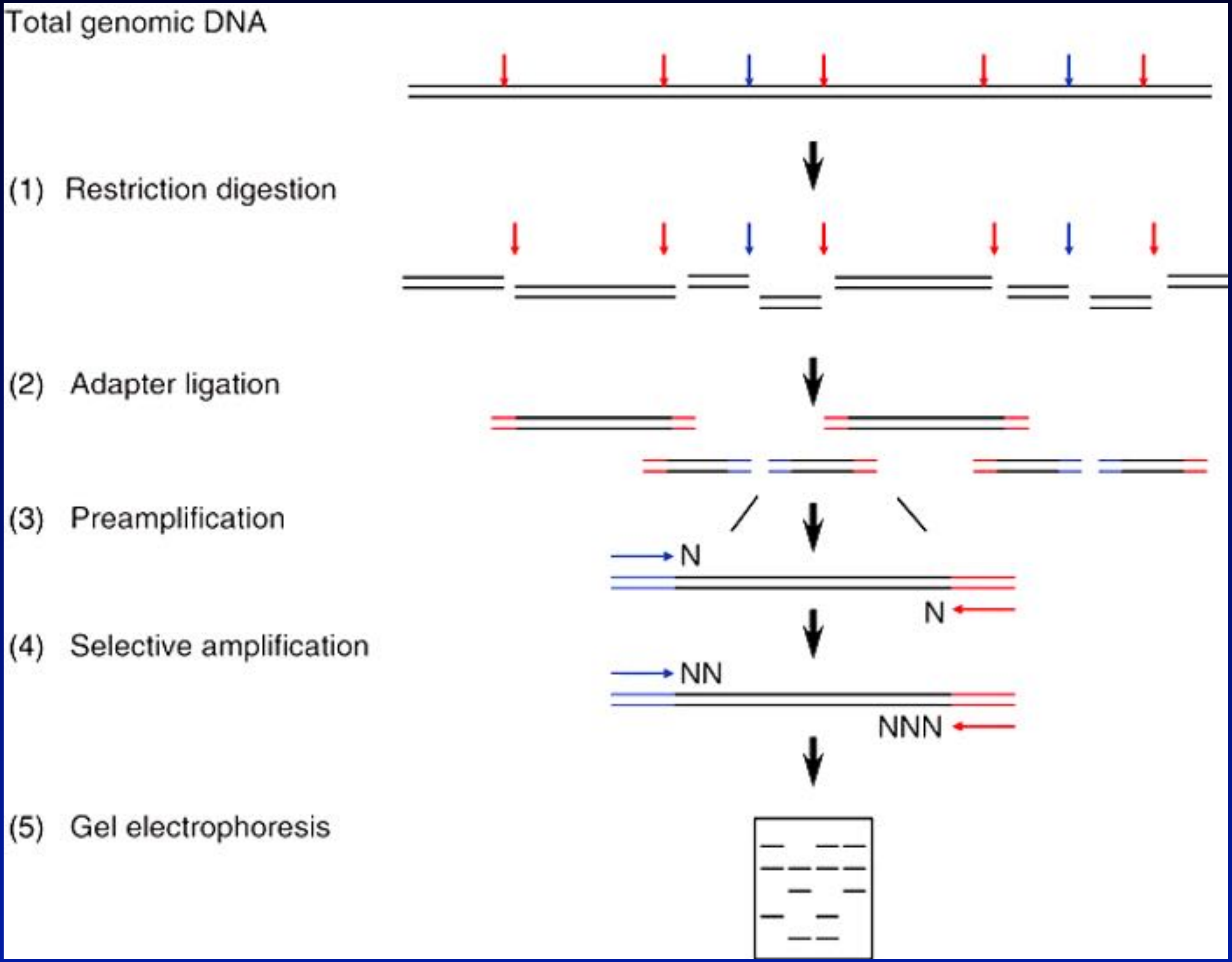
Materials and Methods

- **278 plants sampled & analyzed**
- **Samples collected from actively growing shoots**
- **Surfaced sterilized using 70% ethanol**
- **DNA extracted using a Qiagen kit**

Materials and Methods

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

Methods and Materials
AFLP



Total genomic DNA

(1) Restriction digestion

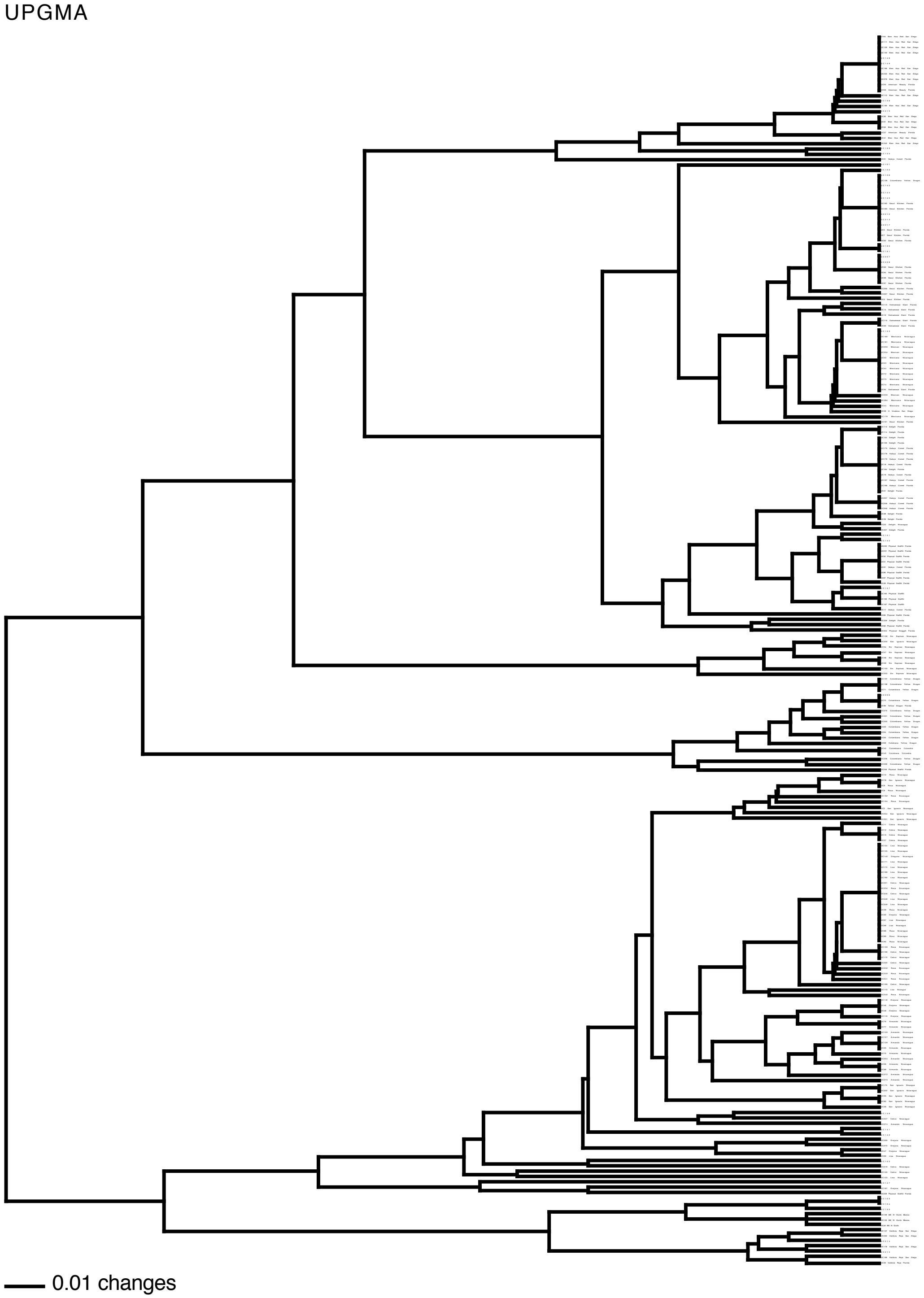
(2) Adapter ligation

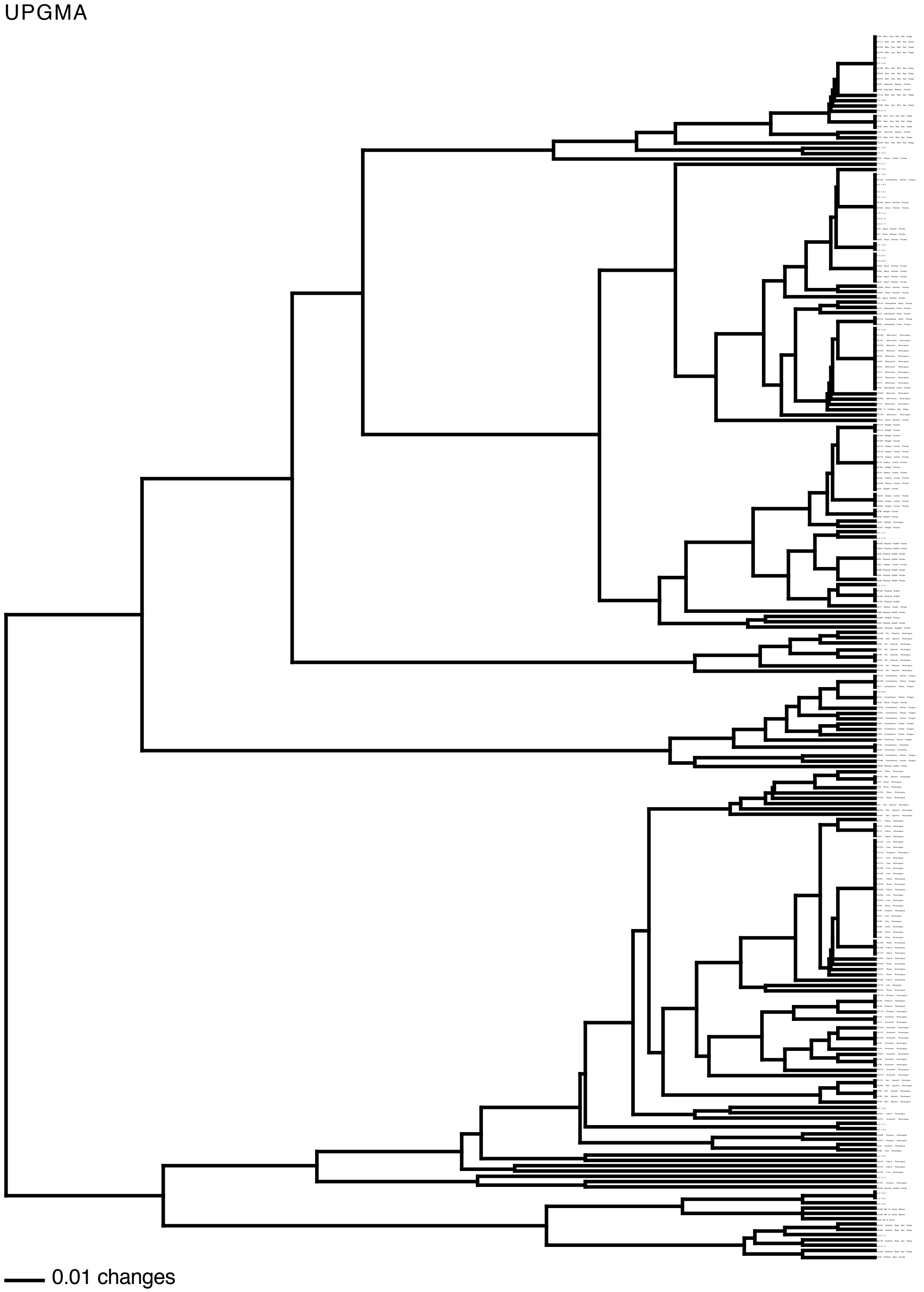
(3) Preamplification

(4) Selective amplification

(5) Gel electrophoresis

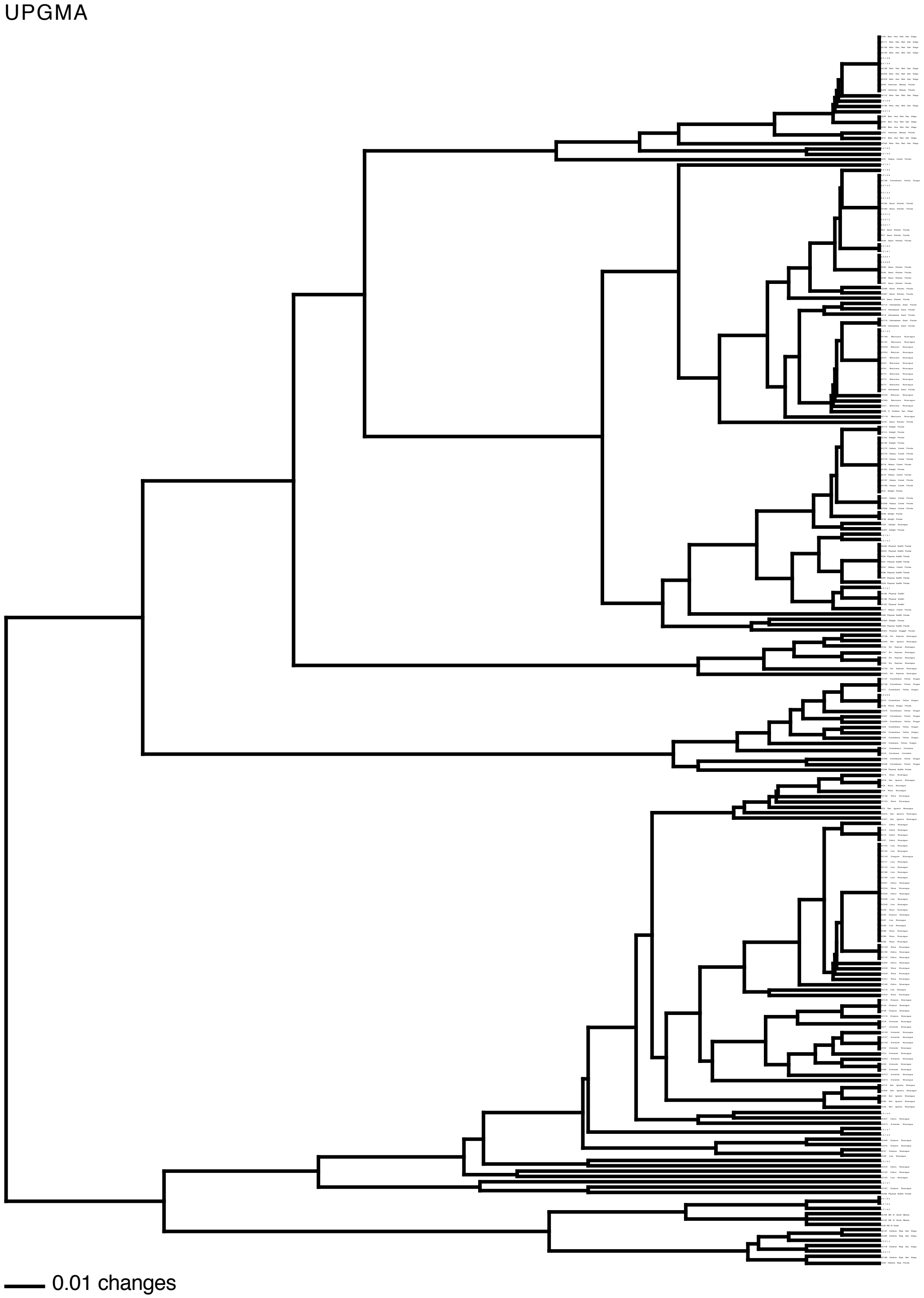
H. guatemalensis





H. guatemalensis

H. undatas

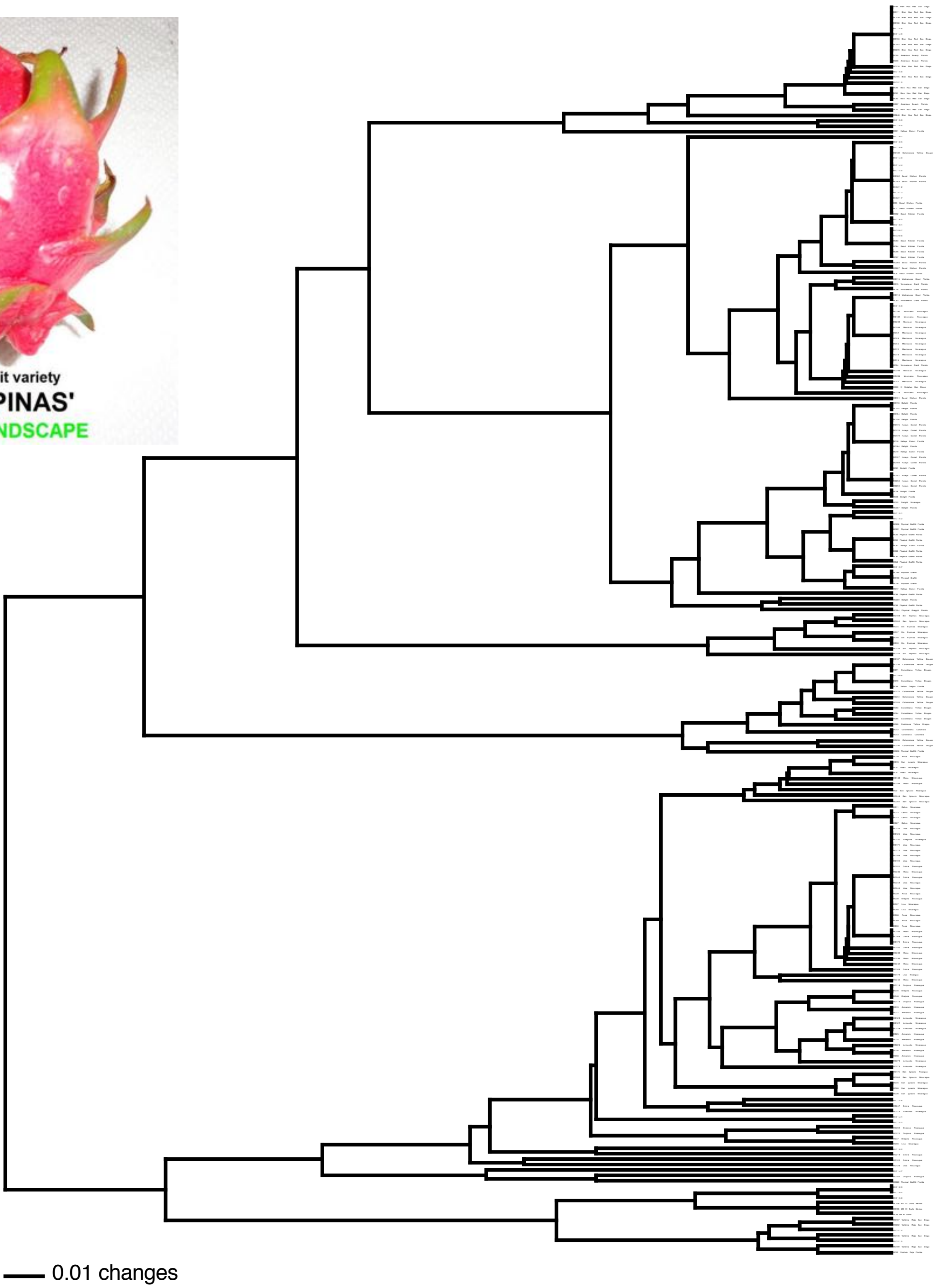


H. guatemalensis

H. undatas

Hybrids

UPGMA

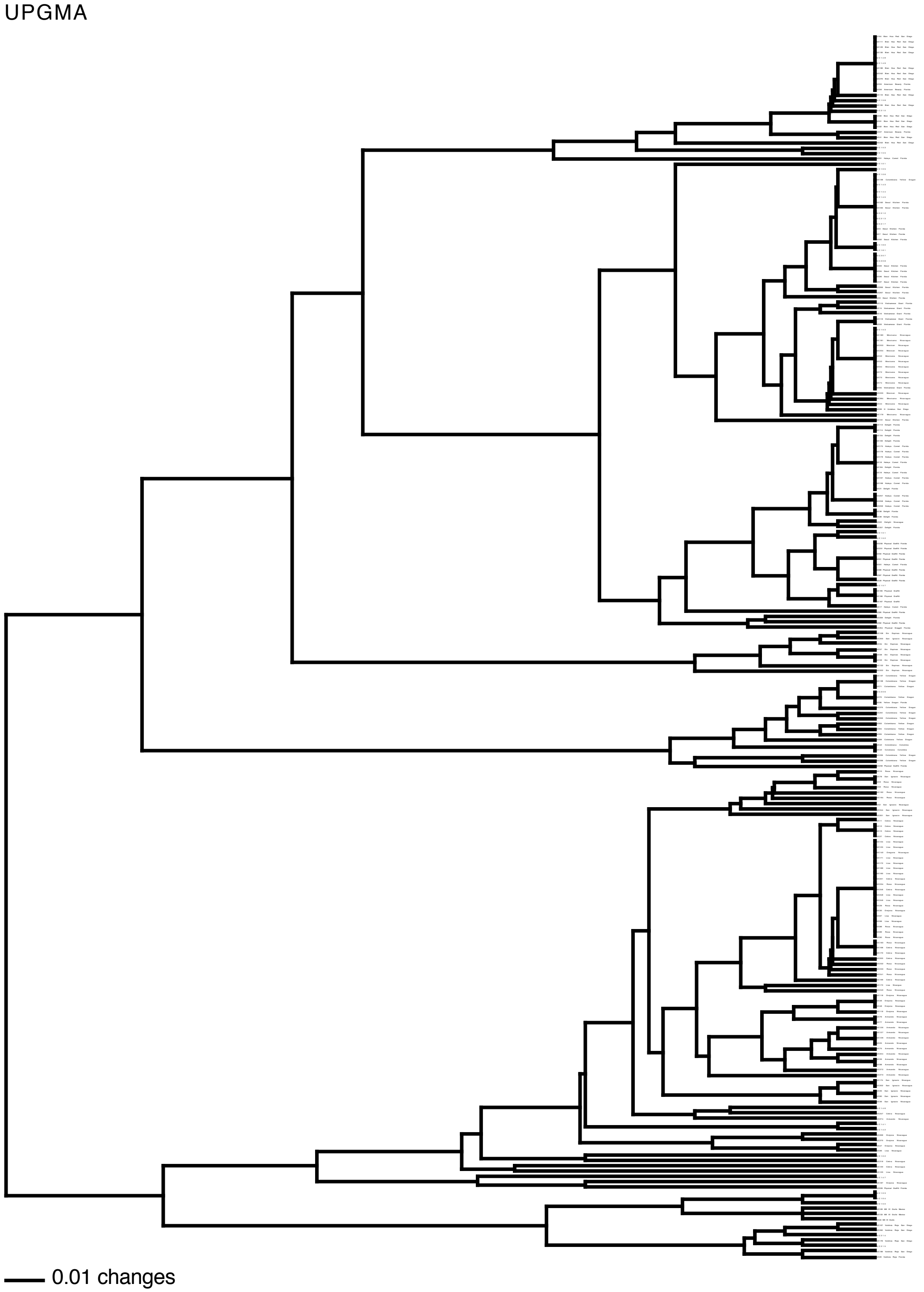


H. guatemalensis

H. undatas

Hybrids

Hylocereus sp.



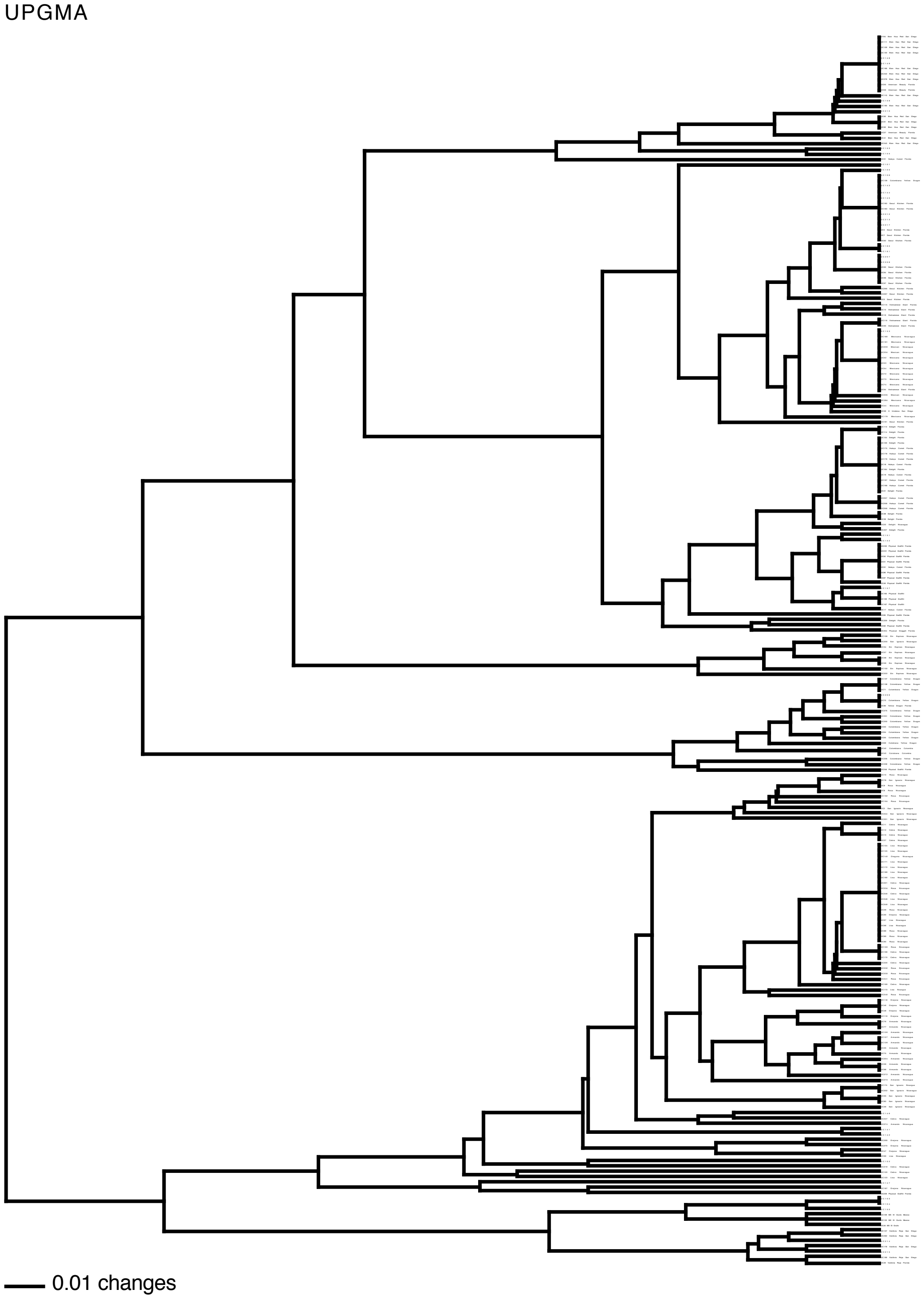
H. guatemalensis

H. undatas

Hybrids

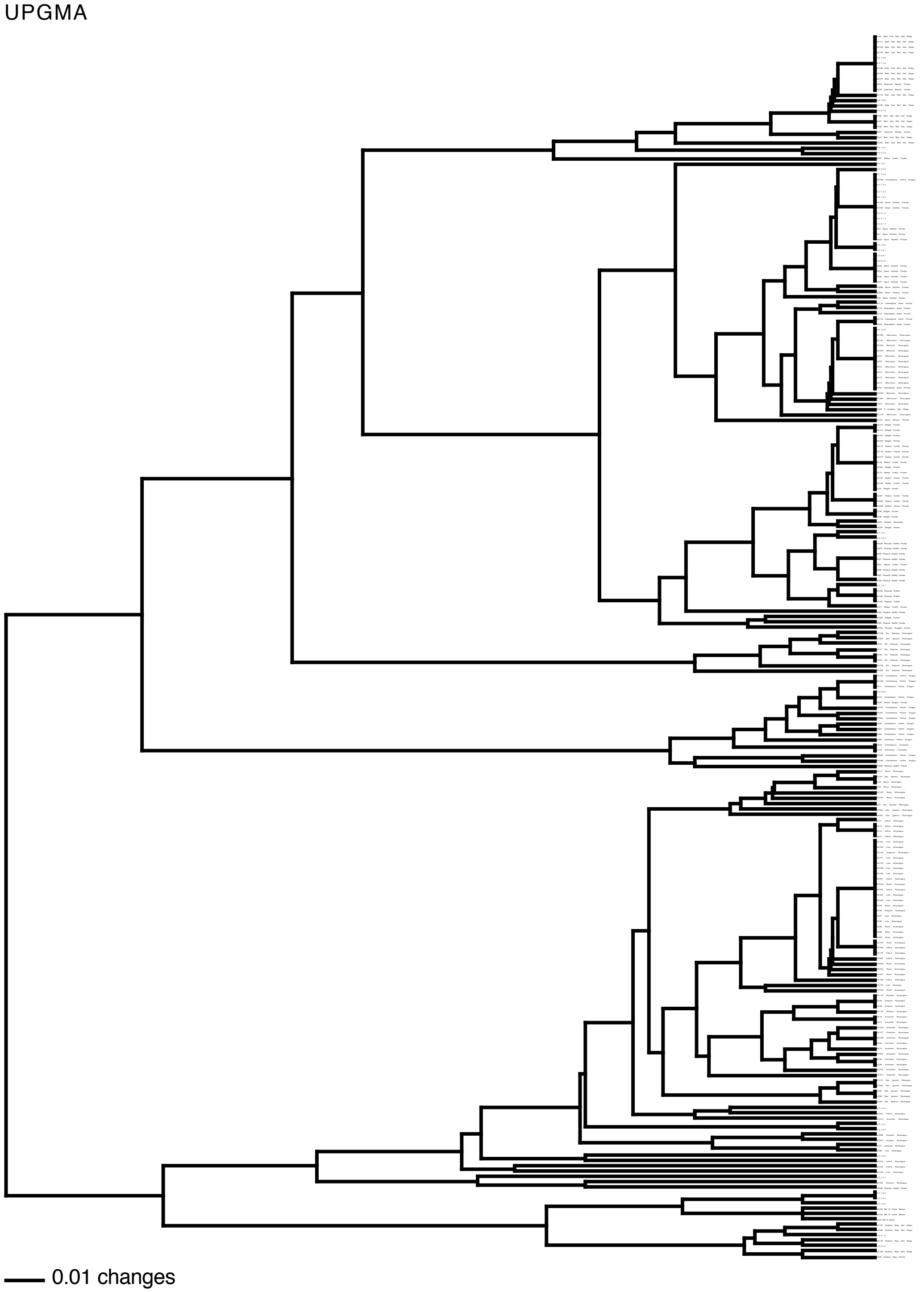
Hylocereus sp.

H. megalanthus



H. guatemalensis

H. polyrhizus



H. guatemalensis

H. undatas

Hybrids

Hylocereus sp.

H. megalanthus

H. ocamponis

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