# OSU Wine and Grape Research and Extension Newsletter

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## Welcome to the April 2008 Newsletter!

**Beginning the 2008 Season…**

It appears that the spring weather we've been waiting for has finally arrived! Bud break is commencing, a week or so later than 2007 due to cold weather in most of Western Oregon. With the advent of the growing season, this edition of the OSU Wine and Grape Research and Extension Newsletter covers the topics of powdery mildew control and continuation of short shoot syndrome scouting. For those with interest in wine production (and consumption), the newsletter also covers the topic of biogenic amines.

The OSU Viticulture and Enology Extension Team has been busy the past few months. Faculty of the program including Jim Kennedy, James Osborne, Patty Skinkis and Vaughn Walton organized and moderated sessions in enology and viticulture and presented research at the Oregon Wine Industry Symposium in February where there was a record attendance of 750! Patty Skinkis launched the hybrid OSU Viticulture Lecture Series open to distance education for winter term 2008 and currently is conducting the spring 2008 Viticulture Lecture Series. In addition, a spring workshop on Vineyard Disease Management was organized by Patty Skinkis and Walt Mahaffee to focus on powdery mildew and botrytis that featured presentations by Wayne Wilcox of Cornell and Walt Mahaffee of USDA. On the enology front, James Osborne presented the Wine Filtration Workshop in late February and will be offering a microbial spoilage workshop in April. For future events, please check out the "Upcoming Events" section of the newsletter and check http://wine.oregonstate.edu for additional updates and information on events.

Here's to hoping for a successful 2008 growing season and vintage!

Cheers,

*~The OSU Winegrape Team*

## Hot Topics in Enology: Biogenic Amines

*James Osborne, Ph.D., Extension Enologist*

A group of compounds that has been receiving a lot of attention from wine researchers in the past 5 years or so are the biogenic amines. Biogenic amines are nitrogen based, low molecular weight compounds that can have undesirable physiological effects on humans when absorbed at too high a concentration. Symptoms can include nausea, reportorial discomfort, hot flushes, cold sweat, palpitations, headaches, red rash, high or low blood pressure. In addition, biogenic amines can have a sensory effect on wine with moderate to high levels decreasing the aroma intensity of red wines masking fruit notes.

Biogenic amines are primarily formed by the decarboxylation of amino acids with histamine being the most frequently found biogenic amine in wine and putrescine being found in the highest concentrations. The other major biogenic amines in wine are tyramine and cadaverine. These compounds can be produced at many steps during the winemaking process. During the alcoholic fermentation yeast can produce certain biogenic amines, primarily putrescine, but the major contributors of biogenic amines in wine are the lactic acid bacteria (LAB). It was thought that spoilage bacteria, mainly *Pediococcus* species, were solely responsible for biogenic amine production in wine. However, it has been recently shown that some *Oenococcus oeni* and *Lactobacillus* strains are able to produce histamine in wine. This has lead to the production of commercial malolactic cultures that do not contain amino acid decarboxylase and therefore do not produce biogenic amines. Malolactic fermentations performed by naturally present LAB may however cause an increase in the concentration of biogenic amines. Furthermore, higher concentrations of biogenic amines have been observed if wines remain in contact with yeast lees, probably due to the increased amount of peptides and free amino acids available for decarboxylation by LAB.

Other factors that can influence the biogenic amine content of a wine include variety, pH, $SO_2$, and nitrogen content of the grape must. In general, red wines show a larger concentration of biogenic amines than white or rosé and this is primarily due to differences

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in winemaking. In particular, higher levels were found in red wines that had undergone an extended maceration post-fermentation. This is probably due to the increased extraction of amino acids into the wine. Other conditions such as pH and $SO_2$ mainly effect the growth of biogenic producing bacteria such as *Pediococcus*. Overall, most factors that impact the formation of biogenic amines influence either the amino acid content of the must/wine or the growth of biogenic amine producing microorganisms.

Given that, at present, the concentrations of biogenic amines that cause toxic effects are not well established, it is difficult to set concrete limits on their presence in wine. In fact, the presence of biogenic amines in wines is currently not regulated but certain countries have recommended maximum limits with regard to histamine levels. Because of their potential health implications, wines with high concentrations may be rejected from some markets. The level of biogenic amines in most wines is usually well below the suggested regulatory level of 10 mg/L of histamine. However this concentration can easily be exceeded in wines that have had any significant growth of spoilage bacteria such as *Pediococcus*. Therefore, it is best to be aware of the potential problems these compounds could cause and care should be taken to minimize their production during winemaking.

There are some practices that might permit winemakers to reduce the accumulation of biogenic amines in wine. pH management in wine is one of the most important parameters, since a pH of above 3.5 promotes the growth of *Lactobacillus* and *Pediococcus* and the initial numbers on grapes may also be higher. In addition, spontaneous MLFs have the potential to have higher levels than when MLF starter cultures are being used. Reducing the amount of skin contact and lees contact may also reduce biogenic amine production. And of course, controlling the growth of spoilage microorganisms is paramount. Many of these management options will only need to be applied if you are seeing elevated levels of biogenic amines in your wines. Good sound cellar practices such as pH and $SO_2$ management should prevent accumulation of these potentially problematic compounds.

**References used:**

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## Facing the Challenge of Powdery Mildew

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

During Oregon's 2007 harvest, 423 tons of winegrapes were lost due to disease which was nearly a three-fold greater loss than in 2006 (NASS 2008). Powdery mildew and botrytis were the major culprits to the diseased fruit after a particularly difficult growing season in 2007. In particular, the pressures were most pronounced for the Willamette Valley while Southern Oregon, Columbia Gorge and Eastern Oregon grape growing regions were not significantly higher in their disease pressures in 2007. Despite the location in Oregon, powdery mildew (*Erisyphe necator*) remains the most important fungal pathogen for grapevines.

The importance of the damages in 2007 warranted a one-day workshop featuring powdery mildew research and control options. OSU Viticulture Extension presented "Vineyard Disease Management Workshop: A Closer Look at Powdery Mildew and Botrytis" in March of this year. Invited speakers to this event were Dr. Wayne Wilcox, plant pathologist at Cornell University, Geneva, NY and Dr. Walt Mahaffee, research plant pathologist with the USDA-ARS Horticulture Research Unit, Corvallis, OR. Each provided information and research results on their studies with powdery mildew. The topics of the seminars were reinforced by an industry panel that discussed their disease management programs and the efficacy, successes and failures they have had with them. The take home message was that an adequate fungicide spray program and canopy management methods were needed to prevent infection throughout the entire growing season. Some of the key features of the conference are outline here.

**Susceptibility and Damage**

Powdery mildew can infect all green, growing parts of the grapevine and cause damage. The symptoms vary throughout the season as both the vines and fungal pathogen advance to different stages of development. In early spring, all growing tissues are highly susceptible to infection by powdery mildew. During this time, the grower must monitor the weather and grape phenology to determine when to apply fungicides. See the OSU Grape Pest Management Guide for 2008 for more information on spray programs (http://extension.oregonstate.edu/catalog/html/em/em8413-e/) or contact your local crop advisor. The potential for infection continues throughout the entire growing season from primary infection to secondary infection by conidia.

While all growing parts of the vine can be readily infected by powdery mildew, some organs are less prone at different times. The flowers and berries are highly susceptible to infection from flower formation through fruit set and until the berries reach 8° Brix. Newly formed and expanding leaves are most susceptible to infection with little new development on mature leaves. The rachis and pedicels of the fruit, petioles of the leaves, and shoots are susceptible throughout the entire season. Infected tissues result in a mycelial mat formatting on the epidermal layer of the various vine parts. The fungus feeds on the cells of the tissues to grow and reproduce. This results in visible white colonies. Infected berries often have a distinct scarring on the surface and may result in cracking. Besides general losses of fruit, infected clusters result in poor quality fruit and wines off aromas and bitterness (Ough and Berg 1979).

Throughout the growing season, newly formed buds can become infected, creating a source of innoculum for the following season. In severely infected vines, these buds grow out as flag shoots that have mycelial growth covering them in the following season. Therefore, it is important to ***prevent*** infection beginning early in the season so

that a viscous cycle of the disease doesn't perpetuate year after year.

The impacts of powdery mildew are detrimental to bud formation, shoot development and of course, berry quality. Commonly, vineyards with powdery mildew infections result in poor regrowth the following season. This is due to the reduced photosynthetic capacity of severely infected vines, resulting in low carbohydrate assimilation and storage that are needed for early season growth the following year (Nail and Howell 2005).

Powdery mildew, when not adequately controlled, can become an epidemic in the vineyard and contribute to infection of surrounding vineyards. Spores can be carried in the wind and can be particularly problematic for vineyards that lie downwind and in areas with many contiguous acres of vineyard. As more vineyard acreage is planted in close proximity to other vineyards, it is becoming an increasing concern regarding proper control of the epidemic.

**Forecasting the Disease**

Forecasting of the infection risk is necessary for development of an effective control program. This requires an understanding of the parameters required for sporulation, or release, of the fungal spores. There are two different forms of the spores produced by Erisyphe necator during its life cycle: ascospores and conidia. Fungal spores survive winters on the vine in a fruiting structure called a chasmothecia. This fruiting structure forms during late summer and overwiners on the vine. In spring, ascospores, the spores produced within fruiting bodies known as chasmothecia, are released when facilitated by precipitation, providing the primary innoculum for infection in spring (Pearson and Gadoury 1987). After the primary infection occurs, powdery mildew can form secondary infections by releasing conidia, asexually produced spores. The production and release of these spores follows temperature and environmental conditions that allow forecasting to be developed for pathogen control.

There are several forecasting models that are used by growers to determine when an infection period has occurred which warrants the application of a fungicide spray. One of these, the Pearson-Gadoury Model, forecasts ascospore release at an average daily temperature of 50°F and 0.10" rain. In general, release of ascospores requires precipitation or other form of water for germination and infection. Another model commonly used throughout California and the Pacific Northwest is the Gubler-Thomas Model which forecasts sporulation and potential infection using leaf wetness hours and temperature. It projects disease development with a minimum of 6 hours leaf wetness at temperatures between 43-90°F. Other powdery mildew forecasting models have been developed and are being validated for use in different regions. The Gubler-Thomas Model, for example, was developed for use in California but may not be best suited for all regions. Currently, Walt Mahaffee, suggests that the Pearson-Gadoury Model is best suited for Western Oregon.

While rainfall is needed to facilitate release and spread of ascospores during bud break and early shoot growth, rainfall is not a promoting factor of conidia spore release. Temperature is the most critical factor determining infection risk when considering conidia spore release (43-90°F). In general, temperatures over 95°F are detrimental to spore survival on tissue surfaces. Care must be taken when considering the air temperature as the temperatures within a canopy or cluster are usually lower due to shading and may be within the range to promote continued growth of powdery mildew. Mild summers can be particularly difficult to manage powdery mildew as the temperatures are maintained in the optimum range for the fungal pathogen, as was observed in 2007. Furthermore, overcast skies have been more detrimental than rainfall in promoting powdery mildew development (Wilcox 2008).

**Impacts of Sunlight and Temperature**

It is known that managing canopies for increased airflow can reduce disease pressures and allow for better spray penetration. To answer the specific results of canopy microclimate on disease infection and severity, Wayne Wilcox conducted applied research trials to examine specific components of temperature and sunlight. A whole vine shading study to investigate its impact on powdery mildew severity and sporulation. When comparing differences in microclimate in the canopy of exposed and shaded vines, the temperature and relative humidity within the canopies did not differ; however, there significantly lower severity of powdery mildew on sun exposed leaves in comparison to shaded canopy leaves. This severity difference was due to temperature. Sun exposed leaves were between 2-23°F higher than shaded leaves, decreasing the survival rate of fungal spores on sun exposed leaves (Wilcox 2008).

An additional study was conducted by Wayne Wilcox et al. to determine the potential impact of UV rays on powdery mildew spores. Results indicate that there was a 2-fold increase in the incidence of disease in vines with the UV-filter in comparison to vines in full sun, indicating the importance of UV light in preventing infection. These studies reinforce the importance of vine canopy exposure and management to reduce shoot density and leaf layers.

**Advancements…**

Powdery mildew can be difficult to control in the vineyard. However, with adequate spray chemistries, formulations, spray coverage and spray scheduling, a crisis can often be averted. The most current research efforts are in fine tuning the forecasting methods of infection that can be used in decision making to prevent disease. Research programs conducted by Walt Mahaffee currently focus on the development of a stronger disease modeling system for the grape grower in Oregon and the Pacific Northwest. Mahaffee is currently working on a multi-state collaborative project to develop an online system to provide disease forecasting with weather modeling that includes institutions throughout the Pacific Northwest. In the future, there is likely to be a better suited and more efficient method for determining pathogen risk for a quick response!

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For more information on powdery mildew spray programs, please check out the following resources:

**OSU Grape Pest Management Guide 2008**
*Authors*: Patty Skinkis, Jay Pscheidt, Vaughn Walton, Amy Dreves, Nancy Allen
http://extension.oregonstate.edu/catalog/html/em/em8413-e/

**Vineyard Disease Management Proceedings**
Proceedings from the Vineyard Disease Management: A Closer Look at Powdery Mildew and Botrytis held March 5, 2008 are now available online for viewing at http://wine.oregonstate.edu/outreach.

**Gubler-Thomas Model for Grape Powdery Mildew**
http://www.ipm.ucdavis.edu/DISEASE/DATABASE/grapepowderymildew.html
http://www.apsnet.org/online/feature/pmildew/Top.html


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Nail, W.R. and G.S. Howell. 2005. Effects of Timing of Powdery Mildew Infection on Carbon Assimilation and Subsequent Seasonal Growth of Potted Chardonnay Vines. Am. J. Enol. Vitic. 56: 220-227.

National Agriculture Statistics Service, 2008. 2007 Oregon Vineyard and Winery Report. <http://www.nass.usda.gov/Statistics_by_State/Oregon/Publications/Vineyard_and_Winery/index.asp>.

Ough, C.S. and H.W. Berg. 1979. Powdery Mildew Sensory Effect on Wine. Am. J. Enol. Vitic.. 30: 321.

Pearson, R.C. and D.M. Gadoury. 1987. Cleistothecia, the Source of Primary Innoculum for Grape Powdery Mildew in New York. Phytopath. 77: 1509-11514.

Wilcox, W. Powdery Mildew Research. Vineyard Disease Management: a Closer Look At Powdery Mildew and Botrytis, 5 Mar. 2008, OSU Viticulture Extension. 5 Apr. 2008 <http://wine.oregonstate.edu/files/files/Powdery_Mildew_Research-Wayne_Wilcox.pdf>.

## Observations in the Vineyard: Keeping an Eye on Short Shoot Syndrome

*Patty Skinkis, Ph.D., Viticulture Extension Specialist*
*Vaughn Walton, Ph.D., Horticultural Entomologist*

Spring has finally arrived! After a slow spring, it appears that bud break is occurring throughout the state, and it is time to begin searching the vineyard for the signs of Short Shoot Syndrome (SSS). During the past few years, Vaughn Walton and his lab have been investigating the incidence of rust mites in association with SSS in vineyards throughout Oregon. They have found significant populations of rust mites infesting dormant buds and young tissues of shoots in early spring of vines that have the characteristics associated with SSS. For more information on SSS and to see pictures of symptoms, please see the following link: http://extension.oregonstate.edu/catalog/pdf/em/em8944-e.pdf.

Preventative control for vineyards with a history of SSS is the application of two early season sulfur sprays. These sprays are applied at wooly bud and 7-10 days later. Consult the 2008 OSU Grape Pest Management Guide http://extension.oregonstate.edu/catalog/html/em/em8413-e/ for more information on rates or contact your local extension agent or crop advisor for more information. With further research on rust mite activity and development and efficacy rates of sulfur, we hope to better identify control and management options for this issue.

The early part of the growing season is prime time for making observations in the vineyard for symptoms of SSS. Short shoot syndrome is easily recognized during the initial shoot development. Shoots tend to be short and stunted near the head of the vine, with small, crinkled or malformed leaves. In some cases, the stunting can appear similar to other problems associated with small, short shoots

including boron and zinc deficiency. If you suspect that you have SSS, you can submit samples of shoots after bud break for assessment of mite populations. Sampling procedures are outlined below:

1. Shoots should be less than 4" in length when sampling.
2. Collect a sample of approximately 40 shoots from an area of 1-4 acres.
3. Place the shoots in a plastic bag and clearly label with the following information: date, cultivar, year planted, location in vineyard, contact name, address, phone and any other pertinent information. Please submit samples from separate vineyard blocks/locations if you have the symptoms in more than one location.
4. Submit samples to Vaughn Walton, Dept. of Horticulture, 4017 ALS Bldg., Corvallis, OR. 97331.

**We need your help!** We are asking ***all*** growers throughout the state of Oregon to participate in the 2008 Short Shoot Survey, whether symptoms have been observed or not. This information will be used as part of the research of this project and is vital to the understanding of localization of this problem. This is an online survey and will take 5-10 minutes; it can be completed online at https://surveys.bus.oregonstate.edu/BsgSurvey2_0/main.aspx?SurveyID=2093&cmd=survey.

## New OSU Extension Publications

**Short Shoot Syndrome of Grapes in the Pacific Northwest.**
Authors: Vaughn Walton, Amy Dreves, Patty Skinkis. November, 2008. Available for download online at: http://extension.oregonstate.edu/catalog/details.php?search=short+shoot

**Protecting Grapevines from Winter Injury**
Authors: Clive Kaiser, Patty Skinkis, Mercy Olmstead. March 2008. Available for download online at: http://extension.oregonstate.edu/catalog/details.php?search=winter+injury

**2008 OSU Grape Pest Management Guide**
Authors : Patty Skinkis, Jay Pscheidt, Vaughn Walton, Amy Dreves, Nancy Allen. March 2008. Available for download online.
http://extension.oregonstate.edu/catalog/html/em/em8413-e/

**2008 Insect Management Handbook**
Authors: Craig Hollingsworth, Art Antonelli, Ronda Hirnyck, Neil Bell, Michael Bush, Joe DeFrancesco, Glenn Fisher, Jeff Olsen, Gene Pirelli Revised March 2008, 672 pages, $45.00 http://extension.oregonstate.edu/catalog/abstract.php?seriesno=INSECT

**2008 Weed Management Handbook**
Authors: Ed Peachey, Dan Ball, Robert Parker, Joseph Yenish, Don Morishita, Pam Hutchinson Revised March 2008, 468 pages, $45.00 http://extension.oregonstate.edu/catalog/abstract.php?seriesno=WEED

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## Upcoming Educational Opportunities and Events

*April 17 Irrigation Management Concepts Strategies and Practice*
Presented by Marcus Buchanan, OSU Viticulture Faculty, and David Bauer, Pacific Ag Systems
This class will provide a detailed discussion about quantitative approaches to winegrape irrigation scheduling. Defining conceptually and practically a few structured approaches to regulated deficit irrigation (RDI) and an introduction to evapotranspiration (ETo) based irrigation scheduling will be discussed. A special topic will also discuss equipment, techniques and tips for fertigation in vineyards. This seminar will be held at Redman's Hall, Jacksonville, OR. 5-8 PM. RSPV to the RVWA at ellisvineyards@yahoo.com. Cost is $10 for participants who are not Rogue Valley Winegrower's Association members.

*April 23 and 25 When Good Wine Goes Bad: A One-Day Workshop on the Microbial Spoilage of Wine*
Presented by OSU Department of Food Science & Technology, OSU Extension Service, and the Oregon Wine Board
This workshop, lead by Dr James Osborne, OSU Extension Enologist, will explore the various microorganisms present during the winemaking process that can cause wine spoilage issues. The growth and occurrence of these microorganisms will be discussed as well as the specific spoilage issues that can arise from their growth in wine. A series of tastings will be used to illustrate taints that specific spoilage microorganisms can cause. In addition, the use and application of a microscope in the winery will be covered. The workshop will be held on April 23rd at the Douglas County Extension Center in Roseburg, and on April 25th at the Food Innovation Center in Portland. The workshop will run from 9:00 am until 5:00 pm with registration at 8:30 am. Lunch will be provided. You may register online at http://oregonwine.org/Industry/Oregon_Wine_Board/Education/Industry_Workshops/

*Early May Short Shoot Syndrome Field Day*
Presented by OSU Viticulture Extension Faculty and Growers
Short Shoot Syndrome has become an increasing concern for grape growers since 2001, and research programs have been implemented to address this concern. To begin the season, a field day will be organized to view vineyards with the problem or discuss the results in vineyard that had this problem previously. The location, time and date are to be determined once locations with this problem are identified. The field day will be in the north Willamette Valley as this is where the majority of incidence has occurred. If your vineyard is a candidate for this field day and you'd like to participate, please contact Patty Skinkis at skinkisp@hort.oregonstate.edu or 541-737-1411.

*June 12 Grape Day in the Umpqua*
OSU Extension is offering a one-day event with a morning vineyard seminar session and afternoon field tour of vineyards in the Umpqua Valley. Steve Renquist, OSU Extension Horticulturist, will be arranging seminar topics and vineyard tours which include. OSU Extension and research faculty will be on hand for seminars, discussions and questions regarding the vineyard visits. Please check out http://wine.oregonstate.edu for more information regarding this event or contact Steve Renquist at 541-672-4461, steve.renquist@oregonstate.edu

*July 31 Southern Oregon Vineyard Tour*
Southern Oregon Research and Extension Center, Central Point, OR will have their annual vineyard tour July 31 from 7:45 am – 4:30 pm. Research and Extension faculty of OSU working on viticulture will host this tour throughout Jackson and Josephine Counties that focuses on problems, practices and successes in the vineyard. More information will be coming in June. Please check out http://wine.oregonstate.edu for information as it becomes available.

*August 5 Columbia Gorge Area Vineyard Field Day Tour*
A tour of vineyards throughout the Columbia Gorge will feature vineyard practices and issues related to specific disease/pest/management problems. OSU faculty will be present to help discuss these issues. More information on times and location will be provided in June. Please check out http://wine.oregonstate.edu for more information as it becomes available.