Field Evaluation of Almond Rootstocks

Field Evaluation of Almond Rootstocks for Stanislaus County – *Roger Duncan, UCCE Stanislaus County*

Trial #1: Field Evaluation of Sixteen Rootstocks in an Unfumigated, Sandy Loam, Replant Location

Keyes, CA. Cooperators: Christine & Peter Bacon, Eric Gemperle

Trial specifics:

- Planted January, 2003
- 2nd generation orchard following nemaguard
- No pre-plant fumigation, fallowed one year
- Hanford sandy loam, pH 6.9 – 7.6

General Conclusions After Twelve Years

- Peach rootstocks, especially Nemaguard, can take up very high levels of sodium and chloride, leading to salt toxicity.
- Atlas and Krymsk 86 are as susceptible to sodium and chloride as the peach rootstocks.
- Many of the peach x almond hybrids are the most tolerant of saline conditions while Viking is intermediate.
- Empyrean 101 is as vigorous and appears to be as salt tolerant as the peach x almond hybrid rootstocks.
- Lovell, Nemaguard, Guardian and Krymsk 86 showed the most severe lime-induced leaf chlorosis.
- 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 per acre is directly related to tree size; the bigger the tree, the higher the yield.
- The exception: Atlas has consistently out-yielded Nemaguard, although the trees are of similar size.
- Smaller trees could be planted closer to increase yield, per acre but it is doubtful that the plum rootstocks would ever produce yields similar to peach x almond hybrids at any spacing in this soil.
- P/A 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 (*Prunus persica x P. davidiana)*
Lovell	Peach: chance seedling selected in 1882
Guardian SC-17	Peach
Avimag (a.k.a. Cadaman)	Peach
Empyrean #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
Empyrean #2 (a.k.a. Penta)	Plum - *P. Domestica* (European plum)
Empyrean 101 (a.k.a. Adesoto)	Plum - *P. Insititia (damson plum)*
Julior	Plum - *P. insititia* x *P. domestica*
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

Relative Chlorophyll Content *

	Nonpareil	Carmel
Hansen	38.4 a	39.8 a
Nickels	37.3 ab	39.5 ab
Penta	37.2 abc	
Cornerstone	36.8 bcd	
Empyrean 101	36.6 bcd	
Paramount	36.6 bcd	39.7 a
Empyrean 1	36.4 bcd	
Atlas	36.1 bcd	36.1 c
Cadaman	35.8 cd	38.3 b
Viking	35.4 d	36.4 c
Krymsk 86	34.0 e	
Guardian	33.2 e	35.3 cd
Nemaguard	33.2 e	34.4 d
Lovell	33.1 e	32.8 e

*Chlorophyll readings taken with a Minolta SPAD 502 chlorophyll meter. Lower numbers indicate that the leaves were more yellow.

Almond Rootstock Sensitivity to Toxic Salt Ions.
Keyes, CA July, 2014

Levels of Toxic Ions in July-Sampled Leaves

	Nonpareil		Carmel	
	% Sodium	% Chloride	% Sodium	% Chloride
Nemaguard	0.88 a	0.27 bc	1.19 a	0.26 a
Guardian	0.66 ab	0.21 cd	0.69 bcd	0.27 a
Lovell	0.58 bc	0.28 bc	0.75 bc	0.25 a
Atlas	0.57 bc	0.16 de	0.86 b	0.22 ab
Krymsk 86	0.55 bc	0.32 b		
Cadaman	0.31 cd	0.23 c	0.47 cde	0.24 ab
Penta	0.24 d	0.50 a		
Viking	0.21 d	0.12 ef	0.43 de	0.18 bc
Nickels	0.18 d	0.12 ef	0.35 ef	0.15 cd
Paramount	0.11 d	0.08 f	0.07 f	0.07 e
Empyrean 1	0.11 d	0.07 f		
Hansen	0.11 d	0.09 ef	0.10 f	0.10 de
Empyrean 101	0.10 d	0.12 ef		
Cornerstone	0.06 d	0.07 f		
Julior			0.37 ef	0.11 de
Critical Level	0.25	0.3	0.25	0.3

Almond Rootstock Sensitivity to Chloride.
Westley, CA July, 2014

Levels of Chloride in July-Sampled Leaves

	% Chloride
Krymsk 86	0.41 a
Lovell	0.41 a
Cadaman	0.28 b
PAC9908-02	0.28 bc
Nemaguard	0.27 bc
HBOK 50	0.26 bc
Paramount	0.24 bcd
Viking	0.22 bcde
Atlas	0.19 bcdef
Hansen	0.17 cdef
Empyrean 1	0.17 cdef
Rootpac R	0.16 def
Brights 5	0.15 def
HM 2	0.14 def
F x A	0.13 ef
BB 106	0.10 f

Trial #2: Evaluation of Alternative Almond Rootstocks for the Westside of the North San Joaquin Valley

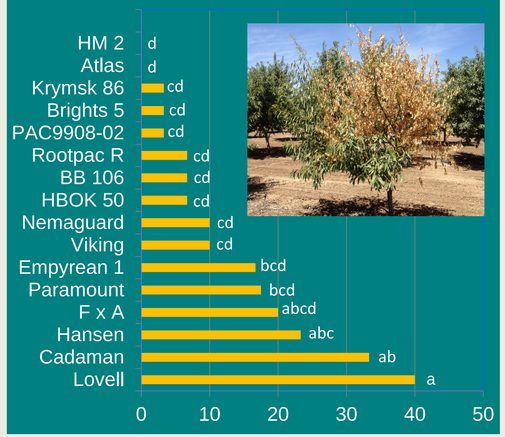
Roger Duncan & Brent Holtz. Cooperator: Lee Del Don

Trial specifics:

- Planted December 2011
- Planted in Westley area near Hwy 33 in Western Stanislaus County
- Soil type is Zacharias clay loam (pH 7.6) irrigated with blend of high pH ground water and district water tainted with significant levels of salt from tail water runoff.
- First generation almond orchard following decades of row crops, including melons and tomatoes (potential for Verticillium wilt).
- Tree performance data, including tree size, yield, leaf nutrient analyses, disease incidence, etc. will be collected for several years, along with soil and water analyses.

1. Lovell	*P. persica*
2. Nemaguard	*P. persica*
3. Empyrean 1	*P. persica x P. davidiana*
4. Avimag	*P. persica x P. davidiana*
5. HBOK 50	Harrow blood x Okinawa peach
6. Hansen	*P. dulcis x P. persica*
7. Brights #5	*P. dulcis x P. persica*
8. BB 106	*P. dulcis x P. persica*
9. Paramount	*P. dulcis x P. persica*
10. Flordaguard x Alnem	*P. persica* x Israeli bitter almond
11. PAC9908-02	(*P. dulcis x P. persica) x P. persica*
12. HM2 +	Hansen (*P. dulcis x P. persica)* x Monegro (*P. dulcis*×*P. persica*)
13. Viking	P. persica (Nemaguard) x (P. dulcis [Jordanolo] x [P. blireiana = P. cerasifera x P. armeniaca)
14. Atlas	*P. persica* (Nemaguard) x (*P. dulcis x P. blierianna)*
15. Krymsk 86	*P. cerasifera x P. persica*
16. Rootpac R	almond x plum

Verticillium Wilt 3rd Leaf



Trunk Circumference of 3rd Leaf Trees

PAC9908-02	37.7 a
Empyrean 1	36.8 a
F x A	36.3 a
Rootpac R	36.1 a
HM 2	35.8 a
BB 06	35.8 a
Hansen	35.7 a
Brights 5*	33.2 b
Nemaguard	33.1 b
Atlas	32.9 b
Viking	32.8 b
HBOK 50*	32.6 b
Paramount	32.9 bc
Krymsk 86	31.8 bc
Lovell	31.5 bc
Cadaman*	30.2 c

*indicates these were potted trees and started out smaller