



Field Evaluation of Sixteen Rootstocks in an Unfumigated, Sandy Loam Replant Location

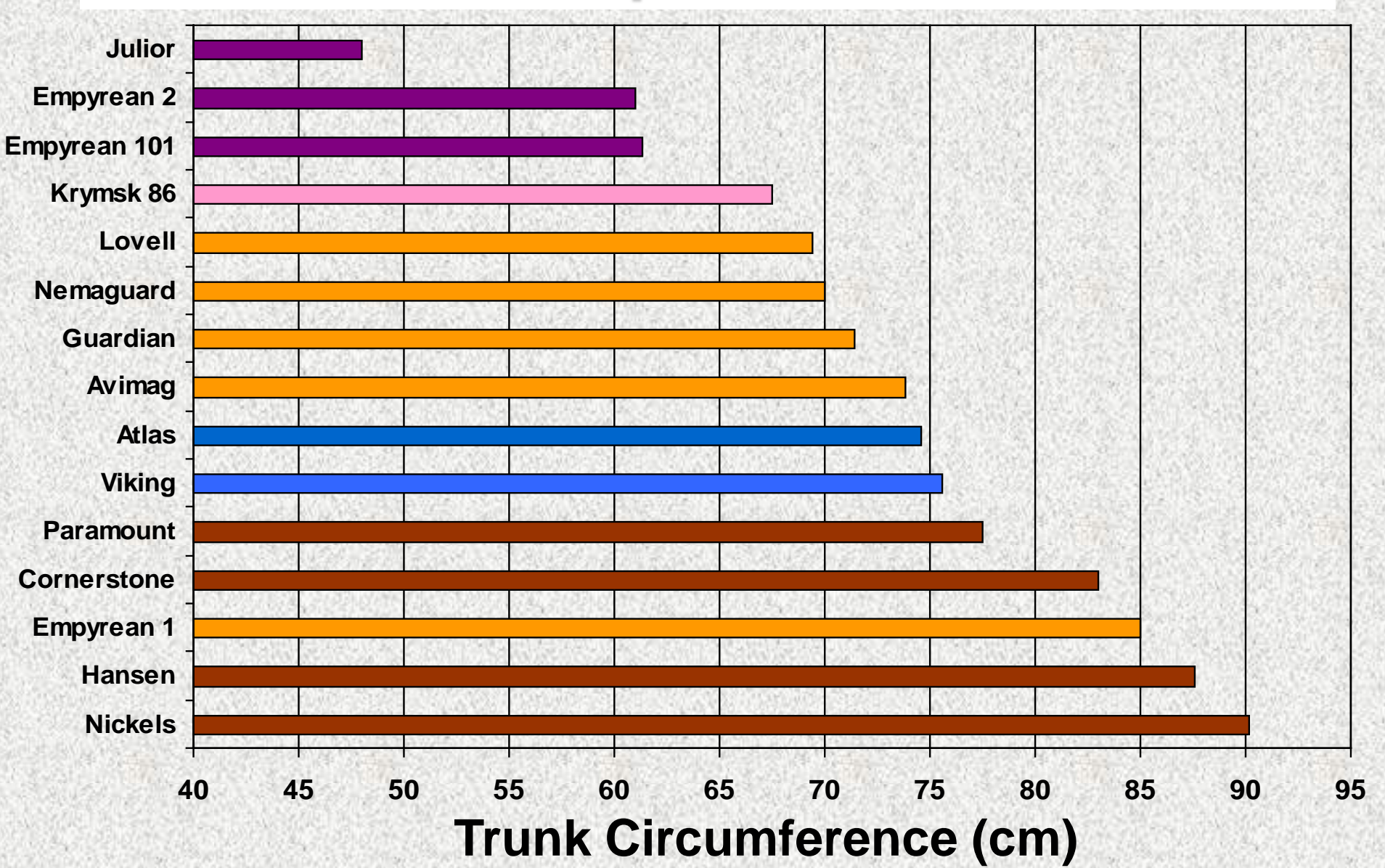


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 Grower Cooperators: Peter Bacon, Christine Gemperle - Bacon & Eric Gemperle

Trial specifics:

- Planted January, 2003
- 2nd generation orchard following nemaguard
- No pre-plant fumigation, fallowed one year
- Hanford sandy loam, pH ~ 6.8
- Flood irrigated with high quality district water

Rootstock Influence on Size of 8-Year-Old Nonpareil Almond Trees.



Yield as Influenced by Rootstock (kernel pounds / acre)

Rootstock	Nonpareil	Carmel
Paramount	--	3600 a
Nickels	3204 a	3529 a
Hansen 536	3139 a	3549 a
Cornerstone	2907 a	--
Emphyrean 1	2668 ab	3405*
Atlas	2599 b	3111 ab
Avimag	2328 bc	3085 ab
Viking	2235 bc	2569 b
Guardian	2143 bc	2398 b
Lovell	2103 bc	2455 b
Nemaguard	1946 c	2614 b
Krymsk 86	1416*	--
Emphyrean 101	1357 d	--
Emphyrean 2	965*	1268*

*Values with asterisks indicate rootstocks which are not fully replicated and were planted for observational purposes

- In general, the peach x almond hybrid rootstocks are the most vigorous and plum rootstocks are the smallest while peach rootstocks are of intermediate size.
- Yield is directly related to tree size; the bigger the tree, the higher the yield.
- Smaller trees could be planted closer to increase yield, but it is doubtful that the plum rootstocks would ever produce yields similar to peach x almond hybrids.
- Hybrid rootstocks may perform better than Nemaguard in replant situations as long as ring nematode is not a problem.

List of Rootstocks in Trial

Rootstock	Parentage
Nemaguard	Peach (<i>Prunus persica</i> x <i>P. davidiana</i>)
Lovell	Peach: chance seedling selected in 1882
Guardian SC-17	Peach
Avimag (a.k.a. Cadaman)	Peach
Emphyrean #1 (a.k.a. Barrier 1)	Peach
Hansen 536	Peach x almond
Nickels	Peach x almond
Cornerstone	Peach x almond
Paramount (a.k.a. GF 677)	Peach x almond
Emphyrean #2 (a.k.a. Penta)	Plum - <i>P. Domestica</i> (European plum)
Emphyrean 101 (a.k.a. Adesoto)	Plum - <i>P. Insititia</i> (damson plum)
Julior	Plum - <i>P. insititia</i> x <i>P. domestica</i>
Krymsk 86 (a.k.a. Kuban 86)	Peach x Myrobalan plum
Atlas	Peach x almond x plum x apricot
Viking	Peach x almond x plum x apricot

Trial #2: Evaluation of plum rootstocks on flood-irrigated, sandy soil infested with oak root fungus

	Trunk Circumference (cm) of 4 th leaf Trees	
	Butte	Padre
Viking	57.0 a	63.2 a
Nemaguard	56.3 a	59.4 ab
Krymsk 86	53.8 ab	57.2 abc
Marianna 40	52.0 ab	56.6 abc
Ishtara	48.9 bc	51.4 bcd
M 26-24	47.1 bcd	52.9 bcd
Tetra	43.2 cd	45.0 d
Hiawatha	41.9 cd	53.4 bc
Emphyrean 2	41.3 d	48.9 cd

- Viking & Nemaguard are the largest trees
- Emphyrean 2 and Tetra are too small and may be unsuitable for almond
- Two Butte trees on M 26-24 showed signs of union mild etch for the first time in 2010 (4th – leaf).
- Krymsk 86 & Marianna 40 are slightly smaller than nemaguard with no suckering

Almond Rootstock Evaluations in Colusa County

John Edstrom, Stan Cutter, Gerry Hernandez

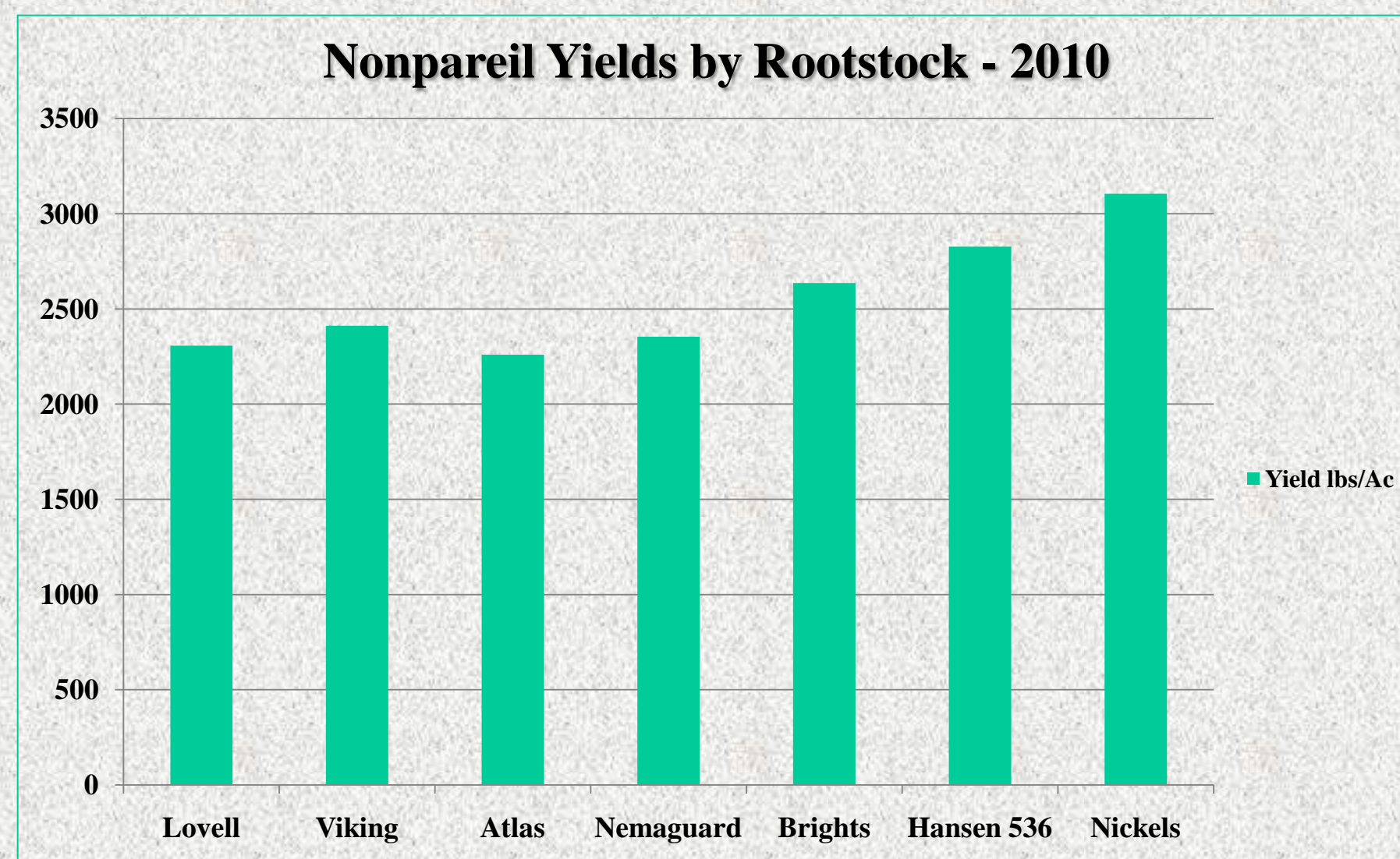


Table 1.

Rootstock	Yield lbs/ac	Kernels/oz
Lovell	2,307 a	22
Viking	2,412 a	22
Atlas	2,260 a	22
Nemaguard	2,354 a	22
Brights	2,636 a	21
Hansen 536	2,827 ab	22
Nickels	3,105 b	22 ns

Nonpareil scions, average of 64 trees. Tukeys alpha = 0.05

Rootstock	Yield lbs/ac	Kernels/oz	Trunk circ.cm
Ishtara	1,167	24	40.2
Lovell	1,704	22	46.0
Krymsk 86	1,926	22	46.3
Nickels Hyb	2,251	22	51.9
Padre/M2624	844	23	46.2
Padre/M-40	665	25	38.1
Hiawatha	1,657	22	47.9
Empyrean 2	1,280	22	47.2

Nonpareil scions - averages of 18 trees each except Padre/M2624 & Lovell - 36 trees

Results:

Commercial Rootstock Evaluation

1) Nonpareil yields on the three Peach/Almond hybrid rootstocks, Nickels, Hansens 536 and Brights have been higher than yields on Nemaguard, Lovell, Atlas and Viking. However, the larger canopy size of the more vigorous P/A hybrids has skewed these production figures in this 22' x 24' tree spacing.

2) Crown gall infections have been extremely high on all P/A hybrids rootstocks compared to moderate levels for peach and low levels for peach/plum rootstocks.

3) Some trees on P/A hybrid have become infected with phytophthora crown rot.

4) Bloom timing has not been different between the rootstocks but crop maturity is delayed 2-5 days for the P/A hybrids.

5) Potassium nitrate foliar sprays 4x @ 30 lbs/acre did not improve yields.

6) To date, highest yields for P/A hybrids 3,500 - 4,000 lbs/acre in 2008.

Plum Type Evaluation

- 1) Nonpareil found compatible with **Krymsk 86, Ishtara and Hiawatha**, but incompatible with **Deep Purple**. Mission was also incompatible with Deep Purple.
- 2) Cadaman, renamed **Avimag** is also compatible with Nonpareil.
- 3) Ishtara and Hiawatha had lower yield than Krymsk 86 and Lovell that were equal.
- 4) **Jaspi** performed poorly, **AC952UC1, Penta CM7** and **Pumiselect** did not survive.
- 5) Avalon and Winters (13-1) found compatible with M2624 but Plateau is not.
- 6) Yield of most cultivars is lower on M2624 than on other rootstocks.
- 7) The European peach/almond hybrid rootstock GF-677 is compatible with Nonpareil and Butte and comparable to Hansens 536 in yield in this small trial.
- 8) **Krymsk 86** is compatible with Nonpareil without root suckering or other problems. Production comparable to Lovell and higher than **Ishtara** and **Hiawatha**.
- 9) **Empyrean 2** shows good compatibility with Nonpareil and vigor equal to Lovell.
- 10) Nonpareil with Padre interstem on M2624 or M-40 plum rootstocks show better compatibility, but trees lack vigor and yields reduced.

Nonpareil Canopies on 2 rootstocks-3rd leaf



Krymsk 86

M2624

Isolated Grower Plantings of Monterey/Krymsk 86 Found with Union-like Problems



Normal trees

Scattered trees with chlorotic & necrotic leaf symptoms

Exploring Alternative Rootstocks in Butte Co.

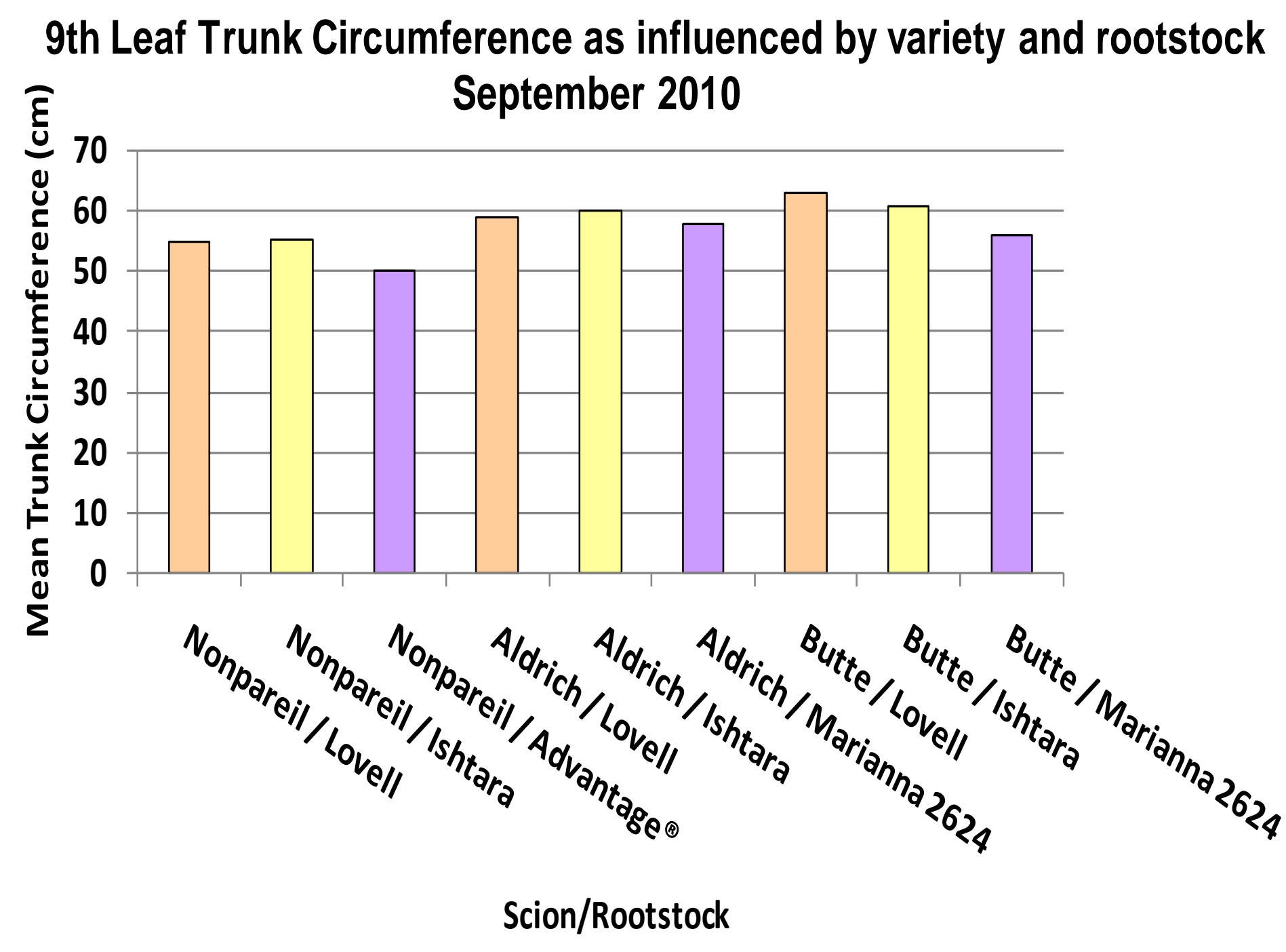
Cooperators: Joe Connell, UC Farm Advisor, Butte Co., Brouwer Orchards, Sam Lewis & Son Orchards, M&T Chico Ranch

Objective:

Evaluate compatibility and field performance of alternative rootstocks for tolerance to oak root fungus, to high pH heavy clay soil, or to a high rainfall environment.

Methods:

- Nonpareil on 'Empyrean 101' is planted in an oak root fungus spot and is evaluated for scion compatibility with 'Nonpareil' almond and for tolerance to oak root fungus. Performance is compared to nearby 'Marianna 2624' rooted trees.
- In 2010, ten Nonpareil trees on 'Krymsk 86' were planted in oak root fungus spots for evaluation of tolerance to the fungus.
- 'Ishtara', 'Lovell', 'Marianna 2624', and 'Advantage®' rootstocks planted on high pH heavy clay soil are compared regarding variety and rootstock effects on tree size.
- A new randomized "Six Rootstocks" trial (5 reps) was planted in March 2010 to compare the performance of Nonpareil on 'Lovell', 'Atlas', 'Empyrean 1', 'Rootpac-R', 'Krymsk 86', and 'Nickels'.



Results & Discussion

Variety & Rootstock Effects on Tree Size on Heavy Soil

- On heavy soil, the 'Ishtara' rootstock is competitive with 'Lovell' in terms of tree size and it produces more vigorous trees than those on 'Marianna 2624'.
- Anchorage is a problem for 'Ishtara' since 3 out of 30 trees were lost in high winds. No 'Lovell' or 'Marianna 2624' rooted trees have been lost.
- In one oak root fungus spot, one of six 'Ishtara' rooted trees was killed in the 6th leaf. In another orchard, none of 23 trees had been lost after 7 years.

Six Rootstocks Trial - Tree Establishment

- Four of six rootstocks established well with no tree loss.
- 'Atlas' suffered 10% mortality at planting and 'Nickels' lost 16% of the new trees.

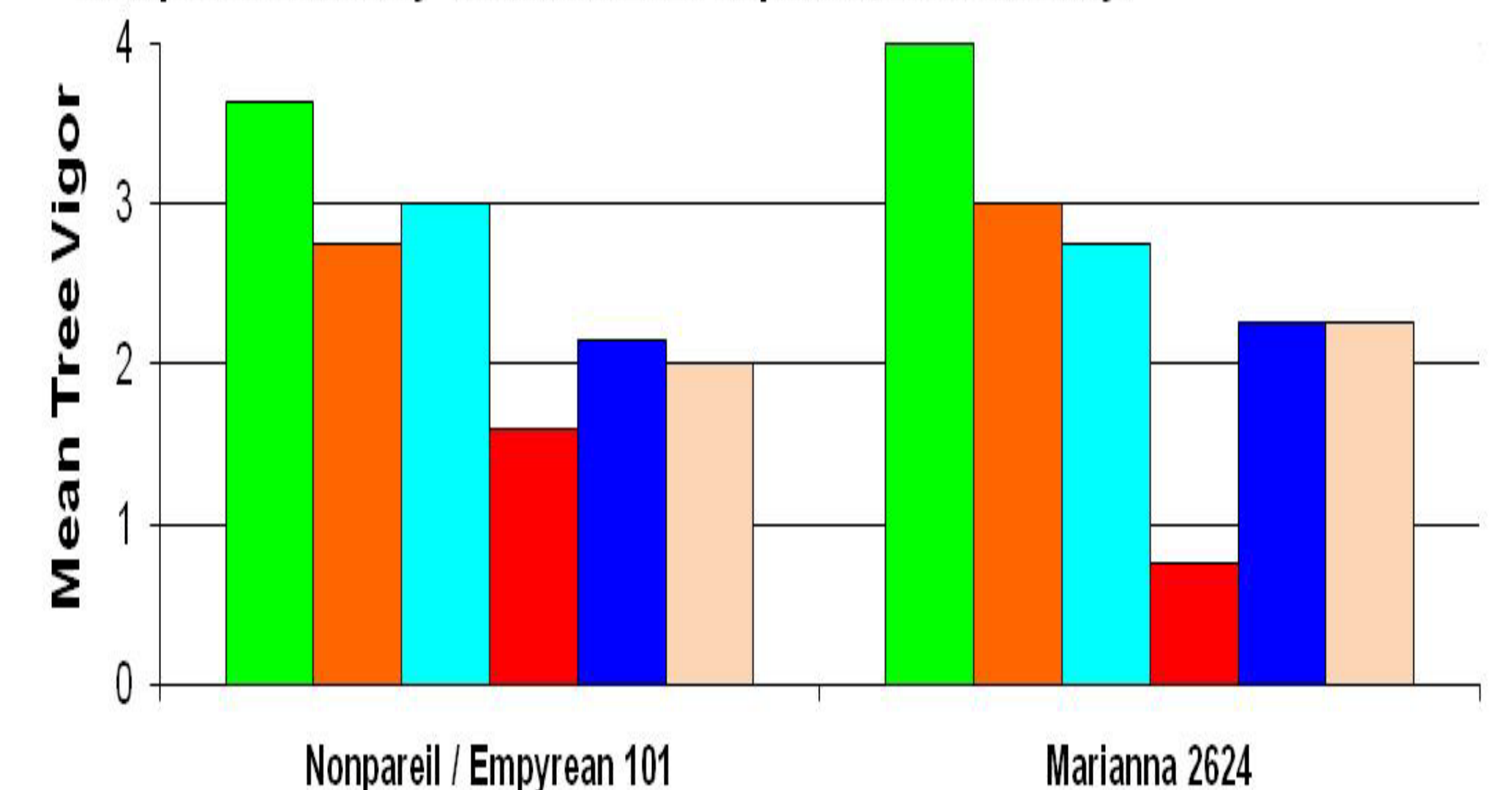
Six Rootstocks -- Trial planted 2010

Rootstock	Mean Trunk		Tree Loss at Planting	
	Circ. (cm)	# per 50	Percent	
Lovell	9.62	0	0	
Atlas	9.57	5	10	
Empyrean 1	10.52	0	0	
Rootpac-R	10.19	0	0	
Krymsk 86	8.79	0	0	
Nickels	10.05	8	16	

Vigor on 'Empyrean 101' vs. 'Marianna 2624'

- 'Nonpareil' trees on 'Empyrean 101' rootstock are similar in size and vigor compared to nearby trees on 'Marianna 2624'.
- Through the 7th leaf, no 'Empyrean 101' rooted trees have succumbed to oak root fungus in this plot.
- However, five of seven 'Empyrean 101' rooted trees are staked and leaning. No trees on 'Marianna 2624' are staked or leaning.
- Poor anchorage of trees on 'Empyrean 101' rootstock precludes the use of this rootstock for almonds.

Tree vigor of 'Nonpareil' on 'Empyrean 101' rootstock planted March 2004 compared to nearby 'Marianna 2624' replants, Butte County.



■ Jan 2005 Rating ■ Oct 2006 Rating ■ Oct 2007 Rating ■ Oct 2008 Rating ■ Sept 2009 Rating ■ Dec 2010 Rating

Note: Through the 7th leaf, Empyrean 101 has survived Oak Root Fungus and has similar vigor to trees on Marianna 2624. Unfortunately, anchorage is poor enough to prevent use of this rootstock. Five of the seven Empyrean 101 rooted trees are staked and leaning.