

The background of the slide is a repeating pattern of avocados. Most are whole, dark green avocados with a bumpy texture, scattered across the frame. In the center, slightly below the main title, is a single avocado cut in half, showing its bright green flesh and dark pit. The avocados are set against a light beige background with soft, dark shadows cast beneath them, giving a three-dimensional effect.

Clonal Avocado Rootstocks for California: Past, Present and Future

Consuelo Fernández Noguera
Brokaw Nursery LLC

Early clonal rootstock selections:

Duke 7 : Released commercially as clonal rootstock in mid 1970s. Still commercially viable.

mid 1970s

Martin Grande: Selected in 1976. Not sufficiently productive.

1976

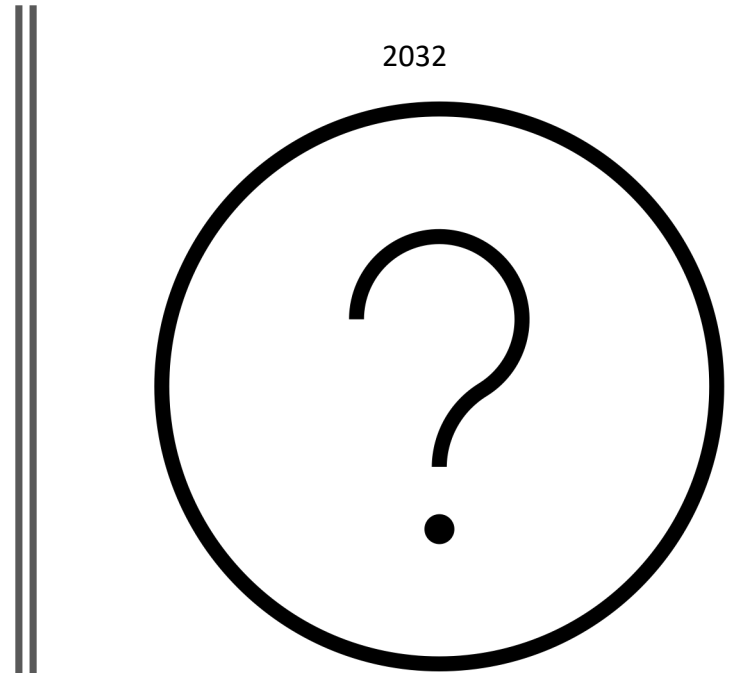
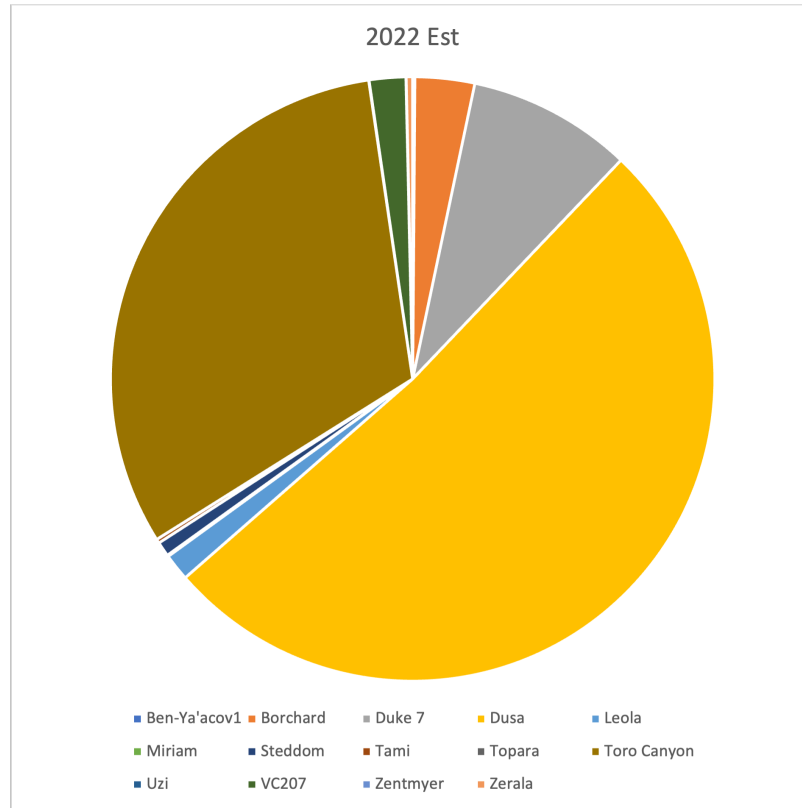
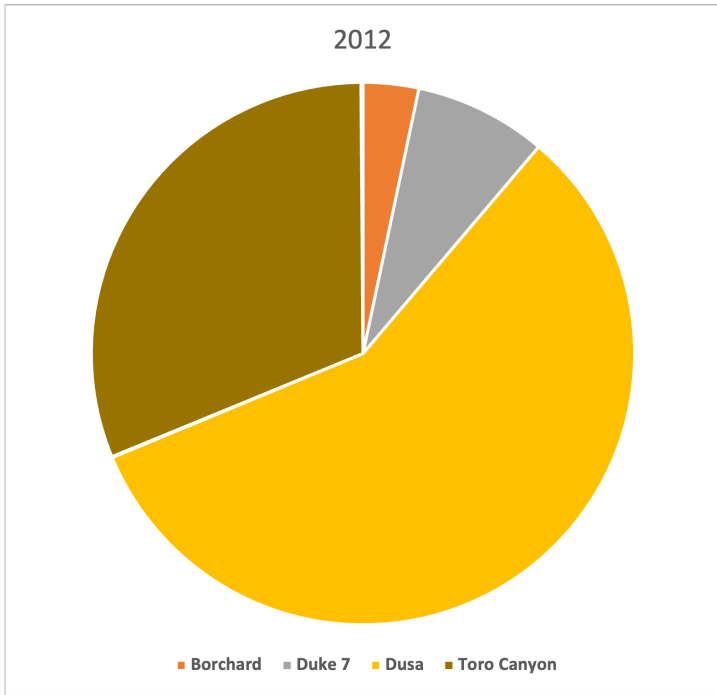
Thomas: Released in late 1980's. Sensitivity to salinity and not productive in some areas.

late 1980's

Toro Canyon: US Patent applied for 1984, granted 1986. Still commercially viable.

1986

Borchard: US Patent applied for 1984, granted 1986. Still commercially viable.



Clonal avocado rootstock availability in California

Commercial rootstocks available in California as of 2022...

Dusa[®]

Toro
Canyon

Borchard

Duke7

Ben Ya'acov
(VC66)

Leola[™]

Zerala[™]

Topara

VC 207

Steddom

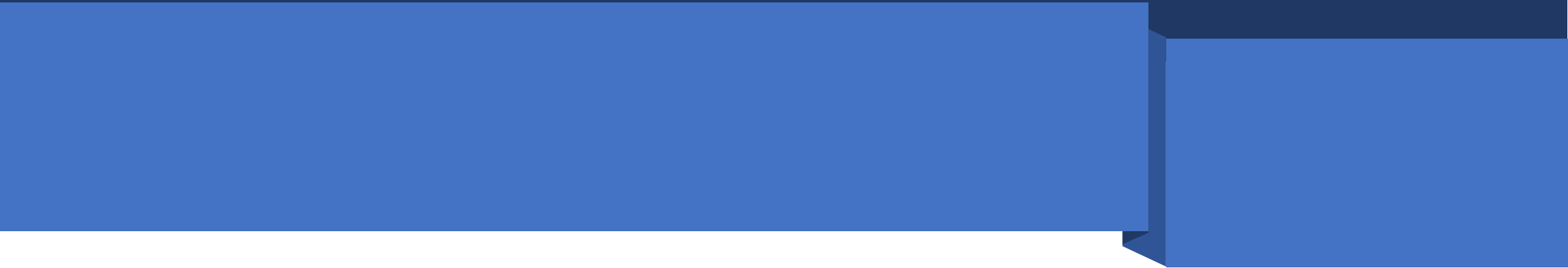
Uzi

Miriam
(VC218)

Tami
(VC801)

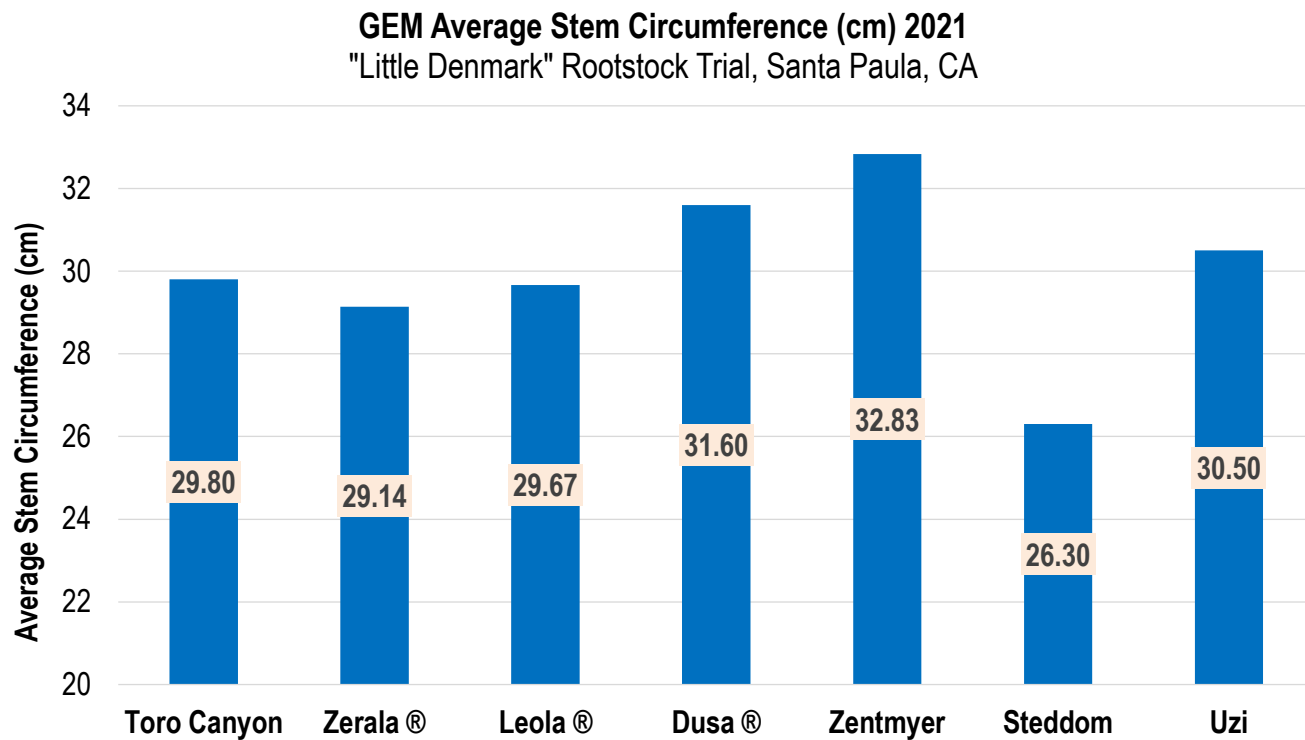
Zentmyer

2014 University of California New Introductions



Steddom

2014



High tolerance to *Phytophthora cinnamomi*

Considered to be moderately tolerant to salts

Reported to produce smaller compact trees

Generally, supports a very healthy tree

Good performance as replant in existing orchards

Uzi

2014

Strong tolerance to *Phytophthora cinnamomi*.

May show leaf burn if planted in an environment where salts are a problem.

Reportedly a very vigorous rootstock, can produce large trees.

Generally competitive in terms of yield when compared to leading commercial varieties.

Zentmyer

2014

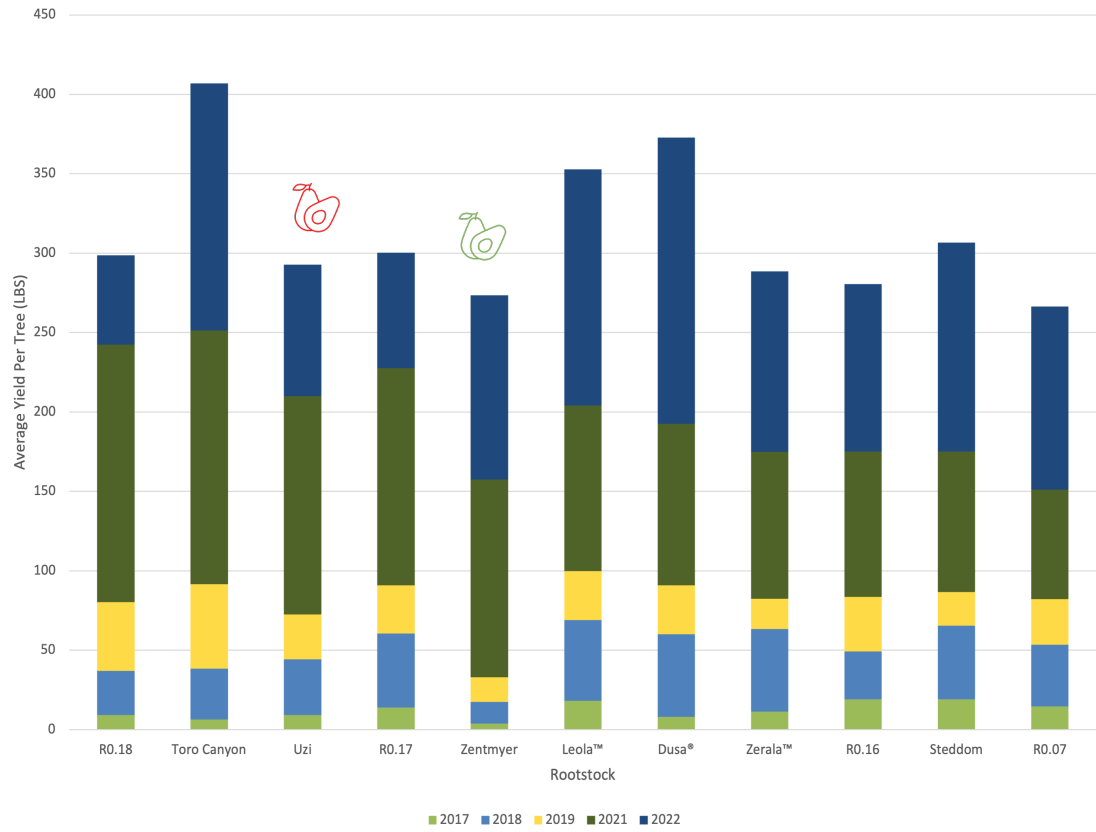
Considered to be highly tolerant to *Phytophthora cinnamomi*.

Sensitive to salinity.

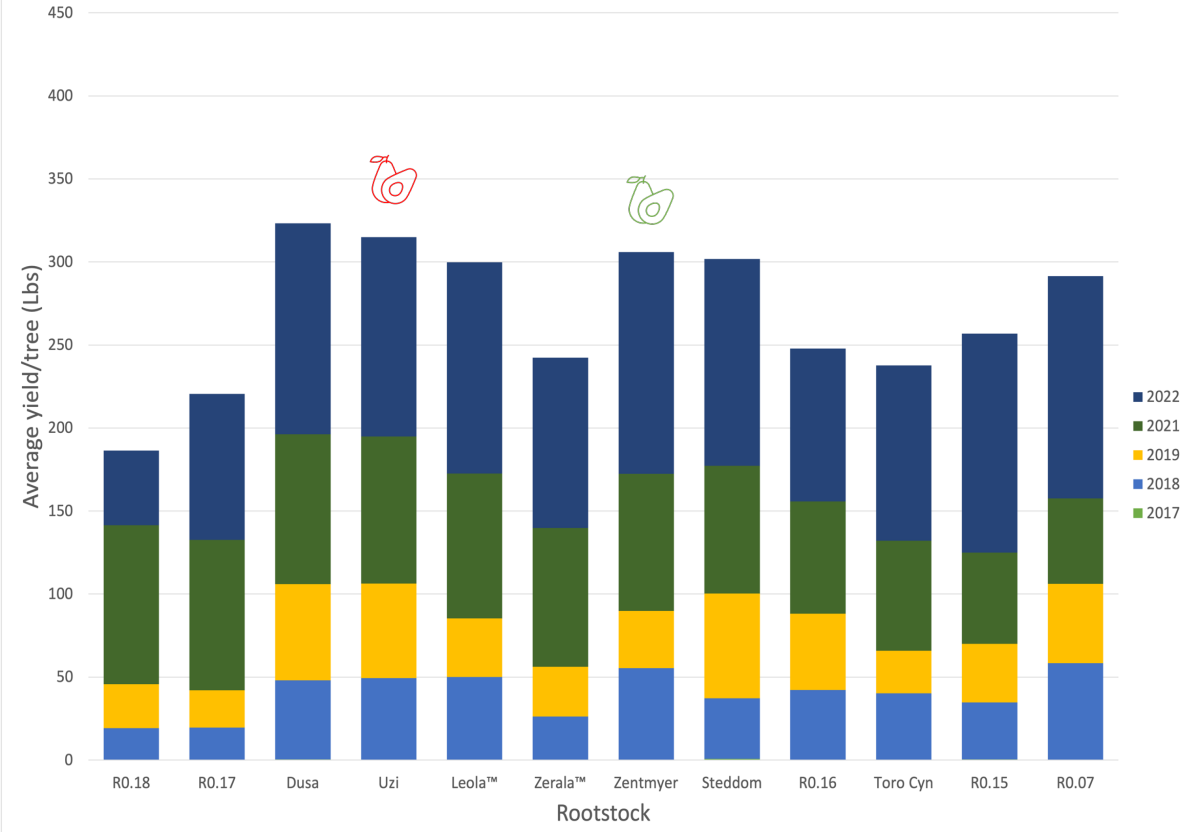
Reported to be the best yielding in root rot situations between Steddom and Uzi.

Recommended for replant situations with high root rot pressure.

Cumulative Average Yield/Tree 2017-2022 (Except 2020) by Rootstock
Goleta Ranch #1



Cumulative Average Yield 2017-2022 (Except 2020) by Rootstock
Goleta Ranch #2

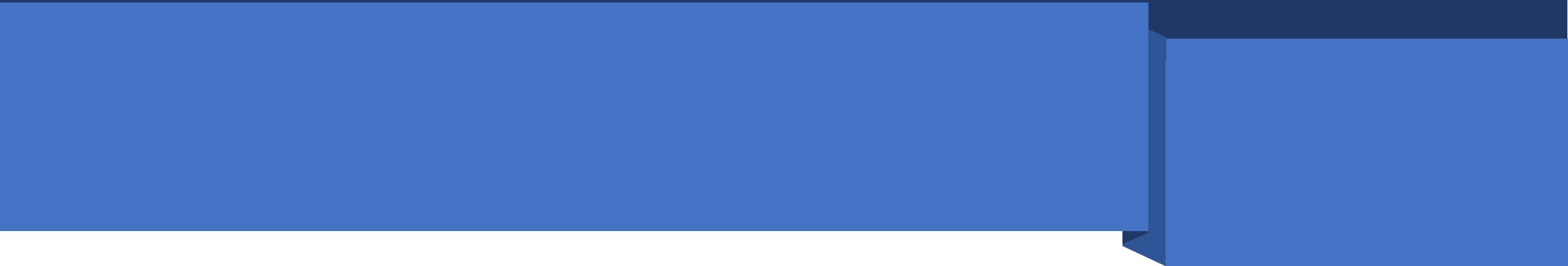


Cumulative Average Yield/Tree (lbs) 2019-2022

Little Denmark Trial (GEM)



2018 Volcani Institute (Israel) New Introductions



West Indian Selections

- Ben-Ya'acov began a program to select the most salt-tolerant West Indian selections that also showed the least lime-induced chlorosis (Ben-Ya'acov and Michelson 1994). Some of these selections have some degree of root rot tolerance.
- Generally had more salinity tolerance than Mexican selections (Oppenheimer 1947).
- Tend to be highly resistant to lime-induced iron chlorosis when trees were grown in calcareous soils.
- *West Indian selections are believed to be sensitive to cold.*

Miriam (VC218)

2018

High tolerance to *Phytophthora cinnamomi*.

Performs well under drought conditions and has demonstrated a very high tolerance to salinity.

Said to have medium to average vigor when grafted with Hass.

Reportedly tolerant to alkaline soils.

Tami (VC801)

2018

Offers moderate tolerance to *Phytophthora cinnamomi*

Has demonstrated high tolerance to salts.

Medium tree vigor

Moderate tolerance to lime chlorosis.

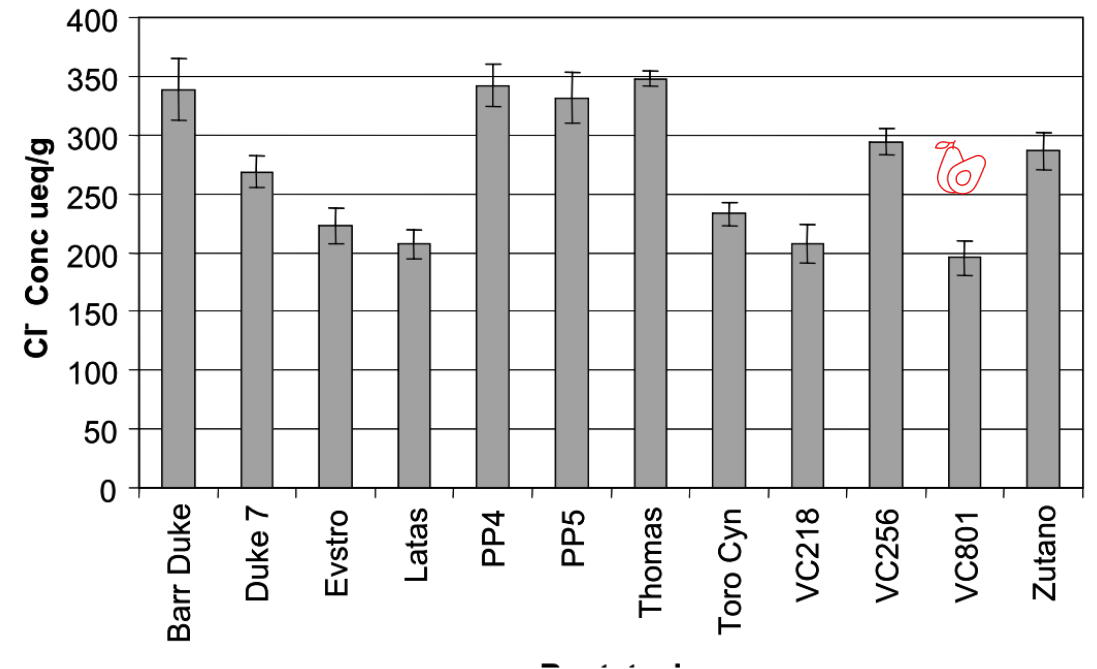


Figure 1. Chloride content of leaf samples from Hass scions grafted on to different rootstocks for leaves collected Sept 24, 2002.

Above: In this rootstock trial, TAMI (VC801) performed extremely well in salinity conditions, allocating the smallest amount of chloride to the Hass scion. Source: Crowley, Arpaia

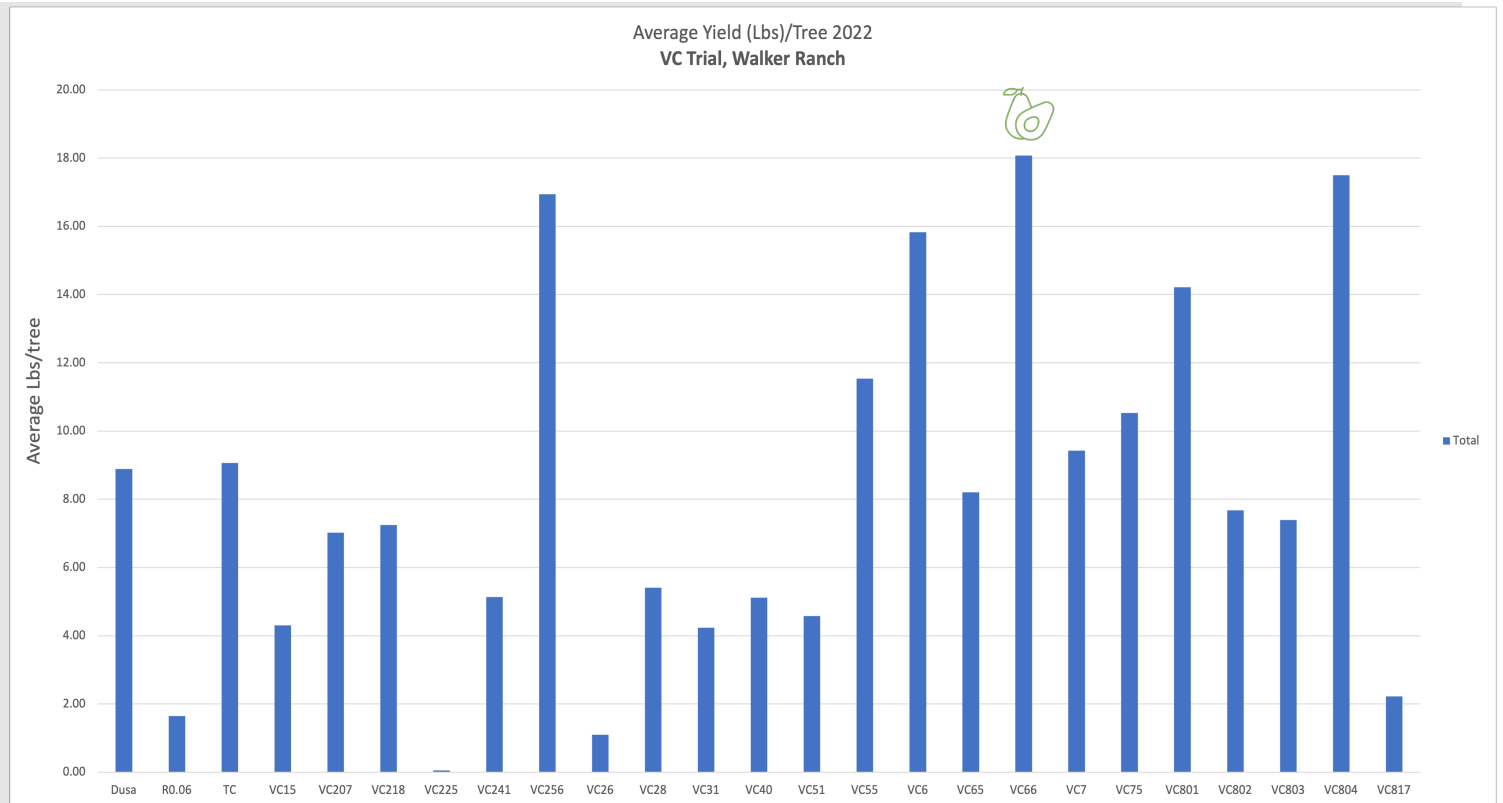
Ben Ya'Acov 1 (VC 66)

Tolerance *Phytophthora cinnamomi*.

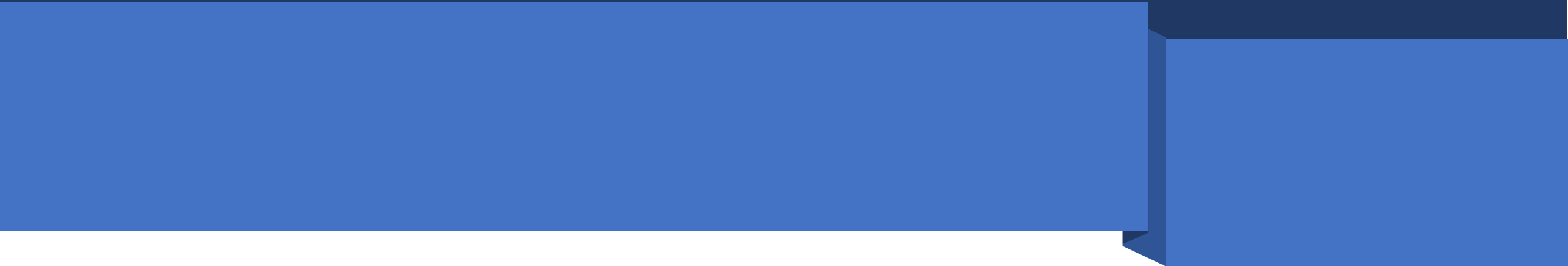
Tolerance of salinity

Vigor unknown

Reported to have a lower tendency towards alternate bearing.



2020 Westfalia Fruit New Introductions



Leola™

2020


Tolerance to *Phytophthora cinnamomi*.

May be susceptible to salinity

Offers competitive yields and good tree-health overall.

Has performed well in both coastal and inland locations.

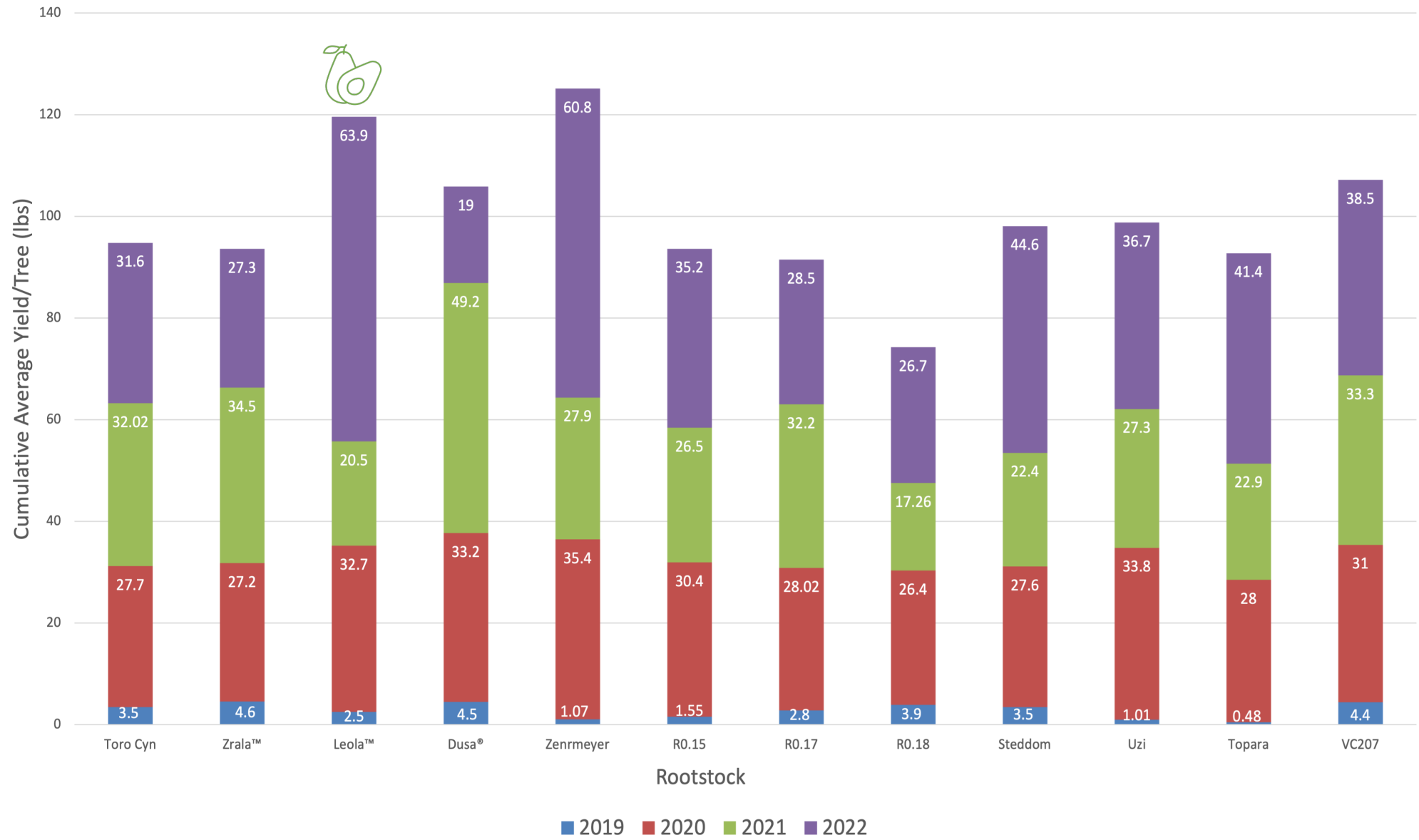
Good performance when grafted to GEM.

Rootstock	Average of Lbs./tree	Estimated Lbs./A*
Dusa	32	12,687
Toro Cyn.	29	11,554
 Leola	34	13,623
Zerala	23	9,059
R0.18	21	8,459
* Planted at 401 trees/A		

Above: Yield data for La Yegua semi-comercial trial, Ventura, CA

Cumulative Average Yield/Tree (lbs) 2019-2022

Little Denmark Trial



Zerala™

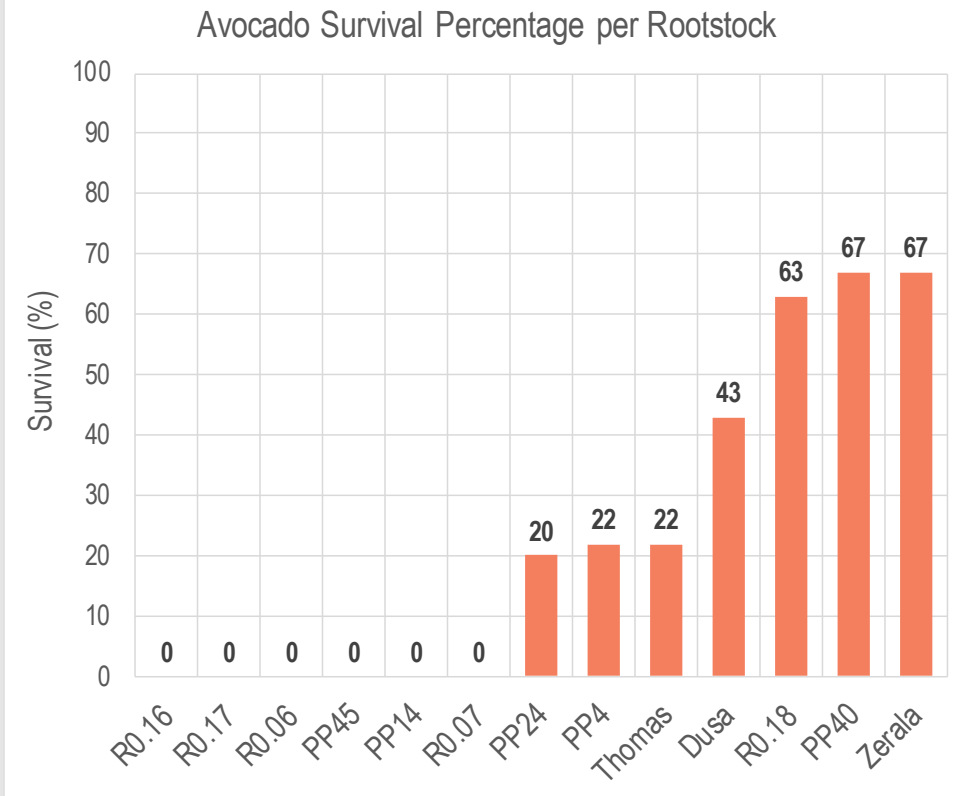
2020

Selected for tolerance to *Phytophthora cinnamomi*,

Zerala has been found to also offer an advantage in saline conditions.

Vigorous tree.

Should be planted on berms, hillsides or well-drained soils.



Graph modified, taken Celis, Nydia, et al. "Salt Tolerance and Growth of 13 Avocado Rootstocks Related Best to Chloride Uptake." HortScience, vol. 53, no. 12, 2018, pp. 1737-45

Zerala™

- Zerala™ together with PP40 and Dusa had the highest salinity tolerance in a salinity trial by UCR researchers
- “Selections such as Zerala showed a promising increase in water use efficiency under saline conditions.”



Figure 1. R0.05 fresh water (left) and salt treated (right). Overall survival rate in salt treated row was 66.67 percent. Photo taken in 2015.

Source: Mauk et al, “The Challenge of Salinity”, *From the Grove*, Spring 2017

TOPARA (KB1)

Peru

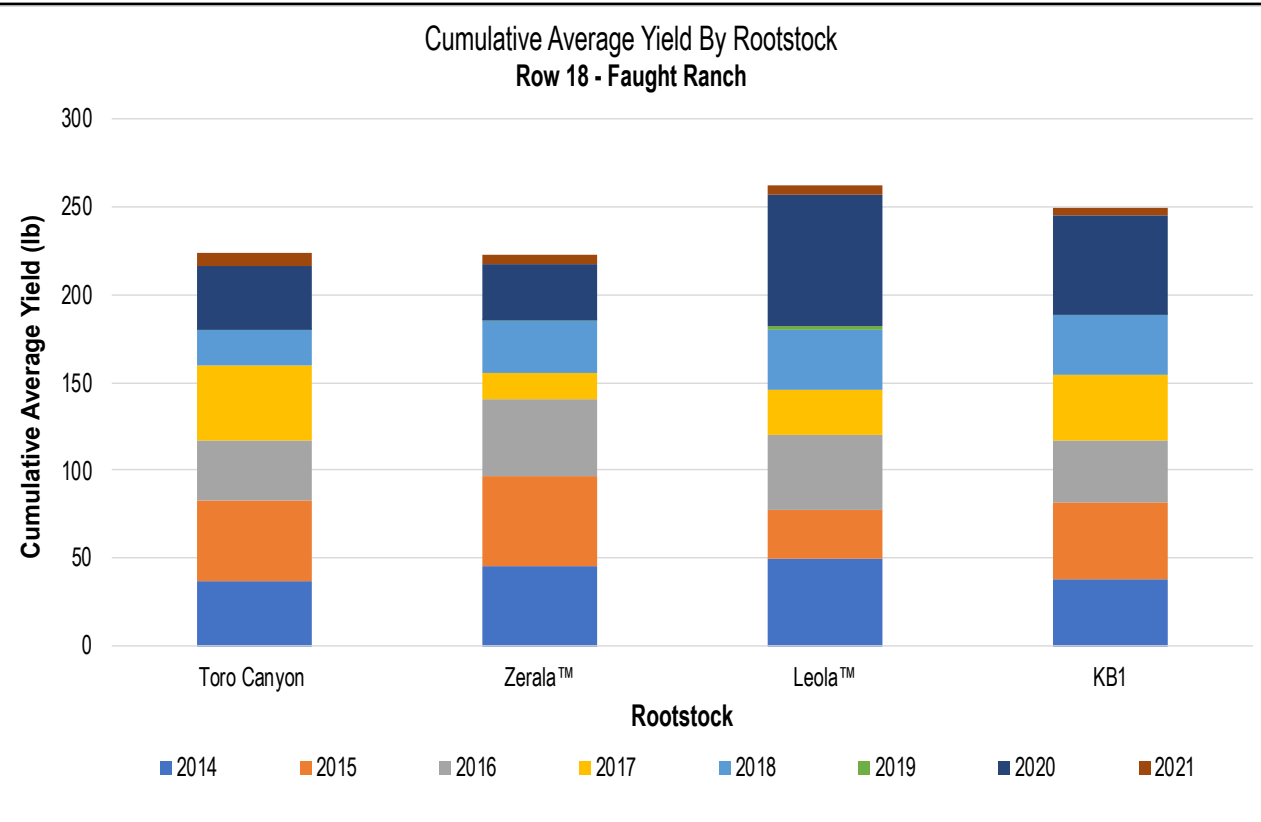
2018

Not tolerant to *Phytophthora cinnamomi*.

Tolerance to salinity has yet to be demonstrated.

Vigorous rootstock

Capable of producing competitive yields.



Day (VC 207)

Tolerance to *Phytophthora cinnamomi*.

Considered to be salinity tolerant.

Capable of producing competitive yields

Moderate tolerance to lime chlorosis.

Future availability...

- UCR releasing 5 new rootstocks in the next 2-5 years.
- 10 + Westfalia advanced selections being in Ventura County.
- Brokaw Nursery testing 17 new Israeli advanced selections in Ventura County.
- Brokaw Nursery has 10 new rootstock selections from Israel in quarantine.
- Brokaw Nursery has one selection from New Zealand in quarantine.

Final notes...



KNOW YOUR
CONDITIONS



TEST
ROOTSTOCKS



GO OUT AND
VISIT



STAY CONNECTED

The image features a background of vertical wooden planks painted in a teal or turquoise color. The wood grain is visible through the paint. At the bottom of the image, there is a decorative border consisting of various autumn leaves in shades of red, orange, and yellow. A white horizontal band is positioned across the middle of the image, containing the text "Thanks!".

Thanks!