Oregon Wine Advisory Board
Research Progress Report

1991 - 1992

Viticulture Extension and Research Support Funds

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Significant Findings:

Phylloxera: Populations of phylloxera were slow to build up in the spring at two infested vineyards. This may have been due to cold injury in December, 1990 or to the cool, wet spring. Population levels "exploded" in August, 1991 and remained high through December, 1991. Population levels are thus high during harvest, a potentially high risk period for spread. Rate of spread in Oregon appears to be 2 X, based on aerial photography and ground mapping. Crawlers were detected on trunk wraps at one site in August, indicating above-ground movement of phylloxera. Low temperature studies will be done at University of California, Davis to determine cold tolerance and estimate number of generations per year of Oregon's phylloxera. Population levels will be monitored all winter and spring, 1992.

Winter injury. Winter injury was extremely variable throughout the state, between regions, varieties, and even within vineyards. However, due to the cool, wet spring that allowed vines to recover" and the exceptionally good fruit set, crop levels were high this past year. A report on the winter injury survey will be available to the industry in winter, 1992.

Objectives:

- Develop and publish literature to provide up-to-date information on specific topics
- Develop grape grower and County Extension Agent training sessions and short courses
- Research phyiloxera biology in Oregon

Methods:

Phylloxera Biology: The Wine Advisory Board was not able to fully support the phylloxera research project to study biology and management of phylloxera in Oregon, 1991-92. This project was possible through added support from the Brotherhood of the Knights of the Vine ($5,000) and the Oregon Agricultural Experiment Station ($10,000). We thank them and the grape growers who let us dig in their vineyards for the purposes of advancing knowledge of this pest for their support.

The phylloxera project has the following objectives:

1. when hibernants (over-wintering populations) become active in the spring and how populations change throughout the season. This would not only determine the number of generations a year, but also when spread can begin in the spring;
2. the rate of spread so that estimates on re-planting date and spread within the Oregon can be made;
3. whether we have a winged form of phylloxera in Oregon -- this would greatly affect the rate of

spread;

4. the low temperature tolerance of phylloxera found in Oregon -- this will affect the amount of population die-back in cold winters and allow estimation of number of generations per year.

Two infested vineyards were selected for this study, one in Lane County and the other in Marion County. The Marion County site has 8-year-old 'Riesling' and 'Gewurztraminer' and the Lane County site has 10-year-old 'Pinot noir' infested with phylloxera. These two sites are distinctly different, especially with regards to microcilmate. We have been monitoring soil and air temperatures at each site since the beginning of June 1991.

Population Biology:

Growth of field populations was determined by examining phylloxera in the rooting profile and reproductive potential at the two infested sites. Each site was sampled monthly from the first week of June through January, 1991. Samples will be taken every 42 days in the winter once insect activity has decreased. From April to July, 1992 samples will be taken every 3 weeks to determine when populations become active in spring.
At each vineyard site, soil and root samples were collected from three vines using a shovel and pruners, bulked into single samples from each of three separate areas from the periphery of the lens of infestation. Samples taken at a soil depth of 30 cm were brought to the laboratory for extraction of phylloxera using a wet sieve sucrose centrifuge. Populations extracted were separated by life stage and counted. Populations will be correlated with date, soil and air temperature, and vineyard condition.

At each site, soil temperatures were recorded at a depth of 30 cm and air temperature near the infested area every 30 minutes using Omni Data DP 212 data pods. Data were transferred to a computer every 21 days. During the winter temperatures will be recorded once per hour due to decreased insect activity.

Rate of Spread:

Rate of spread of phylloxera populations was determined by three methods: trunk wraps to monitor above-ground movement of nymphs; rating of above-ground vine symptoms in infested areas, annually and; aerial photography.

Additional data on life history of phylloxera was determined at the two infested sites by use of trunk wraps to detect crawler (nymph) movement up into the plant canopy. Tape (4cm wide) covered with stick-em was wrapped around the base of the trunk at a height of about 5 cm from the ground surface. Six traps at each site were checked bi-weekly in June and July, 1991. Replicate number was increased to 15 per site from August through October, 1991. Nine trunk wraps will be placed at each infested site in spring 1992. Data will be correlated with air and soil temperatures.

Above-ciround symptoms of phylloxera infestation were rated (0-5 scale) in fall 1990 at the two sites. At another site, ratings taken in 1990 were compared to those taken in fall 1991 to gauge above-ground rate of spread of this pest.

Infrared aerial photographs were taken of all infested sites in fall 1990. Aerial photos taken in 1991 need to be compared to determine rate of spread of phylloxera in Oregon over a two year period.

Presence of aerial forms:

Aerial canopy sticky traps and ground emergence traps were used to monitor the presence of winged forms or windborne phylloxera. Three emergence traps and five aerial traps were set up at each infested

site in August, 1991. In May, 1992, nine of each kind of trap will be distributed within the infested areas of each of the two infested vineyard sites.

Sticky traps were replaced and contents of ground emergence traps emptied every two weeks and brought back to the laboratory for identification. Data will be correlated with air and soil temperatures.

Low temperature tolerance:

Phylloxera populations have been collected from the two infested sites being studied in detail, as well as from one other infested site. These populations are currently being reared in a growth chamber on excised root samples. Laboratory reared phylloxera eggs on roots will be placed at 12, 15, 18 and 21' C. Developmental times and survival to adulthood will be determined. From these data a minimal threshold and degrees to adulthood will be estimated. These will be used to determine number of generations per year at sites at which soil temperature data is being collected. These predictions will be tested by direct counts in the field (see above). Data will also give us an idea of what temperatures will likely cause population die-back in winter.

This work will be done at the entomology laboratory at University of California at Davis where they have the expertise and equipment necessary for the low temperature tolerance studies.

Results & Discussion:

Grape phylloxera *(Daktulosphaira vitifoliae)*, a root-feeding aphid-like insect is the most important pest of vineyards worldwide because they cannot be controlled on infested vines which eventually die. Although it has been in California since the mid-1800's, phylloxera was discovered for the first time in a commercial vineyard in Oregon in 1990 and in Washington in the late 1980's. There are no satisfactory chemical or biological control methods for this pest and its management throughout the world has been by planting resistant rootstocks. Over 95% of Oregon's 5,700 acres of grapes is planted to own-rooted vines which are susceptible to phylloxera.

The life cycle of this insect varies with location. Preliminary data indicate the presence of sexual forms in the Pacific Northwest, a condition different from California. The relevance of this discovery to viticulture here is unknown but may be important to variability and movement. Phylloxera may move between vineyards on infested soil and plant materials by the activities of people or by natural means. Because distribution of phylloxera in the Pacific Northwest is currently limited, characteristics of its current distribution and movement are necessary to limit movement in the future.

The reproductive potential and rates of spread of phylloxera under climatic and soil conditions of the Pacific Northwest are unknown but we believe that these differ from those of California. Growers need as much information about phylloxera as possible to decrease the rate of spread or manage infestations of this pest and to plan for their economic future. This type of information is thus critical.

Population Biology:

Soil and root samples were collected monthly from 3 areas (pooled) in each of two infested vineyard sites, as described above. Populations were separated into mature, immature (often crawlers), and eggs. Table 1 shows the results to date. It is important that populations be monitored through the winter and in spring to determine number of generations per year and when populations become active.

Table 1. Phylloxera population levels (mature and immature forms and eggs) at two infested sites in Oregon, 1991.

Date 1991	Site	Sample[1]	Mature	Immature	Eggs
6/3-6/7	Lane	roots/soil	0	0	0
	Marion	roots/soil	0	0	0
7/1-7/16	Lane	roots	1	1	0
		soil	1	0	0
		total	2	1	0
	Marion	roots	3	9	3
		soil	0	3	0
		total	3	12	3
7/31-8/5	Lane	roots	0	27	58
		soil	1	9	53
		total	1	36	111
	Marion	roots	9	13	204
		soil	4	9	194
		total	13	22	398
9/9-9/13	Lane	roots only	33	455	176
	Marion	roots only	18	216	11
10/4-10/10	Lane	roots	31	405	85
		soil	---	7	19
		total	31	412	104
	Marion	roots	27	738	76
		soil	2	45	21
		total	29	783	97
11/4-11/8	Lane	roots	4	527	120
		soil	--	114	58
		total	4	641	178
	Marion	roots	4	233	105
		soil	0	25	26
		total	4	258	131
12/5-12/10	Lane	roots	1	480	11
		soil	0	79	7
		total	1	559	18
	Marion	roots	1	322	21
		soil	0	31	2
		total	1	353	23

[1]Soil (400 ml associated with roots) collected from 9 vines per site. Roots (per 100 g of roots) collected from 9 vines per site.

Population growth was slow in the spring at both sites, especially at the Lane County site. This may have been due to population die-back from the December, 1990 cold spell, or due to the cool, wet spring. Soil and air temperatures were monitored at both sites (Fig. 1). Population levels "exploded" in August "exploded" and stayed high throughout late summer and fall. Root samples taken in December still showed high levels of adults and immatures, indicating that hibernation had not yet taken place.

Rate of Spread:

Trunk wraps: In June and July, 1991, no crawlers were found on trunk wraps, covered with stick-em. However, three crawlers were found in August at the Lane County site indicating that above ground movement was occurring.

Above-ciround symptoms & aerial photography: Comparisons of the above-ground symptoms from 1990 to 1991 at one vineyard indicated a rate of spread of 1.5 to 2 X. Thus, if a vineyard had 1/8 acre infested in spring 1991, then 1 acre would be infested 3 years from now.

Using aerial photography of the infested sites, 1990 compared to 1991, we also estimated a rate of spread of 2X. We still need more years of data to see if this rate of spread holds; it may differ with year due to climatic variability.

Presence of aerial forms:

No aerial forms, winged or other windborne stages, were detected in ground emergence traps or aerial sticky traps from August through October, 1991.

Low temperature tolerance:

Phylloxera populations from 3 infested sites, reared in the laboratory will be studied for low temperature tolerance (ability to survive at low temperatures and days to adulthood, used for number of generations/year) at University of California, Davis in January, 1992. We have no data at the time of writing this report.

Publications:

Strik, B. 1990. Grape Phylloxera. WAB Special Report, Sept:7-10.

Price, S., B. Strik, and P. Lombard. 1990. Phylloxera response plan and grower rootstock trials. WAB Special Report, Sept.:2-4.

Strik, B. 1990. What can you do to decrease the likelihood of getting phylloxera? WAB Special Report, Sept.:5-7.

Price, S. and B. Strik. 1990. Identifying phylloxera in a vineyard. WAB Special Report, Sept.:insert (re-publication)

Strik, B. 1990. Assessing rootstocks for vineyards in Oregon. WAB Special Report, Sept.: 10-16.

Strik, B. 1990 Phylloxera - an Update, Ask OSU, the Oregon Grapevine 7(4):17.

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Strik, B. 1990. More on phylloxera, Ask OSU, Oregon Grapevine 7(6):3,6

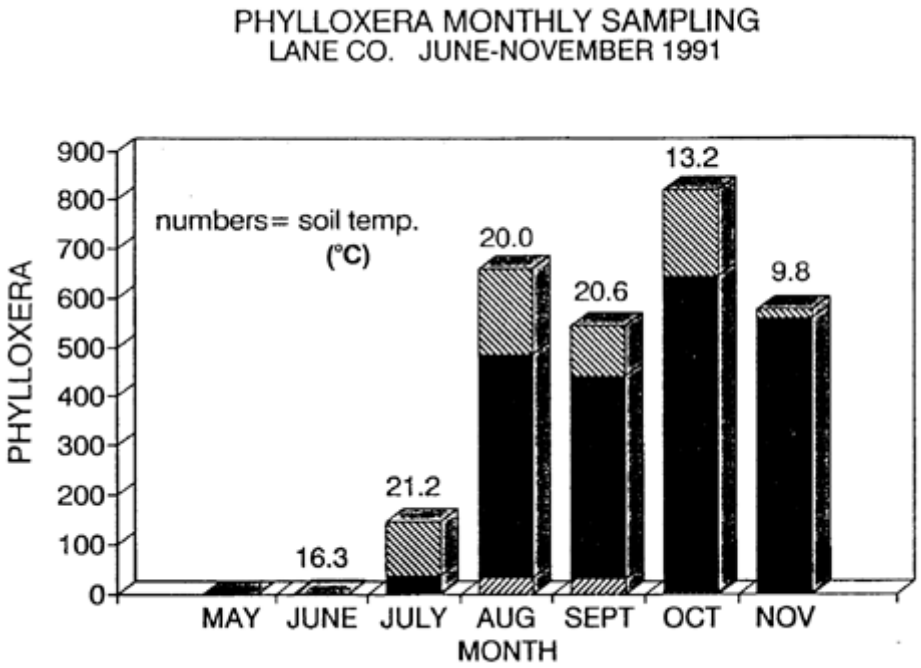
Strik, B. 1991. Update on phylloxera, WAB Cellar & Vineyard Notes, 1 (1): 1

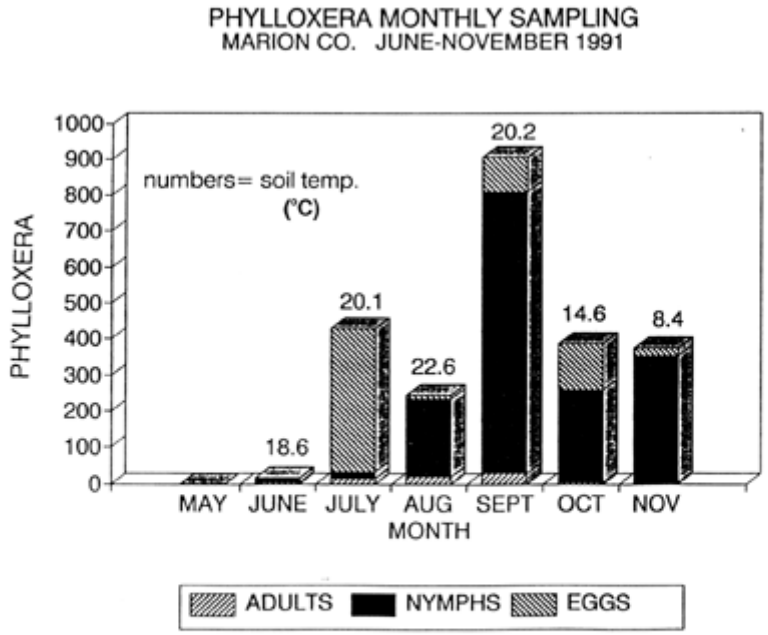
Connelly, A. and B. Strik. 1991. Spread of phylloxera in Oregon, Ask OSU. OR Grapevine 8(5):9-10

Strik, B.C. 1991. Inarch grafting, Ask OSU. The Oregon Grapevine, 8:8,12

Strik, B. 1991. Grower cooperative research trials. WAB Res. Rep. 10:13.

Strik, B. 1991. Rate of spread of phylloxera in Oregon - 2X. The Oregon Grapevine (in press).





Figures A and B. **Phylloxera numbers per 100 grams of roots and 400 ml of soil associated.**

Extension Activities:

Most of my vilicultural Extension activities in 1991/92 have focused on phylloxera (see above) and winter injury -- both major problems this year.

A. Winter Injury Survey:

This project was funded by the USDA (funds from the Small Fruits Center), however, I will give a brief status report here.

In late May, 1991, Porter Lombard, Anne Connelly and I stated surveying vineyards in the Willamette Valley, Umpqua, Southern Oregon, Columbia River, and Eastern Oregon wine grape growing regions to assess winter injury. We have sampled a total of 45 vineyards -- with 126 combinations of variety and pruning method.

The following information was collected from 25 vines at each site/variety/pruning method combination: percent bud break; percent primary, secondary and tertiary shoots; total shoot number; number of clusters (all on 10 nodes per vine); and percent cane and trunk damage. Information on site (elevation, aspect), variety, age of planting, pruning/training methods, and rootstocks (where applicable) were noted for each vineyard.

In most cases we sampled more than one variety per vineyard, and in some cases more than one training method for a particular variety per site. We calculated percent bud break, percent primary bud break, average shoot fertility (clusters/l'+2'), #clusters/node, percent cane damage, and then estimated yield. Yield data is being collected fall/winter, 1991/92.

Cane damage and trunk damage of young vines was rated on a scale of 0 to 5 with 0 being "healthy" and 5 dead. Anything with a rating of 3 or greater was considered "severe damage" and was used to calculate percent cane/trunk damage. In this case very little of the cambium was green thus indicating that the cane or trunk may not survive the season.

Many growers thought their vineyards had escaped the freeze of 1990 when bud break appeared to be relatively uniform near the long term average during the week of April 14-20. Obviously those vineyards with severe bud damage showed little bud break this spring. Our cool, wet spring may have delayed bloom, but it may also have "saved" vines that had cambium damage, as it allowed vines to recover from partial damage.

Damage from the freeze of Dec. 1990 was extremely variable throughout the State, within regions, and even within a particular vineyard. In the Dundee Hills bud break was quite good (80-90%). However, many varieties, especially Chardonnay (CH) and Muller Thurgau (MT), had only from 50-60% primaries. Cane damage ranged from 10-25%. Pinot noir (PN) is apparently more hardy with 75% primaries and less cambium damage than CH -- an exception is a young vineyard of PN with 85% cane and trunk damage. White Riesling (WR) apparently had no damage. I found relatively little damage in Washington County.

In the Mid-Willamette Valley, damage was extremely variable ranging from no damage in some vineyards (on all varieties) to as low as 30%, 35%, 40%, 50%, and 25% primary bud break in CH, PN, GW, MT, and Cabernet Sauvignon (CS), respectively. Cane damage ranged from none to as high as 68% in PN in one vineyard. In general, Sauvignon blanc (SB), Pinot gris (Pg) and WR had little damage in this region.

In the southern Willamette Valley, there was little damage on the valley floor sites (including Lewis Brown Farm). Woodhall III showed good bud break in PN and CH, but from 10-40% cane damage. One CH on St. George vineyard near Eugene showed only 1 0% bud break of primaries with 100% and 90% cane and trunk damage, respectively.

Once again damage was variable in the Umpqua region. Cabernet Sauvignon looked pretty good,

surprisingly. Chardonnay was hit hard in some vineyards (only 1 0% primaries; 40% cane damage), yet was hardly damaged at all in another.

In southern Oregon effects of the freeze were extremely variable. Many vineyards had little damage on most varieties. However, some were hit very hard. Damage in CH ranged from none to 6% primaries and 70% cane damage. Damage in PN ranged from no damage to 3% primaries and 92% cane damage. Sauvignon blanc didn't look too bad. Bud break on Semillion was pretty good; however, only 20-30% were primaries. Medot was hit quite hard in some sites. Again damage on WR was spotty, but little compared to other varieties. Also, Pg came through quite well. In general, CS fared well.

The Columbia River Region fared reasonably well with plantings of PN, CH, CS and WR looking pretty good. One planting of Merlot was killed to the ground.

Finally, eastern Oregon was hit very hard by the cold spell. Only WR came through (in some cases it limped through).

Many growers found crown gall in their vineyards this summer. In most cases this was apparently the result of winter injury to the trunk.

Our full findings, including comparisons between age of plantings and training/pruning methods will be written as a report. We are waiting on final yield data; thus, the report should be available to industry members this winter.

Publications: (in addition to those mentioned above)

Strik, B. 1991. Nematodes in Oregon Vineyards, Ask OSU, Oregon Grapevine, 8(l):7, 22-23

Strik, B. and P. Lombard. 1991. Characterizing the 1990 freeze in Oregon. WAB Special report on winter injury.

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Lombard, P., B. Strik, and S. Price. 1991. Review of the 1990 wine grape season in Oregon. Proc. OHS 82:201-209.

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In: The Oregon Wine Grape Grower's Guide, OWA 1991 ed.:

o Strik, B.C. Assessing rootstocks for wine grapes in Oregon.
o Strik, B.C. Grafting grape vines in Oregon.
o Strik, B.C., J. Capizzi, G. Fisher, J. Pscheidt, R. William. Pest management guide for wine grapes in Oregon.
o Strik, B.C. Grape Phylloxera
o Strik, B.C. How to decrease the likelihood of spread of phylloxera.
o Strik, B.C. Assessing winter injury and pruning accordingly.
o Strik, B.C. and P. Lombard. Strategies to minimize damage from future freezes.