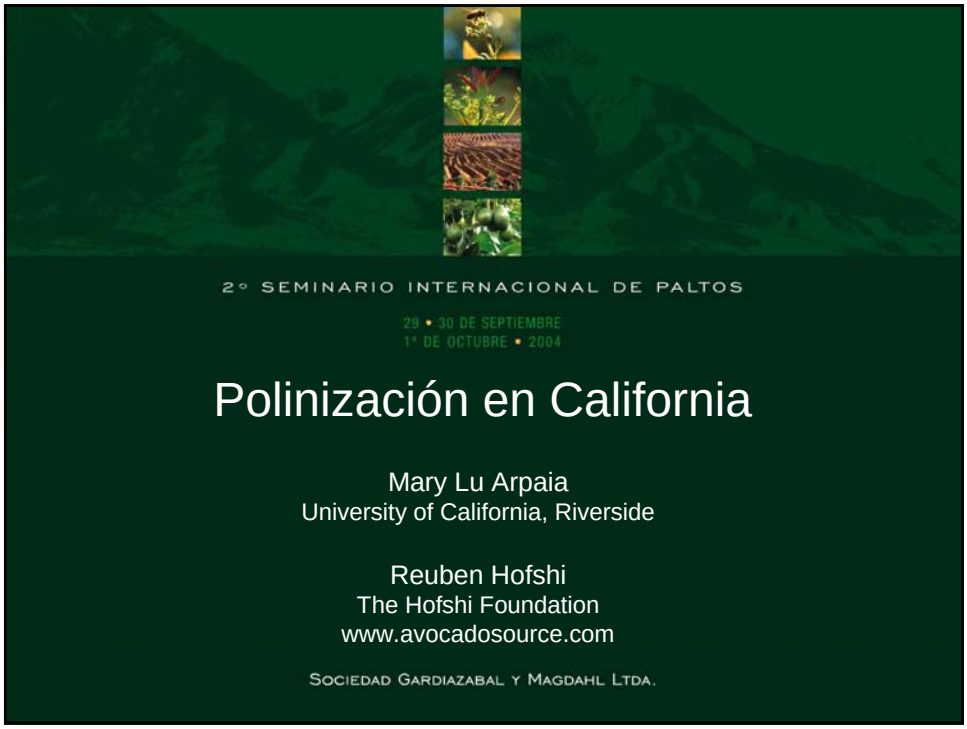

2° SEMINARIO INTERNACIONAL DE PALTOS

29 • 30 DE SEPTIEMBRE
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Polinización en California

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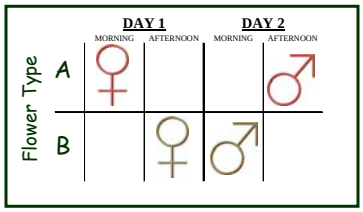
SOCIEDAD GARDIAZABAL Y MAGDAHL LTDA.

The early days – 1920's

- Recognition of floral dichogamy – Stout
  - A and B flower types



- Recognition of the importance of pollinators – Clark
  - Caging studies

The next steps – Bergh and Gustafson

- Recognition of proximity effects in trials looking at Fuerte fruit set as a function of distance from pollinizer varieties
- Recognition of the potential of the honeybee as a pollinator for avocados

Status by the end of 1970's

- Native vegetation – wild honeybees plentiful
- No significant use of introduced hives
- When used, growers did not pay for honeybees
- Beekeepers place hives in avocado groves following almond pollination
- Honeybees were not kept in groves for entire flowering period
- Some controversy over the need for pollinizer varieties

Steps backwards – 1980's

- The rise of Hass as the dominant variety and subsequent loss of value of "greenskins"
- The introduction of varroa mite and decimation of feral honeybees
- RESULT – Loss of pollinizers and pollinators throughout the industry

Rekindling of interest – 1980's and 90's

- Loss of productivity industry wide
- International Research focused on pollination/pollinizers
  - Sedgley – Flower stages, temperature and fruit set
  - Robbertse et al – Boron and fruit set
  - Köhne, Robbertse – pollination in South Africa
  - Davenport – flowering and pollination in Florida
  - Degani, Gazit et al – importance of cross pollination and fruit retention
  - Vithanage – visitors to avocado flowers
  - Ish-Am, Eisikowitch – honeybee behavior
  - Ish-Am, Gazit – searching for the native pollinator of avocado

Understanding and manipulating flowering and fruitset in California

Funding of research by the industry – *Focused on the Plant*

- Genetic analysis for determining outcrossing
  - Ellstrand (isozymes); Clegg (RFLP, microsatellites); Davenport/Schnell (microsatellites)
- Shifting flowering
  - Salazar-Garcia, Lovatt (Gibberellins, boron)
- Selection of new varieties as pollinizers for Hass
  - Bergh et al (SirPrize, BL667, BL516)
- Pollinizer Trials
  - Arpaia et al (DeBusschere Pollinizer Trial)

Understanding and manipulating flowering and fruitset in California

Funding of research by the industry – *Focused on the Pollinator*

- Honeybee visitation and other pollinators
  - Visscher and Sherman
- Honeybee races
  - Hofshi (Carniolan vs Italian)
  - Fetscher, Waser, Hofshi, Arpaia (perseitol to monitor pollination efficacy) has led to collaborative research with Israel – Shafir, Dag, Arpaia, Davenport

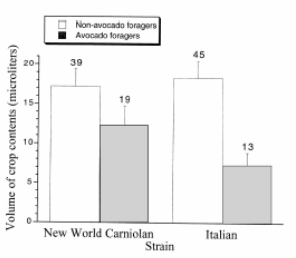
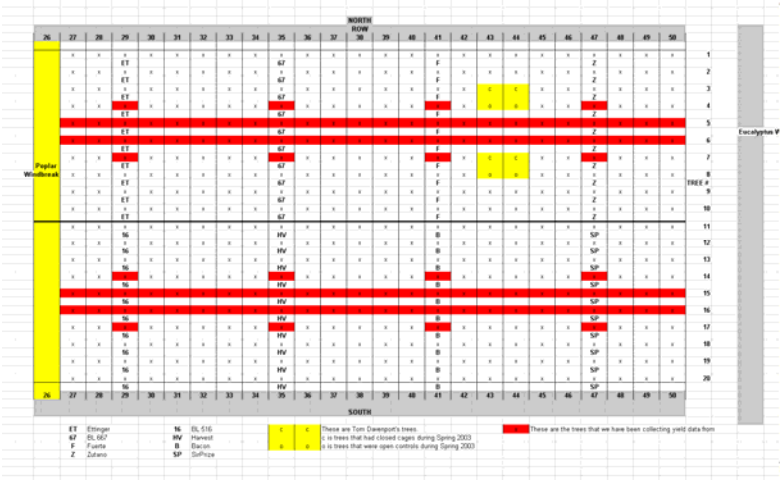


Figure 3. Total volume of crop contents (μL; mean + SE) of foragers caught upon return to their hives from Italian (IT) and New World Carniolan (NWC) colonies placed in a California avocado orchard (CA2), in 2000. Numbers above the error bars are the sample size. The type of bloom visited by a given forager was inferred by the presence or absence of perseitol in the crop sample.

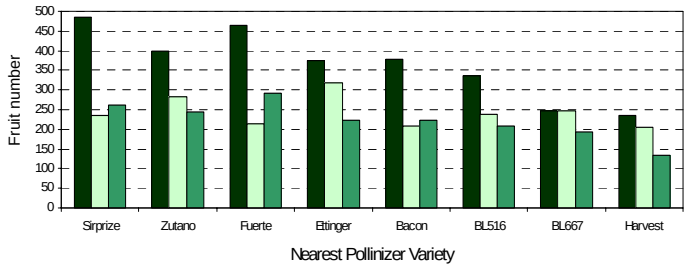
Appreciating Proximity once again

DeBusschere Pollinizer Trial - Coastal Ventura County

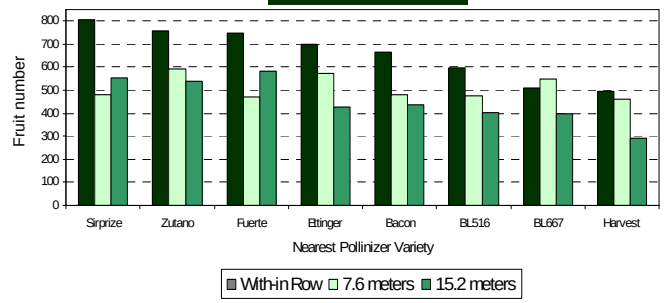


Pollinizer Varieties: 8
Field trial replicates: 6
Pollinizers interset with Hass

2004 Data



Cumulative Data



Trends in California

Planting multiple pollinizers in the same hole

Increasing the % of pollinizers and the placement of pollinizers

Goal: Maximize the opportunity for cross pollination

An example where Bacon, Zutano and Ettinger planted in same hole

Trends in California

Honeybees

- Placement (on pallets)
- Honeybee race (???)
- Paying for bees (~$18-30/hive)
- How many hives? (avg. 2-4 hives/HA, as high as 10)
- Keeping the hives for the entire flowering season