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## Field Confirmation of the Value of a New Approach to Replanting Stone Fruits

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### ABSTRACT

This report marks our sixth year of searching for new rootstocks for the stone fruit industry and our first year of attempting to replant stone fruit orchards using ‘starve and switch’ as an alternative to soil fumigation. In the arena of new rootstocks we have now confirmed that HBOK 1 can provide useful resistance to ring nematode as well as root knot nematode while exhibiting a host status to root-lesion nematode that is similar to that of Nemaguard. The vigor level of HBOK1 appears similar to that of Nemaguard. Its resistance to ring nematode exceeds that of Lovell, Guardian or Viking. The HBOK series is Harrow Blood Peach x Okinawa Peach and three of the HBOK series, #28, 32 and 50, were screened in 2009 against the rejection component of the replant problem and generally none were notably tolerant of the rejection component. HBOK1 has been submitted to a nursery for tissue culturing of up to 1000 trees ready for planting on larger scale in the near future. Krymsk 1 is dwarfing and its compatibilities are primarily to plum scions. It is the only *Prunus spp* with hardy resistance to root-lesion nematode plus resistance to root knot except at its root tips. However, it appears to be hypersensitive to crown gall and that impact on its growth is currently receiving extensive evaluation in existing plots at KAC. In the 4.5 acre plum replant block established in 2009 there was not a serious rejection component present but Krymsk1 is currently showing that fumigation as well as ‘starve and switch’ grew better trees than the untreated blocks. This may be the impact of crown gall rather than the rejection component because this difference was not apparent when Nemaguard was the rootstock.

### OBJECTIVES

1. Using dwarfing stocks, including HBOK and Krymsk 1 replant a 4-acre site at Kearney Ag Center using the “starve the soil ecosystem, switch rootstock parentage” approach compared to fumigation or no fumigation.
2. Using various stocks including Viking and HBOK replant a 2.5-acre block of 20 yr old peach and nectarine at Kearney Ag Center using the “starve the soil ecosystem, switch rootstock parentage” approach compared to fumigation or no fumigation.
3. Finish several 2-year nematode screens involving the HBOK series plus Mirobac selections from Spain.

## PRODUCERS

In fall 2007 a 2% solution of Roundup was carefully sprayed to the foliage of two orchards using large droplets and a hand wand to deliver to one side and then the other without drift. This step has already been shown to be successful. During 2008 we will identify any specific soil pest problems associated with these two blocks and correct those as needed by delivering various nematicides to any treatment site that is not to be fumigated. We have identified potential nematicides during recent studies with grape and walnut replants. In spring 2007 we grafted Krymsk 1 to a number of scions and by June budding time 2008 we should know which scions are best for this rootstock relative to its grafting affinity. HBOK selections have broader grafting capability than Krymsk 1 and the comparison rootstock will be Nemaguard trained according to the Kevin Day method for reduced tree stature.

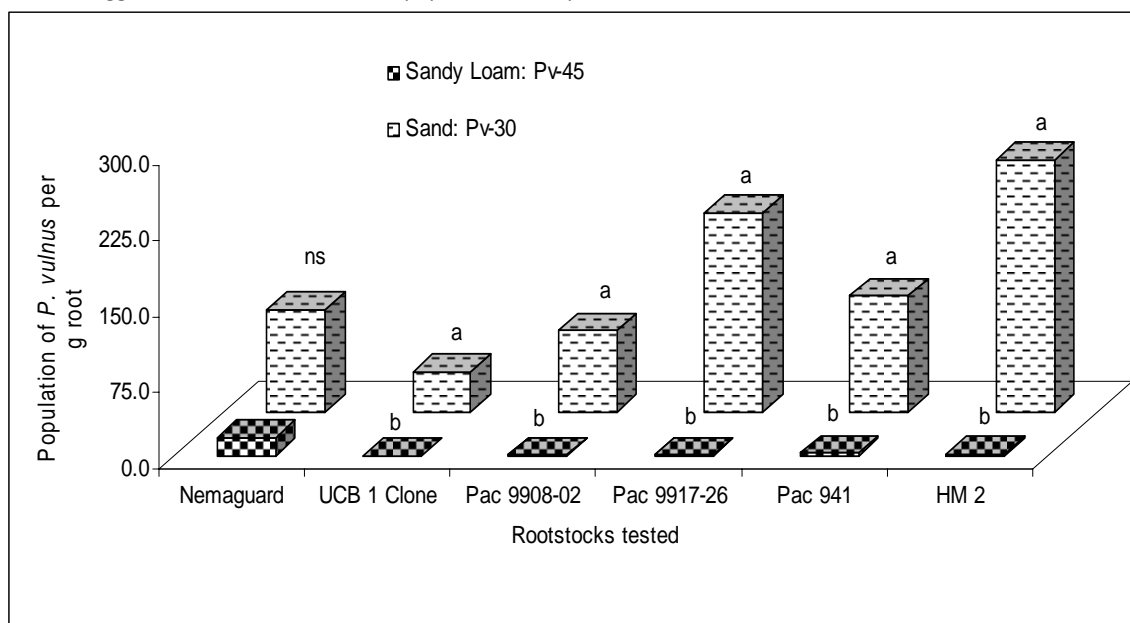
These rootstocks will be planted in 2009 and after that time the blocks will be turned over to Scott Johnson and Kevin Day to gather horticultural information on rootstock differences in association with fruit production. Scott and Kevin will only become involved where there appears to be suitable reason for them to conduct such studies; for example one site may be appropriate but not both sites.

During the first two years these two blocks will be diagnosed for potential field problems, rootstocks will be purchased and grafted and first and second year growth of trees and nematode populations monitored by McKenry. Data will be analyzed by ANOVA and most important, this block will become a demonstration plot for this new approach to replanting with minimal use of a fumigant.

Six accessions from the HBOK series became available from Ted DeJong and his lab at UC Davis. Three accessions from Spain were also made available for evaluation. Our search is for additional sources of resistance to root lesion and ring nematode among these two sources that became interesting to us after the writing of this proposal. Our screening techniques are the same as those reported on in our 2004 – 2008 studies.

## RESULTS AND DISCUSSION

While evaluating several new *Prunus* rootstocks from Spain we conducted our studies in the presence of two different populations of *Pratylenchus vulnus* reared in two different soils. One population, Pv-45 was brought to sandy loam soil at KAC in 1976 and appeared less aggressive to *Prunus* spp than a second population Pv-30, which was originally isolated from sandy soil two miles from KAC. Table 1 depicts nematode host status differences compared to Nemaguard and a 'usually resistant' clone of pistachio for standard comparison.

**Table 1.** Aggressiveness of two *P. vulnus* populations compared

Parentage of these Spanish clones makes them interesting because they are substantially different from Nemaguard and therefore perhaps tolerant of the rejection component (see Table 2). Pac 941 was recently patented in the USA and is available to growers while the other selections are progressing toward commercial availability.

**Table 2.** Parentage and origin of various *Prunus* rootstocks

Rootstocks	Parentage	Origin
UCB 1 Clone	<i>Pistacia atlantica</i> x <i>P. integerrima</i>	USA
PAC- 9908-02	( <i>Prunus dulcis</i> x <i>P. persica</i> ) x ( <i>P. persica</i> )	Spain
PAC 9917-26	( <i>Prunus persica</i> x <i>P. dulcis</i> ) x ( <i>P. persica</i> ) [Cross of 'Monegro' x 'Flordaguard']	Spain
HM 2	( <i>Prunus persica</i> x <i>P. dulcis</i> ) x ( <i>P. dulcis</i> x <i>P. persica</i> ). [Cross of 'Hansen 536' x 'Monegro']	Spain
PAC-941	( <i>Prunus cerasifera</i> 'Myrobaln' x <i>P. dulcis</i> ) [Natural hybrid]	Spain
NEMAGUARD	<i>Prunus persica</i>	USA

**Table 3.** Effects of soil texture on reproduction of two populations of *Pratylenchus vulnus* with different origins and their rate of reproduction on two rootstocks, 90 d after inoculation

	<i>Pratylenchus vulnus</i> per g of root on two rootstocks				<i>Pratylenchus vulnus</i> Pf/Pi on two rootstocks			
	UCB*1		Krymsk**1		UCB*1		Krymsk**1	
	Populations of <i>P. vulnus</i>				Populations of <i>P. vulnus</i>			
	PV-45	PV-30	PV <sup>a</sup> -30	PV <sup>b</sup> -30	PV-45	PV-30	PV <sup>a</sup> -30	PV <sup>b</sup> -30
Soil texture								
Sandy loam	0.95	0.69	-	-	0.03	0.0	-	-
Sand	3.30b	44.60a	0.0	0.0	0.0	0.1	0.0	0.0
Sand + Ring nematode	6.10b	275.70a	0.58b	6.45a	0.025	1.7	0.0	0.08

Means within a row followed by the same letter are not significantly different according to Duncan's Multiple Range Test at  $P = 0.05$ .

\*= Inoculum of both populations came from Nemaguard roots.

\*\*= PV<sup>a</sup>-30 came from UCB1 roots.

PV<sup>b</sup>-30 came from Nemaguard roots.

- = not examined.

Table 3 indicates that Krymsk 1 has hardy resistance to root-lesion nematode populations including the more aggressive Pv 30 population and that sandier texture or presence of ring nematode has minimal to do with its increased virulence. Tables 1, 2 and 3 indicate there are new rootstocks coming on line and if root-lesion nematode is of concern that selection Pac 941 and Pac 9908-02 could perform at least as well as Nemaguard; once more is known about the vigor they impart and their tolerance to the rejection component of the replant problem. Our trees were too small to achieve good assessments for ring nematode and also they did not grow well in the sand tanks where they were placed. There will be more on ring nematode next year. These five rootstocks plus twelve others will be interplanted into the existing almond trial site at KAC in spring 2010.

Growth of trees in the two replant sites revealed a very normal incidence of rejection component in the site with almond replants and an almost nil incidence of rejection component at the plum site. Trees planted to both these sites in March 2009 were quite uniform in size and all cut to knee height after planting. Growth in one area of the almond replant became notably reduced by May and by July incidence of the rejection component was throughout the 2.5 acres. In the plum replant site the rejection component was only barely apparent throughout the year. The best indication of the presence of the rejection component was provided by measurements of tree height on July 1 and again in November/December. These are the months when its presence is normally noticeable. Viking was one of the first rootstocks to begin to grow better by early fall and this was visible in the non-fumigated as well as those that received Roundup in 2007, but not apparent in the fumigated soil. The following two tables depict growth differences among the various treatments. At the present time reasons for the lack of vigor in the Carmel scion are unknown but it does appear to have negatively impacted any value to the earlier treatment of Roundup. In the almond site, increased tree heights were similar for fumigated as well as 'starve and switch' trees as compared to the non-fumigated. The untreated trees should begin to increase their growth in the coming year. Trunk circumferences for each of these trees will be collected in January 2010 but we do not intend to prune these trees back this winter. More information on these studies is presented on-line at [www. MBAO.org](http://www.MBAO.org). Click: 2009 presentation by M. McKenry.

% of Total Tree Height that Occurred  
from July 1 and November 1, 2009

Nonpareil Scion			
Rootstock	Telone II	Roundup + 1 Year	Untreated
Nemaguard	21.2%	23.2%	12.2%
Viking	25.2%	23.8%	21.4%
HBOK 50	21.4%	24.2%	15.4%

% of Total Tree Height that Occurred  
from July 1 and November 1, 2009

Carmel Scion			
Rootstock	Telone II	Roundup + 1 Year	Untreated
Nemaguard	16.1%	11.1%	1.5%
Viking	13.4%	6.6%	8.3%
HBOK 50	14.2%	6.6%	2.4%

% of Total Tree Height that Occurred  
from July 1 and December 1, 2009

Owen T			
Rootstock	Telone II	S&S	Untreated
Nemaguard	27 %	28 %	31 %
Krymsk 1	36 %	36 %	35 %
HBOK 50	42 %	39 %	37 %
HBOK 32	25 %	27 %	20 %
HBOK 28	29 %	28 %	31 %

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