FIELD EVALUATION OF PRUNE ROOTSTOCKS 2014

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PROBLEM AND ITS SIGNIFICANCE

The California Prune Industry has historically utilized five rootstocks, Myrobalan seedling, Myro 29C, Marianna 2624, Lovell Peach and some M40. The last statewide organized prune rootstock effort was the "M" series rootstock plots planted in 1987 (Vina Monastery 3/20/87). Since the conclusion of that experiment many more potential prune rootstocks have been identified. HBOK 50, Krymsk1, Krymsk 86, Citation, Rootpac-R, Viking, Atlas and others.

Three rootstock experiments have been planted in Northern California. One at Wolfskill, planted 1/19/11, a second in Yuba county planted 6/3/11 and a third in Butte county planted 4/28/11. All trees were nursery grafted to the 'Improved French' variety. Rootstock and scion measurements were used to characterize tree growth and initial data is reported as Trunk Cross Sectional Area (TCSA). At the Wolfskill site, fruit counts were made to evaluate early fruit production.

OBJECTIVES

1) Evaluate 29 rootstocks for use in California prune production.
2) Evaluate tree growth and development as trunk cross sectional area (TCSA) and early fruit production.

PLANS AND PROCEDURES

Butte County Location

The Butte county location was planted 4/28/11. The wet winter delayed soil preparation resulting in the late planting date. The Butte county soil survey lists the soil as Farwell clay adobe alternating with a lighter textured soil described as Nord loam. Test trees followed almonds on Lovell peach rootstock with no soil treatments prior to planting. Lesion nematodes were isolated from soil samples. The experiment is a randomized complete block design with 14 treatments and 5 replicates. There are 6 trees per plot in the original design. Trees were headed at 40 inches on 5/10/2011 and the experiment is drip irrigated. HBOK 50 were received as potted trees delivered 5/4/11 and planted by 5/10/11. Instructions were to remove trees from the pots, do not disturb the root ball, cover with 2 inches of soil and irrigate carefully to keep the small root ball moist. HBOK 50 were small bush like trees and did not have sufficient trunk growth to head the first year and were left unpruned. Viking and Atlas were not available in 2011 and were added to the experiment in 2012 and are consequently one year younger. Viking and Atlas were

propagated by Dave Wilson nursery, HBOK 50 from Duarte nursery and the remaining trees were propagated by Fowler nursery. Tree mortality was high during the 2011 season. Missing tree locations were site fumigated with 0.5 pound of chloropicrin on 11/15/11 and replanted 2/10/12. Viking and Atlas were also planted 2/10/12. Many of the Rootpac-R trees did not survive the initial planting and replacement trees were not available. On 2/10/12 the few remaining Rootpac-R were extracted from the Butte experiment and replanted in the Yuba plot. The goal was to have one complete set of Rootpac-R at one location. The Butte experiment had approximately half of the trees replanted one year following the initial planting due to the high initial tree mortality. Fumigated replant trees grew very well and by 2014 were similar in size to the trees planted the first year. Because of the similar trunk size, the 2014 TCSA data includes both tree ages. Trunk measurements include scion circumference measured 12 inches above the graft union using a measuring tape. Trunk circumference was used to calculate TCSA. Scion measurements were made at the Butte location on 11/22/13 and 11/6/14. Butte rootstock entries are listed in figure 1.

Yuba County Location

The Yuba county location was planted 6/3/11. The wet winter delayed soil preparation and subsequently delayed planting. Similar to Butte, the plot is a randomized complete block design with 15 treatments and 5 replicates. There are 6 trees per plot in the original design. Rootstocks are the same as the Butte plot with the exception of Rootpac-R which was transplanted from Butte to Yuba. Tree mortality was high during the first season in the ground. Replants in 2012 replaced missing trees. The Yuba experiment is complete and trees are growing well. Trunk measurements were made December 2013. Trunk measurements for 2014 have not been completed and will be taken in 2015.

Wolfskill Experimental Orchard

A satellite experiment of prune rootstocks was planted at the UC Wolfskill experimental orchard in Winters, California. The plot contains 16 experimental rootstocks and 3 standard or reference rootstocks nursery budded to ‘Improved French.’ This experiment provides an initial evaluation of possible rootstocks that have previously not been tried with prune or have had very little field testing. The experiment is planted with 5-10 trees of each rootstock and is non-replicated which limits statistical analysis. The goal was to get a first look at how these rootstocks performed with ‘Improved French’scions and identify any defects before commercial planting. The standard rootstocks planted for comparison are Marianna 2624, Lovell, and Myro 29C. ‘Improved French’ on its own root differs from the others in that trees were grown in the nursery for two years. Own rooted trees do have a graft union because ‘Improved French’ was budded on top. Wolfskill rootstock entries are listed in figure 2.

The Wolfskill site was previously planted to peaches, removed in 2008 and the field left fallow for 3 years with annual winter wheat. The Yolo county soil survey describes the soil as Yolo loam. Nematode samples were taken at four locations within the field at approximately an 18 inch depth, and combined for nematode evaluation (8/29/11). One liter of soil contained, 50

Lesion (*Pratylenchus sp.)*, 50 Pin (*Pratylenchus sp.)*, and 30 Dagger (*Xiphinema americanum*). There were not enough nematodes to identify the species of either Lesion or Pin nematodes.

The majority of the trees were planted on January 19, 2011. Bare-root trees were planted directly after transportation from the nurseries sawdust box. HBOK 32 and HBOK 10, were potted trees planted on April 25, 2011. At the time of planting, trees were headed at 36 inches. Trees that had not reached heading height were left alone and allowed to grow through 2011 then headed at 36 inches in the following dormant season. Scion measurements were made December 2013 and November 26, 2014. Number of fruit per tree was counted August 4, 2014.

RESULTS AND DISCUSSION

At all three locations trees are growing well and we have not observed anything unusual after three years of growth. Figure 1 shows TCSA for the 14 rootstocks in the Butte experiment. Rootpack R was eliminated due to poor survival following planting. HBOK 50 has the smallest TCSA of the group because it was planted as a potted tree and needed one additional year to grow a headable trunk. At the Wolfskill site there is a much greater size gradient (Figure 2) and differences between rootstocks are starting to become evident. HBOK 10 has the smallest TCSA compared with Empryean 1 as the largest. First year fruit count data from Wolfskill provides a first look at early fruit production influenced by rootstock. Overall, it is too soon to make accurate conclusions but trees are growing well and will provide good reliable information in the future. Rootstock experiments for almond are evaluating many of these rootstocks as well. In the future, additional information will be available for nematode susceptibility, disease resistance and salt/boron tolerance and more. Rootstock pedigrees are shown in figure 3 and the Butte experimental site is illustrated in figure 4.

	Rootstock	TCSA 11/22/13	TCSA 11/6/14	
1	HBOK 50	10.86	18.97	a
2	M58	17.79	28.40	a
3	Citation	16.18	28.61	a
4	Empryrean #2	17.64	29.39	a
5	Krymsk #1	18.85	29.78	a
6	Marianna 2624	18.85	31.90	bc
7	Krymsk #86	17.79	32.01	bc
8	Myrobalan	18.85	32.29	bc
9	M40	20.58	35.21	bcd
10	Lovell	23.24	39.29	bde
11	Viking	23.07	41.22	de
12	M30	26.23	45.09	ef

13	Atlas	25.87	45.89 ef
14	Myro 29C	32.37	51.96 f

Figure 1.Trunk Cross Sectional Area (TCSA) in cm^2 for the Butte County Prune Rootstock comparison. Stat Graphics Multiple Range Test with statistically significant differences at the 95% confidence level. Trunk circumference measured 12 inches above graft union.

Rootstock	TCSA 2013 (cm^2)	TCSA 2014 (cm^2)	Average Fruit Count 2014
HBOK 10	13.70	34.16	1.00
Krymsk 2	26.21	40.53	59.00
HBOK 32	20.94	44.10	8.60
Imperial CA	20.67	44.23	0.25
HBOK 27	23.89	46.36	8.00
Ishtara	31.63	53.55	5.40
Speaker	30.25	54.21	38.00
Controller 9	30.50	56.01	12.00
Own Root	27.39	56.82	5.00
Empyrean 3	24.24	56.90	4.80
Marianna 2624	36.06	58.70	22.80
Krymsk 99	31.91	65.09	30.33
Lovell	42.32	69.53	30.40
Puente	41.17	74.51	18.67
Myro 29C	45.37	82.10	11.40
WRM 2	58.46	95.27	40.00
Fortuna	59.52	112.14	86.40
Empyrean 1	65.69	120.33	24.83

Figure 2. Trunk cross sectional area (TCSA) in cm^2 and average fruit count for the Wolfskill rootstock selections. Average fruit count represents the counted sum of all fruit divided by the number of trees in the plot.

Rootstock	Pedigree (scientific)	Pedigree (Common)	Other names	Trial	Interest to CA
Atlas	P. persica (Nemaguard) x (Prunus dulcis x Prunus blierianna)	Nemaguard x(almond x (apricot x plum))		Grower	Bac canker resistant?
Viking	P.persica x (P. amygdalus x P. blireiana (P.ceresifera x P.Mume)	Nemaguard x(almond x (apricot x plum))		Grower	Bac canker resistant?
Citation	Prunus salicina x Prunus persica	Red Beaut plum x peach	4-G-816	Grower	
Empyrean 2	Prunus domestica	European prune (OP seedling of 'Imperial Epineuse')	Penta	Grower	small tree
HBOK 50	Prunus persica	Harrow Blood X Okinawa		Grower	nematode resistant?
Krymsk 1	Prunus tomentosa x Prunus cerasifera	Plum x plum	VVA1	Grower	grown in Europe
Krymsk 86	Prunus cerasifera x Prunus persica	Plum/peach hybrid	Kuban 86	Grower	Anchorage
M30	Prunus cerasifera x Prunus munsoniana	Plum x wild plum		Grower	
M40	Prunus cerasifera x Prunus munsoniana	Plum x wild plum		Grower	Less suckering
M58	Prunus cerasifera x Prunus munsoniana	Plum x wild plum		Grower	smaller tree?
Myrobalan seedling	Prunus cerasifera	Myrobalan seedlings		Grower	Control
Rootpack R	Prunus cerasifera x prunus dulcis	Plum/almond hybrid	Replantpac	Grower	
Lovell	Prunus persica	peach seedling		Grower/ Wolfskill	Control
M2624	Prunus cerasifera x Prunus munsoniana	Plum x wild plum	Marianna 2624	Grower/ Wolfskill	Control
Myro 29C	Prunus cerasifera	Myrobalan clone		Grower/ Wolfskill	Control
Controller 7	Prunus persica	Harrow Blood X Okinawa	HBOK 32	Wolfskill	
Controller 8	Prunus persica	Harrow Blood X Okinawa	HBOK 10	Wolfskill	
Controller 9	Prunus salicina X Prunus persica	Plum/peach hybrid	P30-135	Wolfskill	
Empyrean 1	Prunus persica x P. davidana	Peach x Chinese wild peach. Venice, Italy	Barrier	Wolfskill	
Empyrean 3	Prunus domestica	European prune (seedling of Regina Claudia Verde)	Tetra	Wolfskill	sensitive to ORF
Fortuna	Prunus cerasifera x Prunus persica	Plum/peach hybrid		Wolfskill	
HBOK 27	Prunus persica	Harrow Blood X Okinawa		Wolfskill	
Imperial California	Prunus domestica	plum R/S Italian Origin		Wolfskill	
Ishtara	(P. cerasifera x P.salicina)X (P. cerasifera x P. persica)	peach/plum hybrid (complex hybrid selected by INRA)	Ferciana	Wolfskill	
Krymsk 2	Prunus incana x Prunus tomentosa	wild cherry x Manchu cherry	VSV 1	Wolfskill	
Krymsk 99	P. besseyi x P. salicina	Plum/Plum hybrid (Sand cherry x Japanese plum)		Wolfskill	
Own rooted French	Prunus domestica	European prune		Wolfskill	
Puente	Prunus cerasifera	Plum (from Spain)	Adara	Wolfskill	
Sharpe	Prunus angustifolia x unknown plum	Plum x plum		Wolfskill	
Speaker	Unknown scientific name	Plum/peach hybrid	Spicer	Wolfskill	
WRM #2	Prunus cerasifera	Red leaf myroblan type (found in water logged soil)		Wolfskill	

Figure 3.Scientific and common pedigree for the Butte,Yuba and Wolfskill prune rootstock experiments.

Figure 4. Prune trees growing in the Butte County prune rootstock experiment. Photo taken 12/15/14.