

Desert Lemon Trial

Dr. Tracy Kahn

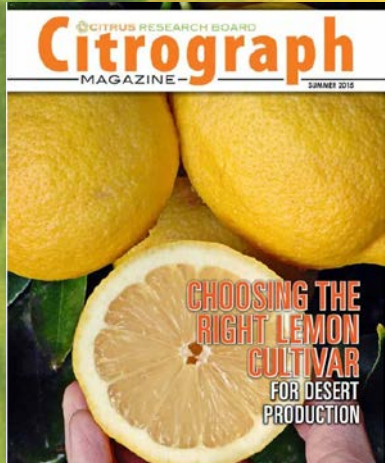
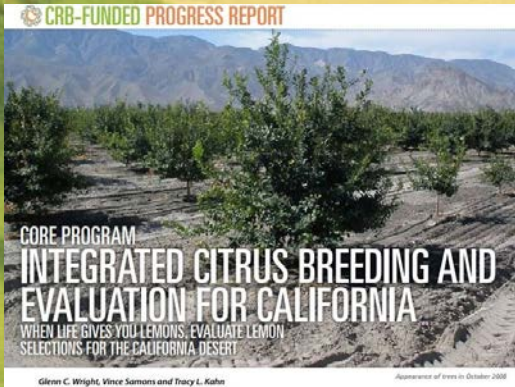
Dr. Glenn C. Wright



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES

COOPERATIVE EXTENSION
Yuma Agricultural Center

Background for Desert Lemon Trial Soon to be Completed



- ▶ This earlier trial at a single location provided background for new multi-location scion trial.
- ▶ Desert lemons occupy an important early-season market niche and are a source for packinghouses located in other parts of state.
- ▶ Goal: To provide the industry with information on the tree growth, yield, packout, and fruit quality characteristics for selected lemon varieties in the California desert.
- ▶ CRB funded trial initiated in 2005-06. Trees of 11 cultivars planted in 2006 on a 2.9 acre site at CVARS. Trees of 12th selection, 'Limonero Fino Largo' planted in 2007.
- ▶ Trial had 20 trees each of 12 selections budded to *Citrus macrophylla* rootstock in 5 groupings of 4 trees per selection.
- ▶ Spacing is 24 ft by 18 ft, and the experimental design is randomized complete block.

UNIVERSITY of CALIFORNIA
 COACHELLA VALLEY AGRICULTURAL RESEARCH STATION
 FIELD 4, BLOCK 6, ROWS 1-16
 LEMON VARIETY TRIAL FOR THE DESERT

BLOCK 1			BLOCK 2			BLOCK 3				BLOCK 4			BLOCK 5			TREE ↓	NORTH →
ROW 16	ROW 15	ROW 14	ROW 13	ROW 12	ROW 11	ROW 10	ROW 9	ROW 8	ROW 7	ROW 6	ROW 5	ROW 4	ROW 3	ROW 2	ROW 1		
4	12	7	6	2	11	12	9	2	11	5	3	1	10	8	9	1	1 Allen Eureka VI 227
4	12	7	6	2	11	12	9	2	11	5	3	1	10	8	9	2	2 Corona Foothills
4	12	7	6	2	11	12	9	2	11	5	3	1	10	8	9	3	3 Femminello Sta. Teresa
X	X	7	6	2	11	12	9	2	11	5	3	1	10	8	9	4	4 Interdonato VI 667
1	2	11	5	8	4	8	7	3	X	10	9	12	11	6	12	5	5 Limoneira 8A Lisbon VI 380
1	2	11	5	8	4	8	7	3	4	10	9	12	11	6	12	6	6 Limonero Fino 49 VI 480
1	2	11	5	8	4	8	7	3	4	10	9	12	11	6	12	7	7 Limonero Fino 95
1	2	11	5	8	4	8	7	3	4	10	9	12	11	6	12	8	8 Messina VI 661
10	8	X	10	1	9	1	6	10	5	8	6	7	3	4	7	9	9 Seedless Lemon VI 492
10	8	3	10	1	9	1	6	10	5	8	6	7	X	4	7	10	10 Variegated Pink Eureka VI 486
10	8	3	10	1	9	1	6	X	5	8	6	7	3	4	7	11	11 Walker Lisbon VI415
10	8	3	X	1	9	1	6	10	5	8	6	7	3	4	7	12	12 Yen Ben VI 586
5	5	5	5	7	7	7	7	11	11	11	11	5	5	5	5	13	13 ... budding. based on visual
9	9	9	9	3	3	3	3	2	2	2	2	1	1	1	1	14	14 3
6	6	6	6	12	12	12	12	4	4	4	4	2	2	2	2	15	15

Lemon Selections and Source



Selection	Source
Allen Eureka VI 227	Standard- Most planted Eureka selection
Variegated Pink-Fleshed Eureka VI 486	Eureka sport with variegated leaves and fruit with pink flesh.
Corona Foothills VI 871	Fruit similar in appearance to Eureka, but has winter distribution of crop similar to Lisbon. Popular in AZ.
Limoneira 8A Lisbon VI 380	Standard –Most planted Lisbon selection in CA
Walker Lisbon VI 415	Vigorous selection from CA.
Femminello Santa Teresa	Selection of Femminello Ovale from Sicily.
Interdonato VI 667	Lemon citron hybrid
Limonero Fino 49 VI 480	Chief winter lemon of Spain.
Limonero Fino Largo 95 VI 674	Another selection from Spain that is reportedly earlier than Fino 49.
Messina VI 661	Purportedly early selection from Italy
Seedless VI 492	Imported 1985 from Lassock's Nursery in South Australia. Consistently low seeded.
Yen Ben VI586	Lisbon from Queensland where precocious with smooth thin peel, high juice content, low seed count.



University of California Coachella Valley Agricultural Research Station



Fall 2008



April, 2014

Commercial Picking and Data Collection

Fruit were harvested using pickers from Coachella Valley Citrus



Sub samples were collected for packout data and interior quality analysis at University of Arizona



Fruit yields were collected as the number of sacks per tree. Packinghouse provides us with sales and packout data for each cultivar.

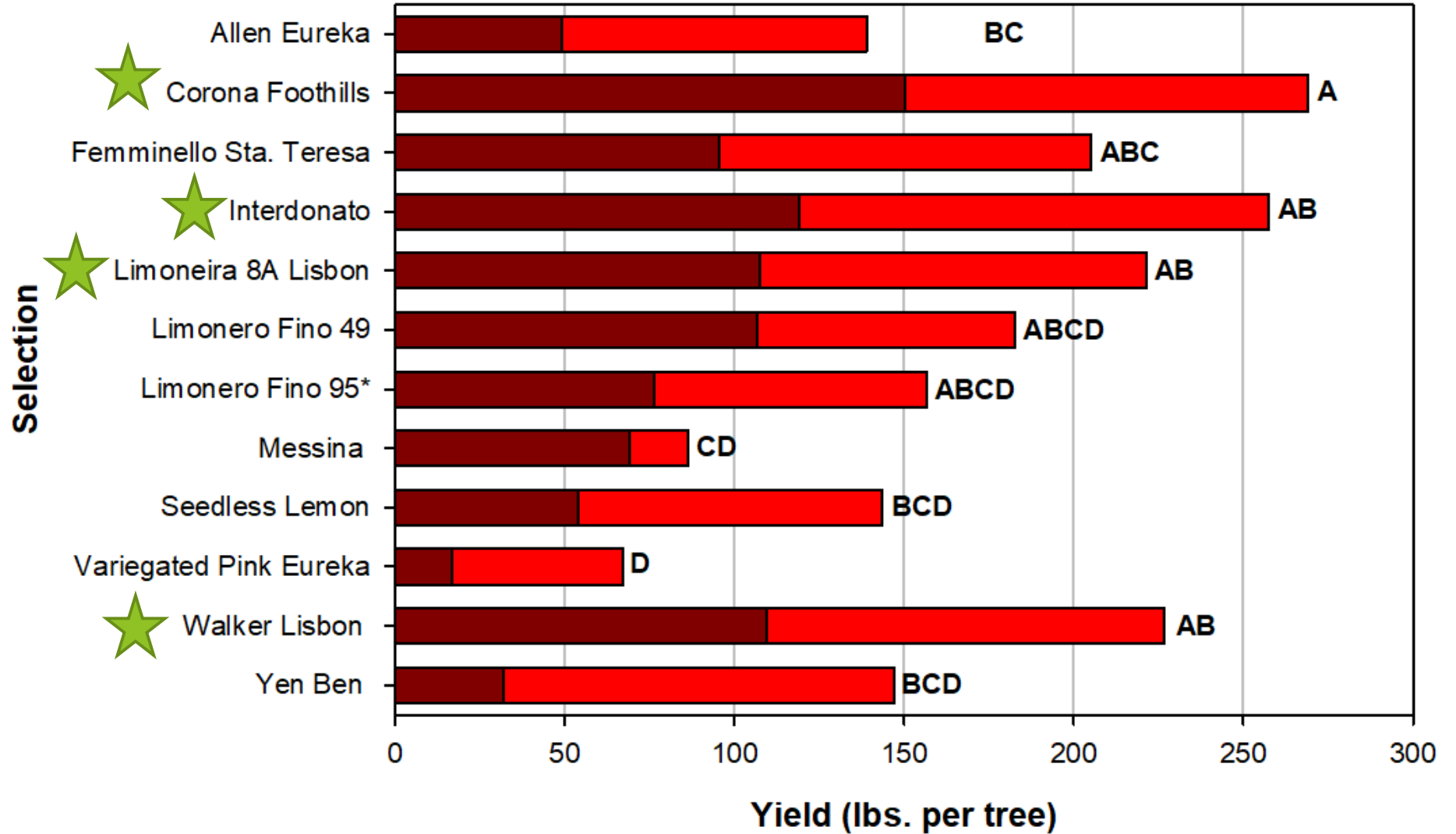


Fruits were collected off the line for quality analysis

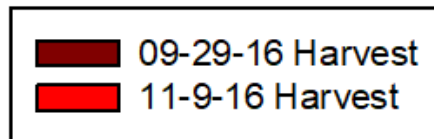
Single Line Fruit Sizer (Aweta America - 1998)



Desert Lemon Trial Yields- 2016-17

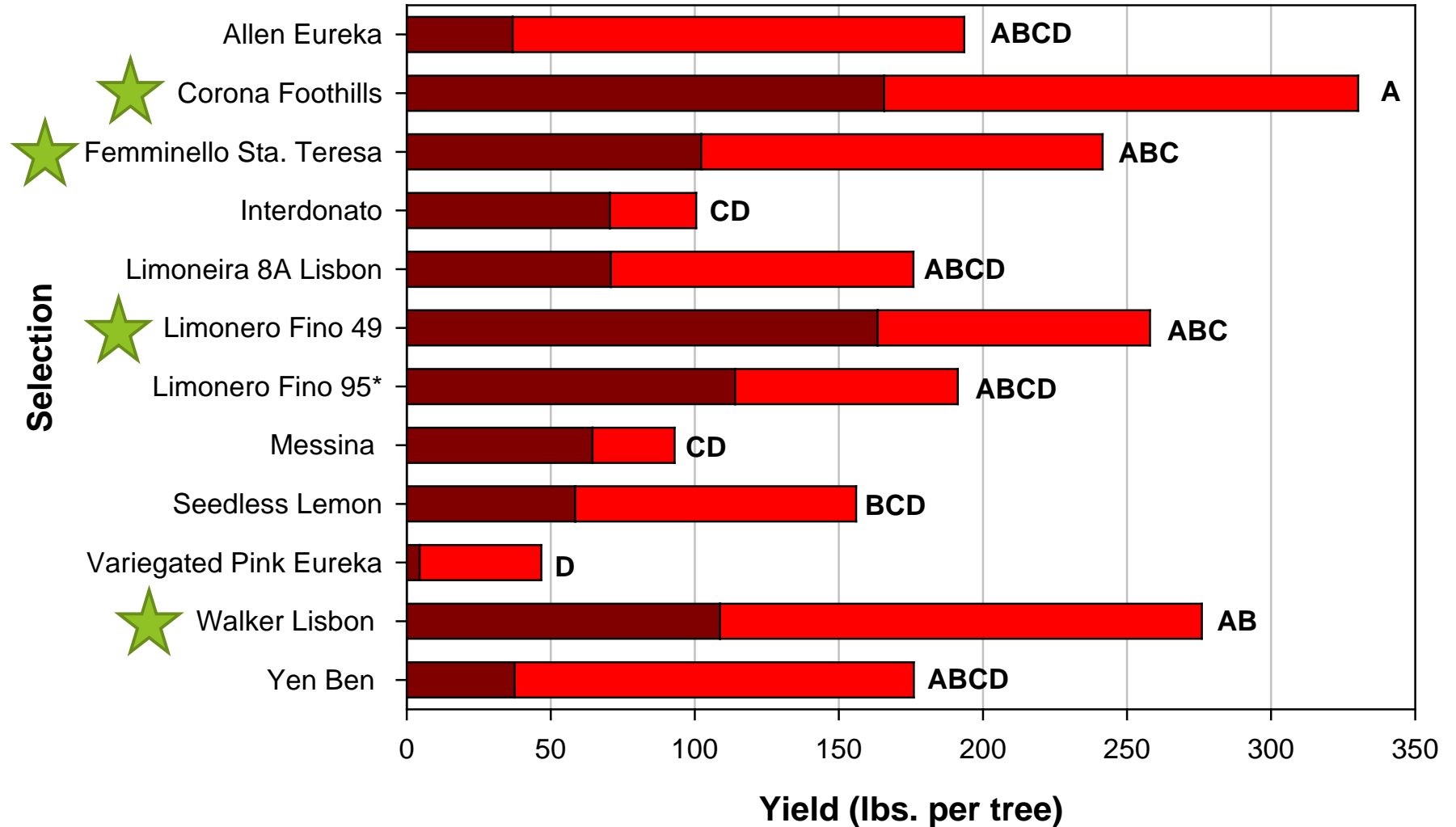


* Limonero Fino 95 trees were planted in 2007, all others were planted in 2006.

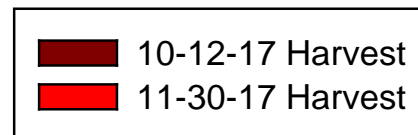


Total 2017-18 Lemon Yield

Desert Lemon Trial Yields - 2017-18

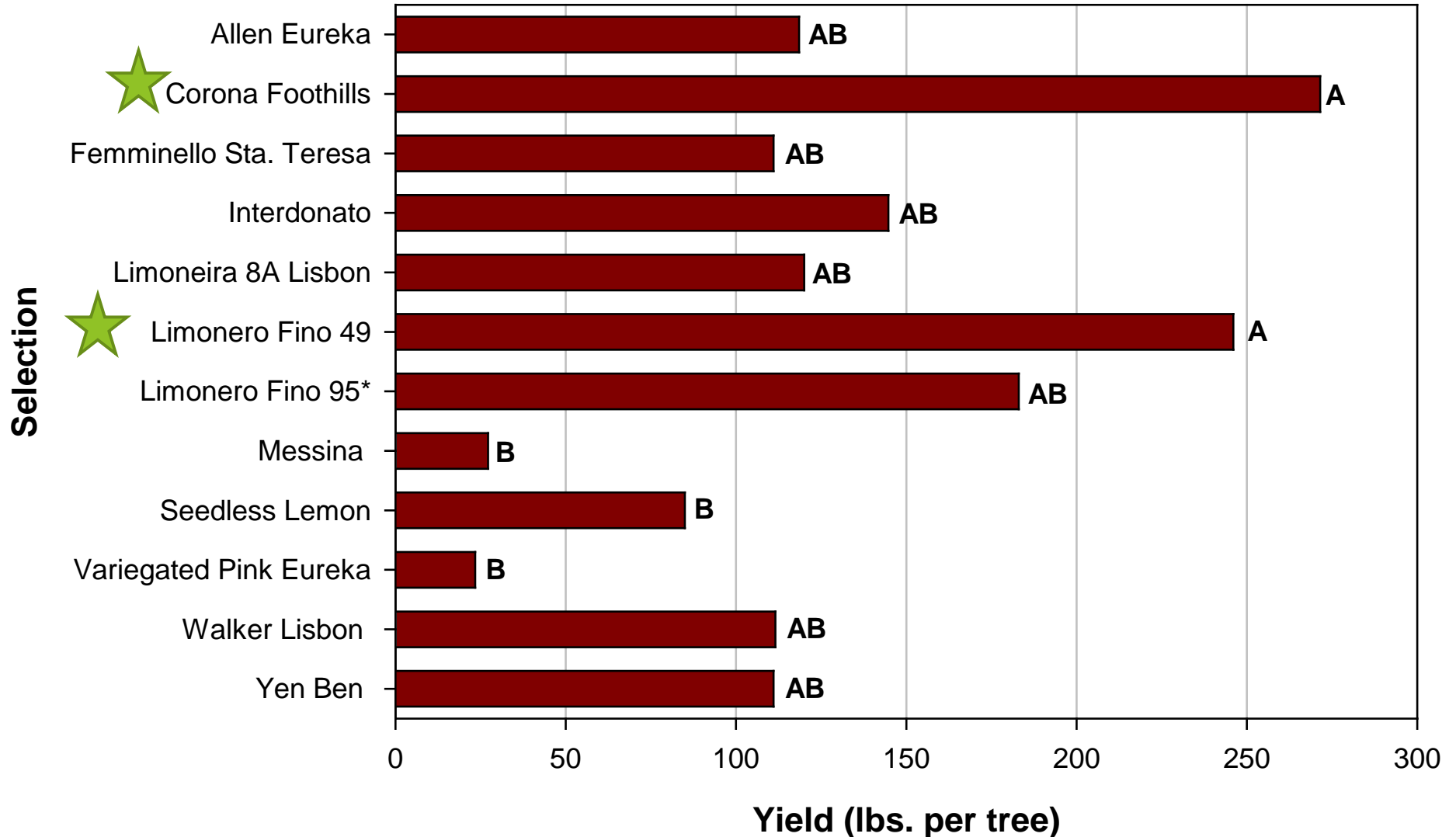


* Limonero Fino 95 trees were planted in 2007, all others were planted in 2006.



Desert Lemon Trial Yields 11-16-18

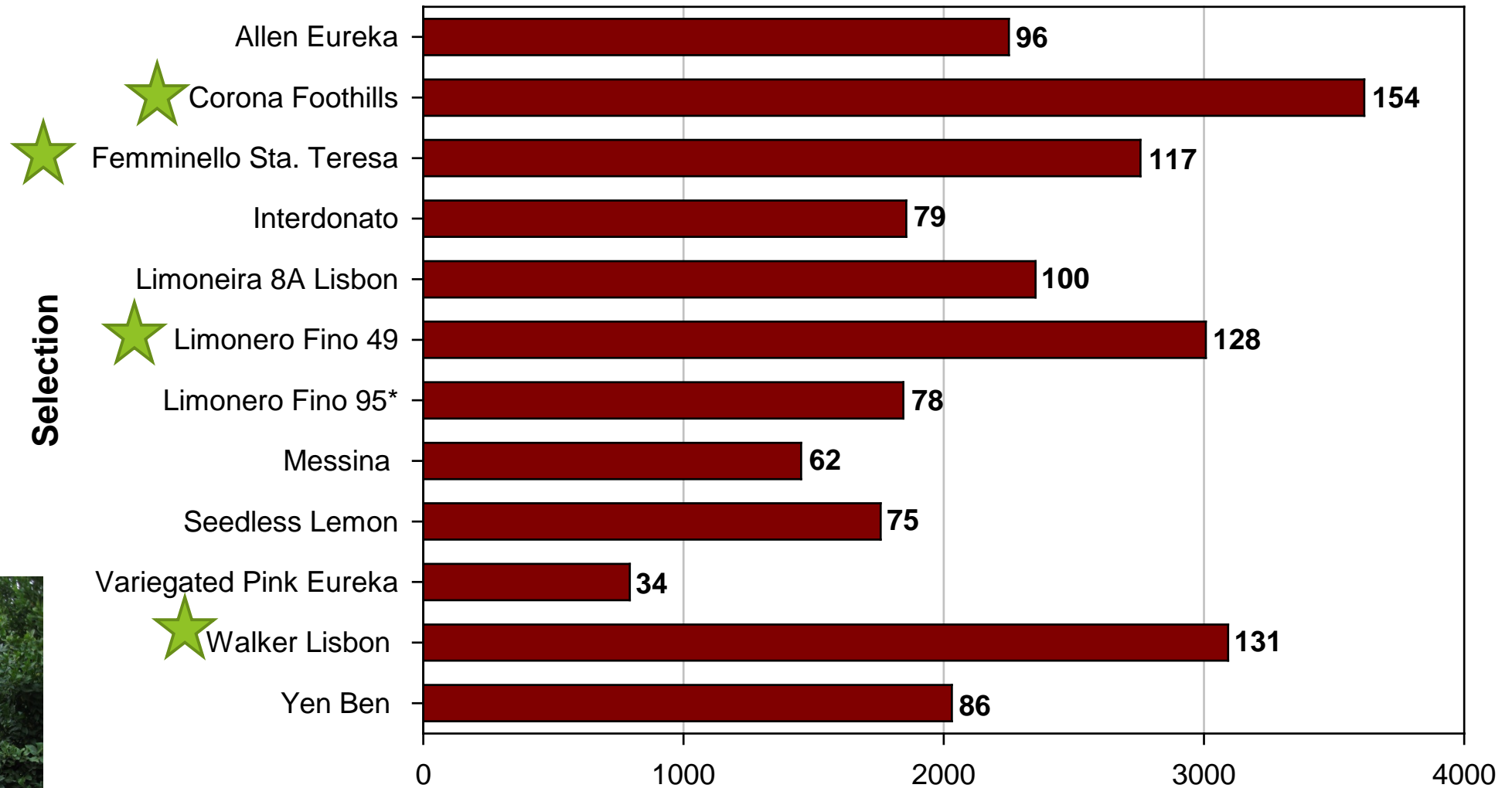
Lemon Yield 11-16-18



* Limonero Fino 95 trees were planted in 2007, all others were planted in 2006.

Cumulative 2008-2018 Lemon Yield

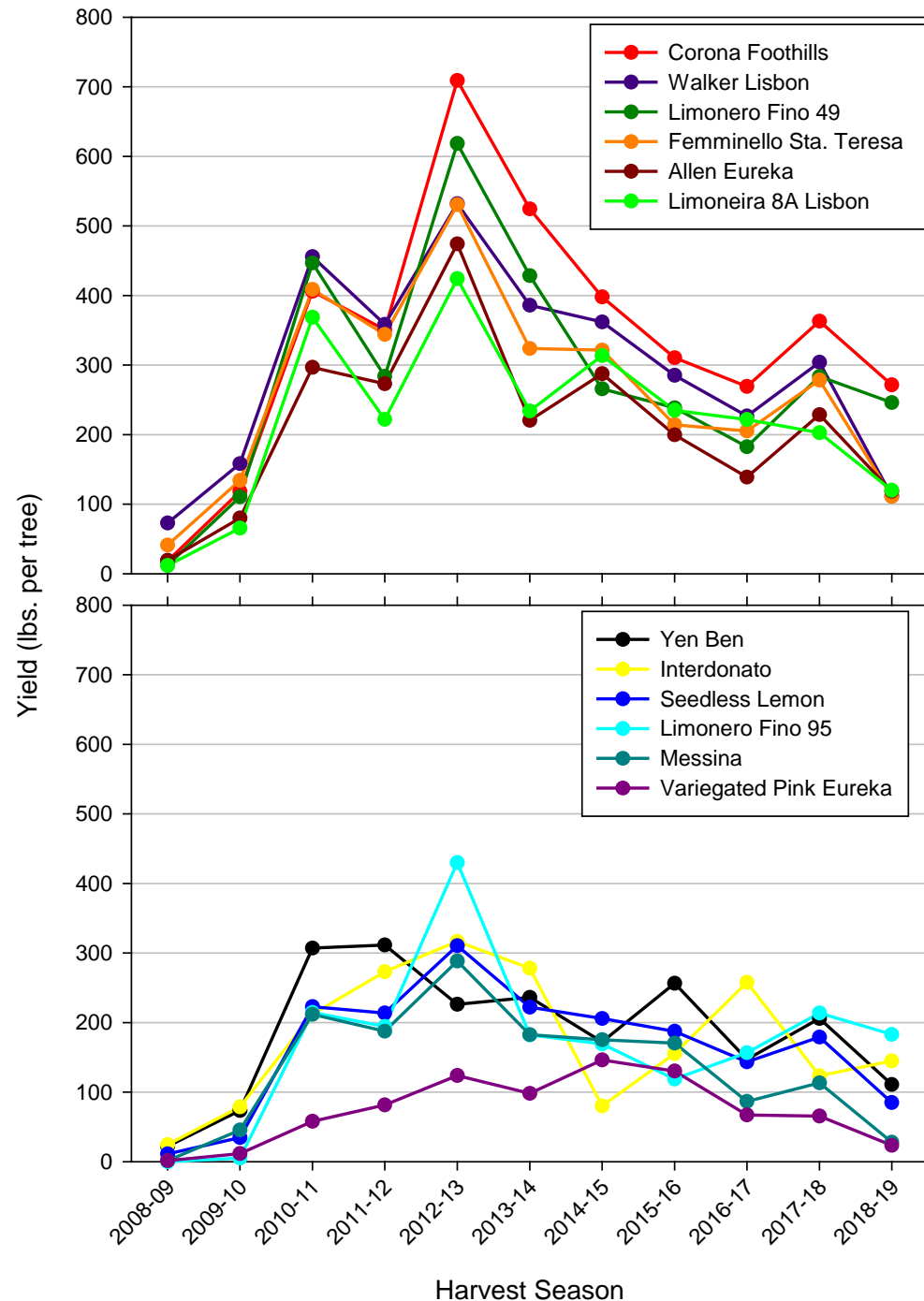
Cumulative Lemon Scion Trial Yields 2008-18



Cumulative Yield (lbs. per tree) and % of Limoneira 8A

* Limonero Fino 95 trees were planted in 2007, all others were planted in 2006.

Desert Lemon Trial Yields 2008-09 Through 2018-19



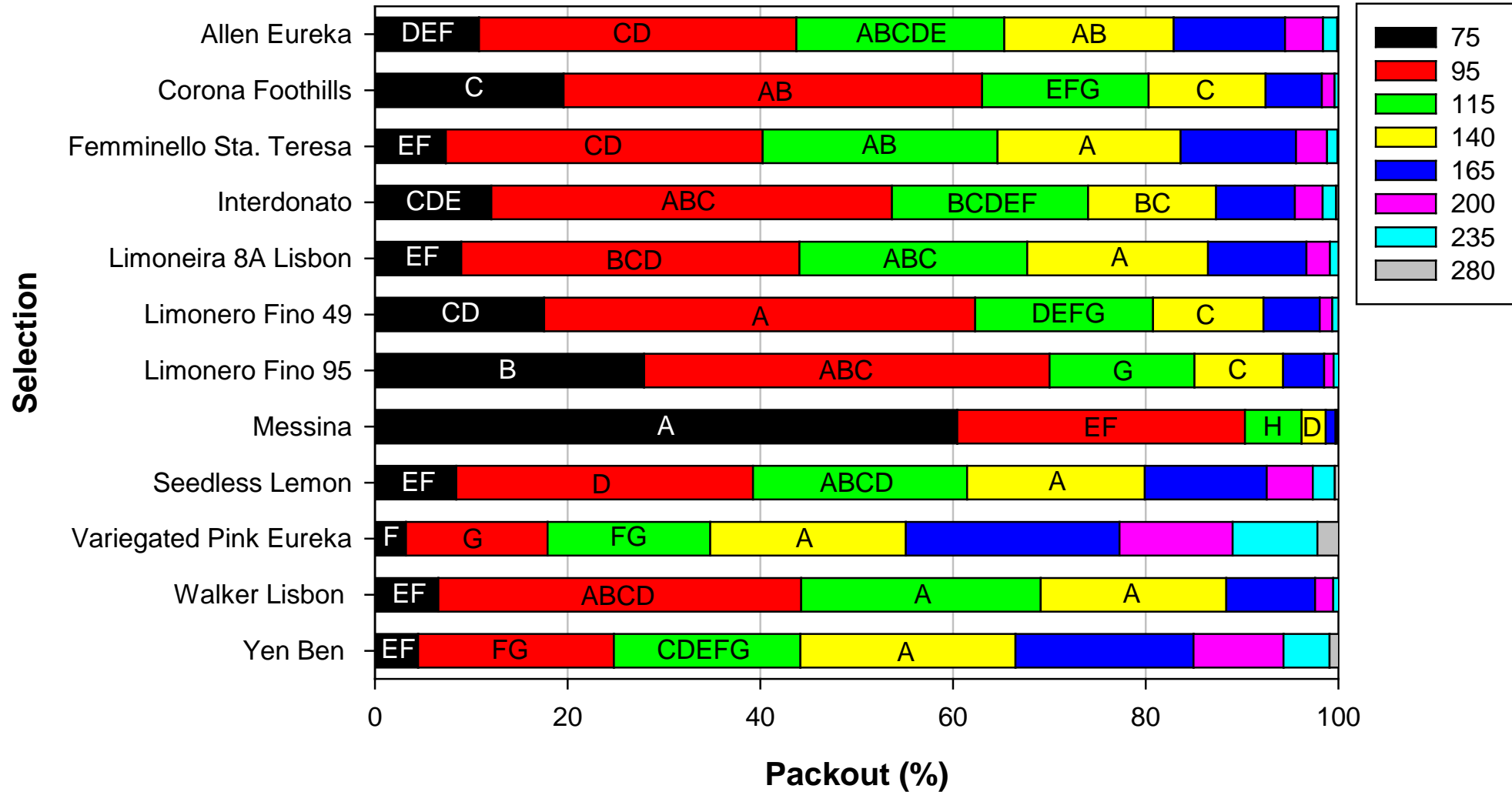
- Best 2018-19 yield for Corona Foothills and Limonero Fino 49.
- Issues with tree crowding due to spacing
- Year to year variation



2008-09 to
2017-18
Packout for
Harvests
between
Sept.1 and
Nov. 15th

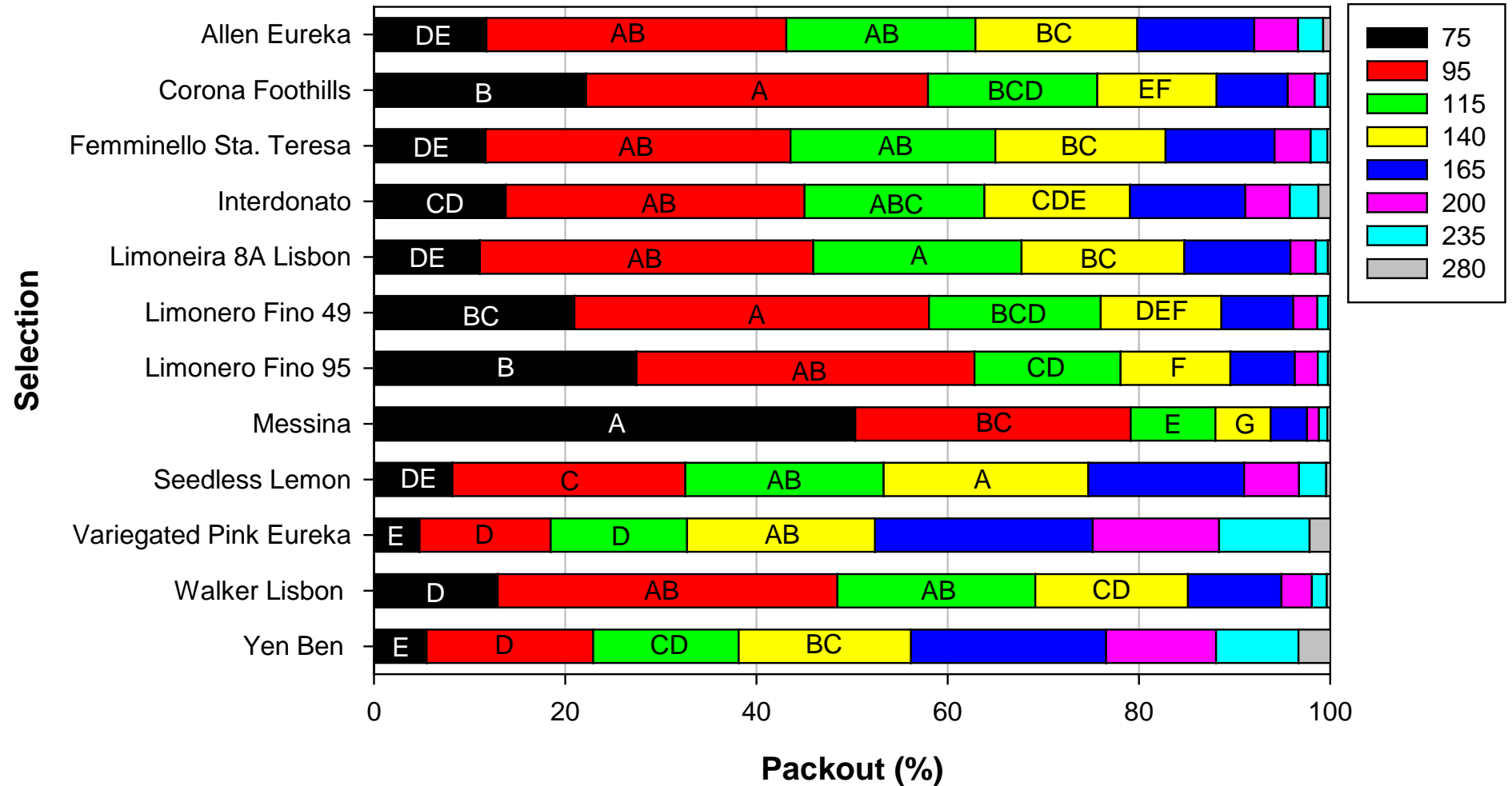
Note: Corona Foothills, Fino 49, Fino 95 and Messina have more fruit 140 size and larger for early season, but Messina has poor yield and much of fruit is huge.

Lemon Packout (Field)
for 2008-17 harvests between 9-1 and 11-15



2008-09 to
2017-18
Packout for
Harvests
between
Nov. 16th and
Jan. 31st

Lemon Packout (Field)
for 2008-17 harvests between 11-16 and 1-31



Interior Fruit Quality 2016-17

Selection	Fruit Shape ^z	Peel Color ^x	Juice Content ^w (%)	Juice pH	Total Soluble Solids (%)	Total Acids (%)	TSS:TA	Seeds per fruit	Peel Thickness (mm)	Peel Smoothness Rating ^v
Allen Eureka	0.794 b ^y	0.766 ef	49.95	2.20	8.92 bc	5.38 bcd	1.66 b	10.22 b	3.19 cde	4.2 cde
Corona Foothills	0.758 d	0.806 d	47.54	2.21	9.02 b	5.62 ab	1.61 bcd	8.00 c	3.92 b	4.8 ab
Femminello Sta. Teresa	0.804 b	0.740 g	48.73	2.18	9.02 b	5.56 abc	1.62 bcd	14.16 a	3.85 b	5.0 a
Interdonato	0.802 b	0.866 b	49.83	2.21	9.70 a	5.55 abc	1.75 a	9.90 bc	2.19 f	3.2 f
Limoneira 8A Lisbon	0.782 bc	0.742 g	49.03	2.31	9.12 b	5.55 abc	1.64 bc	8.28 bc	3.68 bc	4.4 bcd
Limoneiro Fino 49	0.766 cd	0.762 ef	50.17	2.27	8.94 bc	5.61 ab	1.60 bcd	10.06 bc	4.03 ab	5.0 a
Limoneiro Fino 95	0.750 d	0.770 e	48.34	2.28	8.74 bc	5.28 cde	1.66 b	4.00 d	3.55 bcd	4.8 ab
Messina	0.760 d	0.796 d	47.04	2.17	8.6 c	5.24 de	1.64 bc	0.26 e	4.58 a	4.8 ab
Seedless Lemon	0.750 d	0.736 g	52.45	2.10	8.90 bc	5.74 a	1.55 e	0.66 e	3.51 bcd	4.4 bcd
Variegated Pink Eureka	0.846 a	1.080 a	50.73	2.15	8.88 bc	5.69 a	1.56 de	4.10 d	2.78 e	4.0 de
Walker Lisbon	0.786 bc	0.750 fg	47.97	2.18	9.06 b	5.51 abc	1.65 b	14.30 a	3.77 bc	4.6 abc
Yen Ben	0.800 b	0.830 c	48.39	2.18	8.98 bc	5.05 e	1.78 a	1.40 e	2.95 de	3.8 e

Story So Far For High Yielders

- ▶ **‘Corona Foothills’** – Best first harvest yield and next to best total yield and returns. Excellent cumulative yield. Relatively early. Good fruit size. Excellent exterior fruit quality. Oblong fruit, average juice content, high seed count, high peel thickness and average peel smoothness. A little less juice than the others.
- ▶ **‘Walker Lisbon’** – Good first harvest yield and good total yield. Good returns. Good exterior fruit quality of oblong fruit, average juice content, the highest seed count (19 per fruit), and average peel thickness and peel smoothness.
- ▶ **‘Limonero Fino 49’** – Excellent first harvest yield, and good second harvest yield, excellent total yield and cumulative yield. Along with ‘Corona Foothills’ the earliest of the selections. Excellent first and second harvest fruit size, and good exterior quality. Oblong fruit, average juice content, high seed count, average peel thickness and peel not particularly smooth. Has thorns.



Story So Far For Other Top Yielding Selections

- ▶ **'Femminello Santa Teresa'** - Good first harvest and second harvest yield and returns, good total yield, and cumulative yield. Not quite as early as some of the others. Smaller first harvest fruit size, and average exterior quality. Rounder fruit, average juice content, high seed count, average peel thickness and peel not particularly smooth.
- ▶ **Standard 'Allen Eureka'** - Middle-of-the-pack yield, and cumulative yield. Good fruit size. Average exterior quality. Oblong fruit, average juice content, average seed count, peel thickness and peel smoothness.
- ▶ **Standard 'Limoneira 8A Lisbon'** - Average first harvest yield, second harvest yield, total yield and cumulative yield. Not particularly early. Good fruit size and exterior fruit quality. Rounder fruit, average juice content, average seed count, average peel thickness and peel not particularly smooth.



Femminello Santa Teresa



Allen Eureka



Limoneira 8A Lisbon

Story So Far On Others

- ▶ **‘Limonero Fino 95’** – Trees are one year younger than the other selections. Acceptable total yield, and cumulative yield. Excellent earliness, fruit size and exterior fruit quality. Oblong fruit, average juice content; about 5 seeds per fruit. Peel is relatively thick and not particularly smooth
- ▶ **‘Interdonato’** – Middle-of-the-pack yield total yield and cumulative yield. Fruit size usually good, with excellent exterior quality. Rounder fruit, average juice content, average seed count. Peel is extremely thin and nicely smooth. Has a pointed mammilla. This selection is quite susceptible to post-harvest diseases (data not shown).
- ▶ **‘Yen Ben’** – Poor first harvest yield, and unremarkable second harvest yield. Poor total yield, and average cumulative yield. Not an early selection. Small fruit size, but good exterior quality. Relatively round fruit, low juice content, low seed count; about 1.5 per fruit. Peel relatively thin, but quite smooth. Highly susceptible to post-harvest diseases.



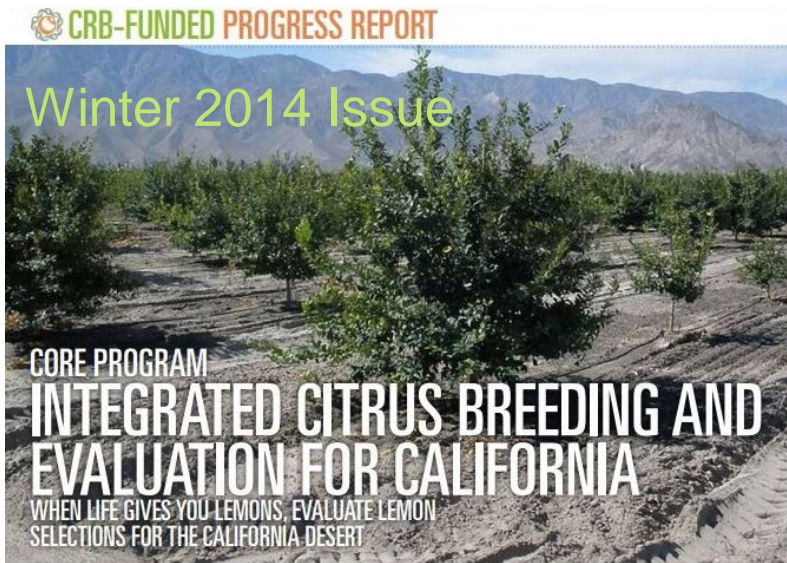
Low Yielding Selections But Other Attributes.

- ▶ **'Seedless'** – Average first harvest yield, but poor second harvest yield. Unremarkable total yield, and cumulative yield. Not an early selection. Small fruit size. Selection has good exterior quality. Oblong fruit, high juice content, low seed count; about 1 per fruit. Peel relatively thick, and average peel smoothness.
- ▶ **'Messina'** – Unremarkable first harvest yield, second harvest yield, total yield and cumulative yield. The earliest of all the selections. Large fruit size and excellent exterior fruit quality. Some pieces may be too large for most markets. Rounder fruit, average juice content, low seed count; almost 3 per fruit. Peel is thick, but always smooth.
- ▶ **'Variegated Pink Eureka'** – Poor first harvest yield, second harvest yield, poor total yield and cumulative yield. Selection is not early, has the smallest fruit size of all selections tested, and has average exterior fruit quality. This selection has exceptional return per field box (data not shown), but average estimated return per acre. Round fruit, good juice content; about 8 seeds per fruit. Peel is thin, but not smooth.



Desert Lemon Scion Trial Completion 11-19

- ▶ Currently summarizing and analyzing data for final publication of this trial which will also include data on commercial yields.
- ▶ Plan for publication of final article in Summer 2020 Issue of Citrograph.
- ▶ This scion trial results paved way for current multi-location scion trial that Glenn will speak about.



Glenn C. Wright, Vince Samons and Tracy L. Kahn



Appearance of trees in October 2008



Acknowledgements

- ▶ Grower-cooperators who provided advice
- ▶ Richard Bagdasarian Inc.
- ▶ Funding by the Citrus Research Board





Questions?

Thanks To CRB and Growers For Your Support!