Enhancement of Avocado Productivity

Plant improvement - selection and evaluation of improved varieties and rootstocks

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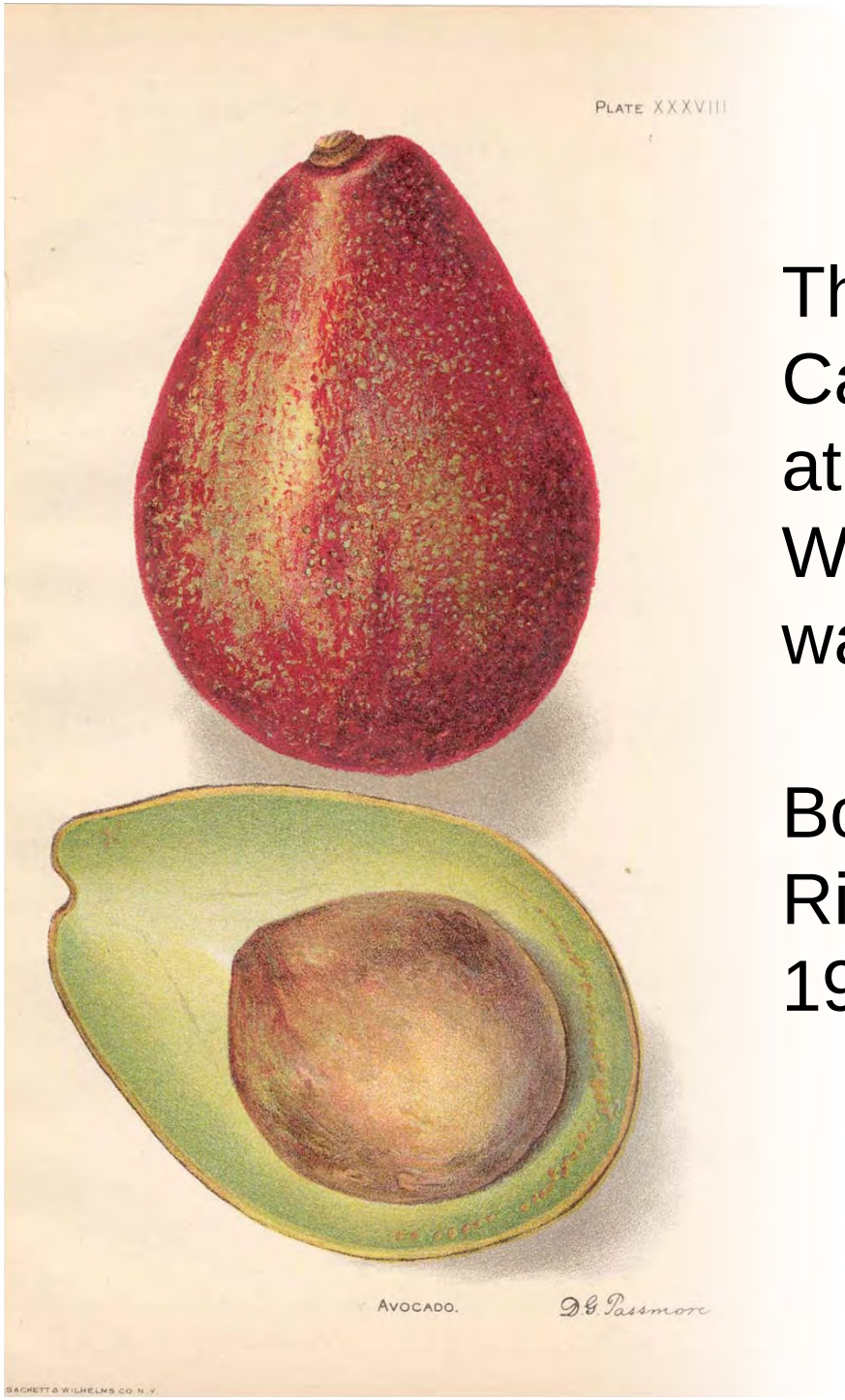
<u>Scion Breeding</u>: Avocados were introduced to California at the turn of the last century. Growers, enthusiasts and researchers have been hunting for improved varieties ever since.

By the 1950's around 25 different varieties of avocados were being commercially packed and shipped in California, with 'Fuerte' accounting for more than two-thirds of the production.

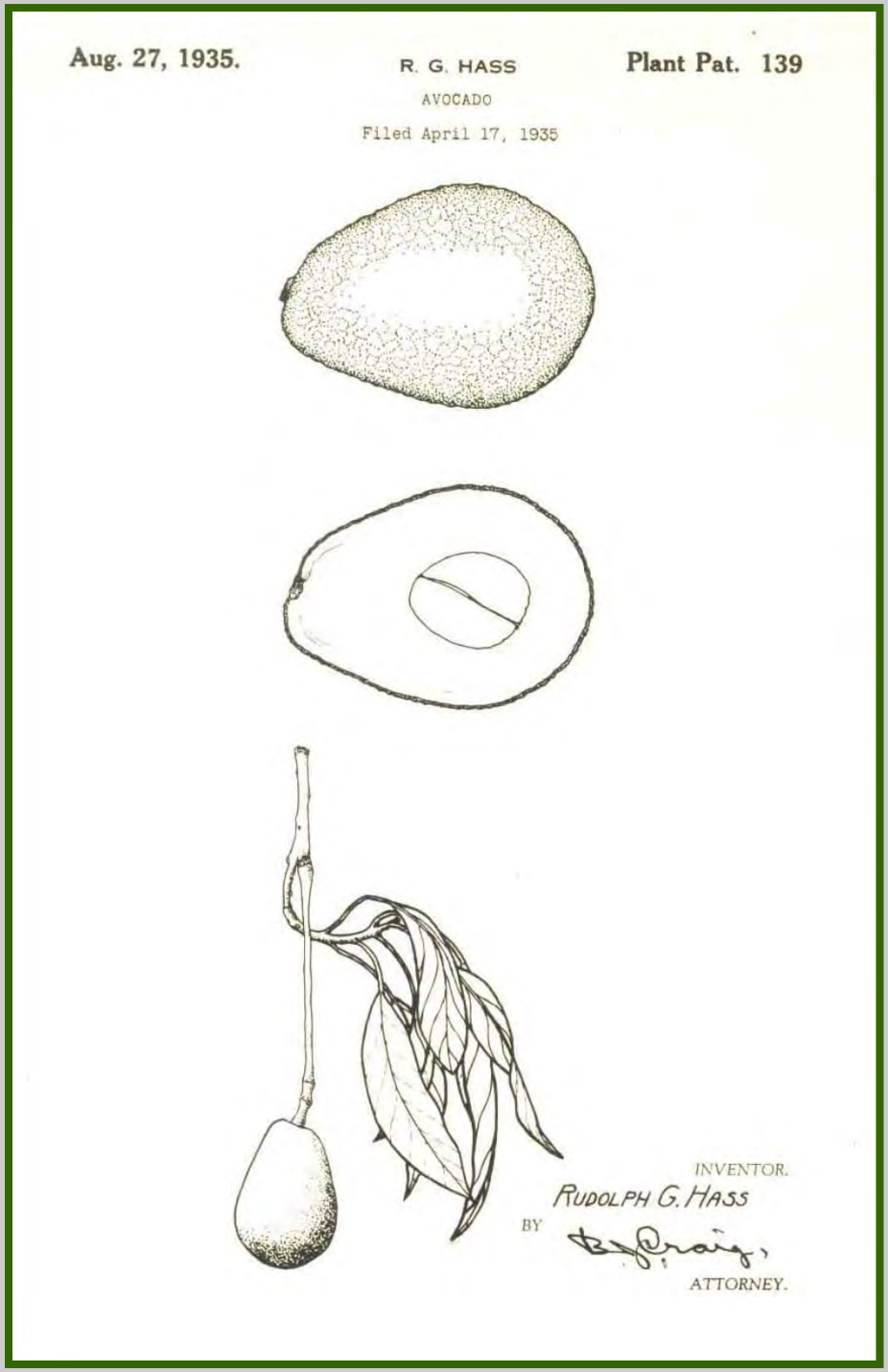


The first controlled breeding in California: 1937 by J. W. Lesley at UC Riverside, and 1939 by W.E. Lammerts at UCLA. He was followed by R. Bringhurst.

Bob Bergh took over the UC Riverside breeding program in 1956, retiring in 1992.

Timeline from 1982 to present

- 1982 – release of Gwen, Whitsell and Esther
- *Mid-1980's; planting of 50,000+ seedlings in various locations*
- 1992 – Bergh retires; Witney assumes responsibility with G. Martin as field person
- *1996 – Lamb Hass and SirPrize released*
- 1996 – Witney resigns, Arpaia assumes responsibility
- *1997 – G. Martin resigns*
- 1999 – Reorganization of project, planting of first seedlings since mid 1980's
- *2003 – 3-29-5 (GEM) and N4 (-5) (Harvest) released*



Aug. 27, 1935. R. G. HASS Plant Pat. 139

AVOCADO

Filed April 17, 1935

INVENTOR.
RUDOLPH G. HASS
BY
ATTORNEY.

Our leading cultivar, ‘Hass’ CAN BE improved:

- Fruit size
- Postharvest quality
- Tree size and structure
- Bearing habit
- Alternate bearing
- Cold tolerance
- Insect tolerance
- Salinity tolerance
- Productivity
- Seasonality

We have the potential to improve

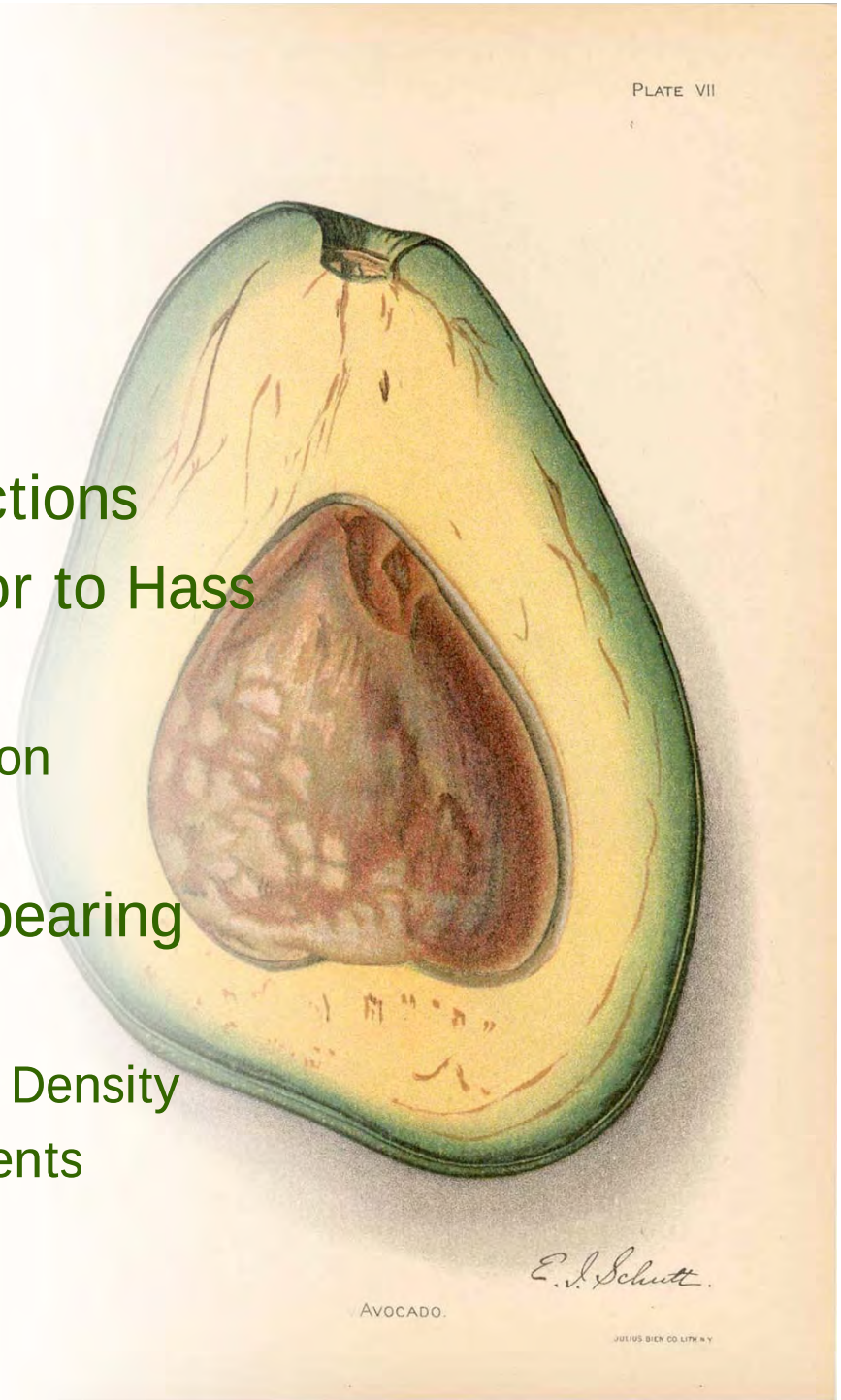
It is dangerous to have an industry based on one variety

Program Goals

Diversify with superior selections

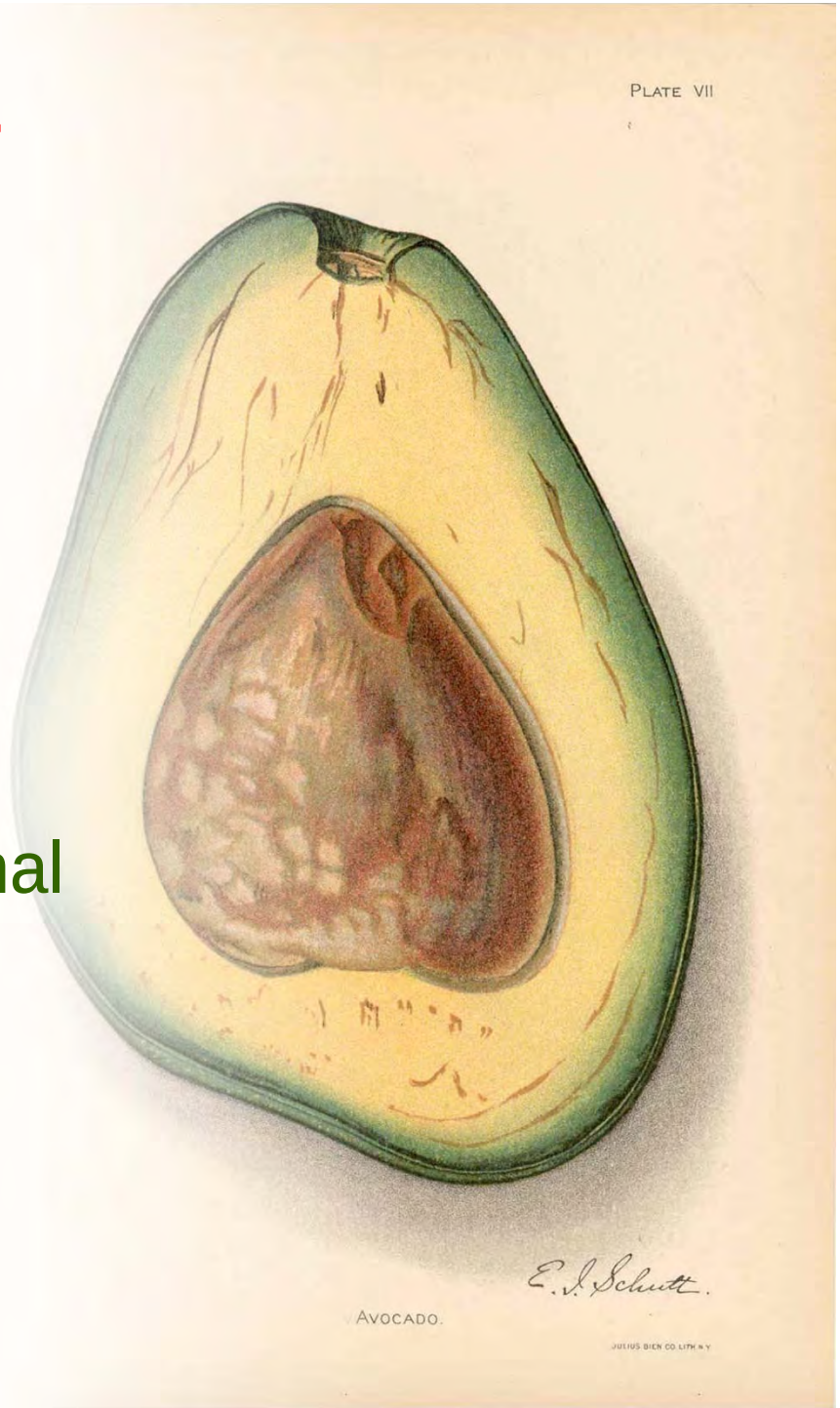
To develop new varieties for CA

- Emphasis on “Hass”-like selections
- Fruit Quality: equal or superior to Hass
- Seasonality
  - Short term: augment Hass season
  - Long term: replace Hass
- Cropping: reduced alternate bearing
- Cultural management
  - Growth habit conducive to High Density
  - Adaptability to varied environments
  - Salinity/drought tolerant
- Pest management

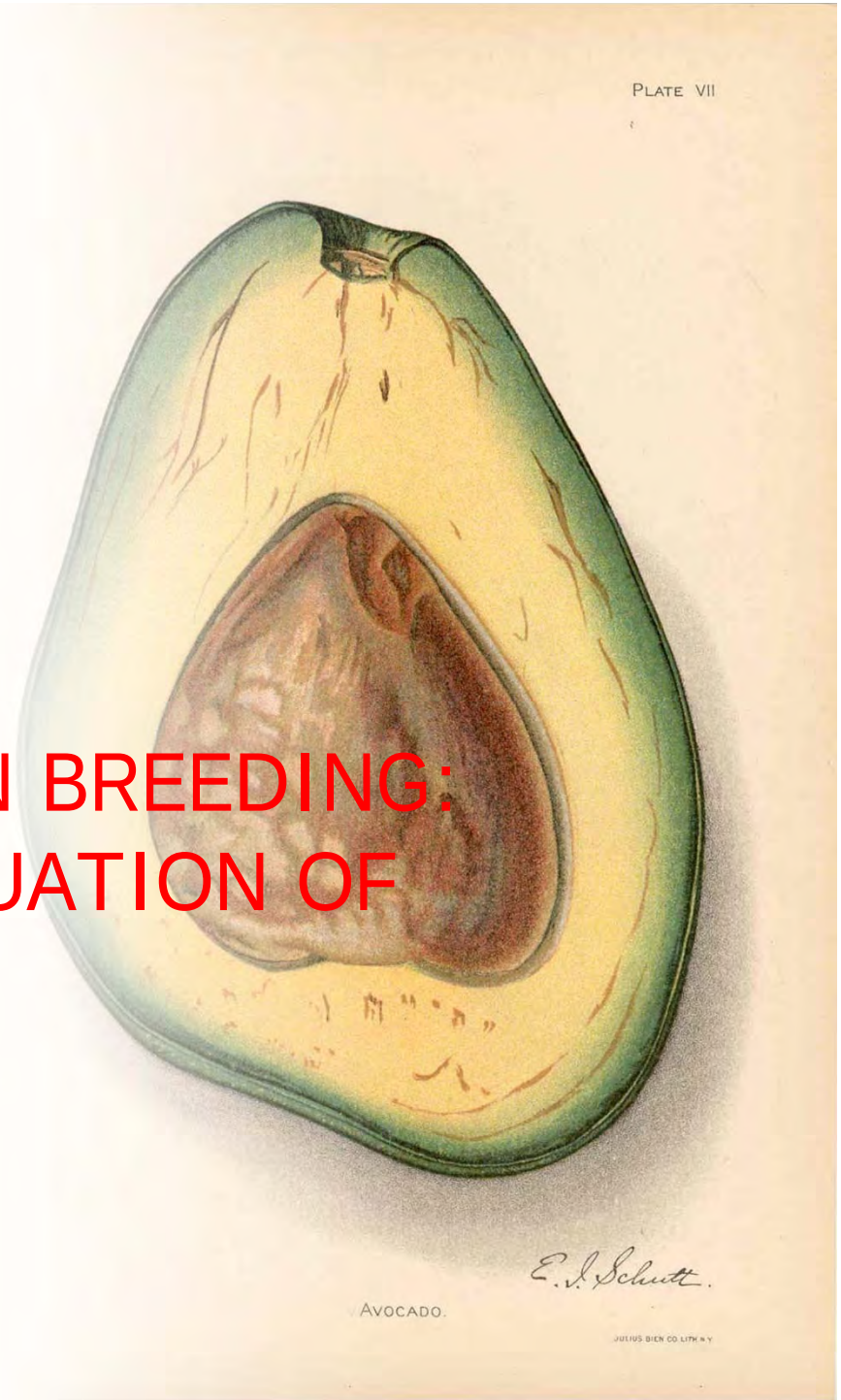


HOW DO WE ACHIEVE THESE GOALS?

- Selection and evaluation of improved varieties
- Scion:rootstock evaluation
- Germplasm preservation
- Collaboration w/ international research community



CONVENTIONAL SCION BREEDING: SELECTION AND EVALUATION OF IMPROVED VARIETIES



Components of evaluation

Tier 1

- *Flavor*
- *Fruit characteristics – size, seed size etc.*

Tier 2

- *Yield and maturity*
- *Postharvest quality and consumer panels*
- *Tree vigor – growth habit*
- *Flowering Behavior*

Components of evaluation

Tier 3

- *Establish evaluation plots throughout CA*
  - Single Rootstock
  - 5 replicates of 3 trees for each selection
  - Cycle trees through plots on a 6 year basis
- *Sites in San Diego, Orange, Ventura, Tulare counties*
  - Site in San Luis Obispo county desirable but no cooperator found

Components of evaluation

Tier 3 Continued

- *Yield*
- *Maturity, postharvest quality and consumer panels*
- *Tree vigor – growth habit*
- *Flowering, stress tolerance*

Tier 4

- *Commercial release of superior material*

Seed sources for plantings

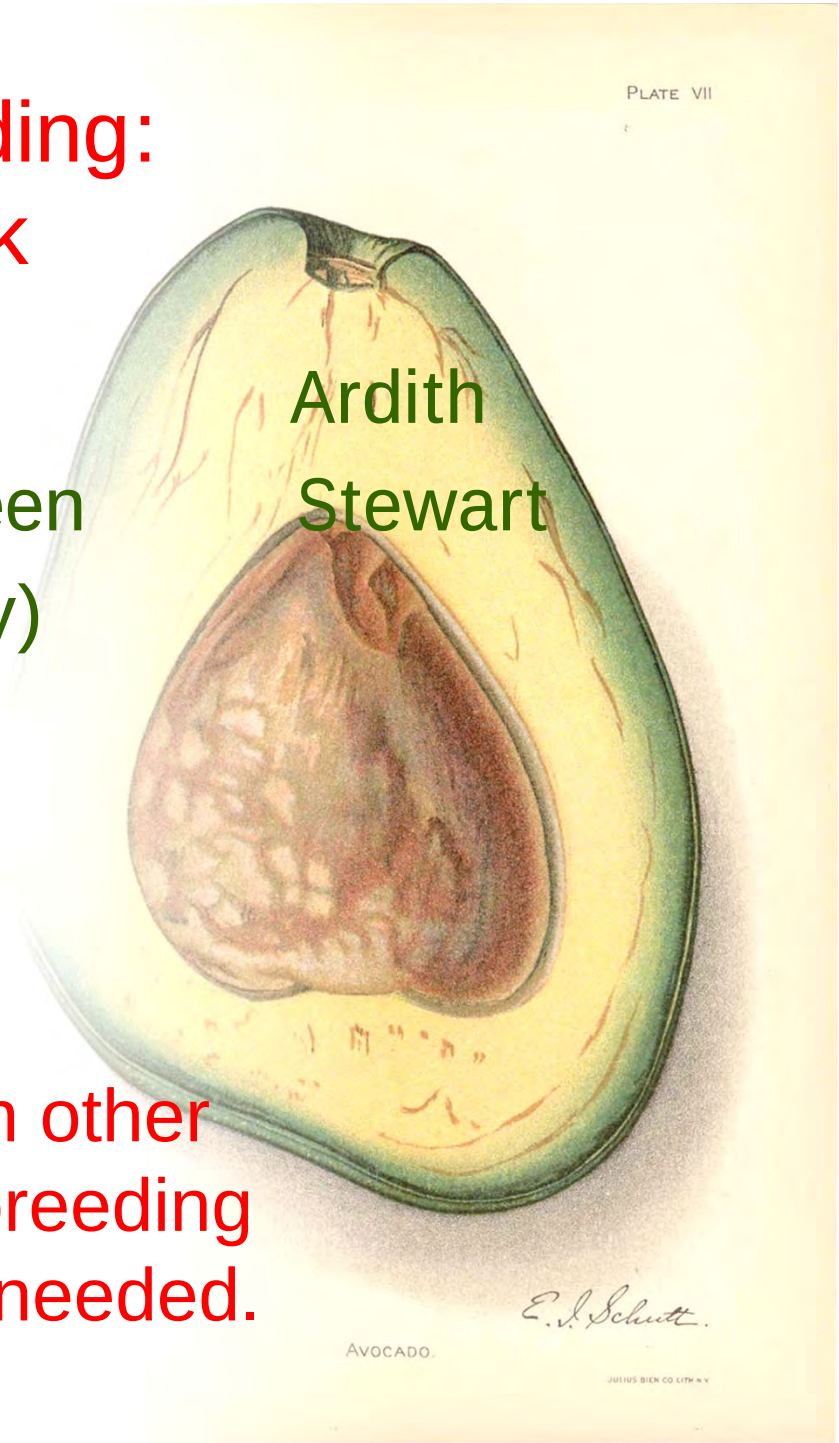
Isolation blocks established in 2000 at UCR

- GEM x BL516
- GEM x Thille

Field 4 Maternal Block at UC South Coast REC

Conventional scion breeding: Field 4 Maternal Block

Gwen	Green Gold	Ardith
GEM	Murietta Green	Stewart
Harvest	XX3 (Holiday)	
Lamb Hass	Puebla	
Marvel	Reed	
Nobel	SirPrize	

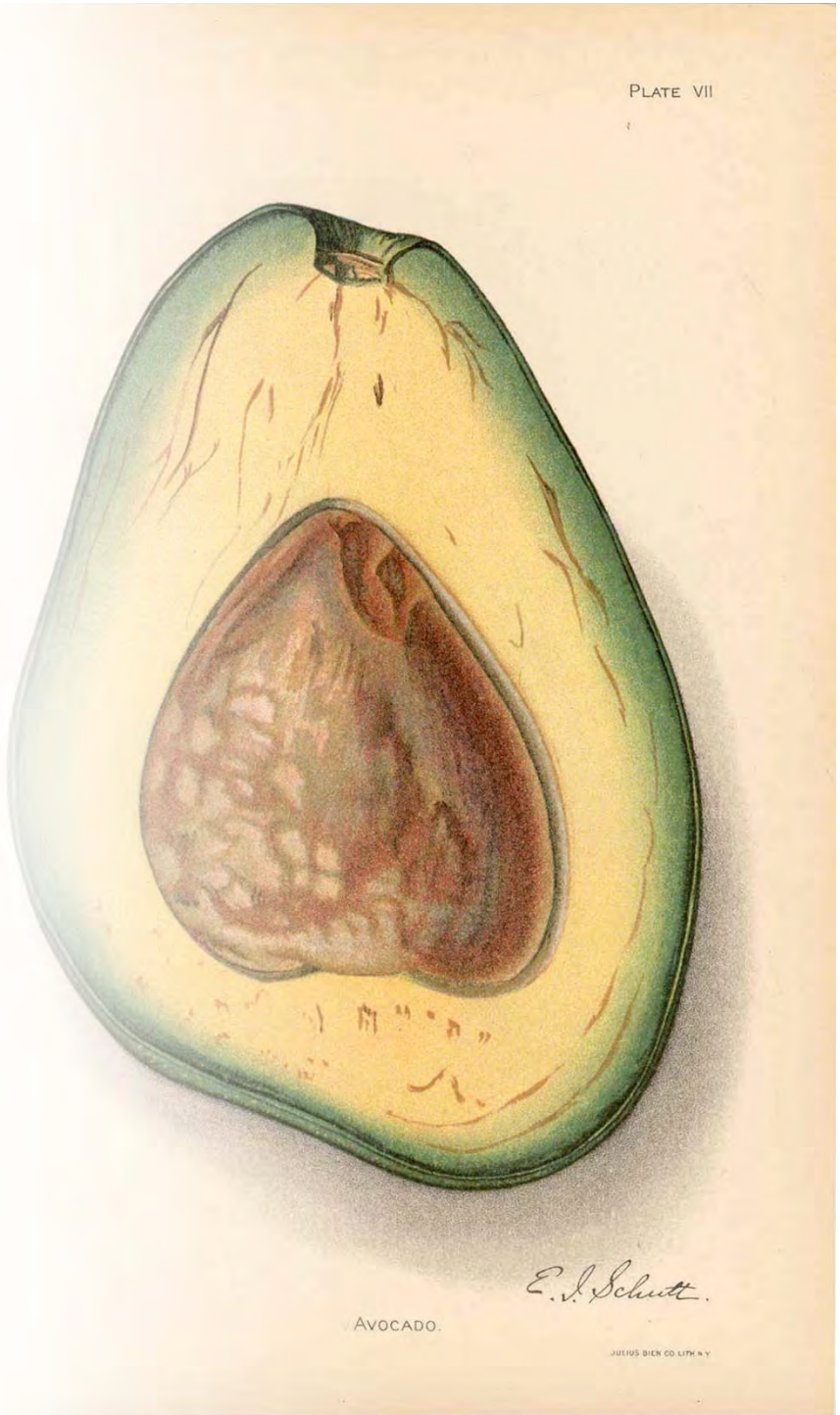


We are continuously working in other interesting material to use as breeding stock. Material is replaced as needed.

SCION:ROOTSTOCK INTERACTIONS

Purpose:

To demonstrate rootstock effect on several horticultural traits including yield, fruit size, alternate bearing, tree size and tree nutrition



SCION:ROOTSTOCK INTERACTIONS

1986 trial

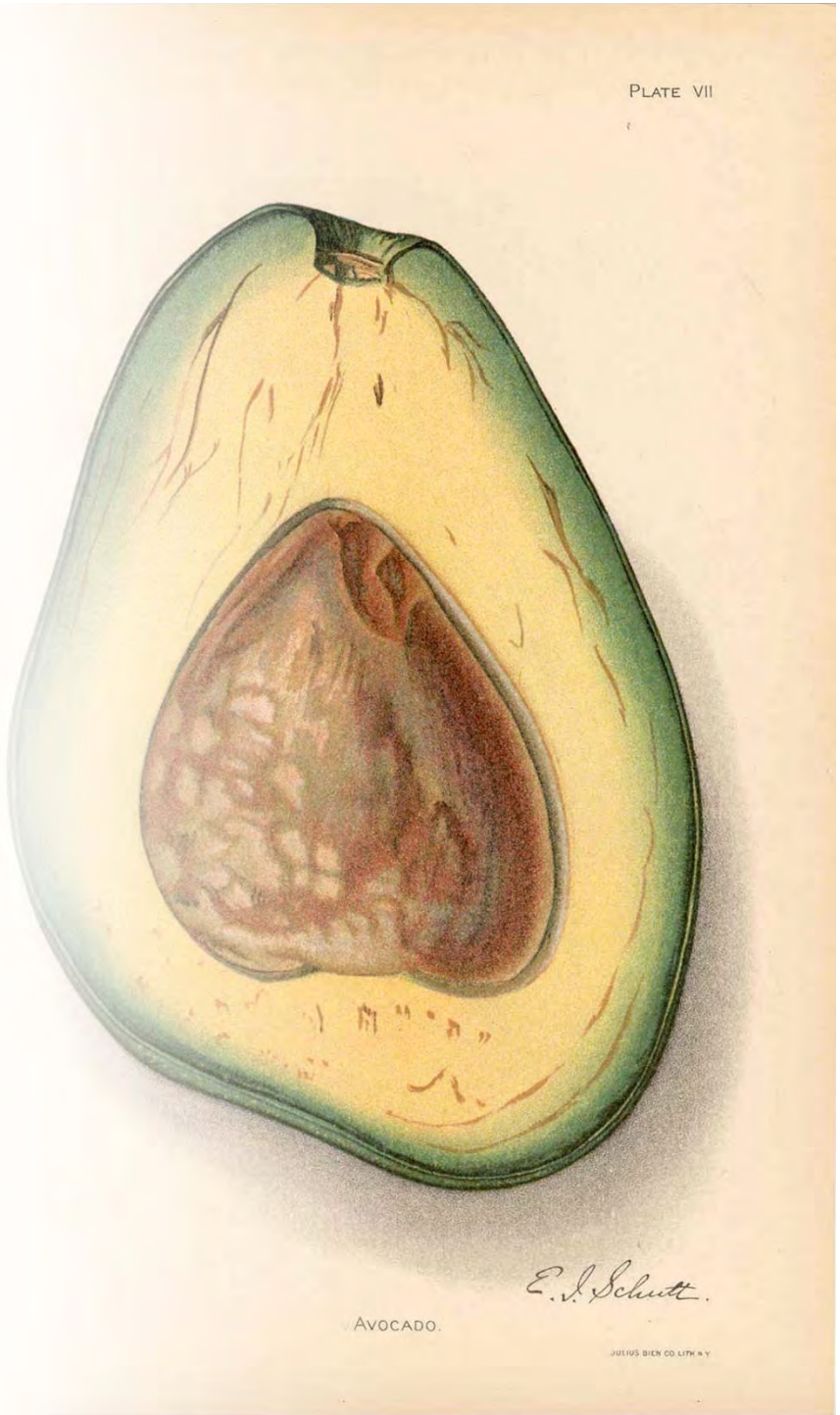
Hass on 10 rootstocks

Borchard, Duke 7 and Toro Canyon best performers

1999 trial

Hass on 10 rootstocks

Lamb Hass on 5 rootstocks



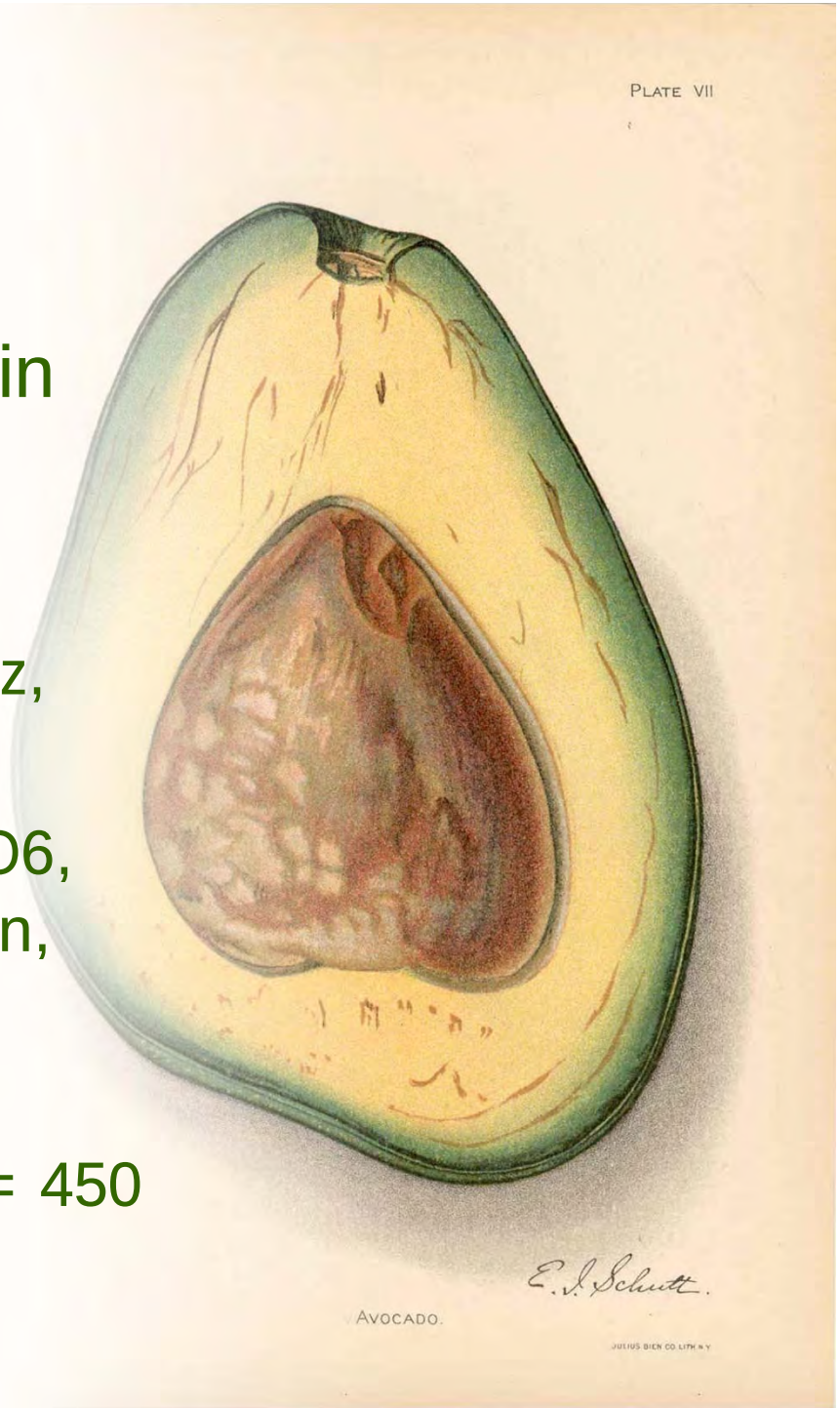
SCION:ROOTSTOCK INTERACTIONS

Trial to be planted in Ventura in Spring 2012

5 Varieties: Hass, Carmen Mendez, Lamb Hass, GEM, Reed

9 Rootstocks: Dusa, Duke7, RO.O6, Zentmyer, Uzi, Steddom, Brandon, Eddie, Anita

10 replicates of each combination = 450 trees



The Importance of the Germplasm Collection

- Preservation of older varieties from the CA and elsewhere
- Largest collection of varieties focused on MX-Guat races
- Home to interesting materials that may one day be useful for future breeding
- Public Education