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

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ABSTRACT

Two years after grafting Krymsk 1 rootstocks to various scions all of the scions remain alive but some peach cultivars will perhaps be most problematic for the future. Krymsk 1 does produce suckers and the intensity of those suckers appears to escalate with some scions, perhaps a sign of incompatibility. Owen T. plum is the scion we have chosen to evaluate for our new large field trial of replanting plums after plums. Two large field trials are ready for planting in spring 2009. Treatments will include 'Starve and Switch' compared to fumigation or non fumigation prior to replanting. A 2% spray of Roundup, very carefully applied to reduce drift, can be safely applied to a field 60 days before tree removal. Minimal damage to the most adjacent trees was observed from these hand sprayed, low pressure treatments but added insurance would be to use trunk applications of Roundup in any adjacent outside tree rows. Clones of several HBOK and Mirobac seedlings were planted into our nematode screening areas at Kearney in spring 2008 with data from those evaluations available in winter 2009.

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.

PROCEDURES

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

Two field trials were sprayed with 2% Roundup in fall 2007. We evaluated tree kill by leaving the Roundup treated trees (2 acres of the 4 acre plum block and 0.8 acres of the 2.4 acre nectarine/peach block) in the field throughout the 2008 season. None of the treated plum trees produced the slightest green vegetation in 2008. Four trees among the 0.8 acre nectarine/peach block produced some green shoots in 2008 but each of these new shoots was within 3 feet of an untreated tree. Thus, during our treatments we erred on the side of caution to avoid damaging adjacent untreated trees. Throughout the two orchards all dead-appearing trees treated with Roundup exhibited completely dead roots when excavated in August 2008. Trees in close proximity to Roundup drift (untreated trees adjacent to treated trees) exhibited a few rosette-appearing leaves beginning April 2008. By July and August the only remaining symptom was shot-hole appearing leaves on trees closest to the Roundup treated plum

trees. There did not appear to be an impact on fruit and the only damaged leaves throughout the orchard were on that half of the tree closest to adjacent treated trees. Nectarine and peach trees within 3 feet of sprayed branches were not impacted by the roundup. There appears to be greater Roundup susceptibility among plum scions compared to nectarine/peach scions. Previously existing weedy ground cover between tree rows did not support vegetation until July 2008.

All Roundup-treated and untreated trees were removed simultaneously in August-September 2008. There was notable ease to stump removal among the Roundup treated trees. Tree removal and ripping/disking activities were conducted in a manner to avoid transfer of soil between blocks treated with Roundup or not. In October 33.7 gallons per acre Telone was applied to deep dried soil (<7% soil moisture throughout the surface five feet of soil). By fall 2008 both blocks of ground had been prepared with three pre-plant treatments: A. 'Starve and Switch', B. Telone fumigation and C. non-treated check. In spring 2009 the old plum block will be replanted to Owen T. plum on three rootstocks including Krymsk 1, HBOK 32 and Nemaguard in randomized rows across the various pre-plant histories. The old nectarine/peach block will be planted to Nemaguard, Viking and HBOK-32 rootstocks; an effort to evaluate growth and yield in a dwarf tree setting compared to trees of normal stature.

Objective 3 of this project is being conducted with 8 to 20 trees planted into root knot and root lesions settings or ring nematode settings. Harrow Blood and Okinawa rootstocks are both resistant to root knot nematode and came upon the scene prior to 1956 when Nemaguard became the dominant Prunus rootstock in California. The HBOK series consists of 150 different seedlings from the more recent cross of Harrow Blood and Okinawa. Ted DeJong and his lab were evaluating them for dwarfing and while surveying nematode populations in field settings at Dr DeJong's Kearney and Modesto trials we encountered some accessions, as reported earlier, that appeared to possess resistance to root lesion or ring nematode. In spring 2008 the DeJong lab provided us with eight to 20 trees each of HBOK seedlings 144, 17, 122, 15, 121 and 1 plus a cross of Flordaguard x Kearneysville. From colleagues in Spain we were also provided with Mirobac 941, a newly patented tree for the US, plus two other selections of Mirobac. Mirobac is a plum x almond hybrid with broad scion compatibilities. In sand tanks infested with ring nematode some of these trees grew differently from those in sandy loam soil with root lesion nematode. We currently have some good looking and poor looking trees in both these soil texture/nematode settings. The first nematode counts from these trees are just becoming available at the time of this writing.

Graft compatibility studies of several rootstocks of interest were begun in 2005 with grafting by John Slaughter of Burchell Nursery and assessments completed in 2008. All the scions grafted to all the rootstocks we tested and survived for the two years of this test. Cadaman and Flordaguard rootstocks were generally compatible and in some cases produced suckers but so did the comparison trees. Least sucker development was associated with Lovell rootstock. Krymsk 1 is known to have compatibility issues and known to produce suckers. In Table 1 we quantify the biomass produced by the various scion/rootstock combinations as well as sucker incidence.

Table 1. Two-year plant growth data collected from various rootstock/scion combinations planted into nematode infested or fumigated, non replant settings (= tolerance to nematode feeding).

		Second-year biomass (kg/tree)			suckers/tree	
Scion	Rootstock	Fumigated	nema infested	value of fumigation	fume	no fume
Spring Flare[R]	Krymsk 1	1.7	2.1	-19%	15	13
Nectarine	Cadaman	32.5	24.5	33%	5	0
(yellow flesh)	Flordaguard	24.8	19.7	26%	1.3	0.3
	Lovell	22.6	18.9	20%	0	0
	Nemaguard	35.3	22	60%	6.7	9.7
SpringFlame[R]	Krymsk 1	0.6	0.8	-25%	24	31
Peach	Cadaman	23	13.9	65%	5.3	13.3
(yellow flesh)	Flordaguard	21	5.3	396%	0	1
	Lovell	6.5	11.5	-43%	0	0.3
	Nemaguard	51.9	33.9	53%	3	4.3
J40.111	Krymsk 1	0.7	1.4	-50%	44	40
Peach	Cadaman	31.2	39.2	-20%	16.3	2
(yellow flesh)	Flordaguard	23.6	22.7	3%	4.7	0
	Lovell	23.3	12	94%	0	0
	Nemaguard	31.4	27.4	15%	5.3	4.3
E45.013	Krymsk 1					
Nectarine	Cadaman	36.6	29	26%	2.7	12.3
(yellow flesh)	Flordaguard	21.6	37.4	-42%	5.7	0
	Lovell	35.4	28.2	25%	1.5	2.7
	Nemaguard	23.7	29.3	-20%	7.7	0.3
Tulare Giant	Krymsk 1	2.9	5.2	-44%	25	11
Prune	Flordaguard	13.6	8.3	64%	0.3	1.7
(P.domestica)	Mariana 2624	11.3	23.1	-51%	9	1.7
	Myrobalan	12.5	11.6	8%	19.7	26.7
Black						
Splendor	Krymsk 1	4.8	5.5	-13%	19.3	13
Plum	Marianna	9.7	11.7	-17%	18	2
(P. salicina)	Lovell	9.7			0	
	Nemaguard	18.8	12.48	50%	8.7	4.7
July Flame[R]	Cadaman	41.8	33	27%	3.3	0.7
Peach	Flordaguard	37	31.5	17%	0	0
(yellow flesh)	Lovell	12.5	7.3	71%	0	0
	Nemaguard	41.8	38.8	8%	6.3	2
Padre	Krymsk 1	9.2	12.3	-25%	4.3	1
Almond	Cadaman	30.1	27.1	11%	5	0.7
	Flordaguard		20.9			0
	Lovell	22.4	18.3	22%	0	0
	Marianna	17	21.2	-20%	7	0