OSU Wine and Grape Research and Extension Newsletter

July 2009 http://wine.oregonstate.edu

In this issue:

- Emergency Quarantine: Vine Mealybug in Grape
- Got Mildew?
- Being Burned by Cold
- Winery Sanitation
- Basic Grape Research Program at OSU
- Vine nutrition and extraction parameters can influence winegrape YAN
- Upcoming Events

Contact Information

Patty Skinkis, Ph.D.
Viticulture Extension Specialist
Oregon State University
Dept. of Horticulture
541-737-1411
skinkisp@hort.oregonstate.edu

Emergency Quarantine Becomes Effective for Vine Mealybug in Grape

Dr. Patty Skinkis, Viticulture Extension Specialist, OSU

After a year of contemplation, discussions and meetings between industry, Oregon Wine Board, Oregon Department of Agriculture and Oregon State University Extension/ research faculty, an emergency quarantine has been put into effect for Vine Mealybugs (*Planococcus ficus*) on all grapes effective July 24, 2009.

This is an extension to the already existing grape quarantine that restricts the movement of diseased and insect-infested plant materials from outside of the state. This new emergency quarantine specifically restricts the movement of all vine parts, including harvested fruit, that may be infested with vine mealybugs from areas known to have vine mealybug such as California unless necessary precautions are taken. The permanent grape quarantine already in place did not require specific handling or quarantine of fruit. The full details can be read in the emergency quarantine available on the OSU Viticulture & Enology website or by clicking here.

This concern over vine mealybug was heightened recently as California has seen a high rate of spread of the grapevine virus grape leafroll associated viruses, a complex of a number of viruses that lead to a lack of fruit ripening and vine health. The vine mealybug and other mealybug species and scale insects can carry the virus from diseased vines and infect healthy plants. Vine mealybug has not yet been found in Oregon, and the industry is poised to keep it that way.

One of the reasons that we may not have vine mealybug or more insect pests of concern in Oregon may be due to the grape quarantine that is already enforced by the Oregon Department of Agriculture. Nurseries outside of Oregon must already abide by the quarantine, which requires them to take steps to eradicate any insect pests, provide disease free materials and include a phytosanitation certificate before shipping into the state. To view the main grape quarantine, see http://oregon.gov/ODA/PLANT/quarantines_index.shtml. The new emergency quarantine, which has a lifespan of 90 days, focuses on fruit movement through harvest 2009, until more permanent modifications are made to the current quarantine.

OSU and USDA researchers discuss with industry the impacts, signs and symptoms of grapevine leafroll virus and mealybug vectors at the southern Oregon vineyard tour held last week.

OSU Wine and Grape Research and Extension Newsletter

July 2009 http://wine.oregonstate.edu

In the meantime, a state-wide trapping and survey study is being conducted to determine if vineyards have vine mealybug. Traps were sent out in mid-July to collaborating vineyard sites. These traps, developed and donated by Suterra, produce a pheromone lure that attracts and traps male vine mealybug and will give an indication of incidence of the pest throughout Oregon. Dr. Vaughn Walton is working with OSU colleagues state-wide on this trapping survey for vine mealybug with grant funds from the USDA and Northwest Center for Small Fruits Research. Instructional documents for scouting and management of mealybugs are currently under development by OSU Viticulture Extension and will be released before harvest 2009.

For more information on vine mealybug, please see the following resources online:

- Field Monitoring for Grapevine Leafroll Virus and Mealybug in Pacific Northwest Vineyards http://wine.oregonstate.edu/publications
- Vine Mealybug: What you should know http://anrcatalog.ucdavis.edu/pdf/8152.pdf
- Mealybug in California Vineyards http://anrcatalog.ucdavis.edu/InsectMiteMolluscPests/21612.aspx

Got Mildew?

Dr. Jay W. Pscheidt, OSU Plant Pathology Specialist

This season has been a very favorable year for the development of powdery mildew. This is a difficult fungus to manage because if you are successful you will not see the disease. However, years like this test your management programs and quickly show any deficiencies. Once you get powdery mildew, it is an uphill battle -- one that takes a slightly different approach. This is for those of you who have found the disease and are wondering what to do differently.

First you must understand a little biology. Once a plant part becomes sick or infected, there is no way to make it healthy. Deformed leaves, blotches on the canes, small or split berries in a cluster will never become normal again. There is no spray to make the affected plant part better again. If feasible, consider dropping infected clusters. Most powdery mildew sprays keep healthy tissue healthy and work best before the disease gets started.

All green portions of the grape vine can become infected by this fungus. This includes suckers, vines growing above or below your spray coverage, wild vines growing in the woods or unprotected or unsprayed vines decoratively growing next to the tasting room.

Thorough coverage of these green tissues is critical to disease management. Alternately, poor coverage might be one reason you have powdery mildew in that overly vigorous section of your vineyard. In 1883, Millardet applied Bordeaux mixture to control downy mildew by dipping a whisk broom in the solution and shaking it on to the vine. As you can imagine, coverage was poor. He sprayed it on the next year with success, and we have been spraying fungicides ever since. Over the last 126 years we have figured out several ways to get good coverage.

You have heard it before to check your spray coverage and calibration, but now that you have powdery mildew showing up in the vineyard it's time to double check. Calibrate the sprayer, change worn nozzles, slow down the tractor (especially for those vigorous areas), increase the gallons of solution per acre, shorten spray intervals and spray every row. Take caution—do not use more material per acre than is allowed by the label. Slowing down and/or using more water per acre could put you over the per acre rate. That is, put the same amount of material on per acre but with more water. While this is a more dilute solution, you will get much better coverage of your vines!

Actually evaluate spray coverage in your vineyard. To do this, obtain water- or oil-sensitive papers and put them on your vines before you spray. Purchase an ample supply and place them in various positions on the outside and interior of the canopy:

- top of leaves
- underside of leaves
- in front of clusters
- behind clusters
- roll up the cards to simulate a stem or cluster
- insert them directly into clusters

Be sure to place these papers in those vigorous vineyard areas. Once all papers are in place, apply your spray and assess coverage and adjust accordingly. Just for fun try some alternate row spraying and see how poor the coverage is in the row that you do not go down! It is amazing how all that misty blow-through you see going into the next row(s) covers the vine so poorly.

Leaf removal, hedging and sticking to your training system will all help get better spray coverage and control. Consider an alternate training system for those pesky vigorous areas, such as one that will reduce vigor naturally rather than requiring repetitive hedging and canopy manipulation. In the busy times, one can fall behind on specific management needs for those areas allowing a window of opportunity for powdery mildew to infect those areas.

Keep spraying for the disease but it is time to reevaluate your fungicide choices. Do not use bicarbonates! The hype is that they will eradicate the disease from the vine. Sorry, but if you have so much powdery mildew that you can see it, these chemistries will not hold up to our disease pressure and you will be sorely disappointed.

However, do use oils as they will shut down sporulation in those established colonies but only if you get them covered well. Watch spray intervals with oils if you are also using sulfur as the combination can burn foliage.

With an active powdery mildew infestation do not use group 3, 11 or 13 fungicides as you will only encourage the development of resistance. Fungicide resistance could be a possible reason for your powdery mildew problem, but by rotating the materials based on groups and limiting their use to critical times, such as full bloom, you can minimize this development.

Timely canopy management, attention to spray application details, increased gallons per acre (not rate per acre) and fungicide choice should help minimize the damage and get you back on track next year. Good luck and call anytime if you have questions or comments.

OSU Wine and Grape Research and Extension Newsletter

July 2009 http://wine.oregonstate.edu

Being Burned by Cold in the Vineyard

Patty Skinkis, Ph.D., OSU Viticulture Extension Specialist

During the heat of summer, low temperature effect on grapevines is probably the furthest from your mind. It is easy to forget that we are managing not only the current season's fruit on the vine but also that of next year's crop in the newly formed buds. These buds can fall victim to early fall frosts, severe winter temperatures and spring frost damage as they make their arduous venture into next growing season. Steps can be taken in vineyards, young and old, during the season to ensure the most adequate cold acclimation this year to make the path to spring less of a risk in face of potentially damaging frost or freeze events. Also, it is during this time mid-season that frost-affected vines require some special management for return production capacity in coming years.

Poor growth has been observed this season across some areas of the state due to previous freeze and cold damage. Not all cold temperatures are created equal and depend on many factors including the stage of dormancy or growth of the vine, vine health, temperature severity and duration. Frost or freeze damage occurs when there is cellular damage to tissues due to below freezing temperatures (<32°F) either during the growing season or dormant period. On the other hand, "cold effects" relates to altered physiological response of grapevines to air temperatures above freezing but at a biologically inhibitory temperature during the growing season. It is the impacts of freeze damage that can be detrimental to vineyard productivity and may require remediation during the growing season. Cold effects on growth are usually temporary and do not cause damage as serious as freeze events but can cause growth distortion.

Freeze Damage

Although the 2008 season ended with a relatively long ripening period with delayed rains and cold weather for most of the state's grape growing regions, some areas experienced an abrupt end to the ripening period in mid-October. Vineyards damaged by frost were in areas of the Rogue, Applegate and Illinois Valleys of southern Oregon, low-lying areas of the Willamette Valley and areas of the Columbia Gorge during October 11-13. Temperatures in most of these locations dipped as low as 23-25°F and were under 31°F for more than several hours, depending on location.

Temperatures this low are able to damage tissues such as leaves, shoots and buds since the vines were not acclimated adequately for these temperatures and not yet in deep dormancy. For most vineyards, the canopy was still green and had not been harvested. The most immediately observed symptom was canopy damage followed by leaf abscission, thereby removing the source of sugar production for the fruit and did not allowing the vine to re-harvest nutrients from the leaves before abscission. This could translate to reduced nutrient reserves as well as carbohydrate reserves during the spring 2009.

Bud damage could also have occurred in fall 2008 frost event. As the vine advances through ripening and post-harvest, the cells of buds and tissues acclimate further for winter, being able to withstand colder temperatures as winter approaches. The maximum cold hardiness is not reached until some time during mid-winter (Davenport et al., 2008; Mills et al., 2006). Although the climate in Oregon winters are moderate enough that low winter temperatures are not usually a problem for vineyards, the cold temperatures in mid-December 2008 may have caused some bud damage throughout the state. Some areas experienced several days with minimum temperatures in the range of 12-18°F. While this is normally not detrimental to most *Vitis vinifera* grapevine buds in mid-winter, vines that were damaged in the fall or were not adequately acclimated may be more susceptible to bud and tissue damage at these temperatures.

The stage of dormancy is the most important component of bud survival during cold temperature events. One of the most obvious signs of the onset of deep dormancy (endodormancy) is lignification of the shoot. This is when the tissues change from green to woody and brown. However, this is not an indicator that the buds or tissues are completely in the deep dormant state. Buds acclimate and go into dormancy based on their position along the shoot (from basal buds upward), so the oldest buds are first to acclimate. Those buds on new growth are the least tolerant to cold temperatures. Vines that are damaged during fall freeze events or colder than usual winter temperatures, result in loss of whole buds or portions of the compound bud at nodes of grapevines. When this occurs, lack of bud break or emergence of secondary or tertiary shoots is common the following spring due to primary bud damage. These shoots emerge from buds that have few to no cluster primordia and yield reductions can be significant.

Once green growth is exposed and growing after bud break, the tissues are easily damaged by freezing temperatures. Research conducted at OSU in the late 80's indicates that the LD50 of grape buds and early growth stages after bud break were impacted by low temperatures. Gardea et al (1988) reported that buds at swell and bud break had LD50 of 26.6 and 28°F, respectively. Also, at the stages of 1 to 2 leaves unfolded, Pinot noir had LD50 of 28-29°F. These temperatures can damage shoot apical meristems (shoot tips) and leaf tissue causing shoot growth to cease and emergence of secondary or tertiary shoots (Figure 1). A widespread April freeze occurred for a period of days in the Midwestern and Eastern US in 2007, reducing yields by 50-70% in nearly all winegrape vineyards that year (Warmund et al., 2008) and most crop was held by secondary shoots that emerged.

Figure 1. A damaged primary shoot in spring is shown on the right, next to a newly emerged secondary shoot (left). May 2009.

Vineyards with frost damage can have the following symptomology:

- Uneven bud break and buds that do not break in spring due to bud damage following fall or winter freeze events.
- Loss of primary shoot growth due to damaged primary bud or shoot tip damage during a spring frost event.
- Delayed growth and shorter shoots early season due to growth

of secondary shoots.
- Necrotic leaf, shoot tip and stem tissues with brown-black, dried appearance visible shortly after a frost event.
- Yield reduction.
- Lack of vine vigor.
- Crown gall development and/or damage to conductive tissues (xylem and phloem) if freeze temperatures are severe enough. These both can lead to problems with movement of water and nutrients through the vine.

By this time in the middle of the season, vineyards affected by freeze damage are likely observing shorter shoots of secondary or tertiary shoot growth and low vigor. This is a concern as it may prevent adequate carbohydrate production to ripen the grapes as well as replenish the carbohydrate reserves for growth the following season. Steps need to be taken to ensure a healthy vine: avoid water stress through irrigation and removal of any weed/vegetation competition that may exist, fertilize as needed to early season to maintain a healthy canopy, and remove crop as necessary. If vines remain in very low vigor throughout the season (identified most readily as shoots not reaching the top canopy wire in VSP-trained vines), there can be a deficit of carbohydrates. This may affect the fruitfulness of buds for next season by reducing flower primordia development within. Furthermore, a lack of carbohydrates when entering next growing season will perpetuate weak growth and delayed development. This is a cycle that needs to be broken in the current growing season and may need additional growing seasons of careful management to regain full productivity.

Depending on the status of the vine health and acclimation at the time of freeze, crown gall can be a concern. Tissues that freeze and experience damage to their xylem or phloem, such as canes, cordons and trunks, can initiate crown gall growth. The best time to observe vineyard symptomology of crown gall is during the spring and early summer when new gall growth occurs. It is a creamy whitish green cauliflower-like growth noticed along cracks or crevices that will turn brown in color during later summer and into fall. Incidences of crown gall are quite common in eastern and southern Oregon where freeze events are more prevalent. For more information on crown gall and this past winter's temperatures, please refer to the December 2008 vineyard notes: http://wine.oregonstate.edu/files/files/December%202008%20Vineyard%20Notes-%20Cold%20Temperatures.pdf.

Although weather cannot be controlled, steps can be taken to protect vineyards from frost events and help vines acclimate for winter adequately to reduce the risk of damage. The process of the vine going into dormancy is regulated by plant physiology and environment (photoperiod and temperature), so we have some limitations on our ability to significantly influence this process. However, any vineyard practice that delays the acclimation of tissues and onset of dormancy can put a vineyard at risk of damage, even during a relatively normal winter.

- Refrain from practices during late summer/fall that initiate new flushes of growth as this new growth will have little time to acclimate properly.
- Prevent over-cropping vines; excessive crop loads can decrease storage reserves of carbohydrates and development of buds.
- High vigor vines do not acclimate as well as moderate or lower vigor vines; allow for management practices that reduce vigor but do not weaken the vines.
- Use proper integrated pest management and keep vines healthy.

Some practices that were once thought to cause significant reductions in cold hardiness were nitrogen fertilization late season and delayed harvests. However, research indicates that these two practices will not decrease cold acclimation and dormancy of grapevines if the vineyard is being managed properly (Wample and Bary, 1992; Wample et al., 1993). If however, a vineyard has had declining vigor due to insects, disease, water stress or nutrients, the impacts could be different.

Figure 2. Frost damage is often variable along the length of vine. As shown above, one node exhibits frost damage while the next node is producing an apparently healthy shoot. May 2009.

Cold Growth Responses

Cold weather during the growing season is different than the freeze damage mentioned previously, but it can have a significant impact on delaying growth. It is generally known that biological activity in plant cells slows with temperatures below 50°F, including photosynthetic rates. This is one of the reasons why this is the threshold temperature for growing degree day (GDDs) calculations. Cold nights (41-50°F) have been found to reduce photosynthetic rates significantly with growth responses similar to water stressed vines (Flexas et al., 1999), indicating the inhibitory effect of cold air temperatures. With a lack of sufficient water movement there can be poor hormone, carbohydrate and nutrient movement from the roots to the shoots, which can cause stunted and chlorotic growth patterns on vines. This slowed growth has been observed regularly during springs in the Willamette Valley in comparison to areas of southern and eastern Oregon that warm up more rapidly in spring. These symptoms are temporary, and once temperatures increase, the growth is able to resume at normal rates.

In the end, grapevines are miraculous plants that are quite rugged. They have an insurance policy in compound buds, providing for growth even if the primary buds or shoots are damaged. New vascular tissue can be grown if killed by freeze events. However, both of these take some careful management in the following growing season. This often means vines will not be an

outstanding performer and carry a consistent crop when they are devigorated by frost damage. Furthermore, if you experience weak spring growth coupled with cool spring temperatures, do not panic as the vine will resume normal growth and development as the season warms up, if adequate management practices are in place.

Literature Cited

Davenport, J.R., M. Keller, and L.J. Mills. 2008. How Cold Can You Go? Frost and Winter Protection for Grape. HortSci. 43: 1966-1969.

Flexas, J., M. Badger, W.S. Chow, H. Medrano, and C.B. Osmond. 1999. Analysis of the Relative Increase in Photosynthetic O2 Uptake When Photosynthesis in Grapevine Leaves Is Inhibited following Low Night Temperatures and/or Water Stress. Plant Phys. 121: 675-684.

Mills, L.J., J.C. Ferguson, and M. Keller. 2006. Cold-Hardiness Evaluation of Grapevine Buds and Cane Tissues. Am. J. Enol. Vitic. 57: 194-200.

Wample, R.L.and A. Bary. 1992. Harvest Date as a Factor in Carbohydrate Storage and Cold Hardiness of Cabernet Sauvignon Grapevines. J. Amer. Soc. Hort. Sci. 117: 32-36.

Wample, R.L., S.E. Spayd, R.G. Evans, and R.G. Stevens. 1993. Nitrogen Fertilization of White Riesling Grapes in Washington: Nitrogen Seasonal Effects on Bud Cold Hardiness and Carbohydrate Reserves. Am. J. Enol. Vitic. 44: 159-167.

Warmund, M.R., P. Guinan, and G. Fernandez. 2008. Temperatures and Cold Damage to Small Fruit Crops Across the Eastern United States Associated with the April 2007 Freeze. HortSci. 43: 1643-1647.

Winery Sanitation

Dr. James Osborne, OSU Enology Extension Specialist

As we head towards another harvest, it is important to review your winery sanitation practices and have a well organized and effective plan in place before the grapes arrive at the crush pad. By reviewing your sanitation practices (I hope you have some!) and making adjustments where necessary, you can save time and money in the long run. An effective sanitization program will minimize the risks of contaminating wines with spoilage microorganisms and may also allow you to reduce interventions such as additions of SO_2 and filtration.

The sanitation process begins with rigorous cleaning. Cleaning refers to the physical removal of organic matter, debris, or minerals from a surface. Proper cleaning is critical to a successful sanitization program as excess organic matter will greatly reduce the effectiveness of most sanitizing agents. Cleaning can be achieved manually or by mechanical cleaning systems such as tank or barrel washers. However, before you begin cleaning it is important to address the quality of your water. Water should be potable, have no discernable odors and aromas, and be free from suspended particles. Hard water (containing large amounts of calcium, magnesium, and other alkali metals) reduces the effectiveness of detergents and a water softening system may have to be considered in this case. Some detergents may contain water softening agents but it may be more cost effective to invest in a water softening system.

With cleaning the key is to always 'clean before and clean after' to prevent build up of caked on material. High pressure water without the addition of chemicals can be useful to remove buildups of organic matter. Warm water is recommended but not hot water as this may 'bake on' the organic matter. After the majority of debris has been removed cleaning with a chemical agent will help solubilize any remaining film or mineral buildups. There are a number of detergents available and each has its own unique specifications so it is important to talk to specific suppliers about their proper use as well as safety considerations. Alkali based detergents are most widely used in the wine industry. These remove protein and fats and include caustics such as NaOH (caustic soda) and KOH (potash). An alternative to these is sodium carbonate but this may cause precipitation buildup when used in hard water. Acids such as phosphoric acid are often part of detergent formulation and these solubilize minerals. Finally, a surfactant may be used. These help to suspend particles and microorganisms making them easier to remove from a surface. Once cleaning has been performed it is important to thoroughly rinse the surfaces to remove any residual chemicals. A mild acid rinse, such as citric acid, may be used to neutralize any alkali residues otherwise hot or cold water is sufficient.

The next step after cleaning is sanitization. Sanitization refers to reducing viable cells populations to acceptable low numbers. It is not the same as sterilization as sterilization infers the elimination of 100% of the viable microorganisms. In a winery setting we are almost always dealing with sanitization rather than sterilization, the one exception being sterile filtration prior to bottling. Before the use of any sanitizer the winemaker should ensure that any chemicals used in sanitation program are approved for use in a winery and their intended-use concentrations. In addition, it is very important to follow recommendations from suppliers regarding their use and concentrations. For example, the combination of some sanitizing or cleaning agents can result in the production of toxic fumes.

A common sanitizer used in the wine industry is acidulated SO_2. SO_2 is effective against most wine microorganisms but is highly dependant on pH. Therefore, SO_2 is used as an acidulated solution where citric acid has been added. For example, a 100 mg/l SO_2 solution would be prepared in combination with 3 g/L citric acid. SO_2 is a volatile, toxic compound and should be prepared in cold water rather than hot water to minimize volatilization. It should always be used in a well ventilated area and direct inhalation or contact should be avoided. Chlorine based sanitizers were once used widely and are very effective sanitizing agents. However, concern over the use of chlorinated sanitizers and the formation of 2, 4, 6-trichloroanisole (TCA) has lead to the recommendation to eliminate chlorine use in the winery.

There are a number of other sanitizing agents that can replace chlorinated sanitizers in the winery; however, each has their benefits and limitations. These include quaternary ammonium compounds (QUATS), iodophores, and peroxides. QUATS are effective against yeast and Gram + bacteria in wine but are less effective against Acetobacter with typical application levels of 200 to 400 mg/l being used depending on the application. In a winery, QUATS are useful for controlling mold growth on, walls, floors, and in drains but do

require long contact times to be effective. Iodophores (a mixture of iodine and acid) are widely used in other food industries and are easy to use with a broad spectrum. However, they may foam excessively, are expensive, and there are concerns over residual flavor and/or aromas. Organic matter inactivates iodine so it is important to properly clean surfaces before using iodophores. Peroxide based sanitizers include hydrogen peroxide (H_2O_2), sodium percarbonate, and peroxyacetic acid (PAA). H_2O_2 has limited uses in the winery as it has a very short shelf life during storage due to chemical decomposition. It may be used to remove excess SO_2 from a wine but this practice must be undertaken with much caution as H_2O_2 can result in oxidation problems. A more stable peroxide based sanitizer is sodium percarbonate (Proxycarb™). This compound is widely used to treat barrels contaminated with microorganisms and/or to neutralize off odors. Finally, PAA is a highly reactive oxidant that is being used with increased frequency in wineries. This compound is a very effective sanitizer, is biodegradable, has wide spectrum activity, and has minimal corrosive properties. However, special training and handling is required when using it in its concentrated form (40% w/v) and PAA is expensive relative to some other sanitizers. Regardless of what sanitizing agent you choose, it may be useful to rotate sanitizers (at least two different classes) on a weekly basis to prevent build up of microorganisms that are not sensitive to a selected sanitizer.

side from chemical sanitizing agents, hot water and steam have also been used effectively as sanitizers. Both have excellent penetrative properties, are relatively cheap to produce, are non-corrosive, and are effective against all wine microorganisms. Hot water must be > 82°C/180°F and is must be applied for at least 20 minutes to be effective. Hot water is often used to sanitize bottling lines, barrels, clean-in-place systems, and stainless steel tanks. Disadvantages of using hot water and/or steam include the high energy costs and water usage.

A sanitizer that is being increasingly adopted in the wine industry is ozone (O3). This strong oxidizer is very unstable and rapidly degrades to O2. This means it cannot be stored and must be generated when needed. Ozone is dissolved in water and commonly used for barrel cleaning and sanitation, tank cleaning and sanitation, clean-in-place systems, and general surface sanitation. Special equipment is required to generate and use ozone and portable ozone generators are often used in wineries. While ozone is very effective against a broad spectrum of wine microorganisms, it does not have any residual activity and special training is required before it can be safely utilized in a winery. In addition, ozone will rapidly react with any organic material so surfaces/barrels must be thoroughly cleaned before using ozone.

Understanding the critical places in the winery where cleaning and sanitizing is required as well as the stages of winemaking where it is important is vital to an effective sanitation program. There are many places in a winery that can be difficult to clean and sanitize and care must be taken to ensure that these areas are not neglected. Areas of particular concern are picking bins, crusher/destemmer, press, hard lines (especially elbows), floors and drains, barrel bungs, hoses and fittings, and the bottling line. Valves and fittings should be taken apart and cleaned to prevent build up of material and barrel bungs must also be regularly cleaned. Grape pomace should be promptly removed from the winery and not kept close by. Fruit flies will quickly become a problem if pomace is left lying around and these may spread acetic acid bacteria (AAB) that will be growing in the pomace. AAB growth can produce large amounts of acetic acid, acetaldehyde, and ethyl acetate, all compounds that can cause spoilage of a wine.

An effective cleaning and sanitation program should greatly reduce the number of microorganisms in the winery and on equipment. However, because of residual microbial populations, verification of the effectiveness of the sanitation program becomes critical. It is important to know whether the program you are following is effective. This is usually achieved through some type of sampling and monitoring. Initially this may mean a quick sensory evaluation of surfaces. Does it look clean? Are there any off odors? Are there any slippery surfaces? For some areas this may be sufficient and indicate that more thorough cleaning and sanitizing is required. But for other more critical areas, such as the bottling line, more in depth testing may be required. This could include swabbing a surface followed by culturing or may mean using more advanced tests such as the use of bioluminescence to detect ATP. Here, a swab is taken and the sample is reacted with specific reagents. The technique utilizes the luciferen-luciferase assay where the reaction of ATP with the enzyme and luciferin results in light being emitted that can be measured by a light meter. An estimation of viable cell numbers is possible as a higher population of microorganisms should result in more ATP being present. Kits are available that include a light meter, swabs, and reagents.

Finally, and perhaps most importantly, a winery should develop specific cleaning and sanitization schedules as well as standard operating procedures (SOPs). These will ensure that set cleaning and sanitization procedures are identified as well as the methods that will be used and the timing of such procedures. Documentation to verify that cleaning and sanitization has occurred must also be prepared. A standard form may be prepared that clearly describes the cleaning and sanitization procedure and requires a signature or initials to document that the procedure was performed. This documentation also allows assessment of the frequency that each procedure is being performed as well as the chemicals that have been used. Data should be collected for future reference especially if a problem arises.

Literature cited

Coggan, M. 2003. Ozone in wineries. Part I. Vineyard Winery Managem. 29:33-43.

Fugelsang, K.C. and C.G. Edwards. 2007. Wine Microbiology. 2nd ed. Springer Science, New York.

Pena-Neira, A., B. Fernandez de Simon, M.C. Garcia-Vallejo, T. Hernandez, E. Cadahia, and J.A. Suarez. 2000. Presence of cork-taint responsible for compounds in wines and their stoppers. Eur. Food Res. Tech. 211:257-261.

Sefton, M.A., and R.F. Simpson. 2005. Compounds causing cork taint and the factors affecting their transfer from natural cork closures to wine - a review. Aust. J. Grape Wine Res. 11:226-240.

Zoecklein, B.W., K.C. Fugelsang, B.H. Gump, and F.S. Nury. 1999. Wine Analysis and Production. Chapman and Hall, New York.

OSU Wine and Grape Research and Extension Newsletter

July 2009 http://wine.oregonstate.edu

Basic Grape Research Program at OSU

Laurent Deluc, Ph.D., OSU Grape Researcher

Soon after I received my B.S. at the University of Bordeaux (France), I decided to improve my expertise in plant chemistry and science. For my graduate studies, I received an M.S. at the University of Nancy I (France), working on the potential utilization of fatty acids composition as taxonomic tools to classify phylogenetically gymnosperm seeds. Later, I joined Dr. Said Hamdi's team at the University of Bordeaux to complete a PhD project that dealt with the identification of two regulatory genes associated with phenolic compound biosynthesis in grape throughout berry development.

In 2004, upon completing my PhD, I was offered a post-doctoral research associate position at the University of Nevada, Reno in the Dr. Cushman Lab in strong collaboration with Dr. Cramer working on transcriptomic studies on grape berry development and under water deficit conditions over two genotypes (Cabernet Sauvignon and Chardonnay). The aim of these two studies was to identify new candidate genes associated with the grape berry development and the transcriptional response of the grape berry undergoing abiotic stress that may have an impact on grape quality. In late 2006, I joined Dr. Cramer's team for a second post-doctoral research associate position in the same University on grape bud dormancy. I performed proteomic and metabolomic studies in order to unravel molecular mechanisms associated with bud endodormancy in grapevines.

In June, I began as a member of the viticulture faculty at Oregon State University. As a researcher, I will be developing a basic research program in two scientific fields important to Oregon wine growers. The first will involve how genetics can influence development of the individual grape berry and therefore grape quality. The second will be more focused on how grape plants respond to environmental stresses such as drought, heat, and cold and how rootstocks interact with scions and eventually affect the wine-grape quality. As required by appointment, I will be working closely with the Oregon wine industry in order to help identify research needs and to communicate scientific results. I will also be working with other scientists in related fields as well as with colleagues at the U.S. Department of Agriculture. I am very excited to be at OSU to share my expertise with other colleagues.

Vine nutrition and extraction parameters can influence winegrape YAN

Jungmin Lee, Ph.D., Food Technologist
USDA-ARS Horticulture Crops Research Unit

Working alongside Paul Schreiner, the initial portion of our work examines how altered vine nutrient regimes and sample preparation methods influence 'Pinot noir' grape nitrogen (N) content and composition. Presently, we are focusing on ammonia and free amino acids, which can be recalculated as YAN (yeast assimilable N); an important value often measured at the winery and adjusted for a healthy fermentation.

'Pinot noir' berries of self rooted 'Pinot noir' clone FPS91 (Pommard) were obtained from a vine nutrition study which used reduced levels of each N, P, or K supplied to vines during 2006 and 2007. Details of the vineyard scheme and nutrient treatments can be found in the manuscript listed below. Berries were either juiced or exhaustively extracted as whole berries prior to chemical analysis.

Extracts, compared to juice samples, had a significantly higher level of ammonia-N, assimilable amino acid-N, and YAN. For example, juice YAN values were approximately 50% of extract YAN values, when both were expressed in the same units. Free amino acid profiles and relative concentrations of individual amino acids were different in juice versus extracts, depending on how well the skin fraction was extracted prior to analysis.

Lowering N supply reduced free amino acids, with arginine being reduced more than the other 20 free amino acids identified in 'Pinot noir' berries. This was true in both juice and extracts. Grape YAN was not affected by decreased P or K treatments. Berry skin contributed to actual YAN, and wineries that determine YAN from the pulp fraction (juice) may underestimate YAN, and as a result add more (artificial) supplemental N than is required for the healthy fermentation of red wine through whole berry fermentations.

Our results demonstrate that extraction procedure itself should be taken into consideration when determining grape YAN, and these findings emphasize the importance in unifying the extraction procedure when free amino acid profiles of grapes are compared. Caution should be given when evaluating YAN values in the literature that employ different methods. More reports are forthcoming.

If you would like to read more about the initial part of this work, please refer to the following publication and please visit the listed websites:

Lee, J. and Schreiner, R.P. 2010. Free amino acid profiles from 'Pinot noir' grapes are influenced by vine N-status and sample preparation method. Food Chem. In press. http://dx.doi.org/10.1016/j.foodchem.2009.06.045

To learn more about our individual research programs in winegrapes, see the following links:

- Jungmin Lee http://www.ars.usda.gov/pwa/hcrl/lee
- Paul Schreiner http://www.ars.usda.gov/pwa/hcrl/schreiner

If you would like to collaborate or obtain a copy of publications, feel free to contact us at jungmin.lee@ars.usda.gov (208-722-6701 ext 282) and paul.schreiner@ars.usda.gov (541-738-4084).

Upcoming OSU Extension Events

OSU Columbia Gorge Annual Vineyard Tour - Tuesday, August 11, 2009 - 9:00 AM – Noon
This is the annual diagnostic/discussion tour where growers have the opportunity to interact with industry members and researchers/Extension faculty from Oregon State University. Visits will be made to several vineyards in the Mosier area to discuss the following topics:

- Comparison of organic and conventional IPM - weed control, powdery mildew control
- Preventing and dealing with phylloxera
- Understanding leaf roll virus and mealy bugs and how to keep Oregon free of the pests
- Syrah decline
- Dealing with leafhoppers
- Unique management of non conventional sites

This event is FREE but registration is required. Upon registration, you will be provided with a map of visits and discussion topics. Click here for registration: http://hort.oregonstate.edu/ViticultureWorkshops