Oregon Wine Advisory Board
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Phylloxera in Oregon Grape Vines: Biology and Treatment of Planting Stock With Hot Water Dips

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In 1994-95, the Oregon Wine Advisory Board supported a cooperative study entitled "Crown gall and phylloxera in Oregon grape vines: Biology and treatment of planting stock with hot water dips" with Bernadine Strik and Marilyn Canfield (Larry Moore) as co-principal investigators. We will report our findings on hot water dips for phylloxera eradication here. Marilyn Canfield has submitted a separate report on Crown Gall.

We will also report on our preliminary findings on rootstock performance in phylloxerated and non-phylloxerated sites (funded by the Center for Applied Agricultural Research). A more complete report on this study will be provided in up-coming industry newsletters.

Hot water dips for eradication of phylloxera. The easiest way to introduce phylloxera to a site is by infested plant material. If a grower can effectively remove any existing phylloxera on new plants, the rate of spread of phylloxera in Oregon vineyards will be significantly decreased.

The objectives of this study are to determine methods for dipping of young grape vine nursery stock that will eradicate existing phylloxera populations without causing plant damage.

In January 1993 and 1994 all life stages of phylloxera were subjected to hot water dips in 125*F water for 0, 3, 5, 7, 9, 11, and 13 minutes to determine potential for eradication. Three root pieces with established populations of eggs, nymphs, adults, and hibernants were dipped for each time treatment. After the heat treatment, the root pieces were placed in petri dishes and stored in an incubator. Data on percent survival for each life stage and amount of time to kill all life stages were collected. The results showed that all life stages were killed with a 5 minute dip in 1250F water.

In 1993, five rootstocks (un-grafted), Pinot noir, 5C, 101-14, 3309C, and Freedom, were tested. Control plants were dipped in 70'F for 10 minutes (5 minutes as a pre-dip and 5 minutes for the time needed to eradicate the insect). The hot water dipped plants received a pre-dip of 5 minutes at 1 10OF to warm the roots and then for 5 minutes in 125'F water. After dipping, all plants were placed in pots and forced in a greenhouse. The percent bud break of primary, secondary, and tertiary shoots was evaluated. The results determined that all plants broke bud in all time intervals but the control plants had a higher percentage of bud break.

In 1995, grafted vines are being tested for the effect of a 5 minute dip at 125F on the viability of the graft union and percent bud break. The grafted vines 101-14 (Pinot noir scion), 3309C and *Riparia gloire* (Chardonnay scion) will be tested as described above. Plants are still to be forced in the

greenhouse (work in progress).

It is apparent that phylloxera can be eradicated with a 5 minute dip at 125'F (plus a pre-dip at 1 10'F for 5 min). It is critical, however, to make sure that the insect experiences this temperature (i.e. hot water bath must be maintained at 125'F and vine bundles to be dipped shouldn't be so large as to prevent roots/insects in center of bundle from experiencing 125'F temperature). Our preliminary work indicates that vines suffer no damage with this type of dipping treatment. However, our tests on grafted vines this winter are not yet completed.

Rootstock performance at selected grower sites in Oregon. Oregon's vineyard industry is currently making a transition from self-rooted vines to grafted, phylloxera-resistant rootstocks. The basis of this study is to provide Oregon's wine grape growers with information on rootstocks that perform best in the different wine grape growing regions of the state and how well the rootstocks perform in already phylloxerated sites.

In spring 1992, a grower cooperator rootstock trial was established at 17 sites in Oregon (2 of the 17 were established in phylloxerated sites). The rootstocks planted were: 3309C, 101-14, 44-53, 5C, Harmony, 420A (scion cultivar, Pinot noir) and a self-rooted vine (Pinot noir). There are 5 plants per replicate and 5 replicates per rootstock for a total of 175 plants at each site.

In June 1994, seven sites (5 without known phylloxera. and 2 with phylloxera) were chosen to be monitored throughout the growing season. Stocks at phylloxerated sites showed too low plant vigor for monitoring in 1994. The sites range from southern Oregon to the northern Willamette Valley. The soil types, water availability, and slope of the sites all differ.

To evaluate the establishment, growth rate, and yield for each rootstock type, the sites were visited about every three weeks from June until harvest in 1994.

In June, the trunk diameter was recorded and two shoots for each plant were selected and flagged on 3 plants per replicate. The shoots were chosen at the second and fifth node at the point where the cane was bent to the fruiting wire. The length of each shoot was measured at each visit. At harvest, the number of clusters and total yield from each replicate were recorded. Cluster samples were picked for average berry weight, and average cluster size (data were also collected on *Brix, malic and titratable acids, and pH, but are not reported here as work is in progress).

In January-February 1995, the trunk diameter was recorded again, vines were pruned with weights recorded, the total number of nodes and shoots per vine were recorded before and after pruning.

This project is still in progress (as of January 30, 1995), thus not all the data can be presented here. We will submit an article to an industry newsletter as soon as possible.

There was no significant effect of site or rootstock on trunk diameter in June. The data for trunk diameter in Jan. 1995 have not yet been completed (1/30/95). The data for average final shoot length (measured at end of August to early September) showed little difference among rootstocks. Only site 4 (Ousterhout) showed an effect of rootstock on shoot growth. At this site, 3309, 101-14, and Harmony produced longer shoots than 420-A and self-rooted Pinot noir. The other stocks fell between these.

As of the date of submitting this progress report, berry weight data had been collected at all sites except site 3 and pruning weight data at all except site 3 and 4. Thus, more complete information will be provided in a future article.

There was a significant site effect and rootstock effect for yield/vine, cluster weight, berry weight, and pruning weight/vine. There was also a significant interaction for all these variables indicating that the rootstocks did not rank the same at all sites.

The data are presented in table 1. Of the 3 trials pruned to date, site 1 (Henry Estate) had the most vigor as evidenced by pruning weights. There was however, little difference among rootstocks with 5C being more vigorous than Pinot noir and Harmony. At site 2 and 5 there was also little difference in pruning weight. Differences may become more evident as the vines age.

Table 1. Effect of rootstocks on growth and yield of Pinot noir at 5 sites in 1994/95.

Rootstock	Yield/Vine (kg)	Cluster Wt. (g)	Berry Wt. (g)	Pruning Wt./ Vine (lb)
SITE 1[z]				
3309	1.27 bc	53.6 ab	0.8 a	3.2 ab
101-14	1.46 bc	50.1 b	0.9 a	3.4 ab
5C	2.67 a	57.2 ab	0.9 a	3.5 a
44-53	2.09 ab	61.2 a	0.9 a	3.1 ab
Harmony	1.03 c	56.3 ab	0.9 a	2.6 bc
420-A	1.62 bc	51.5 b	0.9 a	3.4 ab
Pinot noir	1.34 bc	51.4 b	0.9 a	2.2 c
LSD (*P*<0.05)[y]	**0.98**	**9.5**	**0.1**	**0.8**
SITE 2				
3309	0.73 a	31.4 a	0.8 a	0.6 a
101-14	0.77 a	34.4 a	0.8 a	0.7 a
5C	1.09 a	34.9 a	0.8 ab	0.9 a
44-53	0.89 a	31.9 a	0.7 b	0.7 a
Harmony	---	---	---	---
420-A	0.93 a	32.9 a	0.9 a	0.9 a
Pinot noir	0.89 a	32.7 a	0.8 a	0.8 a
LSD (*P*<0.05)	**0.52**	**9.3 a**	**0.1**	**0.4**
SITE 3				
3309	0.39 b	34.4 b	---[x]	---[x]
101-14	0.46 ab	34.4 b	---	---
5C	0.69 a	46.0 a	---	---
44-53	0.61 ab	45.3 a	---	---
Harmony	0.38 b	37.0 ab	---	---
420-A	0.58 ab	44.7 a	---	---
Pinot noir	0.43 a	31.2 b	---	---
LSD (*P*<0.05)	**0.26**	**9.2**	**---**	**---**
SITE 4				
3309	2.51 a	97.3 ab	1.0 a	---[x]
101-14	2.20 ab	94.5 ab	0.9 ab	y---
5C	1.96 ab	86.9 b	0.9 ab	---
44-53	2.56 a	90.5 ab	0.9 ab	---
Harmony	1.89 ab	85.6 b	0.9 ab	---
420-A	2.26 ab	107.6 a	1.0 a	---
Pinot noir	1.74 b	93.7 ab	0.9 b	---
LSD (*P*<0.05)	**0.68**	**19.2**	**0.1**	**---**
SITE 5				
3309	0.51 a	34.9 a	0.8 ab	1.2 a
101-14	0.39 ab	29.7 abc	0.8 b	0.8 b
5C	0.31 b	25.6 c	0.9 ab	0.9 ab
44-53	0.48 a	33.2 ab	0.8 ab	0.9 ab
Harmony	0.30 b	25.1 c	0.8 ab	0.9 ab
420-A	0.30 b	27.3 bc	0.9 a	0.8 b
Pinot noir	0.35 ab	23.4 c	0.8 ab	0.9 ab
LSD (*P*<0.05)	**0.17**	**6.5**	**0.1**	**0.3**

[z]Site 1 = Henry Estate, site 2 = Seven Springs, site 3 = Whistling Ridge, site 4 = Ousterhout Vineyard, site 5 = Winter's Hill.
[y]LSD = least significant difference; means separated by less than this value are not significantly different. Means followed by the same letter are not significantly different.
[x]Data not yet collected.

In general, site 4 (Ousterhout) had the highest yields/vine. At this site 3309 and 44-53 outyielded the self-rooted Pinot noir. At site 1 (Henry Estate), 5C out-yielded 3309, 101-14, 420-A, Pinot noir, and Harmony. 5C also tended to have higher yield at site 3 (Whistling Ridge) whereas at site 5 (Winter's I-Ell) 5C tended to have a lower yield. There were no differences in yield at site 2 (Seven Springs). Keep

in mind that these vines are quite young and differences may become more apparent as vines mature.

There were few differences among stocks and sites in berry weight. However, some rootstock effects were noted on cluster weight. 44-53 tended to produce the largest clusters at site 1,420-A at site 4, and 3309 C at site 5. There were relatively few differences at sites 2 and 3 (Table 1).

Thus, when considering phylloxera-resistant grafted vines, it seems that there are relatively few, or small differences between stocks at an early stage of vineyard establishment. However, differences may become more pronounced as vines mature.

In addition, at the two sites with phylloxera, the control plants (self-rooted Pinot noir) are dead and the grafted rootstocks are low in vigor and produced no fruit.

We greatly appreciate the help and support of our grower cooperators in this study.