



# American Society for Enology and Viticulture- Eastern Section

## Conference Program

40th Annual Conference  
July 23-25, 2015  
Dunkirk, New York

Email: [info@asev-es.org](mailto:info@asev-es.org)  
Website: <http://www.asev-es.org/>

# Conference Overview

## Wednesday, July 22, 2015

Preconference Board Meeting	Clarion Hotel Conference Room 111	4:00-6:00 pm
Board Meeting Dinner	Clarion Hotel Windjammer/Dockside	6:30-8:30 pm

## Thursday, July 23, 2015

Complimentary Breakfast (for hotel guests)	Clarion Hotel Windjammer	6:30-9:30 am
Conference Registration	Clarion Hotel Lobby	7:00-8:00 am
Tour NY & PA Vineyards & Wineries	Meet in Clarion Hotel Lobby	8:15 am-6:00 pm

## Friday, July 24, 2015

Complimentary Breakfast (for hotel guests)	Clarion Hotel Windjammer	6:30-9:30 am
Conference Registration	Clarion Hotel Lobby	7:30 am-3:00 pm
Welcome & Lake Erie Region Overview	Clarion Hotel Bayside	8:15 am-8:40 am
Student Competition and Flash Talks	Clarion Hotel Bayside	8:40 am-12:00 pm
Lunch	Clarion Hotel Pavilion	12:00-1:30 pm
Technical Program and Flash Talks	Clarion Hotel Bayside	1:30-4:45 pm
View Posters	Clarion Hotel Bayside	4:45-5:15 pm
Oenolympics & Grazing Dinner	Clarion Hotel Pavilion	6:30-8:00 pm
House Band	Clarion Hotel Dockside	9:00-12:00 pm

## Saturday, July 25, 2015

Complimentary Breakfast (for hotel guests)	Clarion Hotel Windjammer	6:30-9:30 am
Conference Registration	Clarion Hotel Lobby	8:00-11:30 am
Technical Program	Clarion Hotel Bayside	9:00 am-12:00 pm
Lunch	Clarion Hotel Lighthouse	12:00-1:00 pm
ASEV-ES Annual Business Meeting	Clarion Hotel Lighthouse	1:00-2:00 pm
Technical Program	Clarion Hotel Bayside	2:00-4:30 pm
View Posters	Clarion Hotel Bayside	4:30-5:00 pm
Sparkling Wine Reception and Banquet	Clarion Hotel Lighthouse	6:00-9:00 pm
House Band	Clarion Hotel Dockside	9:00-12:00 pm

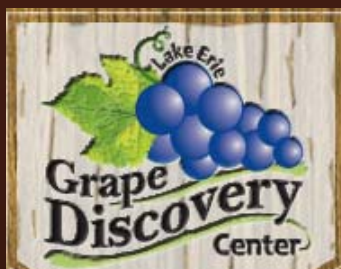
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# Thursday, July 23, 2015

## Tour New York and Pennsylvania Vineyards & Wineries

Meet in Clarion Hotel Lobby	8:15 am
Depart for Liberty Vineyards & Winery	8:30 am
Winery Tour 8:45-9:45 am	
Depart for Cornell Lake Erie Regional Grape Program	9:45 am
Vineyard Tour 10:30-10:55 am	
Depart for 21 Brix Winery	10:55 am
Wine Tasting 11:00-11:45 am	
Depart for Johnson Estate Winery	11:45 am
Lunch and Wine Tasting 12:00-1:30 pm	
Depart for Lake Erie Grape Discovery Center	1:30 pm
Tour 1:45-2:30 pm	
Depart for Arundel Cellars & Brewing Company	2:30 pm
Winery Tour 2:45-3:45 pm	
Depart for South Shore Wine Company	3:45 pm
Winery Tour 4:00-5:00 pm	
Depart for Clarion Hotel	5:00 pm
Arrive at Clarion Hotel	6:00 pm



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LAKE ERIE REGIONAL GRAPE PROGRAM

# Friday, July 24, 2015

## **Welcome**

**8:15-8:25 am**

Lisa Smiley, Cannon Valley Vineyards, Minnesota and ASEV-ES Chair  
Stephen Menke, Colorado State University, Colorado and ASEV-ES Chair Elect

## **Grape and Wine Production in Lake Erie Region**

**8:25-8:40 am**

Terry Bates, Director, Cornell Lake Erie Research & Extension, Portland, New York

## **Student Oral Presentation Competition Sessions**

**8:40 -9:40 am**

**Exogenous Tannin Addition and Lactic Acid Bacteria Strain Selection: Effects on Malolactic Fermentation**

Alex J. Fredrickson and Anna Katharine Mansfield

**Sour Rot Etiology and the Development of Management Strategies**

Megan Hall, Gregory Loeb, and Wayne Wilcox

**Timing and Extent of Fruit-zone Leaf Removal Alters Yield and Fruit Composition in Cabernet Franc**

Cain C. Hickey and Tony K. Wolf

## **Flash Talks-Poster Summaries**

**9:40-10:00 am**

**Increasing Sparkling Wine Quality, Productivity and Winery Revenue with Press Fractioning of L. Cv. Pinot Noir Clone 115 in Ontario**

Esther Onguta, Lisa Dowling, Belinda Kemp, Jim Willwerth, George van der Merwe and Debbie Inglis

**Precursors of Hydrogen Sulfide during Wine Storage and the Role of Elemental Sulfur Pesticide Residues**

Jillian A. Jastrzembski and Gavin L. Sacks

**The Suitability of L. cv. Pinot Noir Mariafeld for Sparkling Wine Production in Niagara, Ontario**

Esther Onguta, Lisa Dowling, Belinda Kemp, Jim Willwerth, George van der Merwe, and Debbie Inglis

**Distribution of Plant Parasitic Nematodes in Missouri and Arkansas Vineyards**

Jackie L. Harris, R. Andrew Allen, Elijah A. Bergmeier, Robert T. Robbins, Terry Kirkpatrick, and R. Keith Striegler

## **Break/View Posters**

**10:00-10:30 am**

## **Student Oral Presentation Competition Sessions**

**10:30 am-12:00 pm**

**Appassimento Wine in Ontario: Characterizing Brock Isolate Yeast**

Jennifer Kelly, Lisa Dowling, Fred DiProffio, Terence van Rooyen, Michael Brownbridge, Vincenzo De Luca, Gary Pickering, and Debbie Inglis

**Frontenac Response to Training Systems and Leaf Removal**

Brittany Olson, Harlene Hatterman-Valenti, and Collin Auwarter

**Disparate House Wines: The Role of Pathogenesis-related Proteins in Limiting Red Wine Astringency**

Lindsay F. Springer, Avery C. Stahlecker, Robert W. Sherwood, and Gavin L. Sacks

**Consumption of YAN During Spontaneous Fermentations in the Finger Lakes**

Camila Tahim, Lucy Goldberg, Kathleen J. Arnink, and Anna Katharine Mansfield

**Lunch**

**12:00-1:30 pm**

**Technical Program**

**1:30-3:15 pm**

Impact of Crop-regulating Practices on Yield, Fruit Composition and Wine Quality of Chancellor Grapevines (includes tasting)

B. Michela Centinari, Bryan Hed, Maria Smith, and Denise Gardner

Newly Developed Pierce's Disease Resistant *Vitis vinifera* Selections Tested in the Southeast

Elina D. Coneva, Andy Walker, Edgar Vinson, and James Pitts

Evaluation of Weed Control Options during Vineyard Establishment in North Dakota

John E. Stenger and Harlene M. Hatterman-Valenti

**Flash Talks-Poster Summaries**

**3:15-3:30 pm**

Rootstock/Irrigation Impacts on Vine Growth, Wine and Fruit Quality Parameters

Arianna Bozzolo, Jackie Harris, Misha T. Kwasniewski, and Connie Liu

Quantitative Comparison of Important Odor Compounds Found in Aromatic *Vitis Vinifera* wines to those Produced from 'Valvin Muscat'

Brian Wayne and Misha Kwasniewski

Investigation into the Genetic Basis of Leaf Shape in Grapes

Brigette Williams, Li-Ling Chen, Katie Hyma, Lance Cadle-Davidson, Dan Chitwood and Chin-Feng Hwang

**Break/View Posters**

**3:30-3:45 pm**

**Technical Program**

**3:45-4:45 pm**

Effects of Leaf Removal and Gibberellin on Chardonnay Grapes in the Lake Erie Region of Pennsylvania

Bryan Hed, Henry K. Ngugi, and James W. Travis

Impact of Crop Level and Harvest Date on Aroma Compounds of Four *Vitis vinifera* Wine Grape Cultivars in Ontario, Canada

Luis Hugo, Moreno Luna, Andrew G. Reynolds, and Fred Di Profio

**View Posters**

**4:45-5:15 pm**

**Adjourn**

**5:15 pm**

**Oenolympics & Grazing Dinner**

**6:30-8:00 pm**

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# Saturday, July 25, 2015

## **ASEV-ES Outstanding Achievement Award**

### **Presentation**

**9:00-10:00 am**

Mold & Mildews, Spots & Rots: Grape Pathology in the East

Dr. Wayne Wilcox , Professor, Cornell University, Geneva, New York

### **Break/View Posters**

**10:00-10:30 am**

### **Technical Program**

**10:30 am-12:00 pm**

Impacts and Interactions of Abscisic Acid (ABA) and Gibberellic Acid (GA) Sprays on Sovereign Coronation and Skookum Seedless Table Grapes

Andrew Reynolds, Naomi Robbins, Hyun-Suk Lee, and Elena Kotsaki

Utilization of Proximal Sensing Technology (Greenseeker) to Map Variability in Ontario Vineyards

Andrew G. Reynolds, Ralph Brown, Elena Kotsaki, and Hyun-Suk Lee

The Contribution of Anthocyanin Bisulfite Complexes to Free SO<sub>2</sub> Measurements and Microbial Stability in Red Wines

Patricia A. Howe, Randy Worobo, Richard DeScenzo, and Gavin L. Sacks

### **Lunch**

**12:00-1:00 pm**

### **ASEV-ES Annual Business Meeting**

**1:00-2:00 pm**

### **Invited Speaker –Enology**

**2:00-3:00 pm**

Fermentation Challenges in the East

Michael Jones, Fermentation Specialist, Scott Laboratories, Petaluma, California

### **Technical Program**

**3:00-4:30 pm**

Impact of Under-vine Floor Management in a Finger Lakes Vineyard

Adam Karl, Ian Merwin, Rebecca Hervieux, Michael Brown, and Justine Vanden Heuvel

Root Restriction as a Tool to Achieve more Balanced Vine Growth and Enhanced Fruit Composition

Tony K. Wolf

Profiling of Cognacs, Armagnacs and American brandies using UHPLC-QTOF/MS2

Thomas S. Collins, Jerry Zweigenbaum, Susan E. Ebeler

### **Break/View Posters**

**4:30-5:00 pm**

### **Adjourn**

**5:00 pm**

### **Sparkling Wine Reception**

**6:00-7:00 pm**

### **ASEV-ES Banquet**

**7:00-9:00 pm**

# Guest Speakers

## Dr. Wayne Wilcox

Professor, Cornell University

Mold & Mildews, Spots & Rots: Grape Pathology in the East

The American Society for Enology and Viticulture-Eastern Section (ASEV-ES) is proud to announce Dr. Wayne Wilcox as the 2015 recipient of the ASEV-ES Outstanding Achievement Award. Disease management is a critical component of viticulture east of the Rockies, and over his career Dr. Wilcox has delivered science-based guidelines that have allowed growers across the region to manage diseases more efficiently and sustainably. His in-depth knowledge of the biology of fungal pathogens has been key to improving the timing of management interventions over the course of the growing season.

A northern California native, Dr. Wilcox received his B.S. in Horticulture and M.S. and Ph.D. degrees in Plant Pathology, all from the University of California at Davis. Since 1984, he has been a professor at Cornell's New York State Agricultural Experiment Station in Geneva (Finger Lakes region), where he has led the grape pathology program for the past 21 years.

His programmatic focus is on the applied biology and practical, integrated management of the major fungal diseases of grapes, utilizing both viticultural and fungicidal tools. He has published nearly 100 research articles in scientific journals, in addition to numerous technical reports and popular articles in grower newsletters and trade magazines, and is the senior editor of the forthcoming *2nd Edition of the Compendium of Grape Diseases, Disorders, and Pests*, an international publication of the American Phytopathological Society. He is also a co-author of the New York/Pennsylvania Pest Management Guidelines for Grapes, and his yearly "Grape Disease Control" newsletter provides grape growers throughout eastern North America with current, practical guidance for the growing season. He also organized and co-teaches a course in Grape Pest Management, in support of Cornell's undergraduate major in viticulture and enology. His extension activities have focused on educational programs for grape growers, vineyard managers, winery owners, and private and public sector agricultural advisers on the identification, biology, and management of infectious diseases. Dr. Wilcox's research program is integrated with his extension program, providing data for educational programs and opportunities to demonstrate specific concepts in the field.

His work is valued by the grape industry and colleagues alike for its impact, as demonstrated by his ASEV Best Viticulture Paper Award in 2012 for research that correlated powdery mildew severity with canopy density. In 2015, he received the award again for seminal work on the persistence of sulfur spray residues during ripening and wine making. In 2013, he received the Australian Journal of Grape and Wine Research Best Viticulture Paper Award for the optimization of a new technique to detect pathogens on grape berries before disease symptoms are visible.



## Michael Jones

Fermentation Specialist, Scott Laboratories, Petaluma, California

Fermentation Challenges in the East

Michael came on board with Scott Laboratories in 2007 with over 35 years of winemaking experience under his belt. Since then he shared his wealth of knowledge with North America by traveling extensively to trade shows and seminars throughout the country, many times as a speaker. A University of California, Davis graduate, Michael has lived and worked in Burgundy, France and the Hunter Valley, Australia. Domestically, Michael built his experience at Novavine, Hanzell Vineyards and Caymus Vineyards. He also spent 19 years at Domaine Chandon where he put on a multitude of hats and was involved with the vineyards, operations, winemaking, laboratory and was part of the team that established the Wine Education program. Prior to his start in the wine industry, Michael spent a year traveling cross-country by freight train, stopping to work on a shrimp boat in the Gulf of Mexico, pitch hay in San Antonio and sell art in New Orleans.



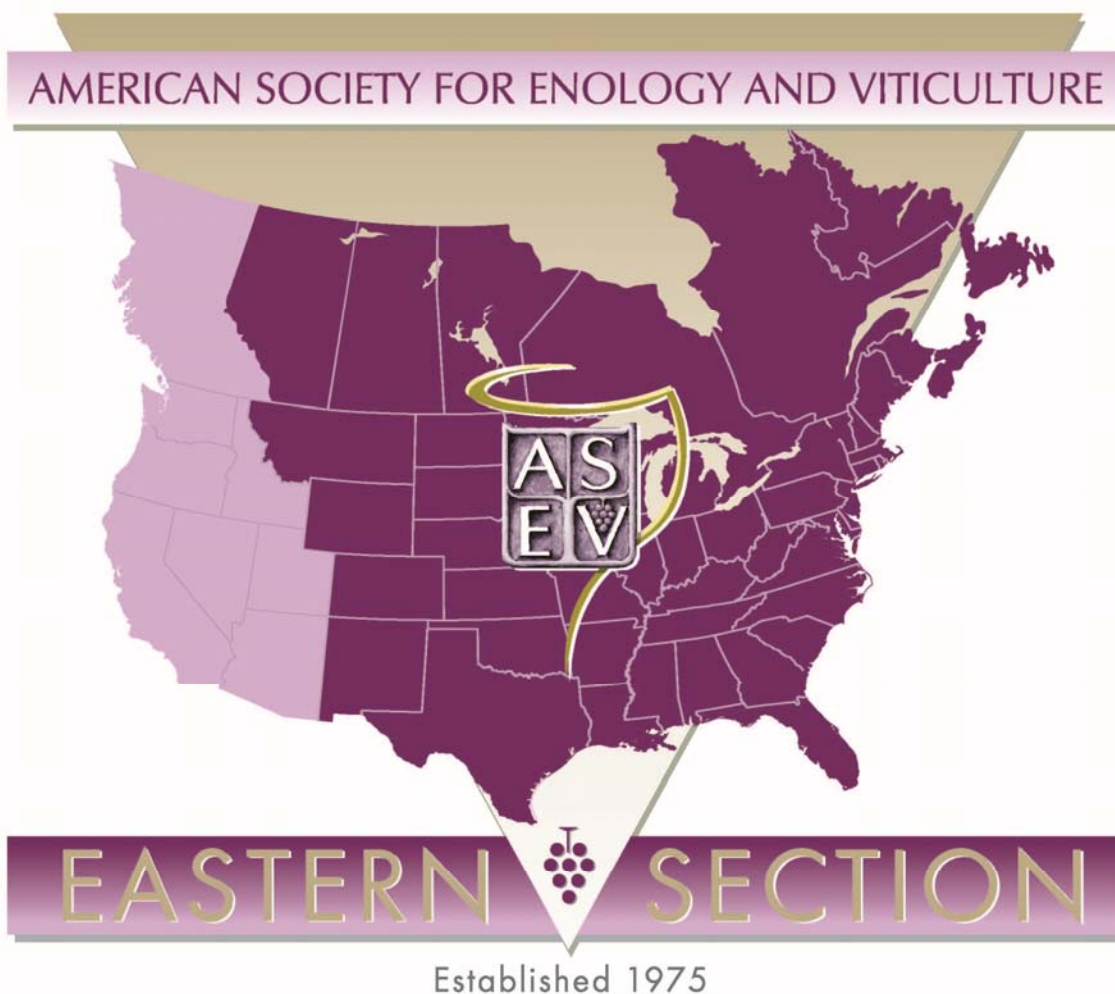
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# About ASEV-Eastern Section

To provide forums for the presentation, discussion, and publication (through the official journal of the ASEV) of research and technology developments for the advancement of wines and the solution of problems of specific interest to the enology and viticulture of grapes grown in the Eastern United States and Canada.

## ASEV-Eastern Section Regions

The ASEV-Eastern Section's geographical area includes all U.S. states and Canadian provinces with territory east of the Continental Divide.







AMERICAN SOCIETY FOR ENOLOGY & VITICULTURE - EASTERN SECTION



SCHOLARSHIP FUNDRAISERS RAISED OVER \$12,000

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# 2015 Scholarship Recipients

Nicholas Basinger, North Carolina State University

Claire Burtch, Cornell University

Laura Homich, Penn State University

Gal Kreitman, Penn State University

Benjamin Loseke, University of Nebraska

Marlena Sheridan, Penn State University

Brigette Williams, Missouri State University



# Student Competition Abstracts

## Exogenous Tannin Addition and Lactic Acid Bacteria Strain Selection: Effects on Malolactic Fermentation

Alex J. Fredrickson and Anna Katharine Mansfield\*

\*corresponding author: Cornell Enology Extension Laboratory, Cornell University NYSAES, Geneva, NY, USA 14456 [akm87@cornell.edu](mailto:akm87@cornell.edu)

The addition of exogenous tannins has become a common practice to increase tannin concentration in red wines produced from cool climate hybrid grape cultivars. Previous research has shown that various phenolic compounds have contrasting effects on lactic acid bacteria (LAB) growth and malolactic fermentation (MLF) success. This study observed exogenous tannin additions and their effect on two strains of LAB during MLF in interspecific hybrid grape cultivars Corot noir, Noiret, and Marquette. Exogenous tannin additions and LAB inoculations were made sequentially following alcoholic fermentation. A mixed effects statistical model was used to determine the interactions of LAB and tannin additions on MLF, independently and together. Corot noir fermentations showed significant interactions between LAB and tannin treatment for malic acid degradation and lactic acid accumulation. Noiret and Marquette had the same interaction with lactic acid accumulation, but not with malic acid degradation. Cell growth was affected by LAB treatment throughout MLF for all three cultivars, while an effect from tannin treatments was only seen in Noiret. LAB strain selection and exogenous tannin additions both had an effect on MLF, independently of each other, and often throughout MLF. Even with the observed effects on MLF, all wine lots finished fermentation in 2 weeks or less. This suggests that, in the cultivars and winemaking conditions studied, MLF can be performed successfully despite the addition of exogenous tannin at the levels used in hybrid red winemaking.

## Sour Rot Etiology and the Development of Management Strategies

Megan Hall, Gregory Loeb, and Wayne Wilcox\*

\*corresponding author: New York State Agricultural Experiment Station, A212 Barton Lab, Geneva, NY, USA 14456 [wfw1@cornell.edu](mailto:wfw1@cornell.edu)

Sour rot, a disease affecting grapes near harvest, is characterized by the discoloration of the grape skin and the smell of acetic acid emanating from the affected cluster, as well as the presence of *Drosophila* (fruit fly) species. Symptoms of sour rot were successfully recreated in the lab by inoculating a wounded healthy berry with a suspension of *Saccharomyces cerevisiae* and *Acetobacter aceti* and simultaneously exposing the berry to *D. melanogaster*, causing an accumulation of ethanol and acetic acid within the berry and visual symptoms characteristic of sour rot-affected berries in Finger Lakes vineyards. When inoculated berries were exposed to either axenic or non-axenic flies, those exposed to axenic flies developed higher concentrations of ethanol and acetic acid, as well as more severe visual symptoms, and those exposed to non-axenic flies developed ethanol and acetic acid concentrations comparable to levels detected in field samples. These results suggest that the flies exacerbate symptom expression, although the presence of normal gut microbiota may actually delay or suppress the development of causal organisms. In a spray trial in a research vineyard of interspecific hybrid cultivar Vignoles, integrating antimicrobials and insecticides provided 50% control of disease severity, with negligible control from either component alone. Cultural control of disease symptoms was investigated in a commercial vineyard of the same cultivar in which disease incidence and severity were reduced significantly on vines with a VSP versus top wire cordon training system.

## Timing and Extent of Fruit-zone Leaf Removal Alters Yield and Fruit Composition in Cabernet Franc

Cain C. Hickey\* and Tony K. Wolf

\*Corresponding author: AHS Jr. AREC, Virginia Tech, 595 Laurel Grove Road, Winchester, VA, USA 22602 [cain1@vt.edu](mailto:cain1@vt.edu)

Generalized fruit exposure guidelines advocate selective leaf removal from fruit zones, if needed, shortly after fruit set. We evaluated if unconventional timing and extent of fruit-zone leaf removal would alter yield components or fruit composition in Cabernet franc. Two post-fruit set leaf/lateral removal treatments of different magnitude (MED, HIGH), one pre-bloom leaf/lateral removal treatment (P-B), and no leaf removal (NO) were evaluated for impacts on Cabernet franc yield components and fruit composition in 2013 and 2014. Compared to NO, P-B reduced crop yield by 30% and berry weight by 6% and MED reduced crop yield by 17% and berry weight by 4% in 2013. In 2014, P-B reduced crop yield by at least 30%, cluster weight by at least 23%, berry weight by at least 10%, and berries per cluster by at least 14% when compared to all other treatments. P-B reduced cluster compactness by an average of 42% compared to NO and MED in 2014. Compared to NO, HIGH and P-B reduced titratable acidity by 16% in 2013 and 11% in 2014. P-B increased total berry phenolics by an average of 31% compared to NO and MED, and increased total berry anthocyanins by 20% compared to MED in 2014. Preliminary results illustrate that pre-bloom leaf removal can reduce crop yield and berry weight, loosen clusters, and improve total berry phenolics and anthocyanins. If regulating crop yield is desired, pre-bloom leaf removal is a management tool that has potential to improve wine quality.

## Appassimento Wine in Ontario: Characterizing Brock Isolate Yeast

Jennifer Kelly, Lisa Dowling, Fred DiProfio, Terence van Rooyen, Michael Brownbridge, Vincenzo De Luca, Gary Pickering and Debbie Inglis\*

\*corresponding author: Brock University, 500 Glenridge Avenue, St. Catharines, ON, Canada L2S 3A1 [dinglis@brocku.ca](mailto:dinglis@brocku.ca)

Appassimento wine has the potential to become a signature style for the Ontario wine industry. This style of winemaking may be used as a tool to combat the difficulties associated with winemaking in a cool climate due to extreme seasonal variations that can impact fruit maturity. Grapes dried post-harvest may contain high starting concentrations of oxidative compounds that can negatively affect organoleptic quality. This project aims to characterize a locally isolated alternate yeast, *Saccharomyces bayanus*, Brock Isolate for Appassimento wine production, which has demonstrated its ability to ferment wines with lower values of undesirable oxidative compounds. Wines were made at the pilot winery at Brock University in 2013 at four different post-harvest drying targets (control ~21.5°Brix, 24.5°Brix, 26.0°Brix and 27.5°Brix) with Brock Isolate, and *S. cerevisiae* EC1118, the recommended Appassimento-style yeast. Chemical analysis of all wines is complete, and statistically significant lower levels of oxidative compounds such as ethyl acetate, acetaldehyde and acetic acid has been determined in wines made with Brock Isolate. A preliminary sensory analysis was conducted on wines made with these two yeast strains at two post-harvest drying targets (23°Brix and 28°Brix) to determine statistical significance (n=40). This confirmation of difference between treatments gave rise to a descriptive analysis study that aims to identify and quantify the yeast and post-harvest drying target concentration attributes. Data analysis is underway. This project will contribute to optimizing the Appassimento winemaking process within the Ontario wine industry.

# Student Competition Abstracts

## Frontenac Response to Training Systems and Leaf Removal

Brittany Olson\*, Harlene Hatterman-Valenti, and Collin Auwarter

\*corresponding author: Department of Plant Sciences, North Dakota State University, PO Box 6050, Fargo, ND, USA 58108

[Brittany.J.Korynta@ndsu.edu](mailto:Brittany.J.Korynta@ndsu.edu)

Experiments conducted in 2013 and 2014 evaluated the effects of training system and leaf removal on yield and quality for 'Frontenac', an interspecific hybrid wine grape, at a research vineyard near Absaraka, North Dakota. The experiment was structured as a randomized complete block design with split plot arrangement including four training system treatments (Geneva double curtain (GDC), high cordon (HC), vertical shoot positioned (VSP), and four arm kniffin (4AK)), four leaf removal treatments (at bloom, two weeks post bloom, veraison, and no removal) and eight replicates. In 2013, 2,571 growing degree days (GDDs) accumulated in the 155 days between frost events. In 2014, 2,080 GDDs accumulated in the 121 days between frost events, 491 GDDs less than the year prior. Combined data analysis showed no significant differences in soluble solids (SS) and total titratable acidity (TA) between trellis or leaf removal treatments. However, significance was found in SS and TA between years, possibly due to growing season differences. The pH in 2013 was significantly higher in VSP as compared to other treatments. In 2014, live nodes and total shoots were significantly greater in GDC and 4AK as compared to HW and VSP. Additionally, GDC cluster number and yield were significantly greater in 2014 than 4AK and VSP. These findings suggest that 'Frontenac' SS accumulation and TA may not be affected by leaf removal or trellis system in North Dakota vineyards, yet yield gains due to training system may be reached without negatively affecting fruit quality.

## Disparate House Wines: The Role of Pathogenesis-Related Proteins in Limiting Red Wine Astringency

Lindsay F. Springer, Avery C. Stahlecker, Robert W. Sherwood, and Gavin L. Sacks\*

\*corresponding author: Department of Food Science, Cornell University, Ithaca, NY, USA 14853 [gls9@cornell.edu](mailto:gls9@cornell.edu)

Condensed tannins (CT) are an important class of polyphenolic compounds that contribute to astringency and color stability of red wines. Unlike other important components of wine quality, such as anthocyanins or organic acids, the amount of CT in fruit is often poorly correlated to CT in wine due to variation in CT extraction. To determine if endogenous pathogenesis-related (PR) proteins could explain variation in tannin extraction during fermentation across cultivars and regions, fruit from 10 different *V. vinifera* and interspecific hybrid (*Vitis spp.*) cultivars were obtained from California (CA) and New York (NY). Small-scale fermentations were carried out in triplicate with daily punch downs and seven days of skin contact before pressing. CT from fruit and wines were measured via protein precipitation and juice proteins were measured using a modified amido black method. Both CT in fruit and juice protein were significant predictors of wine CT ( $p < 0.05$ ) in all models. An excellent predictive model for wine CT in *V. vinifera* wines was generated using fruit CT and juice protein as parameters ( $r^2 = 0.91$ ). There were no significant differences in fruit CT quantity between CA and NY by grape classification (*V. vinifera* or hybrids), but more juice protein was observed in fruit obtained from CA compared to NY ( $p < 0.05$ ).

## Consumption of YAN during Spontaneous Fermentations in the Finger Lakes

Camila Tahim\*, Lucy Goldberg, Kathleen J. Arnink and Anna Katharine Mansfield.

\*corresponding author: Department of Food Science, Cornell University, NYSAES, 630 West North Street, Geneva, NY, USA 14456

[cm646@cornell.edu](mailto:cm646@cornell.edu)

Spontaneous fermentations are a growing trend in winemaking, yet little work has been done to characterize them in the Finger Lakes region. As those systems may contain diverse microflora, the concentration of required and available YAN may vary widely throughout the fermentation. The objective of this study, performed in collaboration with two local wineries, was to provide an initial assessment of microbial diversity and nitrogen requirements of spontaneous fermentations. During the 2014 harvest, five single-vineyard Riesling fermentations were monitored. Prior to harvest, grape samples were collected to analyze microflora present on the surface of the berries. Winery equipment was also sampled to assess winery microflora. YAN, residual sugar, and microbial count were monitored throughout the fermentation, from samples taken at each 5 ° Brix reduction. The initial musts ranged between 17-20 °Brix. In all cases, non-*Saccharomyces* yeasts persisted until the last stages of fermentation, although in varying numbers. While the total microbial count peaked around  $10^7$ - $10^8$  CFU/mL, non-*Saccharomyces* yeasts achieved maximum populations ranging between  $10^5$  and  $10^8$  CFU/mL. The most frequent non-*Saccharomyces* yeasts found were *Hanseniaspora uvarum*, *Pichia fermentans* and *Kluyveromyces* spp. YAN consumption ranged from 64 to 166mg/L among fermentations. In a separate experiment, a Riesling must was supplemented with DAP (diammonium phosphate) and inoculated with common commercial strains. YAN consumption in test wines ranged from 110-250 mg/L. Comparison between those two experiments suggests that, for the vineyards monitored, spontaneous fermentations do not have higher YAN requirements than inoculated fermentations.



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# Technical Session Abstracts

## Impact of Crop-regulating Practices on Yield, Fruit Composition and Wine Quality of Chancellor Grapevines

B. Michela Centinari\*, Bryan Hed, Maria Smith and Denise Gardner

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Cluster thinning (CT) is applied to reduce grapevine crop load and enhanced grape ripening. However, manual CT is time-consuming, requires skilled labor and does not always result in fruit and wine quality improvements. This study builds on previous work conducted in Mediterranean countries to assess if cluster-zone early leaf removal (ELR) performed at trace bloom could be a viable alternative to CT for reducing crop level in high yielding varieties grown in cold climate regions. The effect of CT and ELR severity (light vs. heavy; LELR vs HELR) on crop load, yield components, fruit composition, and wine chemical parameters was investigated in Chancellor in 2014. Yield components were greatly affected by the treatments. CT, LELR and HELR reduced crop yield by an average of 43, 29 and 53%, respectively, as compared to the un-thinned, non-defoliated control (C). The decrease in yield was the result of a lower number of clusters in the CT vines and a reduction in cluster weight in ELR vines. Crop-regulating treatments did not impact either total leaf area at harvest or cane pruning weight. However, CT vines had higher leaf area on the main shoots as compared to HELR vines. At harvest, HELR and CT vines had higher soluble solids compared to the C, while no significant differences among treatments were observed on pH and titratable acidity values. Furthermore, no differences in alcohol concentration, pH, titratable acidity, and color intensity were observed among wines made from the C and crop-regulating treatments. This study is continuing in 2015.

## Profiling of Cognacs, Armagnacs and American brandies using UHPLC-QTOF/MS2

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While the aroma and flavor of newly distilled brandies is largely due to the volatile composition of the spirit, commercial brandies are typically aged in wooden casks for some period of time. During aging, various compounds are extracted from the casks, resulting in changes in the color, flavor and mouth-feel of the spirit. This study evaluated the non-volatile profiles of 19 Cognacs, 9 Armagnacs and 6 American brandies using ultra high pressure liquid chromatography (UHPLC) coupled with quadrupole time-of-flight (QTOF) mass spectrometry. Principal Component and Discriminant Analyses of the non-volatile composition of the brandies was used to evaluate the relationships among the sample types. American brandies were readily distinguished from the Cognacs and Armagnacs; there was some overlap among the Cognacs and Armagnac brandies. The Cognacs could also be differentiated by their quality classification; brandies of the VS, VSOP and XO classes were well separated by PCA of the non-volatile composition of just the Cognac brandies. The compounds important for differentiating among these brandies included wood derived phenolic compounds, wood derived triterpenoid saponins and their glycosides and several C6 and larger oxidized lipids. A number of additional compounds differentiated the brandies but have not yet been identified using MS and MS/MS data alone.

## Newly Developed Pierce's Disease Resistant *Vitis vinifera* Selections Tested in the Southeast

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Three U.C.-Davis developed Pierce's disease (PD) resistant 87.5% *V. vinifera* selections '502-10', '502-01', and '501-12', were planted at the Chilton Research and Extension Center near Clanton, Alabama in 2010 to evaluate their fruit quality characteristics and their field PD resistance in a high risk zone. The experimental vineyard is a RCBD with 6 blocks and 5 vines per block. The first commercial crop was produced in 2012. The fifth season results suggest selection '501-12' had the lowest pruning weight, while '502-01' had the highest. Selection '502-10' matured early in the season, while '501-12' ripened late. The selections differed in total yield per vine with the late maturing '501-12' producing the largest cumulative crop of 17.0 kg/vine for the period 2012-2014. '502-10' and '501-01' also produced very good yield. Selection '501-12' had the highest number of clusters per vine, while '502-10' had the lowest. Early-season selection '502-10' had the largest cluster weight, while mid-season selection '502-01' produced the largest size berries. Late season selection '501-12' had the sweetest berries with soluble solids content of 24.2%. The results of our study are very encouraging based on plant vigor, high yields, and good fruit quality. The newly developed PD resistant *V. vinifera* selections have the potential to advance the environmental and economic sustainability of viticulture in the Southeast and enhance the food systems through the implementation of advanced technologies.

## Evaluation of Weed Control Options during Vineyard Establishment in North Dakota

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Alternative weed control methods were tested in an experimental vineyard near Absaraka, ND for their ability to control annual weed species as well as for their effects on vine growth during establishment. The experiment was arranged in a randomized complete block design and analyzed as a two factor factorial including four white wine cultivars (Alpenglow, Brianna, Frontenac Gris, and LaCrescent) and six weed control methods (Landscape Fabric, Herbicide (glufosinate-ammonium, 2.3 L ha<sup>-1</sup>, with flumioxazin, 420 g ha<sup>-1</sup>), black plastic, Straw Mulch, Tillage, and Turfgrass) with four replications. Weed counts and biomass were collected using a 929 cm<sup>2</sup> (1 ft<sup>2</sup>) quadrat. Data was converted to a per m<sup>2</sup> basis for evaluation. Landscape fabric and straw mulch were the most effective and consistent in reducing weed biomass across months and years. Tillage had the highest weed biomass amounts throughout the study, while landscape fabric, straw mulch, black plastic, and herbicide had the fewest number of weeds present. Dormant pruning weights differed across seasons for cultivars and weed control methods. Frontenac gris had greater growth all three seasons (19.2, 119.3, and 336.8 g/plant, respectively) compared to the other cultivars. Vines within the black plastic mulch consistently had higher pruning weights all three years (23.3, 119.5, and 442.4 g/plant respectively) compared to vines in the other treatments. Turfgrass and straw mulch generally suppressed the growth of all cultivars during the three year study. Findings suggest that black plastic or landscape fabric may be viable weed control alternatives in North Dakota vineyards.



# Technical Session Abstracts

## Effects of Leaf Removal and Gibberellin on Chardonnay Grapes in the Lake Erie Region of Pennsylvania

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Over six consecutive seasons the effects of cluster-zone leaf removal timing and bloom gibberellin applications on *Botrytis* bunch rot, cluster morphology, and yield were evaluated on Chardonnay (*Vitis vinifera* L.) grapevines. All experimental plots received two *Botrytis*-specific fungicide applications, one at bunch pre-closure and one at veraison. Leaf removal at veraison, post fruit-set, or trace bloom reduced *Botrytis* severity by an average of 14, 47, or 71%, respectively, compared to no leaf removal. Leaf removal at trace bloom (LRTB) reduced *Botrytis* incidence and severity in five and four seasons, respectively, and was as effective as (2007 to 2010), or more effective than (2011 and 2012) two additional fungicide applications (at bloom and at pre-harvest), suggesting potential to reduce fungicide inputs. Gibberellin was less effective than LRTB, but reduced the incidence of *Botrytis* in 2008 at 5 mg/L and the severity of *Botrytis* in 2010 at 25 mg/L. *Botrytis* development increases with number of berries per cluster and berries per centimeter of cluster (compactness). Number of berries per cluster was reduced by LRTB in 2007, 2010, and 2011, and by 10 mg/L gibberellin in 2007 and 25 mg/L in 2011. Compactness was reduced by LRTB and gibberellin in 2007, 2008, and 2011. Yield was reduced by LRTB in 2008, but no yield effects were observed in subsequent seasons. The efficacy of LRTB for reducing *Botrytis* bunch rot was highest in years with the most compact clusters, suggesting that the value of this treatment increases with increasing potential for bunch rot development.

## Impact of Crop Level and Harvest Date on Aroma Compounds of Four *Vitis vinifera* Wine Grape Cultivars in Ontario, Canada

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Pinot gris, Riesling, Cabernet franc and Cabernet Sauvignon from a vineyard in Niagara-on-the-Lake, Ontario (Canada) were subjected to two crop level treatments (full crop, half crop) combined with three harvest dates [commercial harvest (T0), 3 wk after T0 (T1), 6 wk after T0 (T2)] in 2011-2012 in a randomized experiment. Wines were produced from all treatment replicates. It was hypothesized that a full crop with a delayed harvest date ( $\approx$  appassimento) might have a greater positive impact on wine aroma than reducing crop level. Analysis of wine aroma volatiles was carried out by GC-MS. Aroma compounds were quantified by calibration with analytical standards prepared at different concentrations in model wine. Delayed harvest overcame effects of crop reduction for almost volatile components. Pinot gris and Riesling benefitted with increases in varietal aromas e.g. monoterpenes (linalool, geraniol, citronellol) and increases in esters, aldehydes, alcohols, and norisoprenoids. Reduced concentrations with delayed harvest for volatile acids and grassy-green odor compounds (e.g. 1-hexanol, hexyl acetate) in wines were also evident. Increases in ethanol were related to increased berry and must sugars, but higher alcohols did not necessarily increase with harvest date. Extended harvest was in some cases disadvantageous, particularly for T2 treatments, due to production of compounds like benzaldehyde, diethyl acetal, or higher concentrations of higher alcohols e.g. isoamyl alcohol and nonanol, which could be linked to pre-harvest spoilage. Crop level had little impact on sensory properties of all four cultivars in both seasons. However, delayed harvest resulted in substantial and mostly positive sensorial changes. Due to largely beneficial chemical and sensorial effects, delayed harvest is recommended rather than crop level reduction to enhance wine quality in these cultivars.

## Impacts and Interactions of Abscisic Acid (ABA) and Gibberellic Acid (GA) Sprays on Sovereign Coronation and Skookum Seedless Table Grapes

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Gibberellic acid (GA; 0, 15, 30 mg/L) and abscisic acid (ABA; 0, 150, 300 mg/L) treatments were applied alone and in combination on Sovereign Coronation and Skookum Seedless (hereinafter "Coronation" and "Skookum", respectively) table grapes in 2013-2014. Two sites (Hipple, Lambert) were used for Coronation and one (Lambert) for Skookum. Trials were randomized complete block designs with factorialized treatment arrangements containing four blocks and 12-vine treatment replicates. GA was applied three times (pre-bloom, 7 d post-set, 14 d post-set); ABA was applied twice (1,2 weeks pre-veraison). Treatments were assessed for yield components (e.g. yield, cluster weight, berry weight), berry composition [Brix, titratable acidity (TA), pH, color intensity, anthocyanins], and sensory variables. GA increased yield, cluster weight, and berry weight in Coronation. GA reduced Brix, color, and anthocyanins and reduced TA (both sites). ABA increased berry pH (both sites) and color intensity and anthocyanins (Hipple 2013). Yield was reduced by GA in Skookum, but cluster weight increased (2013). Several GA-treated Skookum vines in 2013 bore no crop in 2014; therefore, use of GA on Skookum should be made with caution. Brix and Berry pH increased and TA decreased with increasing GA in Skookum, and ABA increased Brix and pH. In Coronation, GA enhanced several sensory variables [e.g. cluster attractiveness, color intensity, juiciness (Hipple); cluster attractiveness, color intensity, labrusca flavor (Lambert)]. ABA enhanced sensory variables (e.g. cluster attractiveness, color intensity, labrusca flavor). In Skookum GA likewise enhanced sensory variables (e.g. flesh firmness, fruity flavor, juiciness) as did ABA (e.g. cluster attractiveness, golden color, visual liking). GA consistently increased yield components with minimal impacts on berry composition, while ABA increased Brix, pH, color, and anthocyanins and decreased TA.

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# Technical Session Abstracts

## Utilization of Proximal Sensing Technology (Greenseeker) to Map Variability in Ontario Vineyards

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Precision agriculture is a term used to describe an amalgam of technologies employed for optimization of production in agronomic crops. Over the past decade, these technologies have been applied to viticulture, including use of GPS, construction of maps using GIS, yield monitors on mechanical harvesters, remote sensing, and surface-based assessment of foliar health. Much of this technology has also been examined for its use in assessment of vine water status and berry composition. This project was intended to assess a recent technology, Greenseeker™ (Trimble Corp.) to evaluate its usefulness by correlating metrics it provides (horizontally-accessed spectral reflectance, NDVI) to yield components (e.g. yield per vine, cluster weight, berry weight), vine and soil water status, and berry composition. Three experimental sites were chosen (Lambert Vineyards, Virgil, ON; Coyotes Run, St Davids, ON; Cave Spring Vineyards, Beamsville, ON). The Lambert and Cave Spring sites each contained Riesling and Cabernet franc vineyards while Coyotes Run had two Pinot noir blocks. A grid of geolocated sentinel vines comprised each study block. Soil moisture and leaf water potential ( $\psi$ ) measurements were collected three times between fruit set and veraison. Greenseeker™ measurements were likewise collected from lag phase to just prior to harvest. Yield and berry composition measurements were collected from each sentinel vine. Linear correlations and spatial correlative relationships were apparent between NDVI data collected by Greenseeker™ and both soil moisture and leaf  $\psi$ , in addition to yield components and berry composition. Furthermore, zones indicative of virus infection (grapevine leafroll 3) could be defined using this technology. Tentative conclusions are that Greenseeker™ technology will be useful for delineation of management zones within vineyards for ultimate application of precision viticulture.

## The Contribution of Anthocyanin Bisulfite Complexes to Free SO<sub>2</sub> Measurements and Microbial Stability in Red Wines

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Common approaches to SO<sub>2</sub> measurement, such as aeration-oxidation (A-O), are known to overestimate free SO<sub>2</sub> in red wines due to dissolution of weak anthocyanin-bisulfite adducts during measurement. However, usage of these methods persists even among researchers who are aware of the artifacts, in part because of the assumption that anthocyanin-bisulfite complexes possess antimicrobial activity, and also because of the absence of convenient artifact-free analytical alternatives. We have recently reported a headspace-gas detection tube method (HS-GDT) that can measure true free SO<sub>2</sub> concentrations with minimal equipment. Free SO<sub>2</sub> values measured by HS-GDT in red wines averaged 2-fold lower and were up to 5-fold lower than those measured by A-O. Sterile filtered 4L subsamples of white and red wines were then prepared, with the latter prepared by addition of an anthocyanin extract. Molecular SO<sub>2</sub> was determined by the HS-GDT method and standard methods (A-O, flow injection analysis (FIA)). Challenge studies were then performed by inoculating wines with *Saccharomyces cerevisiae* strain EC1118, and SO<sub>2</sub> was measured throughout the experiment. Yeast viability was determined at 11 time points by plating and by flow cytometry. No correlation was observed between yeast viability and “apparent” SO<sub>2</sub> (A-O, FIA), but viability was strongly correlated with “true” molecular SO<sub>2</sub> (HS-GDT). Thus, anthocyanin-bisulfite complexes have negligible antimicrobial effect against yeast and standard approaches to SO<sub>2</sub> measurement appear to overestimate microbial stability of red wines.

## Impact of Under-vine Floor Management in a Finger Lakes Vineyard

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Four under-vine floor management treatments were established in a Cabernet Franc vineyard in 2010: cultivation (CULT), native vegetation (NV), white clover (WC), and glyphosate herbicide (GLY) as the control. Drainage lysimeters were installed to monitor leachate nutrient and pesticide concentrations. GLY treatment vines generally had larger pruning weights than the other treatments. GLY vine yields were greater than all other treatments by 2012 but these differences were not attributable to differences in stem water potential. Multi-dimensional sorting suggested no differences in wine sensory characteristics among treatments in any vintage. The smaller vine size and yields of NV cover crop in comparison to GLY vines suggested the potential for cover crops to limit vigor in comparison to conventional practices. Greater yields of GLY vines and lack of sensory differences among treatments suggested that herbicide use promoted higher yields without a sacrifice in fruit composition. Differences in soil structure were observed in the final year of the study when CULT soils had greater bulk density than the other treatments, and less porosity than WC soils. Soil microbial respiration was generally greater in NV and WC treatments. Dissolved organic carbon leachate concentrations were greater in GLY and CULT. Mean annual nitrogen leachate concentrations of CULT and NV were less than GLY and WC samples. In 2012, GLY soils leached greater concentrations of imidacloprid insecticide than other treatments. These factors demonstrate the potential of cover crops to maintain soil quality and decrease the leaching of nutrients and agrochemicals in comparison to conventional practices.

## Root Restriction as a Tool to Achieve more Balanced Vine Growth and Enhanced Fruit Composition

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A field trial was initiated at the AHS AREC in 2009 to evaluate how the volume of root restriction bags affected vine size, components of yield, and fruit composition as part of a larger project aimed at regulating vine balance. Cabernet Sauvignon clone 337 vines, grafted to rootstock 101-14, were planted in fine mesh root restriction bags (Rootmaker®) in 2009: Three rootbag volumes, 0.026 m<sup>3</sup>, 0.036 m<sup>3</sup>, and 0.059 m<sup>3</sup>, were compared with unrestricted (control) vines in a replicated (4, 4-vine plots), complete block design. Data from the 2013 and 2014 seasons illustrated small differences in crop yield between treatments, and Ravaz indices that ranged from around 6 with the small volume bags to about 3 with the control vines. Cane pruning weights increased linearly from 0.51 kg/m of cordon with the smallest volume rootbags to 0.92 kg/m with the control vines. Other positive effects of root restriction included significant increases in fruit Brix, decreases in fruit pH, and decreased total titratable acidity. Bunch stem necrosis was problematic in the 2013 season and the incidence of BSN increased from 5% in the smallest rootbag vines, to 23% of clusters affected in the control vines. Root restriction also led to some increases in both fruit color density and total phenolics measured at harvest. Although there is a material and labor cost involved with their installation, root restriction can mitigate some of the ill effects of surplus plant available water in a humid environment.

# Poster Session Abstracts

## Increasing Sparkling Wine Quality, Productivity and Winery Revenue with Press Fractioning of L. Cv. Pinot Noir Clone 115 in Ontario

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Winemakers often use the entire pressed juice for sparkling wine due to the need for high volumes of non-vintage wines. This study assessed whole bunch pressing of L. Cv. Pinot noir clone 115 to develop a tier-system of sparkling wines based on the chemical composition of each juice press fraction. The first press fraction (PF1) produced the finest wine but later fractions (PF2 and PF3) in this study were used to produce lower quality, 2<sup>nd</sup> label sparkling wines. These later fractioned wines will command a lower retail price but have a higher volume of bottles than the top tier wine (PF1). This will allow for the top quality, top tier wine (PF1) to age longer and increase quality reputation and income from press fractionating than blending all fractions for one wine. Previous press fraction trials have concentrated on a mixture of clones and focused on juice and base wines. This is the first sparkling wine press fraction trial to produce finished sparkling wines from each fraction and to focus on one clone (115) that is not traditionally used for *Blanc de noirs*. pH and YAN (mg/L) were highest in PF3 juice. PF3 juice and wines had the highest oxidation potential. Conductivity (mS/cm), (an indicator of tartrate stability), total phenolics (a.u.) and potassium levels were highest in PF3 base wines but TA (g/L) was lowest. Results demonstrate the superior sparkling wine quality of PF1 to increase revenue and reputation for quality wine for a winery without loss to overall volume of finished wines.

## Precursors of Hydrogen Sulfide during Wine Storage and the Role of Elemental Sulfur Pesticide Residues

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Hydrogen sulfide (H<sub>2</sub>S) is a leading cause of sulfurous off-aromas in wines. H<sub>2</sub>S can increase during post-bottling storage under low oxygen conditions (i.e. screw cap closures), though the mechanism for this post-bottling evolution is not yet fully understood. Our experiments show that elemental sulfur (S-0) residues on grapes not only cause increased H<sub>2</sub>S production during fermentation, but also result in continued H<sub>2</sub>S generation under reductive storage conditions. Grape juice was spiked with various levels of S-0 (0-100 mg/L) and fermented to dryness. Resulting wines were racked and sparged to remove H<sub>2</sub>S, followed by reductive bottling and storage. After 3 months, free H<sub>2</sub>S was found to have increased in proportion to the original S-0 concentration, corresponding to the conversion of approximately 1% S-0 residue. An assay for wine-soluble, non-volatile H<sub>2</sub>S precursors based on (2-carboxyethyl) phosphine (TCEP) addition was developed.

## The Suitability of L. cv. Pinot Noir Mariafeld for Sparkling Wine Production in Niagara, Ontario

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Grapes grown in Niagara, Ontario, a cool climate region, are desirable for sparkling wine production due to high acid levels. Proteins, derived from grapes and yeast, contribute to the foamability in sparkling wine. Foam persistence and stability are two factors that determine the quality of sparkling wine. This research is part of a larger project that aims to investigate the role of protein in finished sparkling wine and its effect on foamability. The objective of this study was to evaluate the suitability of the high acid grape, Pinot noir Mariafeld, for quality sparkling wine production. Grapes were harvested in 2014 and divided into two treatments: a control with no bentonite addition and a treatment that received a 1.0g/L sodium bentonite addition to remove grape proteins. Prior to undergoing primary fermentation with *S. cerevisiae* EC1118 the protein concentration using the Bradford assay, was 42.0 ± 5.0 µg/mL for control and 21.0 ± 2.0 µg/mL for bentonite treated. Chemical analyses were carried out at each stage of winemaking. Sodium bentonite addition affected the protein concentration but did not impact fermentation kinetics or chemical composition of the juice and base wine. Base wines were divided into eight treatments for secondary fermentation in bottle where half was inoculated with *S. cerevisiae* EC1118 and half with *S. bayanus*, Brock isolate. Sodium bentonite was added along with the *liqueur de tirage* to select treatments to remove yeast proteins. Further research is underway to characterise proteins and determine the suitability of Mariafeld for sparkling wine production.

## Distribution of Plant Parasitic Nematodes in Missouri and Arkansas Vineyards

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In the fall of 2008 a nematode survey was conducted from 30 vineyards in Missouri and Arkansas comprising 107 samples. Samples were collected from cultivars of grapevine species *Vitis aestivalis*, *V. vinifera*, hybrids, *V. labrusca*, and *Muscadinia rotundifolia*. Eleven different nematode genera were isolated and identified, three of economic importance to grapevines, *Xiphinema americanum*, *Meloidogyne* sp., and *Pratylenchus* sp. All but two vineyard sites had presence of *X. americanum* with 80% of the sites above economic threshold levels. This is primarily a concern due to the ability of *X. americanum* to transmit ToRSV. Both *Meloidogyne* and *Pratylenchus* sp. were present in much lower frequency and numbers. *X. index*, known to vector GFLV, was not identified in any of the samples collected even though GFLV is present in Missouri, indicating either transmission through infected planting stock or an alternative vector.

## Rootstock/Irrigation Impacts on Vine Growth, Wine and Fruit Quality Parameters

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With increasing competition for water in Missouri between field crops and other anthropogenic needs, it is necessary to find ways to minimize vineyard water use and cost while maintaining wine quality and fruit yield. In 2008, an experimental vineyard was established within a full factorial experiment varying rootstock and irrigation. Either 1103P, SO4, 3309C or self-rooted vines were all planted with cv. Chambourcin as the scion. In 2013 and 2014 the following treatments were added i) unirrigated ii) full replacement of evapotranspiration (ET) iii) irrigated at 70 % of the potential ET (REDI). Soil moisture, canopy development, vine water status and gas exchange were monitored. Yield metrics were taken and basic chemistry analysis including organic acid profiling was conducted. Wines were vinified keeping replicate blocks separate. GC-MS analysis of volatiles was conducted on juice and wine. In both years it was found that the treatments impacted vine development and fruit chemistry. Own-rooted vines consistently were among those under the greatest water stress with those grafted on SO4 among those least impacted. In some cases this resulted in SO4 vines to be under equal stress to own rooted vines receiving more water, this may be partially explained by the smaller canopy of the SO4 vines. Despite similar water potential, canopy development and brix to own-rooted vines 1103P frequently had higher malic and citric acid at harvest. While significant differences in volatile compounds were found between treatments, such as own-rooted ET vines having among the highest β-damascenone concentrations both years, few clear trends between irrigation, rootstock and volatiles were observed.

## Quantitative Comparison of Important Odor Compounds Found in Aromatic *Vitis Vinifera* wines to those produced from 'Valvin Muscat'

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Since its release in 2006 of cv. Valvin Muscat (interspecific hybrid) by Cornell, the acreage under cultivation has grown rapidly in the Midwest and Northeast U.S. While descriptors such as "floral" and "spicy" are used to both describe Valvin Muscat and *V. vinifera* Muscat varieties, little is known about Valvin Muscat's actual aroma chemistry. This information is needed as a first step in allowing aroma-driven optimization of viticultural and vinification parameters of the new cultivar. Eight monoterpenes known to be important to classic Muscat aroma were quantified by GC-MS, following concentration by solid phase extraction. Four Valvin Muscat wines, from three different states (Missouri, New York and Indiana), were compared to wines made from three different examples of Muscat varieties, two Rieslings, two Gewurztraminer and a Vidal and a Traminette. The concentration of linalool in Valvin Muscat was far greater than those found in *V. vinifera* Muscat varieties (a mean of 1,395 µg/L versus 13 µg/L respectively). Total linalool oxides (*cis* and *trans*) concentrations were comparable between Valvin Muscat and *V. vinifera* Muscat's (with mean concentrations of 589 µg/L and 669 µg/L). The Gewurztraminer and Riesling wines had lower concentration of total linalool oxides with mean concentrations of 72 µg/L and 119 µg/L respectively, with concentrations between these varieties not significantly different. While there was large differences in specific monoterpene concentrations within Valvin Muscat, up to 10x, it was found that generally Valvin Muscat wines have concentrations equal or higher to those concentrations found in *V. vinifera* Muscat's for all compounds quantified.

## Investigation into the Genetic Basis of Leaf Shape in Grapes

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Leaf shape is a distinguishing and diverse taxonomic characteristic in grape (*Vitis* spp.). Leaves are a reliable indicator for species and cultivar identification, as well as providing information about plant function as it adapts to its environment. However, little is known about the genetic basis of leaf shape anatomy in grapes. In this project, phenotypic analysis using morphometrics, and genotypic analysis using single-nucleotide polymorphism (SNP) markers have been combined to better define the genetic basis of grape leaf shape. Our mapping population consists of parents, *V. aestivalis* 'Norton' and *V. vinifera* 'Cabernet Sauvignon', and 182 F1 progeny, at MSU Fruit Experiment Station. For phenotyping, we have identified important leaf shape characteristics (n=17) based on the venation pattern, lobes, and sinuses of each leaf. Morphometric analysis will be completed to quantify leaf shape variation. Approximately 43,320 SNP markers generated by genotyping-by-sequencing (GBS) have been identified in this population. Statistical analysis will be performed using a General Procrustes Analysis (GPA) to produce trait measurements in the form of Principal Component (PC) scores. Correlation analysis using genotyping and phenotyping data will be calculated to identify quantitative trait loci (QTLs) responsible for leaf shape.

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