**Special Report 926**
June 1993

# OSU Wine Grape Research Progress Reports, 1992-1993



Oregon Wine Advisory Board

Agricultural Experiment Station
Oregon State University

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# Pinot Noir Maturity and Harvest Information

Barney Watson, Department of Food Science and Technology
Steve Price, Department of Horticulture

## INTRODUCTION AND OBJECTIVES

A Pinot noir maturity study began in 1987 at Woodhall Vineyards in Alpine to monitor the compositional changes that occur during ripening. Extensive fruit sampling and analysis has been done throughout the ripening period for six years. In several years replicated wine lots were also produced from fruit harvested on different dates during the ripening season. The wines differed in intensity and complexity throughout the ripening period, however, the changes observed have not been predictable by monitoring traditional harvest parameters such as sugar content and acidity.

The physiological processes of maturation in grapes are not well understood, especially with respect to the factors affecting the development of color, phenolics, and aroma and flavor. The data we have obtained from this research is helping us develop a maturity data base as well as unique 'profiles' of fruit maturation over several vintages. Our goal is to develop better harvest indices related to grape maturity and wine quality to enable commercial winegrowers to harvest fruit at optimal maturity.

## RESULTS AND DISCUSSION

In 1992 we continued to monitor the development of Pinot noir during maturation. The fruit composition, berry weights, anthocyanin content, and phenolic content were monitored at two sites: the Lewis Brown Farm (LBF) and Woodhall Vineyards (WHV). Woodhall Vineyards (a warm site) was unirrigated while the Lewis Brown Farm vineyard (a cool site) was summer irrigated prior to veraison.

By August 30, the degrees Brix had reached 23 at WHV and 22 at LBF, the highest sugar levels we have ever seen this early at either site.

At Woodhall Vineyards water stress was becoming very evident by this time and there was pronounced berry softening and dehydration occurring. At Lewis Brown Farm there was much less stress evident probably due to the summer irrigation.

Average berry weights reached a maximum by late August and early September and then fluctuated up and down until harvest, possibly due to the changes in the weather. By comparison average berry weights reached a maximum in mid October in 1991. The berry weights were considerably larger at LBF than at WHV by about 29 percent. Average berry weights at harvest were 1.19 and 0.92 grams, respectively.

The anthocyanin content was fairly constant at LBF during the period we monitored, whereas, some fluctuations were observed in the anthocyanin content at WHV. Anthocyanin concentration reached a maximum by September 8 at WHV and this corresponded to a minimum in average berry weight due to softening and dehydration of the fruit. The anthocyanin content was much greater in Pinot noir at WHV compared to LBF at harvest by about 69 percent. The anthocyanin content on a fresh weight basis was about 1.5 and 0.9 mg per gram, respectively (Fig.1). This difference was largely a reflection of the much smaller average berry size at WHV.

The total phenolic content expressed as mg/g of fresh weight of berries fluctuated up and down during maturation at both sites in a similar manner. From late August to early September the concentration of total phenols in the skins of Pinot noir at both sites decreased. During early September, however, a large and rapid increase in total phenols in the skins occurred at both sites (Fig.2). A similar increase in total phenols was observed during the latter stages of ripening of WHV Pinot noir in 1991, and these increases were reflected in the phenolic content wines produced. This increase in total phenols is believed to be due to phenolic compounds other than anthocyanin pigments.

Increases in the concentration of total phenols in the skins during the latter stages of ripening indicate continued physiological maturation of the fruit and result in pronounced changes in the ratio of anthocyanins to total phenols present at harvest. These differences will affect the levels extracted during fermentation and the resulting wine composition.

Pinot noir compositional data from several years helps to provide unique vintage profiles. In particular, the average berry weights and the anthocyanin and phenolic content in the skins of the fruit at harvest vary greatly with vintage. The concentration of anthocyanins and phenols in the wines varies accordingly (Table 1). The relative ratio of anthocyanins to phenolics in the fruit at harvest also varies with harvest season. For example, the anthocyanins were a much higher per cent of the total phenolic content in 1992 than in 1991, by about 50 percent and 20 percent on a mg/g basis, respectively.

The average berry weight at harvest at WHV in 1992 was 0.92 grams, similar to 1987. The anthocyanin content in mg/g of fresh weight of fruit was 1.34, similar to 1989. The only year with smaller average berry weights and greater concentration of anthocyanins in the skins at harvest was 1988.

**OSU Grape Maturity Information Line:** An information phone line was established at OSU during the harvest season to provide access to grape maturity data from OSU experimental trials to interested growers and winemakers. The service began on August 25 and ended on September 23 and was updated every 3-4 days during this period. The information line received a total of 147 calls in October and September.

Information in the updates included maturity data for several varieties and color development data for Pinot noir during ripening from the Lewis Brown Farm in Corvallis and Woodhall

Vineyards in Alpine. In addition, maturity data from several regional cooperators was also provided including the north Willamette Valley, the Umpqua, the Rogue, the Siskiyou Valleys, and the Southern Oregon varietal trial.

This year the maturity phone line was an experiment to see if we could compile data quickly enough during harvest from our research trials and regional cooperators to be of use to producers making harvest decisions. Next year, if there is sufficient interest we can expand the service to include data and graphs which could be sent by electronic mail or by FAX.

## PUBLICATIONS AND PRESENTATIONS

Miranda-Lopez, R. , Libbey, L.M., Watson, B.T., and McDaniel, M.R. 1992. Odor analysis of Pinot noir wines from grapes of different maturities by a gas chromatography-olfactometry technique (Osme). Journal of Food Science, Vol. 57, No. 4, pp 985-1019.

Miranda-Lopez, R., Libbey, L.M., Watson, B.T., and McDaniel, M.R. 1992. Identification of additional odor-active compounds in Pinot noir wines. Am. J. Enol. Vitic., Vol 43, No. 1, pp 290-92.

Watson, Barney and Price, Steve. OSU update, 1992 winegrape harvest season. Annual Meeting of the Oregon Horticultural Society, Portland, Oregon, January 26, 1993.

Figure 1 and Figure 2. LBF - Lewis Brown Farm, Corvallis, Oregon, WBV - Woodhall 3 Vineyard, Alpine, Oregon

Figure 1

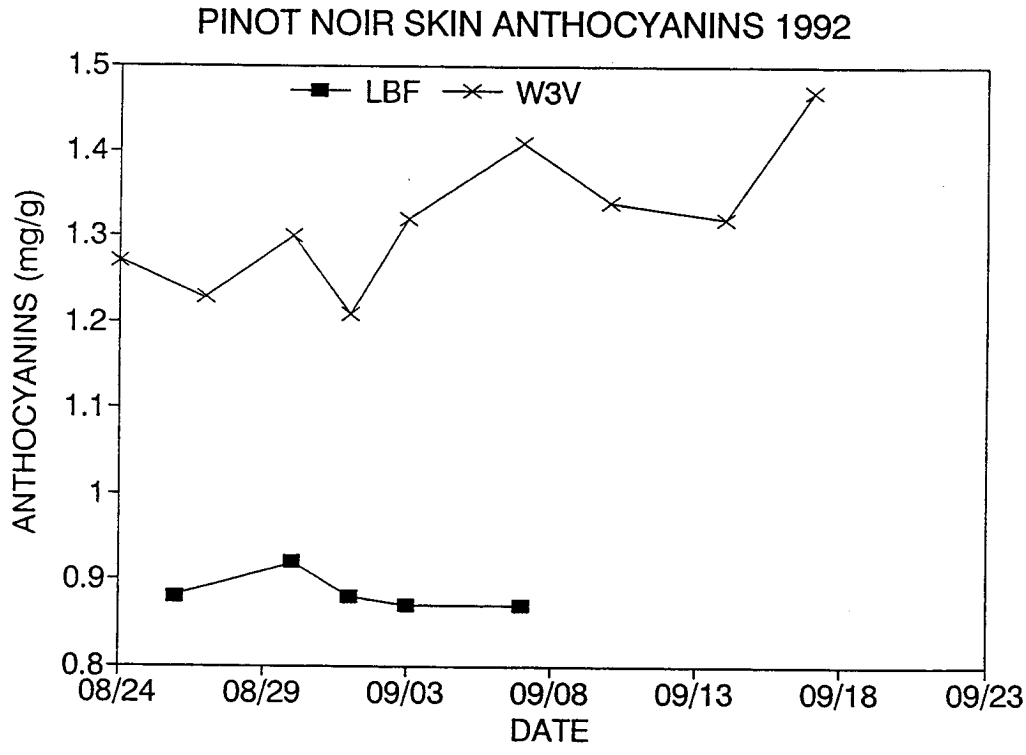



Figure 2

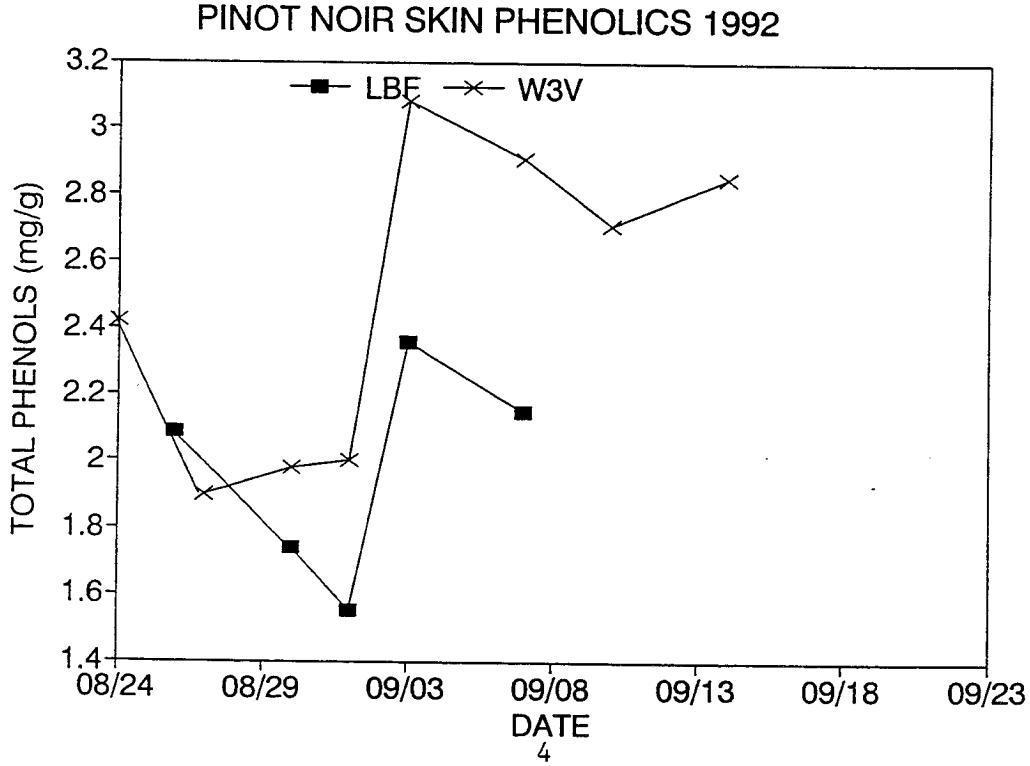


Table 1. Woodhall Vineyard, Alpine, Oregon

**Pinot Noir Color and Phenols**
**Vintage Comparisons**

| Harvest Date | °Brix | Berry Weight grams | Anthocyanin | | Phenols | |
|---|---|---|---|---|---|---|
| | | | mg/g* | mg/L** | mg/g* | mg/L** |
| 09/22/87 | 22.8 | 0.92 | 0.91 | 216 | 2.39 | 1,710 |
| 09/18/88 | 23.6 | 0.72 | 1.53 | 390 | 3.61 | 1,688 |
| 09/29/89 | 24.5 | 0.82 | 1.35 | 351 | --- | 1,990 |
| 10/04/90 | 23.1 | 1.20 | --- | 241 | --- | 1,364 |
| 10/14/91 | 23.6 | 1.26 | 1.03 | 198 | 5.69 | 1,633 |
| 09/10/92 | 23.6 | 0.92 | 1.34 | --- | 2.71 | --- |

* mg/g fresh weight
** mg/L in wine

## Lewis Brown Trellis Trial

Steve Price, Department of Horticulture
Barney Watson, Department of Food Science and Technology

## INTRODUCTION AND OBJECTIVES

Trellis design and canopy management have been major research topics in viticulture during the last ten years. The article by Dave Adelsheim in the first edition of the "Oregon Winegrowers Guide" and the presentations of Shaulis, Smart, Carboneau, Intrerari and Koblet at the 1984 Cool Climate Symposium in Eugene were particularly influential in bringing this subject to the attention of winegrape growers in Oregon. These presentations came just before a major expansion in Oregon winegrape plantings. Many of the vineyards established in Oregon during the early 1980s were planted with the expectation that improvements in trellis design had the potential of both increasing both wine grape quality and production. Canopy management research work at Oregon State University began in 1984 to test the potential of these production systems in Oregon.

One of the larger experiments was the Lewis Brown Farm trellis trial planted in 1984. The trial included the standard system used in Oregon (an upright vertical system with both cane and cordon training) with some of the trellis designs that were advocated at the 1984 Eugene symposium (the Open Lyre, The Geneva Double Curtain) as well as one developed in Oregon (the Scott Henry Trellis). The primary objective of the trial was to determine the effect of trellis design and vine structure on fruit and wine quality. Four cultivars were included in the trial: Pinot noir, Chardonnay, Reisling, and Gewurztraminer. The experiment's design was structured to minimize yield responses; the question of canopy management on crop load has been addressed in other experiments. This decision has generally allowed the evaluation of fruit and wine quality responses without the complications of yield-quality interactions.

The field trial has now been completed although data from 1992 is still being processed and wines from both 1991 and 1992 have yet to be evaluated. The following discussion briefly reviews the main research results from the trial. A final report will be presented to the industry after wines from the 1992 season are evaluated.

## RESULTS AND DISCUSSION

We have been monitoring the vine and fruit responses in the trial since 1986. Although there have been significant vintage differences over the course of the experiment, many of the vine and fruit responses have been fairly consistent. The most consistent and visible response has been canopy density. The divided canopies always had more open canopies than the upright cane and cordon-trained systems. They had fewer shoots per meter of canopy, shorter shoots, fewer leaf layers, better exposed clusters, and less incidence of botrytis and mildew than the upright systems.

These differences had consistent results on grape and wine phenolic composition. Pinot noir wines made from the divided canopies always had higher anthocyanins and total phenolics. This resulted in wines with a more complex tannin structure and generally higher intensity. Although none of the wines from this trial were evaluated by sensory panels or gas chromatography there were also aroma differences between the divided and single canopies.

In industry tastings, the differences in the color and phenolics were always noticed, but there was never an overwhelming preference for the aroma or the overall wine quality of any specific treatment.

Some of the responses varied by variety. Titratable acidity (TA) in Chardonnay was highest on the single canopies while TA in Gewurztraminer was lowest on the single canopies. There was no significant difference in TA in Pinot noir. Some of this difference was due to differences in the maturity at harvest. Chardonnay TA could be correlated with malate levels but malate levels on Pinot and Gewurztraminer were much lower and did not seem to be related to TA. Potassium levels in must had a significant effect on pH in Pinot noir but had no effect on pH in Chardonnay. It seemed that fruit and wine responses directly related to cluster exposure, such as phenolics, were more consistently affected by changes in canopy than less direct responses such as TA or pH that depend on several different variables. Growth responses were generally not affected by variety. All four varieties had the most growth and most dense canopies on the cordon treatment and the least growth and least dense canopies on the GDC.

In 1992, growth and fruit composition were monitored on all four varieties and replicated wines lots were made from Pinot noir. Preliminary results from 1992 are consistent with other year's data.

1992 was intended to be the last year of the experiment, but we have decided to retain the trial at least for one more year as an extension and teaching tool. Over the past nine years, hundreds of growers and students have visited the trial to learn about trellis construction, vine maintenance, and vine growth and development.

## Yield Adjustment

Steve Price and Porter Lombard, Department of Horticulture
Barney Watson, Department of Food Science & Technology

### INTRODUCTION AND OBJECTIVES

In the past ten years, variation in Oregon vineyard yields has come from two main causes: winter injury and inconsistent fruit set. Together these factors have caused significant yield variation in almost every Oregon vineyard. In 1991, a research project was started at Oregon State to develop and evaluate a method of reducing yield variability. The project grew out of previous research trials on yield prediction, canopy management, and yield-quality relationships.

These trials had demonstrated three key points: 1) yields could be predicted with an adequate level of accuracy by using cluster counts and estimates of cluster weight at lag phase of berry development, 2) the temporary presence of extra canes can reduce the growth and canopy of the remaining canes, and 3) divided canopies could produce wines comparable to single canopies at higher yields. Using this information we developed a modification of the Scott Henry Trellis system, a vertically divided canopy that is easy to establish in a vertically trained vineyard.

The system uses the bottom canopy of the Scott Henry Trellis as a yield buffer. In low yield years the bottom canopy is retained and the system is treated just like a normal Scott Henry system. In high yield years the lower canopy is partially or wholly removed based on yield estimates. The presence of the lower canopy, even for only part of the season in a high yield year, will reduce the vegetative growth on the upper canopy. This should result in wine quality improvements.

The objectives of the 1992 research were to test our ability to crop at a target crop level and to determine if the resulting crop level and canopy had an impact on grape and wine composition.

### RESULTS AND DISCUSSION

The successful use of this system requires a good yield prediction method. Using cluster counts and lag phase cluster weights we have found that our crop estimates have generally been within 5 to 20 percent of actual harvest yields. This is a considerable improvement over no estimate and is close enough to use in a crop adjustment program.

The yield adjustment trial was designed to compare the performance of a standard upright vertical system with no crop adjustment to an yield adjusted Scott Henry trellis. The target crop level for the adjusted system was three tons per acre. In the first year of the trial, 1991,

we measured yield and fruit Brix, titratable acidity, and pH. In 1992 the trial was expanded for the production of replicated wine lots from both treatments.

The yield results of the first two years are shown in Figure 1. The yield data from earlier years are presented to show the magnitude of yield variation that has occurred in the block over the last six years. The yield adjusted system came quite close to the target level of three tons per acre each year. The crop on the adjusted treatment was within 10 percent of the target in 1991 and within 3 percent of the target in 1992.

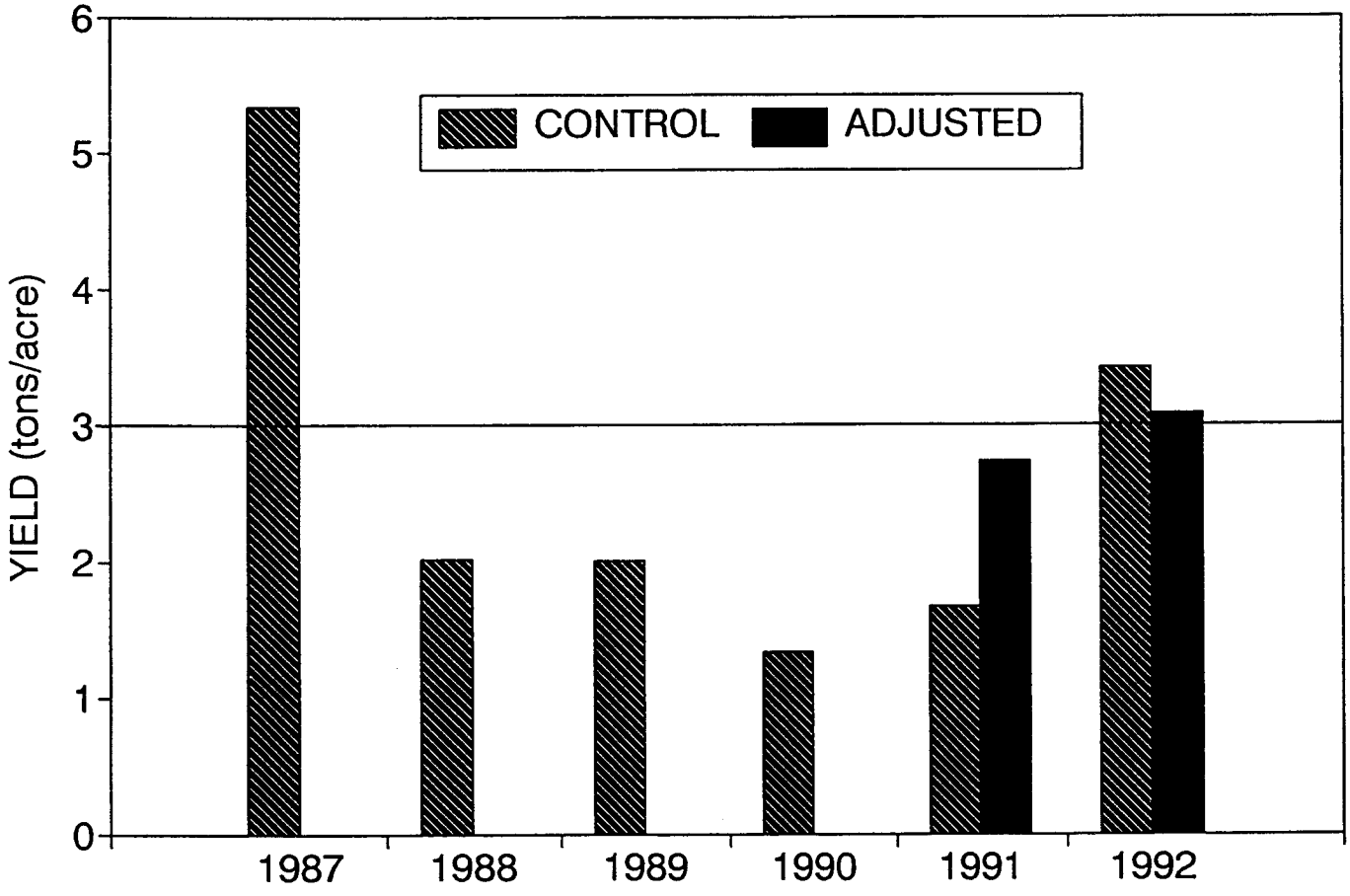
In 1991, the vines in the experiment were damaged by low winter temperatures and the control vines cropped at only 1.7 tons per acre. On the adjusted system, part of the lower canopy was retained to compensate for the low crop and the crop level at harvest was 2.7 tons per acre. There was no injury in 1992 and the weather during bloom was warm. Cluster weights were high and control vines cropped at 3.43 tons per acre. On the adjusted system, all of the lower canopy was removed except for replacement shoots. The crop level on the adjusted system at harvest was 3.09 tons per acre.

There were no significant differences in Brix, TA, or pH between the two canopies in 1991 or 1992. Wines from the adjusted system had seven percent higher anthocyanins and 12 percent higher total phenols than the control wines in 1992.

The trial has so far demonstrated that yield variation can be predicted and then adjusted both up and down by the use of an adjustable canopy system. There appears to be a slight wine quality improvement this year. We have not shown that wine quality would improve in years when the adjusted system is cropped higher than the control, but previous research would suggest that it might. The trial is intended to run for at least two more years to determine if these results can be repeated.

At this point we can only look back on the variation in the block for the last six years and think what would have happened if we had hit a crop level of three tons per acre each year. The total return from the adjusted system would have been higher than the control, the average annual return from an adjusted system would have been more consistent, and wine quality may have been less variable. Given the current uncertain state of the grape and wine market in Oregon, an improvement in yield and quality consistency should be a desirable goal.

Figure 1. Yields of Pinot noir grapes at Woodhall Vineyard, Alpine, Oregon. Control vines were pruned to twenty four nodes per vine each year. Adjusted vines were pruned to 42 nodes per vine and the node number adjusted after a lag phase yield estimate.



## Minimal Pruning

Steve Price and Porter Lombard, Department of Horticulture
Barney Watson, Department of Food Science and Technology

## INTRODUCTION AND OBJECTIVES

Traditional vineyard practices in Oregon are labor intensive and require large pools of available labor for pruning, shoot positioning, and harvest. A mechanized system of grape growing has been developed in Australia to eliminate almost all of the handwork involved with grape production. The cornerstone of this system is minimal pruning. In this system the severe hand pruning normally done during the dormant period is eliminated and replaced with a light summer pruning. This results in a very different vine structure that has the potential to greatly change yield components and the cluster environment. In many instances minimal pruning has resulted in improvements in wine quality. Trials were initiated in Oregon to test the potential of minimal pruning in Oregon and to evaluate possible wine quality responses.

## RESULTS AND DISCUSSION

A trial was established in 1990 in Cabernet Sauvignon at Woodhall. A single row was converted from upright vertical training to minimal pruning. Cabernet is a vigorous variety and this section of the vineyard had been a problem area. To convert the upright system to minimal pruning, the upper wires were removed and the canes were cut back to about 15 nodes each. The following summer the vines were summer pruned, or skirted, below the main canopy. In 1991 the vines were not pruned at all during the dormant season, but were skirted twice, once at shatter and once at veraison to reduce the crop load. In 1992 the vines were only skirted once at shatter. An adjacent row of standard upright trained vines was managed as usual with dormant pruning and summer hedging.

Minimal pruned vines had a typical growth response for vines with very large node numbers. Shoots were much shorter than usual and had smaller, lighter green leaves. Cluster and berry size were much smaller as well. In 1991, with skirting to remove extra crop, the crop loads of the two systems were similar. In 1992, without a second skirting, the crop load on the minimally pruned vines was much higher than the control (control - 2.22 tons/acre, minimally pruned - 6.23 tons/acre). Cluster weights on the control were 50 percent larger than the minimally pruned treatment, but cluster numbers on the control were only one-fourth of the minimally pruned vines.

In both 1991 and 1992, the minimally pruned vines had much higher cluster exposure levels than the control. In 1991 the control vines were excessively vigorous. This was much less of a problem in 1992. Wines made from the two treatments in 1991 were surprisingly different. The minimally pruned wines were less herbaceous and had a much better phenolic structure than the control vines. Anthocyanins were similar between the two treatments. Wines were

also made from the trial in 1992. It will be interesting to see if the minimally pruned treatments make better wine in a year when they cropped at much higher levels.

A new replicated trial was established at Woodhall last winter in a block of Chardonnay. Vines often over crop and have poor wine quality the first year after the conversion. The Chardonnay vines were no exception cropping at about twice the level of the control vines. Cluster exposure was not improved in the minimal treatment this year.

Minimal pruning has the potential of greatly reducing vineyard production costs. In Australia it forms the base of a completely mechanized vineyard production system. In Oregon it could be used to reduce labor demands and production costs. It has the potential to improve wine quality in some cases, but more research is needed before minimal pruning is considered for large scale commercial trial.

## Sun Exposure and Grape Phenolics

Steve Price, Department of Horticulture
Barney Watson, Department of Food Science and Technology

### INTRODUCTION AND OBJECTIVES

Phenolic compounds are key quality components of wine affecting sensory characteristics, wine color, and wine stability. Phenolics are responsible for much of the mouth flavor of wines affecting astringency, bitterness, and the "length" of the flavor impression on the palate. The color in both red and white wine is due to phenolic pigments, primarily anthocyanins, and flavonols. Biochemical changes in the phenolic compounds in wines over time, are responsible for many of the flavor changes associated with wine aging.

The primary source of most of the phenolic compounds in wine is grape skins. The total concentration of phenolics in skins is influenced by the environment of the grape clusters during their development. Generally the more light and sun exposure the cluster receives the higher will be the concentration of phenolics and anthocyanins. We have seen similar results in our research on grape canopies and wine quality at OSU. However, we have also seen that increases in total phenolic concentration are often accompanied by changes in the relative concentration of specific phenolic compounds. This was first apparent in changes in the ratio of total anthocyanins to total phenolics. Wines made from very exposed clusters had increases in total phenolics that were often much greater than the increases in anthocyanins.

In 1991 we found that exposed grape skins had much higher concentrations of flavonols than shaded skins. The increase in flavonol concentration was much greater than increases in other phenolic compounds and could account for a change in the anthocyanin phenolic ratio. In 1992 we began more careful analysis of grape skins. The primary objectives were to describe changes in the phenolic profiles of grape skins exposed to the sun and to determine if these changes had an impact on the phenolic profiles of wines.

### RESULTS AND DISCUSSION

During the summer of 1992 high pressure liquid chromatography (HPLC) equipment was purchased to investigate phenolic compounds in grapes and wine. This equipment can be used to separate, identify, and quantify phenolic compounds. Skin extracts from sun-exposed grape skin were found to have 50 times the flavonol concentration of shaded skins. This response was found in both red and white varieties. The flavonol quercetin was responsible for most of the increase.

Further research clearly showed that quercetin is only produced in sun-exposed grape skin. In an experiment where clusters were covered with aluminum foil we were able to show that 50 percent of the quercetin in skins was synthesized before veraison, and that the differences

between sun-exposed and shaded clusters is established well before the initiation of anthocyanin synthesis.

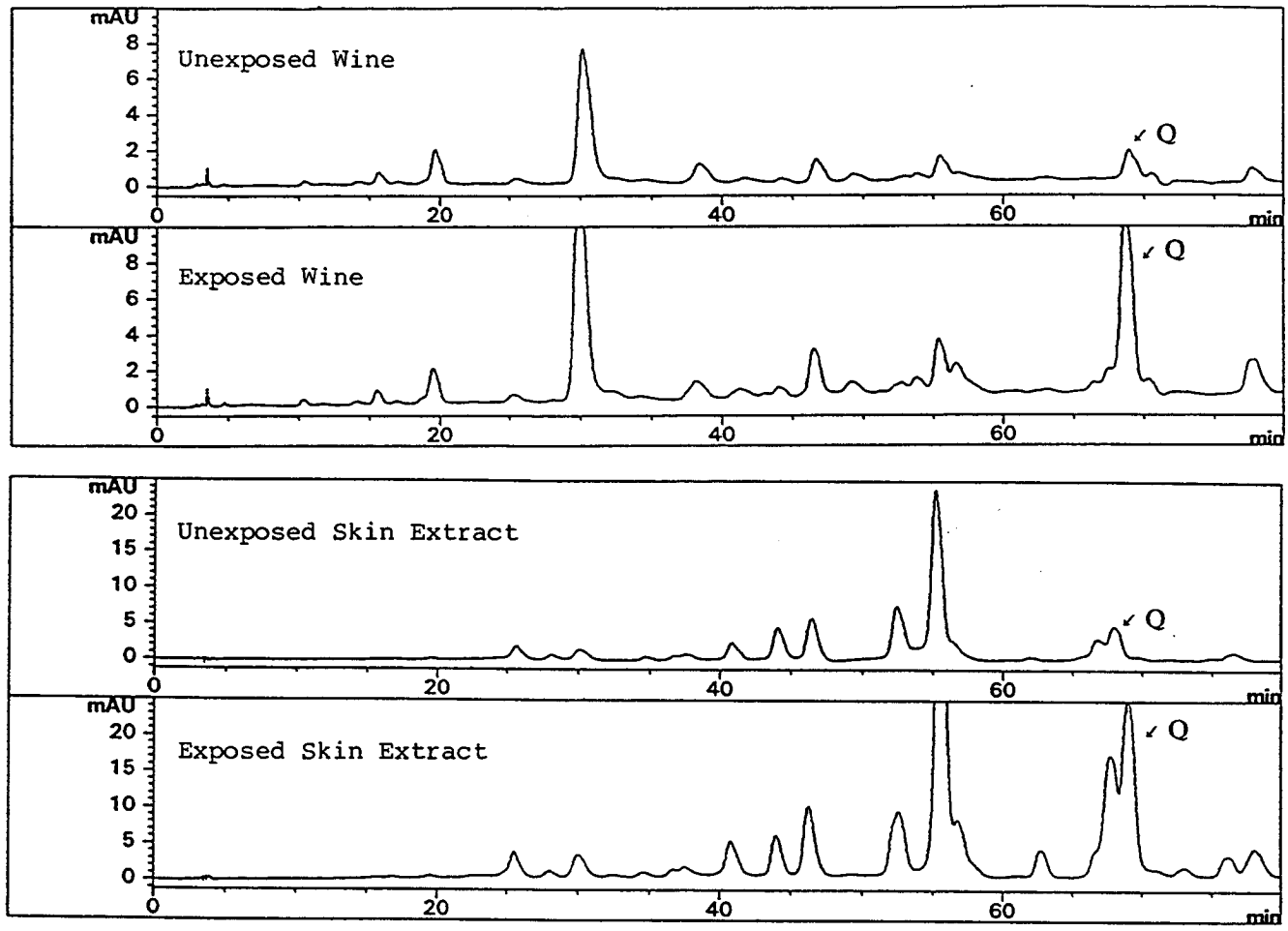
To determine if cluster exposure was affecting quercetin levels in wine, replicated wine lots were made from clusters selected on the basis of their exposure. All the clusters were selected from a single block of Pinot noir grapes in a commercial vineyard. Wines from sun exposed clusters had six times more quercetin than wines from shaded clusters. Anthocyanins were much less affected by cluster exposure. It was clear from this experiment that quercetin levels in wine could be affected by a grower's vineyard practices. HPLC chromatograms at 360 nm of phenolic compounds from exposed and unexposed grape skin extracts and wines in this experiment are shown in figure 1. They show that the phenolic profiles of wines and skin extracts are quite different and that both skin and wine can be greatly affected by cluster exposure. We have discovered several "exposure sensitive" peaks, but it appears that quercetin is by far the most responsive compound to changes in cluster exposure.

Quercetin is widely distributed in various plant tissues. It has been the object of increased attention in recent years, primarily due to its role in protecting plant tissue from damage by UV light, and for its unclear role in human health. Quercetin has been shown to be a mutagen in microbial assays (the Ames test) but has consistently passed mammalian tests for mutagenesis. In some animal feeding studies, quercetin was shown to prevent certain forms of cancer. Quercetin is getting increasing attention in the popular press as public awareness of wine and health increases. More information on the origin of health related compounds in wine could significantly contribute to the discussion.

Quercetin may also have significant effects on wine sensory character, both as an independent compound and as a constituent of condensed tannins. Although quercetin and anthocyanins share many structural similarities, anthocyanins are significantly more soluble in wine. It is possible that high levels of quercetin in wine could reduce the size of soluble tannins affecting both color stability in wine and the sensory impact of the tannins. Quercetin and other flavonols have also been identified as the main pigments contributing to amber and yellow color in white wines. This would generally be considered a positive quality characteristic.

Our future research is aimed at two main areas: the role of the cluster environment in quercetin synthesis, and the effects of quercetin concentrations on wine quality.

Figure 1. HPLC chromatograms at 360nm of grape skin extracts and wines from a cluster exposure trial at Freedom Hill Vineyard, 1992. Q=quercetin.



## Pinot Noir Processing Effects on Wine Color and Phenolics

Barney Watson, Department of Food Science and Technology
Steve Price, Department of Horticulture

### INTRODUCTION AND OBJECTIVES

Different fermentation practices are generally believed to affect wine composition and wine quality of Pinot noir. Oregon winemakers, for example, commonly attribute differences in color and phenolic extraction to differences in processing. There is, however, little information from replicated trials with controls demonstrating the cause and affect of these perceived differences.

A processing trial was established to evaluate several fermentation regimes currently in practice in Oregon for Pinot noir production in order to evaluate their effects on color extraction, phenolic extraction, color stability, and aroma and flavor. The fermentation treatments include the addition of $SO_2$ at crushing vs. no-$SO_2$ added before fermentation, the addition of VR Super enzyme before fermentation, and pre-fermentation cold maceration vs. post-fermentation cold maceration.

### RESULTS AND DISCUSSION

Replicated wines were produced with the following fermentation variables: a control with 50 ppm $SO_2$ added at crush, no-$SO_2$ added at crush, VR Super enzyme added at crushing at the rate of 50 mL/ton, cold maceration before fermentation at $7^0$C for one week, and cold maceration after fermentation before pressing at $7^0$C for one week. All treatments with the exception of the no $SO_2$ treatments had 50 ppm $SO_2$ added at crushing before fermentation (Table 1).

Preliminary analysis shows differences in total anthocyanins, total phenolics and in color intensity in the new wines. The wines with the highest concentration of anthocyanins included the control and the VR Super enzyme treated sample. The wines with the lowest concentration of anthocyanins included the no-$SO_2$ treatment, and both the pre- and post-fermentation cold maceration treatments. Interestingly, the wines with the greatest color intensity (420 + 520 nanometers) included the control, the enzyme treatment, and the pre-fermentation cold maceration (even though the anthocyanin concentration was lower than the other two treatments). The new wines with the lowest color intensity were the no-$SO_2$ and the post-fermentation cold maceration treatments.

The wine with the highest concentration of total phenols was the pre-fermentation cold maceration treatment (11 percent greater than the controls). The total phenolic content in wines from the other treatments varied little from the control (4 percent or less).

The new wines will be analyzed by high pressure liquid chromatography (HPLC) to obtain detailed phenolic profiles in order to better assess the qualitative and quantitative differences among the treatments. The wines will also be evaluated by a sensory panel for differences in aroma and flavor. During processing and aging the color intensity, color stability, and development of polymeric pigment will be monitored.

Table 1. 1992 Pinot Noir Processing Trials, Lewis Brown Farm, Corvallis, Oregon

| Treatment | Anthocyanin[1] mg/L | Total[1] Phenols mg/L | A/P | Color Intensity[2] 420 + 520 nm |
|---|---|---|---|---|
| Control[3] | 191 | 2293 | .083 | 4.27 |
| Cold Mac. Pre Ferm.[4] | 176 | 2546 | .069 | 4.27 |
| VR super[5] | 206 | 2343 | .088 | 4.48 |
| Cold Mac. Post Ferm.[6] | 155 | 2227 | .070 | 3.42 |
| No $SO_2$ | 173 | 2199 | .079 | 3.92 |

1 New wines
2 Optical density 420 + 420 nm, 1 mm cuvette (wine pH) X 10
3 +50ppm $SO_2$, fermentation on skins 10 days, 25-30°C
4 Cold maceration, prefermentation, 7 days, 7°C
5 + VR Super enzyme, 50 mL/Ton
6 Cold maceration, post fermentation, 7 days, 7°C

## Ammonium Metabolism in Grapes

Glen L. Creasy and Patrick J. Breen
Department of Horticulture

## INTRODUCTION AND OBJECTIVES

Oregon grape growers are sometimes troubled with fruit set problems. There are many types of fruit set disorders, but a recently described one is inflorescence necrosis (IN). Though many studies related to the disorder have been done at OSU and elsewhere, investigation into IN is still in its infancy. Several OSU researchers have shown that high levels of ammonium ($NH_4^+$) in inflorescences are associated with severe IN.

## RESULTS AND DISCUSSION

At this point, simple surveys of ($NH_4^+$) in different tissues and vineyards can help in finding some answers about IN. Shown here (Figure 1) is an example of how diverse factors such as vineyard location, cane thickness, and shoot orientation affect $NH_4^+$ (the prime suspect for causing IN) within inflorescences.

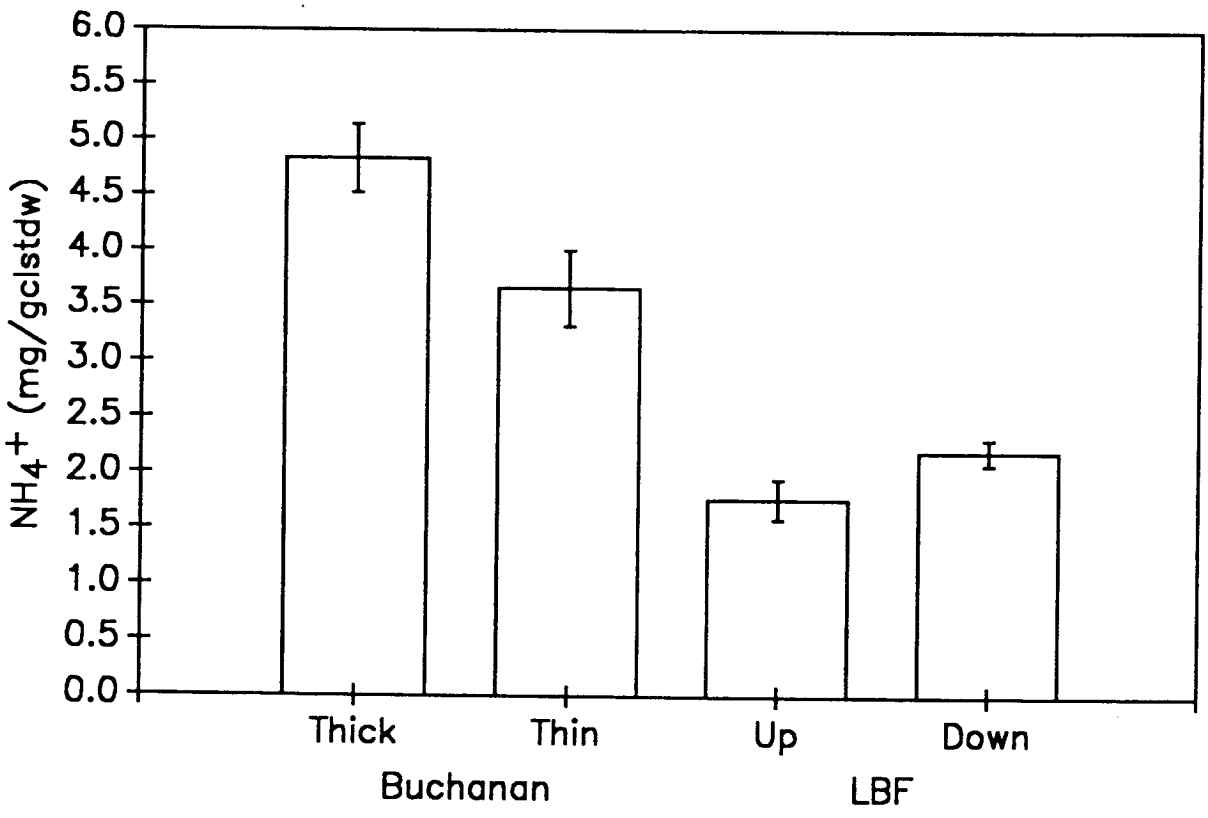
Clusters from shoots arising from thick canes had a higher concentration of $NH_4^+$ than clusters arising from thin canes. It's possible that the more vigorous shoot growth associated with large diameter canes increased the shade around the shoots, which caused $NH_4^+$ to be higher. However, there may be some other association between vigor and an $NH_4^+$ response in the tissue.

Clusters from upward trained shoots had slightly lower $NH_4^+$ than clusters from downward trained shoots at Lewis Brown Farm (LBF). At present, there isn't a satisfactory explanation as to why there should be a difference between the up and down shoots. This early in the season there might be a slight temperature difference caused by the downward shoots being closer to the ground. This could affect $NH_4^+$ directly or indirectly.

Note the difference in $NH_4^+$ levels between the two vineyards. The Buchanan vineyard has a history of IN and high cluster $NH_4^+$ levels; the LBF has had fewer problems with IN. Neither of the rows where the clusters were collected showed appreciable IN.

Research plans for 1993 include: obtaining antibodies to probe for the glutamine oxoglutarate amino transferase (GOGAT) enzyme in different aerial tissue of the grapevine, specifically those tissues susceptible and not susceptible to IN; developing a feasible extraction procedure for retrieving the GOGAT enzyme from grapevine tissue, and determining the activity of the recovered enzyme.

Figure 1. Ammonium ($NH_4^+$) concentrations (mg/gram cluster dry weight) in flower clusters from two different cane-pruned vineyards and different shoot categories. Inflorescences were collected from shoots on thick (about 1.5cm diameter) canes and thin (<~1cm diameter) canes from a single row of vines at the Buchanan vineyard, Corvallis, Oregon. At the Lewis Brown Farm (LBF), Corvallis, Oregon, flower inflorescences were collected from shoots on upward trained vines and downward trained vines in the trellis trial. Flower clusters collected at Buchanan were near first bloom, 1992; those collected at LBF were slightly farther along.



## Evaluation of the Effects of Yeast Strains on the Composition, Aroma, and Flavor on Several Winegrape Cultivars

Barney Watson, Mina McDaniel, and Ann Dumont
Department of Food Science and Technology

### INTRODUCTION AND OBJECTIVES

Yeast strains used in wine production are known to differ in some fermentation characteristics, including rates of fermentation, alcohol tolerance, degree of foaming, temperature tolerances, volatile acid production, and hydrogen sulfide production. There may also be significant sensory differences in aroma and flavor in wines fermented with different yeast strains.

The objective of this research is to evaluate the effects of different yeast strains of *Saccharomyces cerevisiae* on wine composition, aroma, and flavor of Pinot noir, Chardonnay, and Riesling, the primary winegrape varieties grown in Oregon. The yeast strains to be studied were selected from commercially available freeze-dried concentrates, many of which are used commercially in Oregon.

### RESULTS AND DISCUSSION

Pinot noir, Chardonnay, and Riesling were harvested from the Lewis Brown Farm (LBF), a university experimental research vineyard. Pinot noir was also harvested from a commercial Willamette Valley vineyard, Beaver Creek Vineyards (BCV) in Corvallis, Oregon. Replicated lots were inoculated with several different yeast strains (Table 1).

Chardonnay and Riesling were crushed, destemmed, and 35 ppm of $SO_2$ were added. The musts were settled overnight at 7$^0$C and racked from the solids. Pooled juice was subdivided into uniform duplicate lots and inoculated with rehydrated freeze-dried yeasts. During fermentation temperatures ranged from 13-23$^0$C. Yeast strains used for Chardonnay included: Lalvin EC-1118 Prise de Mousse, Lalvin M Montrachet, Lalvin Bourgoblanc 3079, Lalvin QA 23, and Enoferm ICV D47. Yeast strains used for Riesling included: Uvaferm Epernay 2 CEG, Lalvin Yzmaflore VL1, Lalvin K-1 (V-1116), Lalvin CS-2, and Enoferm Simi White.

Pinot noir wines from two vineyards were divided into uniform replicate lots. The fruit was crushed and destemmed, with 50 ppm of $SO_2$ added before fermentation, the fruit was inoculated with rehydrated freeze-dried yeasts. Pinot noir wines were fermented at 25-30$^0$ C on the skins for 14 days prior to pressing. The wines were punched down twice daily. New wines were inoculated with OSU malolactic bacteria strains. Yeast strains used for Pinot noir included: Lalvin Wadenswil WSK-27, Lalvin Bourgorouge 212, Lalvin Bourgorouge RA 17, Enoferm Assmanshausen, Enoferm Burgundy (BGY), and Lalvin 2056.

The new wines are being analyzed for alcohol, titratable acidity, pH, volatile acidity, absorbance at 420 nm (white wines), color intensity as absorbance at 420 + 520 nm, anthocyanin content (red wines), and for total phenolic content (Folin-ciocalteau, and absorbance at 280 nm). Phenolic profiles will also be analyzed by high performance liquid chromatography (HPLC).

Preliminary observations include differences in fermentation rates in Chardonnay, Riesling, and Pinot noir as well as differences in anthocyanin content, color intensity, and phenolic content in Pinot noir (Tables 1 & 2).

Chardonnay fermentation rates ( based on the time required to reach -1.0 degrees Brix) ranged from 45 to 106 days. EC-1118, D47, and QA-23 were the fastest fermentors while Montrachet (M) and 3079 were the slowest. Riesling fermentation rates ranged from 23 to 64 days with CS-2 and K1 being the fastest fermentors, and Simi White, VL-1, and CEG being the slowest. In Pinot noir, 71B, 212, and 2056 were the fastest fermentors while WSk 27, Assmanshausen, and BGY were the slowest.

The highest concentration of anthocyanins was in Pinot noir wines fermented with 71B, 2056, and 212. The lowest anthocyanin concentrations were in wines fermented with BGY, WSK-27, RA 17, and Assmanshausen. The highest color intensity (420+520 nm) was in wines fermented with 2056 followed by 212. The lowest color intensity was in wines fermented with RA 17 and 71B. Interestingly, wines fermented with 71B had a high anthocyanin content, but a relatively low overall color intensity. Wines fermented with 71B and RA 17 also had lower total phenolics than the other wines. The ratio of anthocyanin content to the total phenolic content (A/P) in the new wines also varied from as low as 0.083 for BGY (low anthocyanin content, high phenols) to as high as 0.153 for 71 B (high anthocyanin content, low phenols).

The wines will undergo preliminary sensory evaluation this winter by an OSU-industry trained panel for color, aroma, flavor, and body using descriptive analysis. Wines with significant sensory differences will be analyzed by a gas-chromatography (GC) sensory technique developed in our laboratory. Trained panelists will identify and describe aroma intensive compounds as they elute from the GC to provide a bioassay of aroma activity and an aroma profile of wines fermented with different yeast strains.

Table 2. 1992 Pinot Noir Yeast Trials, Lewis Brown Farm and Beaver Creek Vineyards, Corvallis, Oregon

| Yeast Strain | Ferm. Time days[1] | Anthocyanin[2] mg/L | Total[2] Phenols mg/L | Ratio[3] A/P | Color Intensity[4] 420 + 520 nm |
|---|---|---|---|---|---|
| WSK 27 | 12 | 177 | 1,836 | .096 | 3.31 |
| Assm. | 13.5 | 187 | 1,854 | .101 | 3.57 |
| 2056 | 10 | 224 | 1,900 | .118 | 4.23 |
| 212 | 10.5 | 211 | 2,019 | .104 | 3.93 |
| 71B | 9.5 | 231 | 1,510 | .153 | 3.13 |
| RA17 | 11.5 | 182 | 1,617 | .113 | 2.96 |
| BGY[5] | 12.0 | 162 | 1,954 | .083 | 3.26 |

1 Ave. time to reach -1.0 °Brix, 25-30°C, maceration on skins 14 days
2 Average of 2 reps each of two wine lots
3 Ratio anthocyanins/phenolics
4 Optical density, 420 + 520 nm, 1 mm cuvette (wine pH) X 10
5 Average of 2 reps of one wine lot

## The use of nisin resistant strains of *Leuconostoc oenos* to control malolactic fermentation and to prevent the growth of spoilage bacteria in Oregon wines

Mark Daeschel, Cynthia Bower, and Barney Watson,
Department of Food Science and Technology

### INTRODUCTION AND OBJECTIVES

Our objective is to develop methodologies to allow winemakers to precisely control the malolactic fermentation and to prevent spoilage of wines by undesirable bacteria.

### RESULTS AND DISCUSSION

Nisin, a bactericidal polypeptide produced by *Lactococcus lactis*, has been shown to be active against gram-positive bacteria, but not gram-negative bacteria or yeast. These antimicrobial properties have proven effective for inhibiting the lactic acid bacteria during winemaking. Adding nisin in combination with a nisin-resistant strain of *Leuconostoc oenos* may provide winemakers with a means of controlling the malolactic fermentation.

Nisin may have the potential to replace (or reduce) sulfiting agents traditionally added to wines to prevent the growth of spoilage lactic acid bacteria. This may be valuable since sulfites are believed to cause toxic responses in sensitive individuals. As a result, the U.S. Food and Drug Administration withdrew the GRAS (generally recognized as safe) status of sulfiting agents in 1986 and required their declaration on labels when concentrations present exceeded 10 ppm.

Extensive studies have shown that nisin is a safe, non-toxic antimicrobial agent that is non-allergenic to humans. It has been affirmed as GRAS by the U.S. Food and Drug Administration (Federal Register, April 6, 1988) for use in pasteurized cheese spreads at levels up to 250 ppm to prevent the growth and toxin production of *Clostridium botulinum.* Nisin has not yet been approved for use in wines, however, petitions are currently pending.

Our research efforts have progressed to the point where are now ready to proceed with winery-scale evaluations. Recent conversations with representatives from the company (Integrated Ingredients Inc.) that distributes nisin were encouraging about the likelihood of nisin being approved for broad use approval. Past objections by FDA for broader use approval were based on a interpretation of toxicological data. In addition, a process known as "self-affirmation" will help us expedite the approval process. Essentially, self-affirmation is when a food or beverage processor sends a letter to FDA stating that they are planning to use an ingredient or food processing aid that has "GRAS" (generally recognized as safe) in their product. FDA will receive the letter and either will not allow it or not respond. In any event, FDA will not respond with an approval. All liability will be assumed by the processor and FDA will not go on record as having given approval. More information regarding how to

proceed with self-affirmation will be given to us from attorneys representing Integrated Ingredients, Inc. in the near future.

**Funding History:** Year initiated: 1990, 1990-1991 ($3175), 1991-1992 ($3175), 1992-1993 $3,500

## PUBLICATIONS AND PRESENTATIONS: 1992

Bower, C.K., B.T. Watson and M.A. Daeschel. 1992. Applications of bacteriocins in controlling bacterial spoilage and malolactic fermentation of wine: Interactions between the bacteriocin nisin and components of red wine. Proceedings 3rd Intl. Symp. Innovations in wine technology. Deutscher Weinbauverband, Heussallee 6, D-5300 Bonn. May 25-27. Stuttgart. pp. 102-109.

Daeschel, M.A., C.K. Bower and B.T. Watson. 1992. The use of nisin to control spoilage bacteria and malolactic fermentation in wines. Advanced Science and Technology Institute. Executives Conference. May 4-5. Portland, Oregon.

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Daeschel, M.A. 1992. Controlling malolactic fermentation. 11th Annual New Mexico Growers and Winemakers Conference. April 10-12. Albuquerque, NM.

Daeschel, M.A., C.K. Bower and B.T. Watson. 1992. Applications of bacteriocins in controlling bacterial spoilage and malolactic fermentation of wine: Interactions between the bacteriocin nisin and components of red wine. 3rd Intl. Symp. Innovations in wine technology. May 25-27. Stuttgart, Germany.

Daeschel, M.A., C.K. Bower and B.T. Watson. 1992. Factors affecting the activity of nisin on wines. 3rd Intl. Cool Climate Symposium. Forschungsanstalt Geisenheim-University of Mainz, Mainz, Germany. June 8-11.

Daeschel, M.A., C.K. Bower and B.T. Watson. 1992. Use of the bacteriocin nisin in controlling bacterial spoilage and malolactic fermentation in wines. Pacific Northwest Chap., Amer. Soc. of Enology and Viticulture Annual Meeting. Kelowna, British Columbia. Aug. 13-16.

## Industry Wine Panel

Mina R. McDaniel and Barney Watson
Department of Food Science and Technology

## INTRODUCTION AND OBJECTIVES

A sensory panel, consisting of approximately 10 Oregon winemakers will be established to evaluate experimental wines. Their evaluations will allow us to draw conclusions regarding the sensory qualities of the wine from viticultural and enology research trials. The sensory properties of experimental wines will be described by free choice profiling, a technique where winemakers can use their own words to describe the sensory characteristics of the wines. No training is necessary and winemakers are not forced to adopt the same language. The data will be analyzed using sophisticated statistical techniques. The result is a mapping of all samples in relation to each other. Their place on the map is dictated by how they differ from other samples. It is a good technique to use when extensive training and language development is not possible.

## RESULTS AND DISCUSSION

Our plan is to meet at least twice during the year, once in the winter and once in the spring. The first panel will meet this March. Approximately 10 experienced winemakers will take part each time. Each winemaker will generate his or her own list of descriptors and use those descriptors to rate the wines under study. Because no training is required, the industry members will be able to use the descriptors they have used for years and for which they have a precise meaning.

The wines to be evaluated come from viticultural and enology experimental trials including the comparative yeast trials on Riesling, Pinot noir, and Chardonnay; wines produced from fruit with varying light exposure in the vineyard; Pinot noir wines made using fermentation variables which affect wine color and phenolics; and wines produced from the trellis trial experiments.

## Varieties, Clones, and Rootstocks.

Steve Price, Department of Horticulture
Barney Watson, Department of Food Science and Technology
Beverly Clark, Foundation Seed Project

## INTRODUCTION AND OBJECTIVES

The introduction and evaluation of new planting material for the Oregon wine industry has been one of the top priorities of OSU and Oregon Wine Advisory Board (OWAB) for many years. The emphasis at OSU has been on two main objectives: to facilitate the introduction of new material into commercial Oregon vineyards and to evaluate the plant material options of Oregon growers. These are very broad goals and they require an integrated program. There are several groups on campus working on vine improvement and OSU is working with several other groups both in and out of Oregon. The OWAB has worked actively on these issues through its Winegrape Improvement Committee and by funding of programs at OSU.

**Introduction of new material.** New material for Oregon vineyards has come from several sources. From the mid-1970s through 1990 OSU had an import license for importing and virus testing grape plant material from outside of the United States. The most important contribution of this program was the introduction of new clones and varieties from France. Clones and varieties from Colmar, Espiguette, and Dijon came to Oregon via this program. With the retirement of Ron Cameron, OSU no longer has an importation license. Foreign material coming into Oregon must now come through virus-testing programs in New York, California, or Canada.

The primary source of new material coming into Oregon is now the Foundation Plant Materials Service at the University of California (FPMS). FPMS has recently received significant federal funding to upgrade its facility. Bringing plant material into Oregon from FPMS has been difficult at times.

Virus certification rules in California were more rigid than Oregon rules. Material infected with Rupestris stem pitting was not allowed out of quarantine. This virus is common in Oregon vineyards and does not appear to cause economic damage. The Oregon Department of Agriculture (ODA), OSU, and the OWAB decided that Rupestris stem pitting should not be considered a quarantinable disease and the USDA concurred. We were able to work with the ODA and USDA to allow the release of some stem pitting infected material in Oregon. Partly due to our efforts, the State of California has just changed the quarantine regulations to allow release of grape plant material infected only with Rupestris stem pitting. This ruling will allow the release of eighty new varieties and clones from quarantine. The list of new material includes many clones and varieties that may have promise for Oregon. These new regulations should make FPMS more viable as an avenue for introducing new material into Oregon.

We have also been working with FPMS in reevaluating the leafroll status of the OSU mother block. New leafroll tests have found infected vines in the FPMS foundation vineyard. Release of registered material from OSU will be delayed until material from the OSU mother block can be retested for leafroll.

The Foundation Seed Project (FSP) at OSU is the primary vehicle for the initial distribution of new grape material within Oregon. FSP ships cuttings, graft sticks, and mist-propagated plants to nurseries and growers in Oregon. They are also the primary source for distributing plant material released by OSU. Much of this material is shipped out of state. In the 1992 growing season, FSP shipped 3,787 dormant cuttings and 3,325 mist propagated plants to 52 growers and nurseries. The OSU mother block was expanded this year to make room for new clones and varieties.

**New material evaluation**. New plant material is being evaluated in several trials around the state. There is a large trial for evaluating Pinot noir and Chardonnay clones at Woodhall Vineyard, a rootstock trial also at Woodhall, a trial evaluating new Italian, Spanish, Rhone, and Bordeaux varieties at the Southern Oregon Experiment Station. Phylloxera resistant rootstock trials have been established at 17 sites around the state in commercial vineyards. The Southern Oregon trial is described in a separate report in this publication.

The Pinot noir and Chardonnay trials were in their third leaf this last summer. We had hoped to get a half crop this season, but the dry weather conditions resulted in less growth than we had anticipated and the vines were cropped lightly. Clonal differences in Pinot noir were readily apparent. The unique growth habit of upright types such as UCD 22 and ESP 374 were clear as was the unique cluster morphology of the Mariafeld types UCD 17 and UCD 23. The high yielding clone ESP 236 had distinctly larger clusters. The low crop and early season resulted in very few differences in Brix, TA, and pH, however. Differences in the Chardonnay trial were less apparent and no must analysis of fruit was done this year.

The rootstock trial at Woodhall was trained to the wire this season and should have its first small crop next year.

Seventeen rootstock trials were planted in commercial Oregon vineyards in May, 1992. The scion was Pinot noir clone UCD 2A and the rootstocks were 3309, 5C, 420A, 101-14, 44-53, Harmony, and self-rooted. These trials are intended to be the growers' trials, however we hope to be able to work with many of the growers in evaluating the response of Pinot noir. We would like to select several trials in diverse conditions for long term evaluation.

We have also worked with a commercial nursery to design a second set of trials. These trials are being offered for sale to Oregon growers and will use Chardonnay as scion and have a slightly different set of rootstocks. The plot plan for these trials will be similar to the Pinot trial. We would like to continue to work with growers in designing and managing on-site experiments. As the industry shifts to a rootstock based vineyard, there will be many questions that can be best answered by a cooperative approach.

## Identification of Grape Rootstocks and Varietal Clones by DNA Fingerprinting

Alan Bakalinsky, Department of Food Science and Technology

## INTRODUCTION AND OBJECTIVES

Correct identification of grapevines is of extreme importance to the expanding U.S. viticulture and wine industries. Several recent cases of misidentifications have occurred because the tools for accurate typing of plants are either inadequate or lacking. We have been applying one type of DNA-based procedure that has shown great promise in distinguishing a variety of closely-related plants and other organisms. We summarize here our preliminary results based on its application to rootstock identification.

The objectives of this research are to isolate DNA from leaf tissue derived from rootstocks in the collection of the OSU Department of Horticulture and selected commercial sources and to screen "RAPD" primers in DNA amplification reactions to generate genetic markers able to fingerprint each rootstock.

## RESULTS AND DISCUSSION

DNA was isolated from 15 samples of nine different rootstocks including samples of uncertain origin. A relatively crude and convenient DNA isolation procedure based on use of the detergent hexadecyltrimethylammonium bromide (CTAB) was found to be inadequate. However, the CTAB-purified DNA was found amenable to analysis after further purification.

Using our fingerprinting method, we found that we could distinguish all 9 different rootstocks examined. (Table 1). The DNA markers are indicated in the table as numbers and their presence in a given rootstock is shown with a "+". Examination of the table shows that each rootstock has a unique pattern of markers except for Couderc 3309 and 1616. (We have recently identified a new marker, not included in the table, that now also distinguishes these two.) The pattern of markers obtained for 5C was identical to that obtained for two different samples of SO4. Based on the recent history of mistaken identities involving these two rootstocks, it is possible that the latter samples were only mistakenly believed to be SO4. Another sample of SO4, (SO4 #12), displayed a pattern that neither matched that of 5C nor that of the other SO4s.

We have made initial efforts to improve the procedure by converting the genetic markers into a form that will make them more reliable and accessible to interested parties. We are also beginning to screen our collection of varietal clones which we anticipate will prove more challenging than the rootstocks.

| | DNA MARKERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ROOTSTOCK | **1** | **2** | **3A** | **4A** | **6** | **7** | **8** | **9** |
| MG 420A | + | | | + | + | | | |
| Richter 99 | + | + | | | + | + | + | + |
| 5C* | + | | | | | | + | |
| SO4 #4 | + | | | | + | | + | |
| SO4 #12 | + | | | | + | | + | + |
| Riparia Gloire | ? | | | | | | | |
| Couderc 3309 | | | | ? | + | | | ? |
| MG 101-14 | | | | + | | | + | + |
| Kober 5BB | ? | | + | | | | | + |
| 1616 | | | | | + | | | |

**Table 1.** DNA fingerprints of rootstocks. A "+" indicates the presence of the indicated marker (#1-#9) when rootstock DNA was used in an appropriate DNA amplification reaction. A "?" indicates an ambiguous result. *The pattern presented for 5C was the same obtained for two other SO4 isolates (SO4 #3 and SO4 #14).

**Funding History:**

| | | |
|---|---|---|
| 1991-1992: | Oregon Wine Advisory Board | $3,500; |
| | OSU Center for Gene Research and Biotechnology | $5,700. |
| 1992-1993: | Pacific Northwest Center for Small Fruit Research | $6,330; |
| | OSU Center for Gene Research and Biotechnology | $6,000; |
| | Agritope, Inc. | $6,000. |

## Evaluation of New Wine Grape Cultivars for Production Potential in Southern Oregon

David Sugar, Porter Lombard, and Richard Hilton
Southern Oregon Experiment Station

### OBJECTIVE

To characterize the cultural aspects, maturation, production, and wine quality of several untested Italian, French, and Spanish wine cultivars in southern Oregon.

### RESULTS AND DISCUSSION

#### Cultural aspects

Most vines had sufficient growth following the 1990 freeze to prune two or three canes for a total of 10-20 nodes per vine depending on vigor. The canes were trained horizontally on a 30-inch high wire and shoots were trained upright with two foliage wires 18 inches above. Approximately half of the clusters were removed in late July to reduce the crop load on most vines and/or to remove the mildew infected clusters. Two applications of Rally were made in early July and August for mildew control. Shoot thinning, lateral removal, and tipping was done in June to expose the canopy and clusters. Observations on cultural aspects of the cultivars are summarized in Table 1.

The trellising in the plot will be improved by placing a post every 25 feet instead of the present 50 feet with fruiting wires at 36 and 42 inches above the ground for the Scott Henry system when necessary plus two permanent foliage wires at 57 and 72 inches. Fully developed vines will be pruned to 25 nodes for undivided canopy and 50 nodes for Scott Henry system.

#### Harvest aspects

A 30 berry per replicate sample was collected weekly from each variety for measurement of °Brix and TA. At harvest, 10 clusters per rep were pressed by hand and filtered through cheesecloth for °Brix, TA, and pH. Bird netting of the late harvested varieties was necessary to protect the fruit from the birds. Harvest occurred when the white varieties reached 22°Brix and the reds reached 24°Brix. Wine samples were made of Tempranillo, Viognier, Dolcetto, Syrah, Petite Verdot, and Sangiovese by Sarah Powell of Foris Vineyards.

#### Comments about 1992 season

The 1992 season was early and warm. Bud break occurred from March 29 to April 5 (about 17 days early) while harvest was about 22 days in advance of long term average for Pinot noir. In addition, the season was quite warm (3631 degree days compared to an average of 2611 degree days for Medford). Therefore, some of the late maturing varieties such as Petite

Verdot, the Nebbiolos, and Sangiovese were able to mature. We would expect these varieties to mature in less than 50 percent of the seasons (like Zinfandel and Barbera). This season's maturation benefitted from a low crop load also and it would be important to keep the crop load to less than 2 tons/acre (2 kg/vine) for these varieties in the future. Varietal phenology and juice characteristics at maturity are summarized in Table 2.

Funding History:

Year Initiated: 1988-1989.

Funding for 1991-1992: $1,000

Table 1. Winegrape varietal observations in 1992 and possible cultural treatments in 1993, Southern Oregon.

| Varieties | % frost damage Apr 28 28° F | Powdery mildew damage (June) | Vine vigor (growth) | Laterals (number) | Canopy (shading) | Cluster per shoot | Cluster desc. | Poss. pruning type | Poss. canopy system |
|---|---|---|---|---|---|---|---|---|---|
| Chardonnay | 4.0 | light | mod. | few | mod. | 1-2 | tight | cane | divided |
| Cabernet franc | 6.0 | high | high | few | mod. | 2-3 | loose | cane | divided |
| Cabernet Sauvignon | 5.2 | high | high | few | mod. | 1-2 | loose | cane | divided |
| Dolcetto | 2.7 | high | low | many | mod. | 2-4 | loose | spur | undivided |
| Fresia | 0.4 | mod. | mod. | many | mod. | 1-2 | loose | cane | divided |
| Gamay noir | 5.2 | high | low | none | mod. | 3-4 | tight | spur | undivided |
| Graciano | 3.3 | light | mod. | few | dense | 2-3 | tight | spur | divided |
| Limberger | 7.2 | mod. | high | few | mod. | 2-3 | loose | spur | divided |
| Nebbiolo | 2.9 | high | mod. | many | mod. | 0-1 | loose | cane | divided |
| Nebbiolo fino | 2.0 | high | mod. | many | mod. | 0-1 | loose | cane | divided |
| Nebbiolo lampia | 1.2 | high | mod. | many | mod. | 0-1 | loose | cane | divided |
| Pinot blanc | 9.1 | mod. | low | few | mod. | 1-2 | tight | cane | undivided |
| Pinot gris | 1.7 | light | low | none | mod. | 1-2 | tight | cane | undivided |
| Petite Verdot | 2.8 | light | mod. | some | dense | 2-3 | loose | spur | divided |
| Refosco | 4.5 | high | high | few | mod. | 2-3 | mod. | spur | divided |
| Sangiovese | 10.2 | high | high | few | mod. | 1-2 | mod. | cane | divided |
| Syrah | 3.6 | light | high | many | dense | 1-2 | loose | cane | divided |
| Tempranillo | 3.0 | mod. | high | many | dense | 1-2 | loose | cane | divided |
| Viognier | 3.3 | mod. | mod. | many | open | 1-2 | loose | cane | divided |

Table 2. Winegrape varietal phenological and harvest data in 1992, Southern Oregon.

| Variety | Bud break date | Veraison date | Harvest date | Season BB-Har (days) | Yield (tons/ac) | Cluster weight (g) | Brix | TA (g/l) | pH |
|---|---|---|---|---|---|---|---|---|---|
| White | | | | | | | | | |
| Pinot gris | 3-31 | 7-26 | 9-4 | 150 | 0.9 | 83 | 23.3 | 7.4 | 3.55 |
| Chardonnay | 3-31 | 7-31 | 9-4 | 157 | 1.1 | 81 | 23.1 | 10.4 | 3.31 |
| Pinot blanc | 3-31 | 7-26 | 9-4 | 157 | 1.6 | 139 | 22.8 | 9.1 | 3.39 |
| Viognier | 3-31 | 7-26 | 9-4 | 157 | 0.6 | 89 | 22.5 | 8.9 | 3.43 |
| Red | | | | | | | | | |
| Gamay noir | 3-31 | 7-29 | 9-4 | 157 | 4.9 | 190 | 23.6 | 10.3 | 3.30 |
| Tempranillo | 3-31 | 8-1 | 9-4 | 157 | 0.5 | 88 | 24.1 | 7.5 | 3.51 |
| Dolcetto | 3-31 | 8-6 | 9-10 | 163 | 0.8 | 72 | 24.3 | 6.6 | 3.37 |
| Limberger | 3-31 | 8-2 | 9-4 | 166 | 0.4 | 69 | 22.7 | 10.4 | 3.25 |
| Fresia | 4-5 | 8-8 | 9-17 | 165 | 0.6 | 84 | 24.3 | 10.5 | 3.31 |
| Cabernet franc | 4-5 | 8-12 | 9-17 | 165 | 1.0 | 59 | 24.2 | 8.8 | 3.33 |
| Nebbiolo fino | 3-29 | 8-12 | 9-17 | 178 | 0.2 | 47 | 24.1 | 11.5 | 3.13 |
| Cabernet Sauvigon | 4-5 | 8-12 | 9-17 | 172 | 0.5 | 42 | 22.8 | 10.5 | 3.23 |
| Syrah | 4-5 | 8-10 | 9-30 | 178 | 1.1 | 80 | 24.7 | 8.9 | 3.43 |
| Petite Verdot | 4-5 | 8-16 | 9-30 | 178 | 0.9 | 50 | 24.7 | 13.7 | 3.24 |
| Nebbiolo | 4-2 | 8-12 | 9-17 | 181 | 0.3 | 76 | 23.7 | 13.9 | 2.99 |
| Nebbiolo lampia | 4-2 | 8-14 | 9-17 | 181 | 0.3 | 149 | 23.7 | 12.9 | 3.05 |
| Refosco | 4-2 | 8-8 | 9-30 | 188 | - | - | 22.9 | 8.6 | - |
| Graciano | 4-5 | 8-11 | 9-30 | 192 | - | - | 22.5 | 9.3 | - |
| Sangiovese | 4-2 | 8-10 | 10-14 | 195 | 0.6 | 107 | 23.9 | 8.8 | 3.35 |

## Grape Phylloxera Biology and Management in Oregon

Bernadine C. Strik and Anne Connelly
Department of Horticulture

## INTRODUCTION AND OBJECTIVES

Grape phylloxera (*Daktulosphaira vitifoliae*), a root-feeding aphid-like insect, is the most important pest of European winegrape vineyards worldwide. They cannot be controlled on infested vines which eventually die. There are currently no satisfactory chemical or biological control methods for this pest; its management throughout the world has been by planting resistant rootstocks and through techniques that seek to limit the rate of spread.

Although it has been in California since the mid-1800s, phylloxera was discovered for the first time in a commercial vineyard in Oregon in 1990 and in Washington in the late 1980s. Seven vineyards are now known to be infested. With over 95 percent of Oregon's 6,000 acres of grapes being own-rooted, susceptible vines, the potential for serious economic loss to the industry is great. Infested vineyards will have to be replanted on grafted vines (resistant rootstock) at a cost of over $11,000 per acre for re-planting and years out of production. Rate of spread of this insect within a vineyard is estimated to be 2 times to 4 times in Oregon -- thus at the very least, a 1/8 acre infestation will be 1 acre in size in 3 years. Phylloxera can be spread from one vineyard to another on infested soil or plant material.

The life cycle of this insect varies with location. Our findings indicate the presence of sexual, winged forms in the Pacific Northwest. The relevance of this discovery to viticulture here is unknown but may be important to insect population variability and movement (greatly increase rate of spread). 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.

Although replanting vineyards on phylloxera resistant rootstock is the long term, preferred and inevitable mechanism for control of the pest, there is a large number of resistant rootstocks to choose from, but none of which have yet been characterized as suitable for production systems in Oregon.

Existing phylloxera infestations must be managed to decrease the rate of spread, within and among vineyards. Delaying the need for the industry to replant on resistant rootstock is essential, as growers will have to make educated decisions on what stocks are best for Oregon. Our industry does not want to be faced with having to replant 80 percent of existing vineyards because of inappropriate initial rootstock recommendations, a situation now in effect in California's Napa and Sonoma counties. Research on phylloxera biology, rate of spread, and its association with other pests in Oregon is needed to better manage this insect. We need sufficient time to conduct concurrent research on rootstocks resistant to variations of phylloxera, resistance to other pests such as nematodes and fungal pathogens, and suitability

for our viticultural region. Studies on other traits of rootstocks, to provide consistent productivity and quality perfection for Oregon conditions has the potential to make Oregon's change to rootstocks a positive development and an enhancement of long-term competitiveness.

Additional information on phylloxera biology, rate of spread, methods to decrease the rate of spread, and rootstocks for Oregon vineyards is available in the Oregon Winegrape Growers' Guide (1992).

The objectives of our research were to determine when phylloxera 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. Also, it's important to be able to estimate the rate of spread as accurately as possible so that growers may predict replanting date and the industry can forecast spread within the Oregon. We also wanted to determine whether we have a winged form of phylloxera in Oregon, because this could greatly affect the rate of spread of this pest. Determining the low temperature tolerance of phylloxera found in Oregon is necessary to better estimate number of generations per year and the potential amount of population die-back in cold winters. Finally, we planned to determine the resistance of rootstocks to biotype(s) of phylloxera found in Oregon.

## RESULTS AND DISCUSSION

Two infested vineyards were selected for this study, one in Lane County and the other in Marion County. The Lane County site has 8-year-old Riesling and Gewurztraminer and the Marion County site has 10-year-old 'Pinot noir' infested with phylloxera. These two sites are distinctly different, especially with regards to microclimate. We have been monitoring soil (30 cm) and air temperatures at each site since the beginning of June 1991.

The Lane County site was pulled in April 1992 and research was begun at two Yamhill County sites. Yamhill I is a 20-year-old 3-acre unirrigated vineyard of Pinot noir managed organically. Yamhill II is a much larger vineyard site with 15-year-old Riesling on drip irrigation (not irrigated in 1992). The Marion County site will remain in the study with two border rows (of the lens of infestation) planted with a rootstock trial.

### Population levels throughout the season

Growth of field populations (reproductive potential) was determined by sampling the two infested sites every four weeks from June 1991 through June 1992. The Lane County site was pulled in April 1992, so research was moved to two Yamhill County sites. In June 1992, sampling was increased to every two weeks based on recommendations from entomologists Jeff Granett (UCD) and Glenn Fisher (OSU).

At each vineyard site, soil (400 ml) and root samples (100 g) were collected from ten vines from the periphery of the lens of infestation, using a shovel and pruners. Samples were collected at soil depths of 15 and 30 cm beginning in July 1992 and were brought to the laboratory for extraction of phylloxera using a wet sieve sucrose centrifuge. Populations extracted were then separated by life stage and counted. Root pieces were measured in 1992 and checked for nodosities and tuberosities.

At each site, soil temperatures were recorded at a depth of 30 cm and air canopy temperature near the infested area every 30 minutes using Omni Data DP 212 data pods. Data were transferred to a computer every 21 days.

Phylloxera hibernants began molting to adulthood in April/May 1992, when mean soil temperatures were between 16 to 21°C (at a soil depth of 15 to 30cm). Population levels increased slowly until June at all three sites (Table 2). Peak populations occurred in August at the Yamhill County sites and in September at the Marion County site (Table 3; Fig. 1). Peak populations occurred about one month earlier than in 1991. At all sites, except Yamhill-II, populations decreased after September (Fig. 1). Based on color, sluggish activity, and number of first instar nymphs, we believe hibernation began in early September when mean soil temperatures were between 21 and 24°C. Phylloxera adults and eggs were still present in November extractions, indicating that development of hibernation occurs over a protracted period (data not shown).

Phylloxera populations at the Yamhill-I site were lower than at the Yamhill-II or Marion site (Tables 2 and 3; Fig. 1). The Yamhill-I site is characterized by its dry, heavily compacted soil. We believe that the summer drought provided little moisture for root growth in this compacted soil, which in turn decreased phylloxera population levels. The Marion county site continues to have show population levels that rise and fall rapidly. Whether this denotes some race difference has yet to be determined.

**Rate of spread/winged forms**

The rate of spread of phylloxera populations was determined by three methods: trunk wraps to monitor aboveground movement of nymphs, annual rating of aboveground vine symptoms in infested areas, and aerial photography.

Trunk wraps were used to detect crawler (nymph) movement up into the plant canopy. Tape covered with stick-em was wrapped around the base of the trunk. Six traps at each site were checked bi-weekly in June and July 1991, but no crawlers were found. Replicate number was increased to 15 per site from August through October 1991. Three crawlers were found in August 1991, indicating that aboveground movement was occurring. Fifteen trunk wraps were placed at each of the three infested sites in May/June 1992, but no crawlers were found on these in 1992.

Four winged phylloxera were found on trunk wrap in July at the Marion county site. A nymph with wing pads was found in extractions made in September at this same site, denoting a protracted period in which the winged forms are active. The Marion county site has high population levels per gram of root. The polymorphic responses of aphid-like insects in creating winged forms is believed to come from a crowding effect.

Only trunk wraps will be used to monitor above-ground movement in 1993, because aerial sticky traps and ground emergence traps have proven ineffective.

The significance of finding winged forms in a commercial Oregon vineyard is difficult to ascertain at this stage of our research. If the winged form of phylloxera can only complete its life cycle on American or hybrid type grapes ("Concord", "Niagara", "Marechal Foch") then rate of spread, aerially, can only occur through American rootstock blocks or plantings of these American or hybrid types. Certainly if growers have a self-rooted European vineyard near these types of grapes, they may be at risk. If winged phylloxera can complete their life cycle on European vines, then the implications for a greatly increased rate of spread are obvious. Research is needed in this area.

Above-ground symptoms of phylloxera infestation were rated (0-5 scale) in fall 1990 at one infested site. Ratings from 1990 were compared to those taken in fall 1991 to gauge aboveground rate of spread of this pest. Mapping seemed to indicate a rate of spread of 1.5 to 2 fold; thus a one-eighth acre infestation would be one acre in size in three years. At the Yamhill-II site, 44 percent of the vines rated in August 1992 declined in vigor rating compared to 1991.

Infrared aerial photographs were taken of all infested sites in fall 1990, 1991, and 1992. Aerial photos taken in 1991 indicated a 2 fold rate of spread at some sites. However, in 1992, sites with large infestations are showing rate of spread at 4 fold or greater. Infrared aerial photos were loaded into a digital computer program that will assign a value to the vine color (vigor); this will provide us with a less subjective evaluation of rate of spread.

Two new infested sites (one in Lane and the other in Yamhill County) were confirmed in summer 1992.

Phylloxera populations have been collected from the three infested sites being studied. These populations are currently being reared in a growth chamber on excised root pieces. However, techniques to reduce population fatality still need to be worked out. Spring populations may be needed for this study.

We plan to place laboratory-reared phylloxera eggs on roots at 12, 15, 18, and 21° C. Developmental times and survival to adulthood will be determined. From these data a minimal threshold and degree-days 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.

We plan test the rootstock resistance to all biotypes found in Oregon. However, to date only biotype A has been found. There is some evidence of at least two strains of biotype A being present, however. At this time we do not know the significance of this. Rootstock selections have been propagated and are sufficiently old for greenhouse studies of phylloxera resistance.

## Funding History

This project was supported by the Wine Advisory Board ($15,348) and the PNW Center for Small Fruits Research ($9,890) in 1992-93. We also received funding of $17,000 from the Center for Applied Agricultural Research in January 1992.

## Publications

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

Lombard, P., B. Strik, A. Connelly, and S. Price. 1992. Review of the 1991 winegrape season in Oregon. OHS Proc 83:211-220.

Phylloxera workshop (250 growers) and rootstock mini-conference (100 growers).

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

Strik, B.C. 1992. In: The Oregon Winegrape Grower's Guide, 4th Ed., T. Casteel Ed., Oregon Winegrape Growers' Assoc, Portland, OR, 1992: Strik, B.C. Assessing rootstocks for winegrape production in Oregon, pp 43-48; Grape Phylloxera, pp. 187-190; What can you do to decrease the likelihood of getting phylloxera? pp 191-192.

Strik, B.C. 1992. Implications of winged phylloxera, Ask OSU, Oregon Grapevine, 9(5).

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Strik, B. 1991. Rate of Spread of phylloxera -- 2X, Ask OSU, The Oregon Grapevine 8(6):

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

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

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

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. Not Biotype "B", Ask OSU, Oregon Grapevine 7(5):7.

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

Table 1. Temperatures For Three Vineyard Sites Infested with Phylloxera, 1992[z]

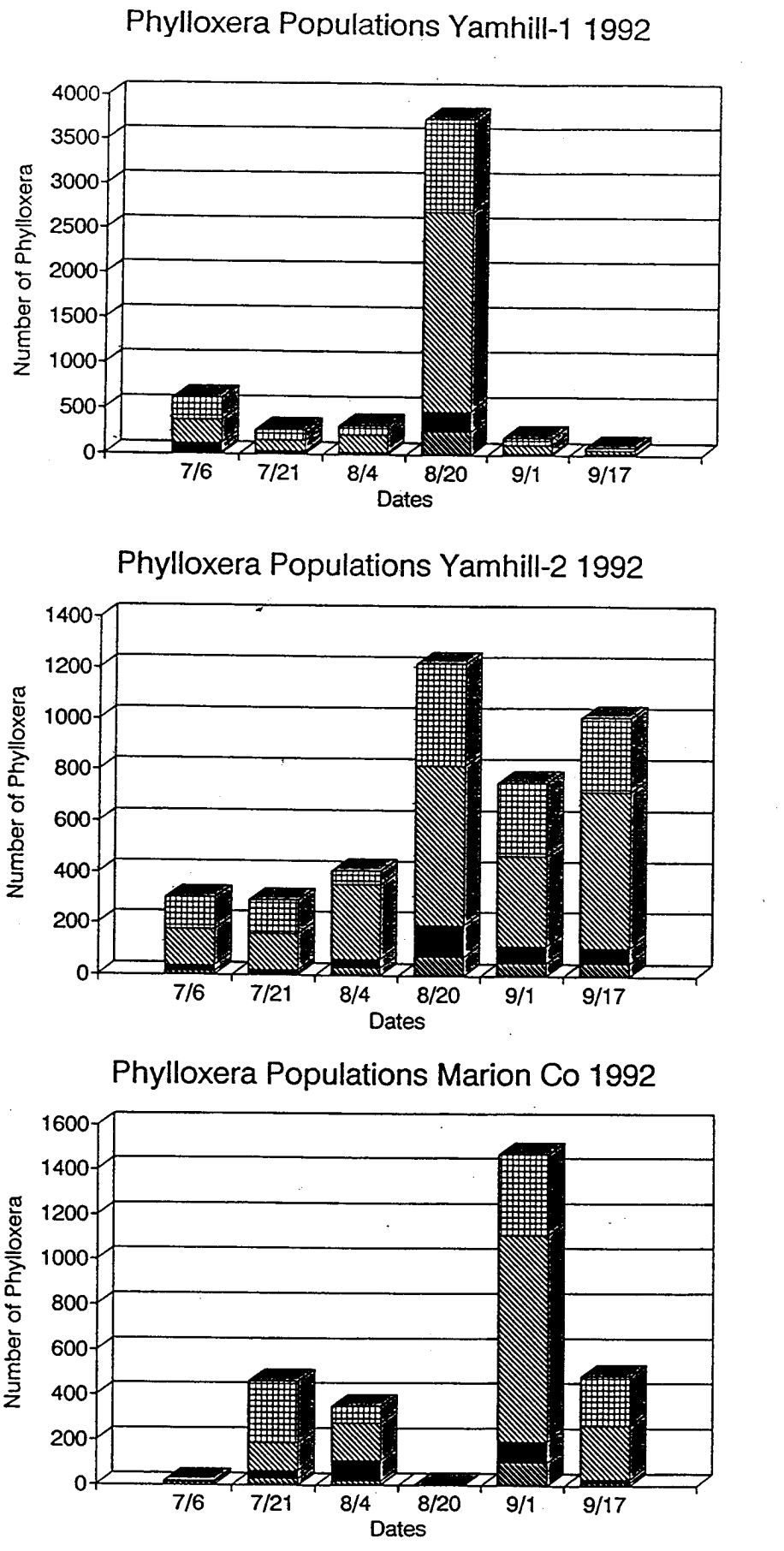
| Site | Date | Mean Range Soil Temperature (15-30 cm) | Mean Soil Temperature | Mean Air Temperature (4 ft. in canopy) |
|---|---|---|---|---|
| Yamhill I | 4/22-5/10 | 12.2-21.4 | 16.1 | 14.6 |
| | 5/14-6/1 | 19.1-24.0 | 21.2 | 16.4 |
| | 6/4-6/21 | 19.9-24.5 | 21.8 | 16.0 |
| | 6/24-7/5 | 21.1-27.2 | 23.7 | 22.6 |
| | 7/7-7/19 | 21.2-26.5 | 23.6 | 20.1 |
| | 7/22-8/2 | 22.2-26.5 | 24.5 | 19.7 |
| | 8/5-8/19 | 21.4-25.9 | 24.2 | 20.0 |
| | 8/21-8/30 | 21.9-24.0 | 20.7 | 19.0 |
| Yamhill II | 4/22-5/10 | 12.9-21.3 | 17.0 | 17.3 |
| | 5/15-6/1 | 18.9-23.9 | 21.2 | 17.0 |
| | 6/4-6/20 | 20.0-24.0 | 22.3 | 18.3 |
| | 7/7-7/19 | 21.7-27.6 | 24.3 | * |
| | 7/22-8/2 | 22.9-27.7 | 25.4 | * |
| | 8/5-8/18 | 21.7-26.6 | 25.1 | * |
| | 8/21-8/30 | 22.3-25.2 | 24.1 | * |
| Marion** | 7/7-7/19 | 18.7-23.3 | 19.2 | 17.8 |
| | 7/22-8/2 | 20.0-23.5 | 19.8 | 18.9 |
| | 8/26-8/31 | 20.9-21.8 | 21.4 | 19.0 |

[z]Temperatures taken every 30 minutes on a Datapod 212 and summarized for mean temperatures.

*Data errors on air temperature channel.

**Datapod replaced after early season failure.

Figure 1. Phylloxera Populations at Three Vineyard Sites in Oregon



## Enology Personnel Development and Extension

Barney Watson, Department Food Science and Technology

## INTRODUCTION AND OBJECTIVES

The Oregon wine industry has grown rapidly in recent years to 100 wineries. There is a strong and increasing need for enology Extension, technical assistance, and technology transfer of relevant research for commercial application. Enology Extension at OSU provides technical assistance to wineries with an emphasis on troubleshooting production problems and training of industry personnel.

The primary focus of the OSU enology Extension program is to increase commercial wine producer ability to recognize, avoid, and correct for physical, chemical, and microbial problems in Oregon wines. This is done primarily by consultation, troubleshooting analysis of problem wines, and by training industry members in laboratory analysis and wine stabilization at the OSU Enology Laboratory.

In addition, technical workshops and seminars are organized to provide educational materials and to demonstrate processing and quality control management practices to industry members to enhance their ability to produce sound, high quality table wines.

Seminars and workshops focus on wine processing and microbiology, wine analysis and stabilization, and sensory evaluation training for detection of wine defects.

## RESULTS AND DISCUSSION

This last year over 200 wines were submitted to our laboratory by over 40 wineries for evaluation and analysis. Analysis included must and wine composition, chemical and physical stability testing, fining trials, and extensive microbial evaluation and troubleshooting of individual winery problems.

During the 1992 harvest season many wines were sampled from several commercial wineries during fermentation in order to isolate numerous lactic acid bacteria from Oregon wines. After isolation the bacteria are being identified and used for ongoing research trials (see Daeschel, Use of nisin resistant strains). In addition to building a "library" of Oregon lactic acid bacteria, we were able to obtain microbiological profiles of several different wineries and to relate the established microflora in different wineries to their processing practices.

For example, of 71 wines screened 22 (31 percent) had detectable levels of *Lactobacillus sp.* (rods) present during and after the primary yeast fermentation (Table 1). Of the five wineries screened the percent of wines with detectable lactobacilli ranged from 0 to 80 percent. The winery with 80 percent has been having chronic 'lactic' spoilage problems in some wines for several years. These bacteria are serious potential spoilage organisms in wines, particularly in

the presence of fermentable sugars. They readily metabolize sugars to acetic acid and lactic acid, resulting in rapid wine spoilage due to excessive volatile acidity.

In recent years we have encountered an increasing number of commercial Oregon wines with microbial defects due to lactic acid bacteria and spoilage yeasts such as *Brettanomyces sp.* The trend toward minimal processing and the use of little or no $SO_2$ before fermentation is at least partly responsible for many of the problems we have observed. An article entitled "Occurrence and prevention of lactic spoilage during fermentation" will be in our first Enology and Viticulture Extension Newsletter published February 1993.

We are continuing to gear up our OSU Enology Laboratory to provide specialized quality control services to the industry and for teaching and training purposes. In addition to evaluating wine chemical and physical stability problems and chemical analysis of musts and wine composition, we now have the capability to evaluate wines for microbiological stability.

The following quality control services are currently available from the OSU Enology Laboratory:

Microscopic screening: Wineries are encouraged to submit samples for microscopic screening for determining viability of wine yeast and malolactic bacteria and for the detection of potential spoilage microorganisms. Microscopic screening is strongly recommended for juice and musts during processing, wines during fermentation, processing, and aging.

Microbial stability of bottled wine: Wine samples should be evaluated after bottling for the presence of wine yeast and bacteria and potential spoilage microorganisms. We encourage wineries who are not currently evaluating bottled wines to submit wines for plating. Unfiltered wines and wines not sterile filtered are always potentially at risk for post-bottle spoilage. Sterile filtered wines need to be plated for viable yeast and bacteria to ensure the integrity of the sterile filtration to avoid post bottling re-fermentation. We provide training to winemakers in sterile plating techniques and assistance in setting-up the assays in their wineries. Advice and consultation is also available on filtration and sterile bottling procedures.

Differential Plating for Yeast and Bacteria: Wine samples can be plated on differential media to identify and enumerate the microorganisms present, including *Leuconostoc oenos*, *Pediococcus sp.*, *Lactobacillus sp.*, acetic acid bacteria, and spoilage yeasts including *Brettanomyces sp.*.

## FUNDING HISTORY

Oregon Wine Advisory Board support for enology research and Extension was initiated in 1984. WAB support in 1992-1993 for the project entitled Personnel Support for Enology Research and Extension is $28,423, including 35 percent enology research and 15 percent

enology Extension FTE support for Watson's position (matched by OSU Agricultural Experiment Station) and funds for supplies, telephone, and travel.

## WORKSHOPS, SEMINARS, AND INDUSTRY PRESENTATIONS

Price, Steve and Barney Watson. 1992. Grape cultivar response to trellis systems. June 9, 1992. 3rd International Cool Climate Symposium, University of Mainz, Germany.

Watson, Barney and Steve Price. 1993. Enology and Viticulture Extension Notes. Volume 1, No. 1, February 1993. Occurrence and prevention of lactic spoilage during fermentation. (Watson). Leafroll at FPMS (Price).

Watson, Barney. 1992. Evaluation of Winegrape Maturity in Oregon. Chapter 28. Oregon Winegrape Grower's Guide. 4th Edition.

Watson, Barney. 1992. Current Topics in Wine Production Management, May 13, 1992. LaSells Stewart Center, OSU. A workshop focused on use of sulfur dioxide, wine microbiology, fermentation management, and the use of pure cultures of yeast and bacteria was attended by 65 industry members.

Watson, Barney. 1992. Recognition of Commercial Wine Defects, three seminars April 13, July 22, December 16, 1992. Presented to the Wine Advisory.

Watson, Barney. 1992. Board Wine Screening Panel at the Oregon State Department of Agriculture to train industry members to recognize commercial wine defects.

Watson, Barney and Steve Price. 1992. Anthocyanin content of Oregon Pinot noir fruit and wine: effects of vintage, fruit maturity and processing. Presented June 10, 1992. 3rd International Cool Climate Symposium, University of Mainz, Germany.

Wine Microbiology Workshop, August 15,1992. A workshop was co-organized in conjunction with the Northwest American Society of Enology and Viticulture annual meeting in Kelowna, British Columbia. Microbiological laboratory procedures and culturing techniques for wine yeast and bacteria were presented to 25 industry members from Oregon, Washington, and Canada.

Table 1. 1992 Microbial Screening of New Wines from Oregon

| Winery | Number Wines Screened | Number with *Lactobacillus sp.* | % |
|---|---|---|---|
| A | 18 | 7 | 39 |
| B | 10 | 8 | 80 |
| C | 26 | 2 | 8 |
| D | 11 | 5 | 45 |
| E | 6 | 0 | 0 |

## Viticulture Personnel Development and Extension

Steve Price, Department of Horticulture

## INTRODUCTION AND OBJECTIVES

There have been significant changes in personnel assignments in the OSU Viticulture program during the past year, resulting in shifts in assignments and responsibilities affecting both research and extension in viticulture. Some of these changes are temporary and the current Extension program in viticulture should be considered an interim program.

Porter Lombard retired in February 1992. He is still active in the program and has been a tremendous help in managing the new variety trial at the Southern Oregon Experiment Station. Since Porter's retirement I have been managing the viticulture research program at OSU. Much of my work load is unchanged but Porter's expertise and understanding of winegrapes in Oregon is sorely missed. The core research program has not changed but the lack of a professor-level position means that we do not have graduate students directly involved with our program. Dr. Pat Breen is currently serving as advisor for Glen Creasy and his grape nitrogen research program.

The viticulture position that was advertised a year ago is still on hold. It is likely to remain in limbo until a new department head of Horticulture is in place and the ramifications of the University's restructuring are apparent.

The new viticulture position will have an Extension assignment but in the meantime Extension responsibilities for grapes has shifted to my position. Bernadine Strik has taken on new research and administrative responsibilities at the North Willamette Experiment Station but she will continue her research program in grape phylloxera.

Both the Oregon Agriculture Experiment Station and the Extension Service have assisted our program during this interim period and have provided funds for activities in research and Extension that would not have been possible without their support. The Oregon Wine Advisory Board has provided both salary and program support that has been essential for the continued operation of the viticulture program. We are grateful for their long standing and continued support.

## EXTENSION ACTIVITIES

Funds provided by the Extension Service and the James K. Weatherspoon Foundation supported a ten day visit by Armond Kasamatis in July and August. Mr. Kasamatis visited twenty eight vineyards in the Willamette, Umpqua, and Rouge regions. Mr. Kasamatis was winegrape extension specialist at the University of California, Davis for many years and his experience and expertise was a valuable addition to our program. We would like to have Mr. Kasamatis return to Oregon this June for a similar visit.

Dr. David Jordan, federal viticulturist for New Zealand, came to Oregon on a similar visit in early September. His visit unfortunately coincided with harvest but he was able to visit twelve vineyards and assisted us with our research trials. Dr. Jordan was particularly helpful to us after his return to New Zealand in providing information on leafroll occurrence and spread in New Zealand (see Variety, Clone, and Rootstock report in this publication).

The Oregon Grape Pest Management Guide was revised in December and currently being reprinted. This publication should be a basic resource for all Oregon grape growers. It provides information on disease, insect, weed, and vertebrate pest management and has the most recent registered control options available to Oregon growers. In past years this publication was available at County Extension Offices or through the OSU Publications Office. However, only 70 were sold in 1992. To increase use of this valuable resource we have decided to send the publication to all Oregon commercial winegrape growers in 1993 free of charge.

A viticulture and enology Extension newsletter has been started in conjunction with the enology program. The first issue will be sent to all Oregon wineries and growers in February. The objective of this publication is to provide timely information on practical problems facing the Oregon wine industry as well as a place for announcements on university and industry events. We hope to get out three or four issues a year.

The Oregon Horticulture Society Annual meeting is one of the major informational events of the year for winegrape growers. This year, I served a secretary of the organizing committee and arranged for the visit of Steve Smith to talk on managing phylloxerated vineyards. His presentation and the publication in the proceedings will be useful to many growers as they start to deal with the realities of phylloxera.

As part of an effort to expand the range of information available to Oregon winegrape growers we have decided to send the OWAB research progress reports to all Oregon growers. This publication is intended to outline the scope and range of OWAB funded winegrape research at OSU. Transfer of information from the University to industry is one of the objectives of the Extension Service. This publication should give more growers access to the research in progress at OSU and we hope it provides more channels for communications between the researchers and growers.

## FUNDING HISTORY

Oregon Wine Advisory Board support for a viticulture research assistant was initiated in 1983. WAB support in 1992-1993 for the project: Personnel Support in Viticulture was $22,250. This funding was matched by funds from the OSU Agricultural Experiment Station.

## Matching Support Funds for Extension Agent in Viticulture for Josephine County

Philip Van Buskirk
OSU Extension Jackson and Josephine County

### INTRODUCTION AND OBJECTIVES

For over 13 years there has been an area horticultural Extension agent available to assist winegrape growers in Jackson and Josephine Counties with production problems by conducting educational programs and applied research projects. While the salary for this position is paid by Oregon State University Extension, support funds which pay for travel expenses, office, office supplies, postage, secretary support, etc. are provided by the county in which the agent works, in this case Jackson and Josephine Counties. Beginning in 1991 after the passage of Proposition 5, support funds for this position and others were cut from the Josephine County budget, leaving the county without an Extension agent to assist the wine industry.

In 1991, with the assistance of members of the Rogue Chapter of the Oregon Winegrowers Association, an agreement was made with Josephine County Commissioners which stated: if Josephine County winegrape growers could provide $1,500 of the estimated $3,000 needed to support Extension winegrape activities, the county would match that amount. A request was made to the Oregon Wine Advisory Board for assistance and the board has provided a grant in the amount of $1,500 to support winegrape extension activities beginning in 1991-92 and again in 1992-93.

Through this project matching funds are provided for an area Extension agent to conduct educational programs, applied research, and grower support in viticulture for residents of Josephine County. The majority of the funds will be used for travel and related expenses.

### RESULTS AND DISCUSSION:

One-on-one support for Josephine County winegrape growers continues to be provided by area OSU Extension agent. Information provided includes pest identification and management, fertilization, soil sampling, rootstocks, vineyard economics, phylloxera update, training, and site selection.

Black vine weevil, cutworm, and thrips populations were monitored on a weekly or biweekly basis in one Cave Junction vineyard during 1992. A better understanding of insect development, chemical control, and timing of applications was achieved, but research needs to be continued for at least another one to two years. With the assistance of the Oregon Department of Agriculture and Dr. Glenn Fisher at OSU, winegrape growers will now find

"dimethoate" listed in the 1993 Oregon Vineyard Pest Management Guide for control of thrips on winegrapes.

Cooperative educational programs with the Rogue Chapter of the Oregon Wine Growers Association continue to be conducted in Grants Pass and Medford, Oregon. Programs conducted during 1992: February, Private Pesticide Applicator Re-certification Training (Core A and B); May, Vineyard Nutrition; July, Oregon's Phylloxera Infestation; August, Southern Oregon Vineyard Tour; September, Nematodes and Your Vineyard.

**Funding History**

| | | |
|---|---|---|
| Year Initiated: | 1991-92 | $1000 |
| | 1992-93 | $1500 |