Field Evaluation of Almond Rootstocks

Project No.: **10-HORT4-Duncan**

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Introduction:

Several new rootstocks, including many from other countries, have recently become available to plant in California. Field trials were initiated in three almond-growing counties to evaluate some of these alternative rootstocks with the following objectives.

Objectives:

Stanislaus County, Roger Duncan
- Evaluate the field performance of Nonpareil and Carmel almonds on sixteen rootstocks in an unfumigated, sandy loam, replant location.
- Evaluate the field performance of potentially oak root rot tolerant rootstocks in a replanted, flood irrigated, sandy loam location.

Butte County, Joe Connell
- Evaluate variety compatibility with alternative rootstocks.
- Evaluate alternative rootstocks for tolerance to Armillaria root and crown rots.

Colusa County, John Edstrom
- Evaluate the compatibility and field performance of new, alternative rootstocks on several almond varieties.
- Evaluate the compatibility and field performance of newer almond varieties on Marianna 2624.

A. Field Performance of Sixteen Rootstocks in an Unfumigated, Sandy Loam, Replant Location.

Roger Duncan, Farm Advisor; UCCE - Stanislaus County
Peter & Christene Bacon and Eric Gemperle; growers

Interpretive Summary:

In January, 2003, a replicated field trial was planted in a commercial almond orchard to test the performance of sixteen rootstocks budded with Nonpareil and Carmel scions in an unfumigated, sandy loam, replant location. An old almond orchard on Nemaguard rootstock was removed one year prior to replanting. Tree sites were backhoed with an excavator in the fall prior to planting but were not fumigated. The soil is a Hanford sandy loam with no particular chemical or physical soil problems (pH = 6.8; ECe = 0.9 dS/m; CEC = 5.2). The orchard spacing is 17' x 21' (122 trees per acre) and is flood irrigated with excellent quality water from the Turlock Irrigation District. Rootstocks and their parentage are listed in **Table 1** below.

Table 1. List of Rootstocks Planted in Almond Replant Trial. Ceres, CA

Rootstock	Parentage	Origin
Nemaguard	Peach (*P. persica*)	USA
Lovell	Peach 1882 processing peach selection (*P. persica*)	USA
Guardian SC-17	Peach (OP seedling of S-37 x Nemaguard)	Clemson University
Avimag (a.k.a. Cadaman)	Peach (*P. persica x P. davidiana*)	Hungary
Empyrean 1 (a.k.a. Barrier 1)	Peach (*P. persica x P. davidiana*)	Venice, Italy
Hansen 536	Peach x almond	UC Davis
Nickels	Peach x almond	UC Davis
Cornerstone (a.k.a. SLAP)	Peach x almond	Burchell Nursery
Paramount (a.k.a. GF 677)	Peach x almond (open pollinated)	France
Empyrean 2 (a.k.a. Penta)	*P. domestica* open pollinated	Rome, Italy
Empyrean 101 (a.k.a. Adesoto)	*P. insititia*	Zaragoza, Spain
Julior	*P. insititia* x *P. domestica*	France
Krymsk 86 (a.k.a. Kuban 86)	*P. cerasifera* x *P. persica*	Russia
Controller 9 (a.k.a. P30-135)	*P. salicina x P. persica*	USDA
Atlas	Complex hybrids containing Nemaguard, Jordanolo almond, plum and apricot	Zaiger Genetics
Viking		Zaiger Genetics

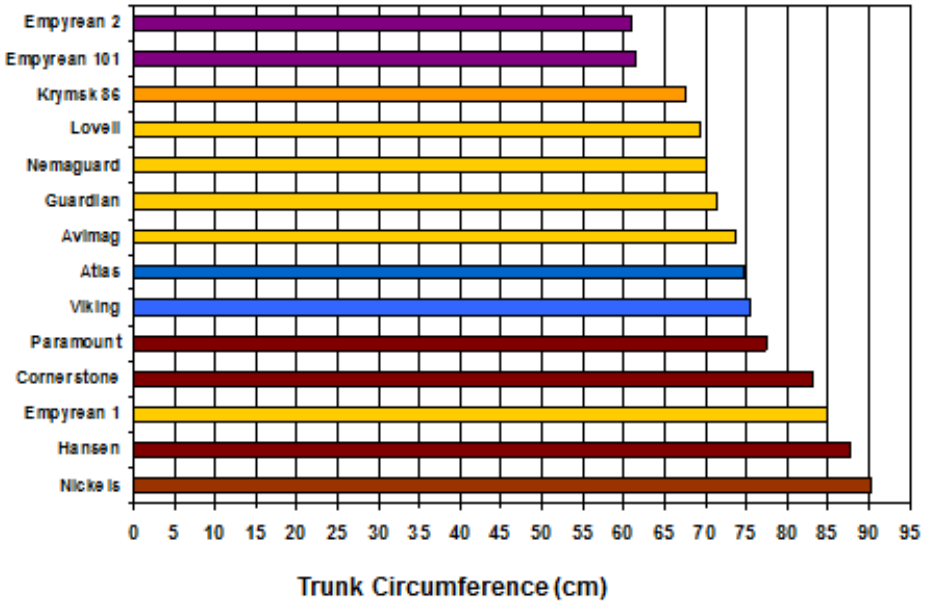
Tree Growth and Yield. Even though this orchard was not fumigated prior to planting, growth has been good to excellent for many of the rootstocks. Calculated yields per acre correlate very strongly with tree size. The most vigorous rootstocks tend to have the highest per acre yields because the canopy has developed more rapidly. Per acre yields of less vigorous rootstocks might be increased early in the life of an orchard by planting trees more densely. The American peach x almond hybrid rootstocks (Nickels, Hansen, Cornerstone) are very large trees and tend to have the highest yields (**Figure 1** & **Table 2**). The Carmel variety has particularly benefitted from being on a vigorous

rootstock. Carmel trees on Nickels have accumulated 6860 kernel pounds per acre more than Carmel trees on Nemaguard through the eighth leaf. Trees on the European peach / almond hybrid (Paramount) tend to be little smaller than the American peach / almond hybrids. The peach rootstocks (Avimag, Nemaguard, Guardian and Lovell) are all very similar in size and have similar yields. Of the four peach rootstocks, Avimag is slightly larger and Lovell is slightly smaller than the others. Empyrean 1, although it is a peach rootstock, has vigor and yields more comparable to the peach x almond hybrids.

Trees on the plum rootstocks (Empyrean 2, Empyrean 101 and Julior) are very small and may not be well suited for a sandy loam soil, especially under flood irrigation. They probably would have significantly lower yields than the peach x almond hybrid rootstocks even if they were planted very densely. Krymsk 86, a peach x plum hybrid, appears to be slightly less vigorous than Lovell under these growing conditions. To date, we have seen no bacterial canker in the test orchard.

Fig. 1. Rootstock Influence on Size of 7-Year-Old Nonpareil Almond Trees

Stanislaus County Almond Rootstock Trial. January, 2010



Lovell Nickels

Nemaguard Hansen

Table 2. Yield (kernel pounds per acre) of Nonpareil & Carmel Almond Trees in 2010 (8th Leaf) & Cumulatively (4th – 8th Leaf).				
	Nonpareil		Carmel	
	2010 (8th leaf)	Cumulative (4th – 8th leaf)	2010 (8th leaf)	Cumulative (4th – 8th leaf)
Paramount	--	--	3600 a	17,075
Nickels	3204 a	14,719	3529 a	18,744
Hansen 536	3139 a	15,113	3549 a	17,415
Cornerstone	2907 a	14,460	--	--
Empyrean #1	2668 ab	14,194	3405*	16,914*
Atlas	2599 b	12,428	3111 ab	16,140
Avimag	2328 bc	12,059	3085 ab	14,786
Viking	2235 bc	11,447	2569 b	13,354
Guardian	2143 bc	11,273	2398 b	12,391
Lovell	2103 bc	10,897	2455 b	11,486
Nemaguard (standard)	**1946 c**	**10,884**	**2614 b**	**11,884**
Krymsk 86	1416*	7,186*	--	--
Empyrean 101	1357 d	6,028	--	--
Empyrean 2	965*	5,182*	1268*	--
Julior	--	--	924*	--

*Indicates rootstocks that are not fully replicated. Krymsk 86 is fully replicated but many of the trees are one year younger than the rest of the trial.

B. Field Evaluation of Almond Rootstocks Potentially Tolerant to Oak Root Rot in a Flood Irrigated, Sandy Loam Soil

Roger Duncan, Farm Advisor; UCCE - Stanislaus County

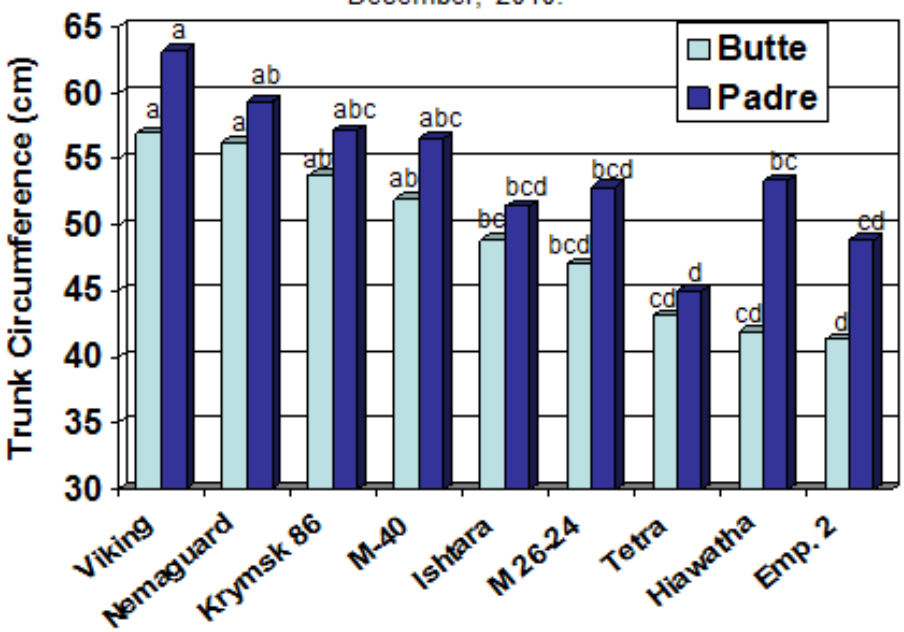
Armillaria mellea, the fungus that causes oak root rot, is often most severe in heavy clay soils. However, many North San Joaquin Valley orchards growing in sandy loam soils are also infested with *Armillaria mellea*. Most *Prunus* spp. rootstocks which are thought to be tolerant to oak root rot are plum or have a significant amount of plum in their parentage. In general, plum rootstocks do not perform well in flood irrigated, sandy San Joaquin Valley soils because of their low soil moisture holding capacity and the presence of pathogenic nematodes.

A replicated trial was established in 2007 to monitor the performance of eight rootstocks with plum parentage with the hope that one or more may prove to be tolerant to oak root rot and perform adequately in sandy soil. One year prior to planting the trial, an orchard infested with *Armillaria mellea* was removed. In the fall prior to planting the trial, the soil was treated with Vapam. The trial, which includes the rootstocks Empyrean 2 (a.k.a. Penta), Tetra, Hiawatha, Ishtara, Krymsk 86, Marianna 26-24, Marianna 40, Nemaguard and Viking was planted in January 2007. The scion varieties are Butte and Padre.

Results:

Tree size. Most rootstocks have grown adequately into their fifth leaf. **Figure 2** shows trunk circumference at the end of the 4th leaf season. Trees on Viking and Nemaguard are the largest while trees on Tetra, and Empyrean 2 are the smallest. Butte trees on Hiawatha are also very small but Padre trees on Hiawatha are more moderate in size. Trees on Krymsk 86, a promising new peach x plum hybrid, are growing well and are only a little smaller than trees on Nemaguard (although not statistically different). Trees on Marianna 40 tend to be larger than trees on Marianna 26-24 and have no root suckers. So far we have had no problem with trees on Ishtara or Hiawatha leaning excessively or falling over as has been reported in previous trials in the Sacramento Valley. In the spring of 2010 (early 4th leaf), two Butte trees on Marianna 26-24 showed signs of union mild etch. These signs of partial incompatibility had faded by mid-summer and no signs were evident in 2011. No signs of oak root rot have appeared yet in this trial.

Fig. 2. Rootstock Effect on Tree Size of Fourth Leaf Butte and Padre Almond Trees.
December, 2010.



Suckering. Trees were rated for root and crown suckering (**Table 3**) in May 2011 (fifth leaf). Every tree on Marianna 26-24 suckered profusely from both the crown and from the roots. Suckering was worse on the Butte trees, probably a reflection of the partial incompatibility of M 26-24 with the Butte variety. Trees on Empyrean 2 and Tetra had a

moderate amount of suckering. Only one tree on Krymsk 86 had suckers. There were no suckers observed on Nemaguard, Viking or Marianna 40.

Table 3. The Propensity of Various Plum or Plum Hybrid Rootstocks for Suckering		
	Average number of suckers per tree	
	Butte	Padre
Nemaguard	0	0
Viking	0	0
Marianna 40	0	0
Krymsk 86	0	0.1
Hiawatha	0.5	0
Tetra	0.5	0.4
Empyrean 2	1.6	0.6
Marianna 26-24	7.9	3.6

Figure 3. Root and crown suckers on Marianna 26-24 (left) and Empyrean 2 (right).

Field Evaluation of Rootstocks for Almond in Non-fumigated Replanted Orchard Sites

Project Leader: J.H. Connell, UCCE Farm Advisor, Butte County

Project Cooperators: Almont Orchards, Brouwer Orchards, M&T Chico Ranch, Sam Lewis & Son Orchards

Objectives: Evaluate variety compatibility with rootstocks for almond, particularly compatibility with Nonpareil. Assess tree field performance and/or tolerance to oak root fungus, high pH clay loam soil, and loam soil in a high rainfall area.

Materials and Methods:

A) Replants on alternative rootstocks are planted in non-fumigated oak root fungus spots to gauge their compatibility with almond and survival when exposed to the fungus. 'Nonpareil' on 'Empyrean 101' rootstock has been observed in two orchards since 2004. Nine trees of 'Nonpareil' on 'Krymsk 86' were replanted in oak root fungus spots in spring 2010. A rating scale from 0 to 4 is used to evaluate tree performance with 0 = a very weak tree with almost no growth or poor anchorage and 4 = a very vigorous tree with excellent growth and anchorage.

B) Working with Brouwer Orchards in Durham, Fowler Nursery planted 10 tree plots of 'Ishtara' and Advantage® ('Marianna 2624' with a long 'Padre' interstem) rootstocks in a high pH (>8.0) alkaline spot on heavy clay soil in 2002 while the grower planted 'Marianna 2624' plum to fill in the trouble spot and 'Lovell' peach rootstock throughout the remainder of the orchard. A quantitative comparison of the effects of variety and rootstock on tree growth is made through trunk circumference measurements of trees on the three rootstocks. Measurements were taken in June 2007 and in fall 2008, 2009, and 2010. Tree anchorage/mortality is also noted.

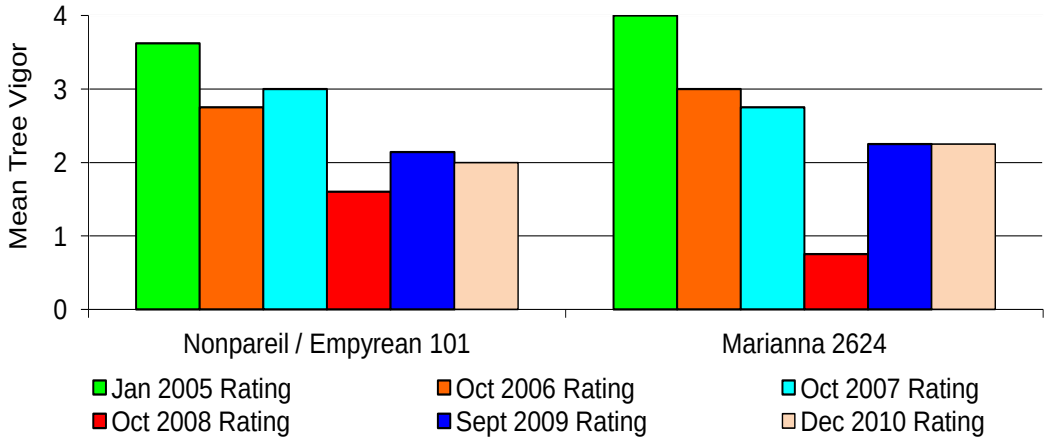
C) Following the removal of a Lovell peach rooted orchard, Greg Browne and I planted a randomized replant disease fumigation trial in 2004 with Almont Orchards in Durham. 20 single tree replicates of 'Krymsk 86', 'Lovell', 'Marianna 2624', and 'Ishtara' rootstocks were planted in both fumigated and non-fumigated tree sites. Although the fumigation trial is complete, observations related to vigor and mortality of the trees on these rootstocks still have value. Trunk circumference measurements were taken to characterize tree size differences and tree anchorage and mortality was noted.

D) Again, working with Brouwer Orchards in Durham and Fowler Nursery, a new rootstock trial was planted in spring 2010 following the removal of a previous 'Lovell' peach rooted orchard containing some plum rooted replants. This replicated randomized trial will evaluate six rootstocks, all with 'Nonpareil' as the scion, planted with five replicates of ten trees each. The trial is planted on Farwell Loam soil, a relatively heavy series bordering Stockton Clay Adobe. The rootstocks 'Rootpac®', 'Atlas', 'Krymsk 86', and 'Empyrean 1' are compared to standard rootstocks 'Nickels' and 'Lovell'. Tree growth is documented with trunk circumference measurements and mortality and anchorage will be noted as opportunities arise.

Results and Discussion:

A) 'Nonpareil' scions on the 'Empyrean 101' rootstock have grown well and are similar in vigor to nearby trees on 'Marianna 2624' (**Figure 1**). However, the trees are poorly anchored compared to trees on 'Marianna 2624'. In this commercial orchard one of four 'Marianna 2624' rooted trees were staked while five out of seven 'Empyrean 101' rooted trees required staking. Poor anchorage of trees on 'Empyrean 101' rootstock precludes the use of this rootstock for almonds. Planted in an oak root fungus spot in 2004 none of these trees have succumbed to *Armillaria mellea* at this point.

Figure 1. Tree vigor of 'Nonpareil' on 'Empyrean 101' rootstock planted March 2004



All nine 'Nonpareil' trees on 'Krymsk 86' planted in spring 2010 in three different oak root fungus spots got established and grew well the first year. Time will tell whether they are able to resist the fungus and survive. It frequently takes 3 or 4 years for a new tree planted on a susceptible rootstock to become infected in an oak root fungus spot.

B) On heavy soil, 'Ishtara' is competitive with 'Lovell' in terms of tree size and it produces more vigorous trees than those on 'Marianna 2624' (**Table 1**). Unfortunately, anchorage is a problem for 'Ishtara' since 3 out of 30 trees were lost in high winds. None of the 'Lovell' or 'Marianna 2624' rooted trees have been lost.

Table 1. Trunk circumference (cm) as influenced by variety and rootstock.

Scion/Rootstock	2007 Circ.	2008 Circ.	2009 Circ.	2010 Circ.
Nonpareil / Lovell	40.1	46.9	50.4	54.9
Nonpareil / Ishtara	38.9	48.0	51.2	55.4
Nonpareil / Advantage®	35.5	43.8	46.7	50.2
Aldrich / Lovell	42.7	48.6	54.1	58.9
Aldrich / Ishtara	43.1	49.0	54.9	60.0
Aldrich / Marianna 2624	39.3	46.9	51.7	57.7
Butte / Lovell	47.2	53.8	58.0	63.0
Butte / Ishtara	42.4	51.8	56.2	60.8
Butte / Marianna 2624	39.8	48.1	52.6	55.8

C) In 2004, 'Krymsk 86', 'Lovell', and 'Ishtara' rootstocks were planted in both fumigated and non-fumigated replant tree sites. The observations reported here relate to vigor and mortality of the trees on these rootstocks after six years.

Table 2 reports observations on anchorage and tree mortality by rootstock. These data reinforce information from other trial observations that the Ishtara rootstock is poorly anchored. Over 32 percent of the 'Ishtara' rooted trees were leaning. Conversely, 'Krymsk 86' is well anchored and had no trees leaning in this trial. Some 'Lovell' trees were leaning but this rootstock also had the highest percentage of missing trees.

Table 2. Observations on anchorage and mortality by rootstock.

Rootstock	Total # Trees	Number Leaning	Percent Leaning	Number Missing	Percent Missing
Ishtara	40	13	32.5	2	5.0
Krymsk 86	40	0	0	2	5.0
Lovell	40	2	5	4	10.0

Table 3. Average trunk circumference after six years as affected by rootstock and fumigation treatment.

Rootstock/Treatment	Average Trunk Circumference (cm)
Ishtara/Check	35.2
Ishtara/Chloropicrin	36.7
Krymsk 86/Check	40.8
Krymsk 86/Chloropicrin	41.2
Lovell/Check	34.2
Lovell/Chloropicrin	37.8

Trunk circumference measurements indicate tree size differences and are a reflection of tree vigor. All three rootstocks benefited from Chloropicrin fumigation but the greatest improvement in tree vigor was noted in trees on the 'Lovell' peach rootstock (**Table 3**). Trees on the 'Krymsk 86' rootstock have the largest trunk circumference, roughly 5 centimeters larger than the other two rootstocks. When trunk circumference measurements for both fumigated and non-fumigated treatments are averaged, the circumference of the 'Ishtara' and 'Lovell' rooted trees are nearly identical.

D) These six rootstocks were planted on March 15, 2010. 'Rootpac®', 'Atlas', 'Krymsk 86', and 'Empyrean 1' are all compared to standard rootstocks 'Nickels' and 'Lovell', all with 'Nonpareil' scions. Four of the six rootstocks established well in the first growing season with no tree losses. 'Atlas' suffered 10% mortality at planting and 'Nickels' lost 16% of the new trees (**Table 4**). Both of these rootstocks had poor root development on the bare root trees and root volume was limited compared to other rootstocks. No differences in anchorage have been noted at this time. After the first growing season, trees on the 'Empyrean 1' rootstock were the largest in circumference and those growing on 'Krymsk 86' were the smallest.

Table 4. Trunk circumference after the first growing season and tree loss at planting.

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

Alternate Rootstocks for Almonds

John Edstrom, Stan Cutter**,** Gerry Hernandez

Objectives:

1) Continue the long-term evaluation of seven commercially available rootstocks for Nonpareil yield and other important characteristics.
2) Evaluate the compatibility of Krymsk 86, Ishtara, Hiawatha and other plum rootstock combinations for Nonpareil and test the compatibility of newer almond varieties on Marianna 2624 plum.

2010 Summary:

1) Nonpareil production in this 1997 planting is close to its maximum potential as most tree canopies have nearly filled their 22 x 24 ft. spacing. The peach/almond hybrid selections Nickels, Hansen 536 and Bright's have filled their space while the peach rootstocks Nemaguard and Lovell and the mixed hybrid rootstocks, Atlas and Viking have 1-2 feet more space to fill. As a result, these yields are skewed in favor of the larger peach-almond (P/A) hybrid trees. Again, yields on Nickels are slightly ahead of all other rootstocks. Given more time the smaller trees may catch-up and show a more commercial per acre yield comparison with the P/A hybrids. However, it appears that the 22 x 24 ft. spacing is unacceptably wide for the peach and peach/plum hybrids. Replicated yield data for 2010, shown in **Table 1** shows lower production than previous years but still generally shows the higher production from the larger P/A hybrid trees and lower from peach, Atlas and Viking. Nonpareil kernel sizes 21-22/oz. were not significantly different between the rootstocks. Of concern has been the problem of Phytophthora root/crown rot on some P/A hybrid trees. Despite the use of water stream deflectors, micro-sprinkler irrigation sporadically wets the lower trunks of many trees. This problem again points to the high susceptibility of peach x almond hybrid rootstocks to soil fungi and "wet-feet". Yearly foliar applications of phosphonates in October seem to have helped alleviate this problem, but this practice was not evaluated. Trees were planted on small mounds so most surface water drains away from crowns, however, current local practices include taller berms that further protect crowns. This practice may

improve drainage and reduce vulnerability to root rot. The orchard has not lost many trees to wind and interestingly, tree productivity is quite good in spite of high crown gall infection rates as reported last year.

Nonpareil on Atlas and Viking bloomed 3 days before Lovell and Nemaguard while all P/A hybrids bloomed 2 days before both peach rootstocks.

Table 1. 2010 Nonpareil yield and average kernel size on test rootstocks.

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
Bright's	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

2) The orchard planted in 2006 has shown clear differences between Nonpareil scion growth budded onto the eight rootstocks. The trunk measurements (**Table 2**.) generally reflect tree size except for those with Padre interstems. The high vigor/large girth of the Padre interstem misrepresents the actual size of the canopy. Nonpareil canopy size has been greatly reduced with Padre interstems on M 2624 and M-40. Due to the smaller canopies/lower water demand compared to most trees in this planting, M2624 trees were over watered in year 3-4 leading to off color and poor performance. Twenty percent of the drip emitters were plugged this season to reduce water application rates and apply closer to optimum water. Tree condition improved greatly and is now acceptable. This again shows that even with a "water log tolerant" plum rootstock, over application of irrigation water can be very detrimental to tree performance.
Of special interest to the industry is the performance of Nonpareil directly on Krymsk 86, a peach x plum hybrid from Russia. This selection may become a replacement for M2624 and possibly Lovell if continued evaluations confirm the traits seen during nine successful years of University and industry trials. Unlike other plum type rootstocks, Krymsk 86 shows good vigor, slightly less than Lovell, under local soil conditions and is reported to have better anchorage (a weakness in peach). Other desirable characteristics include very low suckering and some tolerance to wet/heavy soils.

Preliminary yield figures as seen here and elsewhere show Krymsk 86 production similar to Lovell. However, more time is needed to fully evaluate this promising rootstock. The primary known weakness of Krymsk 86 is susceptibility to root knot nematode. Other problems may show up as Krymsk 86 is planted in varying growing conditions. Some reports indicate a sporadic problem with Monterey compatibility on Krymsk 86. The compatibility of K86 with most almond varieties has not been evaluated adequately. Another trait of particular importance is the potential tolerance of K86 to oak root fungus, high salt and excess boron conditions. These traits have not yet been evaluated.

Another new plum rootstock, Empyrean 2, is also showing good vigor with Nonpareil compared to Lovell, but has suckered profusely at the base of most trees. The suckering is comparable to, or even worse than, the sucking produced by M2624 rootstock. Hiawatha performed well initially in this test orchard, however poor anchorage has been problematic. Bloom timing was noticeably separated this year between some rootstocks with Nonpareil. Hiawatha, Ishtara, Nonpareil/Padre/M2624 and Nonpareil/Padre/M-40 trees all bloomed 1-2 days before Krymsk 86, Lovell and Empyrean 2, while Nickels P/A rootstock was 1 day after Lovell. Data in **Table 2** show the yields, kernel sizes and trunk diameters for this 5th leaf non-replicated test.

Table 2. 5th leaf Nonpareil Performance on Eight Rootstocks

Rootstock	yield (lbs/ac)	kernels/oz	trunk circumference (cm)
Ishtara	1,167	24	40.2
Lovell	1,704	22	46.0
Krymsk 86	1,926	22	46.3
Nickels	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 found during early years of these tests have shown:

1) Nonpareil yields on the three Peach/Almond hybrid rootstocks, Nickels, Hansen 536 and Bright's, have been consistently 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. The wide tree spacing of 22' x 24' appears well suited only to the P/A hybrids and far too wide for the peach types. Recalculating per acre yields using per tree yield figures and appropriate tree spacing/tree numbers for the peach and peach/plum rooted trees shows near equal production between all rootstocks tested. 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. Bloom timing has not been noticeably different between the rootstocks but crop maturity is delayed 2-5 days for the P/A hybrids.

2) Nonpareil was found compatible when grafted onto the three experimental rootstocks; Krymsk 86, Ishtara and Hiawatha, but incompatible with Deep Purple. Mission was also graft incompatible with Deep Purple. Ishtara and Hiawatha appear to have lower productive capacity than Krymsk 86 and Lovell which were similar in yields. Hiawatha has exhibited poor anchorage with many trees leaning or falling over completely. Cadman, renamed Avimag is also compatible with Nonpareil. Another selection, Jaspi is performing poorly while AC952UC1, Penta CM7 and Pumiselect have not survived when grafted to Nonpareil.
Commercially available varieties that are graft compatible with Marianna 2624 include, Avalon and Winters (13-1), while Plateau was found incompatible. Padre, Mission and Sonora were again shown to be compatible on M2624 while various clones of Nonpareil were found incompatible. Productivity of most almond cultivars is lower on M2624 than on other rootstocks. The European peach/almond hybrid rootstock GF-677 (Paramount) was found compatible with Nonpareil and Butte and comparable to Hansen 536 in productivity in this small trial.

3) Krymsk 86 has shown excellent compatibility with Nonpareil without any root suckering or other noticeable problems. Nonpareil production on K86 is comparable to Lovell and higher than Ishtara and Hiawatha that also show compatibility with Nonpareil. Empyrean 2 is also showing good compatibility with Nonpareil and vigor comparable to Lovell. When an interstem of Padre is used with M2624 or M-40 plum rootstocks, Nonpareil compatibility is much improved but the trees lack vigor and show very poor production in this test.

Recent Publications:
Annual Report of the Nickels Soil Laboratory, May, 2010.