American Society for Enology and Viticulture-Eastern Section

41st Annual Conference
July 18-21, 2016
St. Louis, Missouri

Symposium
Adapting and Adopting: The Future of Grapes and Wine

Email: info@asev-es.org
Website: http://www.asev-es.org/

Conference Overview

Sunday, July 17, 2016

Preconference Board Meeting	Magnolia Hotel Heiss Boardroom	**4:00-6:00 pm**

Monday, July 18, 2016

Complimentary Breakfast (for hotel guests)	Magnolia Hotel	**6:00-9:00 am**
Conference Registration	Magnolia Hotel Ballroom AB	**7:00-7:45 am**
Tour Missouri Vineyards & Wineries	Meet in Magnolia Hotel Lobby	**7:45 am-7:00 pm**

Tuesday, July 19, 2016

Complimentary Breakfast (for hotel guests)	Magnolia Hotel	**6:00-9:00 am**
Conference Registration	Magnolia Hotel Ballroom AB	**7:30 am-3:00 pm**
Welcome and Overview	Magnolia Hotel Ballroom AB	**8:15 am-9:00 am**
Student Competition and Flash Talks	Magnolia Hotel Ballroom AB	**9:00 am-12:00 pm**
Lunch and ASEV-ES Business Meeting	Magnolia Hotel Ballroom CD	**12:00-2:00 pm**
Technical Program	Magnolia Hotel Ballroom AB	**2:00-5:00 pm**
View Posters	Magnolia Hotel Ballroom AB	**5:00-5:30 pm**
Oenolympics & Grazing Dinner	Magnolia Hotel Ballroom CD	**6:00-7:30 pm**

Wednesday, July 20, 2016

Complimentary Breakfast (for hotel guests)	Magnolia Hotel	**6:00-9:00 am**
Conference Registration	Magnolia Hotel Ballroom AB	**7:30-11:00 am**
Welcome and Announcements	Magnolia Hotel Ballroom AB	**8:30 am-8:45 am**
Student Competition and Flash Talks	Magnolia Hotel Ballroom AB	**8:45 am-12:00 pm**
Lunch	Own Your Own	**12:00-2:00 pm**
Technical Program	Magnolia Hotel Ballroom AB	**2:00-4:00 pm**
View Posters	Magnolia Hotel Ballroom AB	**4:00-4:30 pm**
Sparkling Wine Reception and Banquet	Magnolia Hotel Mezzanine & Ballroom	**6:30-9:00 pm**

Thursday, July 21, 2016

Complimentary Breakfast (for hotel guests)	Magnolia Hotel	**6:00-9:00 am**
Symposium Registration	Magnolia Hotel Ballroom AB	**7:30-9:00 am**
Future of Grapes and Wine Symposium	Magnolia Hotel Ballroom AB	**8:30 am-12:00 pm**
Lunch	Magnolia Hotel Ballroom CD	**12:00-1:00 pm**
Future of Grapes and Wine Symposium	Magnolia Hotel Ballroom AB	**1:00-4:30 pm**
Postconference Board Meeting	Magnolia Hotel Heiss Boardroom	**5:00-6:30 pm**

ASEV-ES Conference Sponsors

Monday, July 18, 2016

Tour Missouri Vineyards & Wineries

Meet in Magnolia Hotel Lobby	**7:45 am**
Depart for Morre Vineyard	**8:00 am**
Vineyard Tour 9:45-10:45 am	
Depart for Stone Hill Winery	**10:45 am**
Winery Tour 11:00 am-12:00 pm	
Lunch and Tasting at Stone Hill Winery	**12:00 pm**
Lunch and Tasting 12:00-1:30 pm	
Visit Historic Herman	**1:30 pm**
Tour Hermannoff, Star Lanes, Microbrewery and More 1:45-2:45 pm	
Depart for Augusta Vineyards	**2:45 pm**
Tour Vineyard 3:45-4:30 pm	
Depart for Montelle Winery	**4:30 pm**
Winery Tour 4:45-5:45 pm	
Depart for Magnolia Hotel	**5:45 pm**
Arrive at Magnolia Hotel	**7:00 pm**

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Tuesday, July 19, 2016

Welcome and Overview — 8:15-8:30 am

Stephen Menke, Colorado State University and ASEV-ES Chair
Harlene Hatterman-Valenti, North Dakota State University and ASEV-ES Chair Elect

Grape and Wine Production in the Midwest — 8:30-9:00 am

Misha Kwasniewski, Enology Program Leader, Grape and Wine Institute, Columbia, Missouri

Student Oral Presentation Competition Sessions — 9:00-10:00 am

Impact of Novel Groundcover Management Systems on Vineyard Productivity, Water and Nutrient Relationships, and Weed Dynamics
Sarah Bowman* and Bradley Taylor

Quantification of Wine Fault Markers and their Relation with Risk Factors
Paula Grossi*, Connie Liu, and Misha T. Kwasniewski

An Ecological Survey of Native Riesling Microflora in the Finger Lakes Region
Marie Guido-Miner*, Jenny Kao-Kniffen, and Anna Katharine Mansfield

Understanding and Developing Management Solutions for Sour Rot in Grapes
Megan Hall*, Gregory Loeb, and Wayne Wilcox

Flash Talks-Poster Summaries (3 minutes each) — 10:00-10:30 am

Genetic Study of Cold Hardiness in *Vitis aestivalis*-derived 'Norton' Based Population
Daniel Adams, Li-Ling Chen, Shanshan Yang, Lance Cadle-Davidson, and Chin-Feng Hwang*

Vineyard Floor Management Impacts Soil and Grape Microbial Communities in a New York State Riesling Vineyard
Ming-Yi Chou, Terrence Bell, Anna Katharine Mansfield, Jenny Kao-Kniffin, and Justine Vanden Heuvel*

Performance of 'Frontenac' and 'Marquette' Grapevines Grown on Four Training Systems
Diana R. Cochran* and Gail R. Nonnecke

Identifying Key Parameters for Berry Ripeness and Regionality in Missouri Norton Grapes
Courtney E. Duncan*, Misha Kwasniewski, and Dean Volenberg

"Kicker" Canes Removed at Bloom affects Hedging Weights in Cabernet Franc, Chambourcin and Chardonnay in New Jersey
Hemant Gohil* and Daniel Ward

Effectiveness of Closure Methods on Preserving Wine Quality after Resealing
Stephanie Grau and Misha T. Kwasniewski*

Impact of Clone and Rootstock Selection on Riesling and Sauvignon Blanc Winter Hardiness
Andréanne Hébert-Haché*, Debbie Inglis, and James J. Willwerth

Optimization of Enzymatic Release and Stabilization of Glycosidically Bound Aroma Compounds by SPME GC-MS
Connie Liu and Misha T. Kwasniewski*

HPLC Analysis of Microvinified Deacidified Cold Climate Grape Wines
Brittany Olson*, **Harlene Hatterman-Valenti**, and Ganesh Bala (Narayanaganesh Balasubramanian)

Break/View Posters 10:30-11:00 am

Student Oral Presentation Competition Sessions 11:00 am-12:00 pm

Effects of Variable Rooting Volume on Growth, Crop Yield, and Berry Composition of Cabernet Sauvignon
Brycen T. Hill, Tony K. Wolf*, and Amanda C. Stewart

Yeast and *Botrytis cinerea* Considerations for the Development of Regional Appassimento Wines in Ontario
Jennifer Kelly*, Lisa Dowling, Fred DiProfio, Michael Brownbridge, Vincenzo De Luca, Gary Pickering, and Debbie Inglis

Assessing Vine-Groundcover Competition Using Infrared Thermography in a Midwestern Vineyard
Benjamin A. Loseke* and Paul E. Read

Discovery and Analysis of Grapevine Vein Clearing Virus in Ampelopsis Cordata
Sylvia M. Petersen, Steven Beach, and Wenping Qiu*

Lunch and ASEV-ES Annual Business Meeting 12:00-2:00 pm

Invited Speaker-Viticulture

Impacting Grower Decision Making in an Era of Science and Technology Overload 2:00-3:00 pm

Fritz Westover, Owner, Westover Vineyard Advising, Houston, Texas

Technical Program 3:00-5:00 pm

Effect of Leaf Removal Timing and Duration on Rotundone Content in Noiret Grapes and Wine
Laura J. Homich, Ryan J. Elias, Justine Vanden Heuvel, and **Michela Centinari***

Ten Years of Cover Crops: Effects on Nematode Populations and Vegetative Parameters of Cabernet Sauvignon
Gill Giese*, Ciro Velasco-Cruz, Lucas Roberts, and Jon Eisenback

The Mechanization of Early Leaf Removal in Pennsylvania
Bryan Hed* and Michela Centinari

Molecular Genetic Approaches to Norton Grape Improvement
Chin-Feng Hwang*, Surya Sapkota, Logan Duncan, Brigette Williams, Mia Mann, Daniel Adams, and Li-Ling Chen

Break/View Posters 5:00-5:30 pm

Adjourn 5:30 pm

Oenolympics & Grazing Dinner 6:00-7:30 pm

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Wednesday, July 20, 2016

Welcome and Announcements 8:30-8:45 am

Stephen Menke, Colorado State University and ASEV-ES Chair
Harlene Hatterman-Valenti, North Dakota State University and ASEV-ES Chair Elect

Flash Talks-Poster Summaries (3 minutes each) 8:45-9:15 am

Changes in C_6 Compounds and Fatty Acids during the Ripening of Maréchal Foch Berries
Geneviève Montminy, Martine Dorais, Marie-Pier Vigneux, Paul Angers, and **Karine Pedneault***

Impact of White Hybrid Grape Pomace Addition on the Proanthocyanidin Composition of Red Hybrid Wines
Paméla Nicolle, Paul Angers, Annabelle Veillette, Pascal Dubé, and Karine Pedneault*

The Role of Protein Concentration on Sparkling Wine Foaming Properties and Sensory Attributes
Esther Onguta*, Belinda Kemp, Paul van der Merwe, and Debbie Inglis

Vineyard Response to Reduced Mowing Frequency
Amelia Raymond*, Bradley Taylor, Sarah Bowman, and Amanda Weidhuner

Construction of High Density Linkage Maps and Detection of Downy Mildew Resistance Locus in *Vitis aestivalis*-derived 'Norton' Population
Surya Sapkota, Li-Ling Chen, Shanshan Yang, Lance Cadle-Davidson, and Chin-Feng Hwang*

Glyphosate and Phenoxy Herbicide Symptomology in Grapes
Dean S. Volenberg*, Mandy D. Bish, and Kevin Bradley

Vineyard Floor Management Analysis using Nematode Colonizer-Persister Index as a Bio-indicator of Soil Health
Amanda Weidhuner*, Bradley Taylor, and Sarah Bowman

Training Systems for Cold Hardy Wine Grape Cultivars
Madeline Kay Wimmer* and Amaya Atucha

A Survey of Grapevine Vein Clearing Virus in *Vitis* Species in the National Plant Germplasm Collection
Kaylie Winschel, Steven Beach, Jason Londo, and Wenping Qiu*

Break/View Posters 10:00-10:30 am

Student Oral Presentation Competition Sessions 10:30 am-12:00 pm

The Effects of Hyperoxidation and Storage Temperatures on the Flavor Profiles of Riesling Wine
Lisa Robbins*, Todd Steiner, and Joseph Scheerens

Effects of Early Leaf Removal and Cluster Thinning on Yield Components, Fruit Composition, Bud Cold Hardiness, Wine Chemistry, and Sensory Perception in French-American Hybrid Chancellor
Maria S. Smith, Bryan Hed, Denise M. Gardner, and Michela Centinari*

Investigating Vine Phenology, Growth, and Yield of Three Pierce's Disease Resistant *Vitis vinifera* L. Selections in Central Alabama
Andrej Svyantek, Elina Coneva*, J. Raymond Kessler, James A. Pitts, James D. Spiers, and Edgar Vinson

Cane Morphology Influences Bud Freezing Tolerance in *Vitis vinifera* Cabernet Franc
Thomas M. Todaro and Imed E. Dami*

Effect of Biochar on Soil Quality and Grapevine Growth in a Greenhouse Experiment
Arianna Bozzolo*, Diego Pizzeghello*, **Tim Weber**, Alessandra Cardinali, Ornella Francioso, and Serenella Nardi

The Composition of Exogenous Tannins affects Malolactic Fermentation Rates and Tannin Retention
Mark R. Skoglund and Anna Katharine Mansfield*

Lunch Own Your Own — 12:00-2:00 pm

Invited Speaker –Enology — 2:00-3:00 pm

Yeast Nutrition is More than Nitrogen Management

Nichola Hall, Fermentation Specialist, Scott Laboratories, Petaluma, California

Technical Program — 3:00-4:00 pm

Region and Organizational Role Interact with Cane Pruning Decision Preference
Andrew Kirk*, Valerie Saxton, Glen Creasy, Gary Steel, and Richard Green

Application of Remote Sensing by Unmanned Aerial Vehicles to Map Variability in Ontario Vineyards
Andrew G. Reynolds*, Ralph Brown, Marilyne Jollineau, Adam Shemrock, Jerome Theau, Elena Kotsaki, and Hyun-Suk Lee

Utilization of Proximal Sensing Technology (Greenseeker) to Map Variability in Ontario Vineyards
Elena Kotsaki, **Andrew G. Reynolds***, Ralph Brown, Marilyne Jollineau, and Hyun-Suk Lee

The Use of Geotextiles to Reduce Freeze Injury in Vineyards
James J. Willwerth* and Mary Jasinski

View Posters — 4:00-4:30 pm

Adjourn — 4:30 pm

Sparkling Wine Reception — 6:30-7:00 pm

ASEV-ES Grand Awards Banquet — 7:00-9:00 pm

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Thursday, July 21, 2016

Adapting and Adopting: The Future of Grapes and Wine Symposium

Welcome **8:30-9:00 am**
Misha Kwasniewski, Program Leader, Grape and Wine Institute, Columbia, Missouri

Developments in Understanding Hybrid Aromas and Impacts on Viticulture and Winemaking Decisions **9:00-10:00 am**
Karine Pedneault, Research Scientist, Institut de Recherche en Biologie Végétale, Canada

Break **10:00-10:15 am**

Managing Wine Production from Different Terroirs **10:15-11:15 am**
Jean-Philippe Roby, Associate Professor Bordeaux Sciences Agro-ISVV, France

Panel Discussion **11:15 am-12:00 pm**
Lunch **12:00-1:00 pm**

Delivering Extension Education to a Geographically Dispersed Industry: Tales from the Northern Grapes Project **1:00-2:00 pm**
Tim Martinson, Senior Extension Associate, Cornell University, New York

Trends in Viticulture: Observations from a Practitioner **2:00-3:00 pm**
Hector Bedolla, Crop Advisor, Agronomist, Crop Protection Services, California

Break **3:00-3:30 pm**

Managing Malic Acid in Challenging Climate Winemaking **3:30-4:30 pm**
Nichola Hall, Fermentation Specialist, Scott Laboratories, Petaluma, California

Adjourn **5:00 pm**

Guest Speakers

Hector Bedolla is a wine industry veteran having managed vineyards and worked in various aspects of the California winegrape industry. Growing up in the Napa wine country, he gained an appreciation for the lifestyle and rewards. As a graduate in Plant Science from the University of California, Davis specialized in Agronomy and Viticulture, laying the foundation for his 35-year career in northern California. He has been a local and international consultant, a vineyard manager, a grape and wine broker, a biologist, and now an agronomist/crop advisor and pest control advisor. He has taught technical viticultural information at several levels during the span of his career.

Nichola Hall earned a BSc in Microbial Biotechnology (1997) and a PhD in Yeast Physiology and Fermentation Science (2001) from the University of Abertay Dundee, Dundee, Scotland, United Kingdom. Dr. Hall has worked at the Bronco Wine Company (2002-2007), Vinquiry, Inc. (2007-2009) and is currently a Technical Representative for Scott Laboratories. Dr. Hall has been a professional member of the American Society of Enology and Viticulture (ASEV) since 2002 and is currently the 1st Vice President and on the Exhibitor Advisory committee (2010- Present) and Nominating committee (2011- Present). She has also served on the Best Student Paper Award Committee (2010 and 2011, 2013-2015), as a Moderator Wine Aroma/ Sensory Session, National Conference (2010) and a Presenter at the ASEV National Conference (2007 and 2008). She has been a Managing Committee member for Unified Wine and Grape Symposium (2015-Present) and other activities include Member, Gold Standard Committee (2011- Present), Board Member Sonoma County Wine Technical Group (2008-2011), American Vineyard Foundation Grant Management Committee (2002-Present), and as in invited speaker at national and international meetings.

Tim Martinson has been involved in grape extension and research with Cornell University since 1991, where he completed his MS (1988) and PhD (1990) degrees in Entomology. Since 2007, he has been Senior Extension Associate with the Statewide Viticulture Extension Program. He edits the *Veraison to Harvest* weekly newsletter distributed statewide September-October in New York, and *Appellation Cornell,* a quarterly publication highlighting research, extension, and teaching programs in Viticulture and Enology at Cornell. He is project director for the Northern Grapes Project (USDA's Specialty Crops Research Initiative), which focuses on viticulture, enology, and marketing of wines made from cold-hardy grape cultivars in 12 midwestern and northeastern states. Martinson was the recipient of the Research Award from the *New York Wine and Grape Foundation* in 2007, and the Outstanding Accomplishments in Extension/ Outreach Award from the Cornell University's *College of Agriculture and Life Sciences* in 2015.

Karine Pedneault has a BSc in Biochemistry, and a MSc and a PhD in Plant Science from Université Laval (Québec, Canada) with a specialization in plant's natural products extraction, analysis and characterization. After her PhD, she was a research scientist at E&J Gallo Winery (Modesto, California). In 2011, she started her research program on northern viticulture and winemaking in Québec at the Centre de développement bioalimentaire du Québec (CDBQ), in addition to have an adjunct professor appointment in Université Laval. She now pursues her research at the Institut de recherche en biologie végétale de Montréal (IRBV). Her projects focus on understanding varietal characteristics of interspecific hybrids grown in northern conditions, including berry ripening and wine quality.

Jean-Phillippe Roby is an Associate Professor at the Bordeaux Sciences Agro, ISVV (Vine and Wine Science Institute of Bordeaux). His research area is ecophysiology. He is the Head of Innovation and Technology Transfert at ISVV (2009-2016) and the Chief of Publication of Oeno Oene European Journal (new 2016), and a consultant for international wineries in Europe and the United States.

Fritz Westover is a Viticulturist and owner of Westover Viticulture, based in Houston, Texas. He obtained his BS in horticulture and MS in Plant Pathology from Penn State University, where he worked on projects including grapevine decline, grape disease management, and the science of compost application in vineyards. He specializes in vineyard consulting, research and education in the south and southeastern United States, drawing from more than 15 years experience in the vineyard industry including extension and outreach positions in Virginia, Texas, and California. Fritz contributes to wine industry educational programs in several states, contributes to Wines & Vines Magazine, and maintains a practical grape growing blog and grower resources at www.VineyardAdvising.com.


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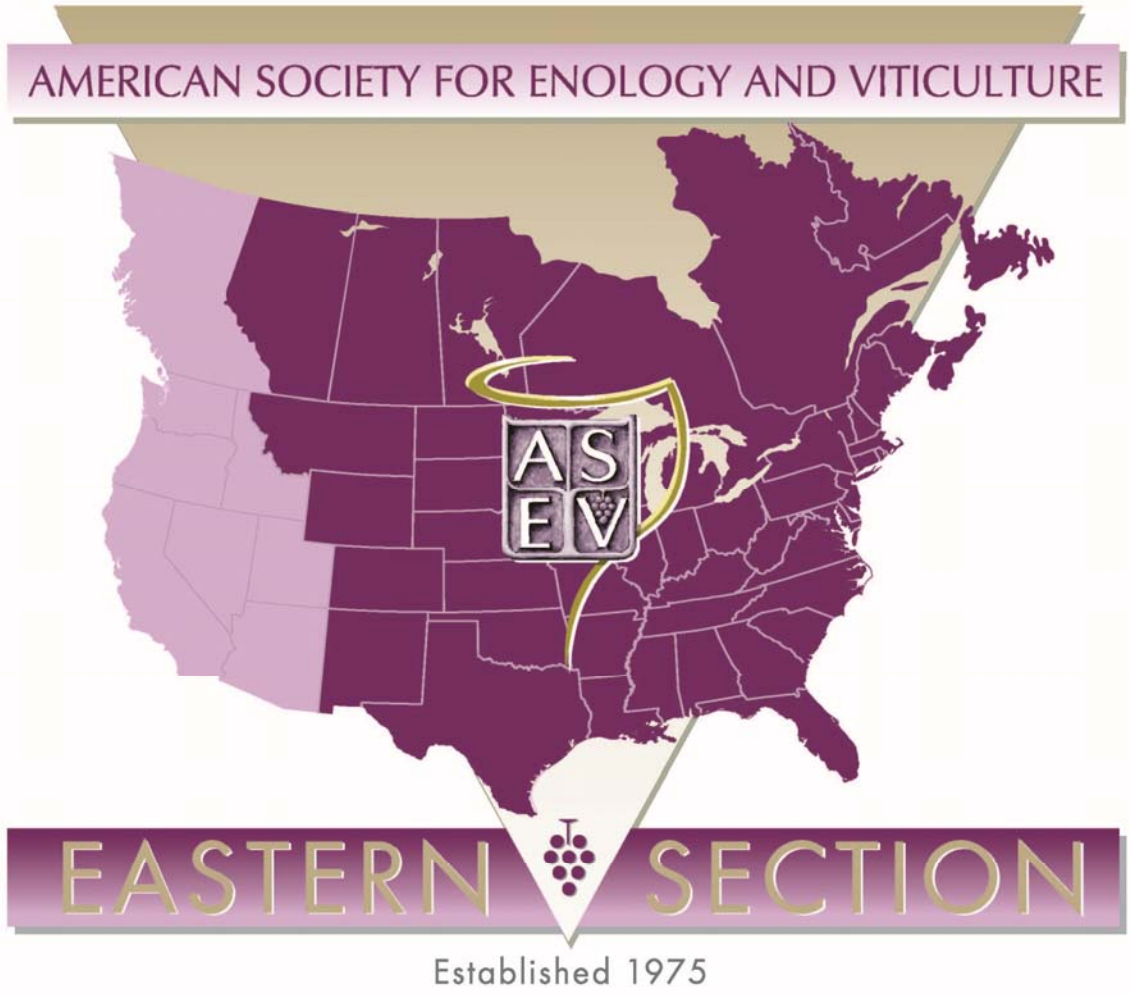
About ASEV-Eastern Section

To provide forums for the presentation, discussion, and publication 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.



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The ASEV-ES works every year to raise scholarship funds for students working toward careers in viticulture and enology. ASEV-ES typically awards students a $1,000 scholarship. Thanks to our 2016 scholarship fundraising events at the Eastern Winery Exposition, ASEV-ES raised money at a Live Auction and a Silent Auction. Thank you to Eastern Winery Exposition, Wines & Vines, Wine Industry Suppliers, and Auction Bidders. Donate online at www.asev-es.org/PaypalASEVES.php

SAVE THE DATE:
41st Annual ASEV-ES Conference & Symposium
St. Louis, MO - July 18-21, 2016
CONTACT ASEV-ES: 479-575-4677
OR INFO@ASEV-ES.ORG

2016 Scholarship Recipients

Courtney Duncan, University of Missouri
Ming-Yi Chou, Cornell University
Jennifer Kelly, Brock University
Maria Smith, Penn State University
Marie Guido-Miner, Cornell University
Thomas Todaro, Ohio State University
Pamela Nicolle, Laval University

Dr. William (Bill) Nail Memorial Scholarship Recipient

Andrej Svyantek, Auburn University

Donations for Scholarship
ASEV (Gold Donor)
Stephen Menke (Gold Donor)
Fritz Westover (Bronze Donor)

Student Competition Abstracts

Impact of Novel Groundcover Management Systems on Vineyard Productivity, Water and Nutrient Relationships, and Weed Dynamics
Sarah Bowman* and Bradley Taylor
*Corresponding author: Southern Illinois University, 1205 Lincoln Drive, Carbondale, IL 62901, USA, saraheb@siu.edu
In humid growing regions, the common practice of traditional vineyard floor management (herbicide bare driplines and frequently mown aisles) promotes soil erosion and crusting creating many physical and biological soil health issues. Furthermore, to reduce canopy management labor, many vineyard managers provide below or no maintenance level nitrogen fertility. These soil health and fertility issues lead to water and nutrient stress; thus, insufficient grapevine growth and yield making production economically unsustainable. Research is needed in the eastern United States to evaluate the impact of alternative groundcover management systems on the vineyard ecosystem, as these systems have potential to provide growers with tools to manage weeds, improve soil health, and promote balanced grapevine growth and yield; therefore, increasing grower profit potential and long-term viability of the winegrape industry. In 2013, five main-plot groundcover treatments (grower control, mow and throw, red fescue, successional, and compost) and two split-plot grapevine fertility treatments (no nitrogen, or 60 lb nitrogen/acre/year) were applied in a randomized complete block design to GDC trained Norton (planted in 2006, on eroded Hosmer silt loam soil, in Union County, IL). In 2014 (late season drought), 60 lb nitrogen/acre/year increased specific leaf area 5%, and improved mid-day leaf water potential 5% compared to no nitrogen. In 2015 (above average rainfall), 60 lb nitrogen/acre/year increased vine size 19%, increased petiole magnesium content 8%, and increased leaf chlorophyll content 11% compared to no nitrogen. Red fescue and successional provided excellent soil cover and weed control throughout the 2014 and 2015 growing seasons.

Quantification of Wine Fault Markers and their Relation with Risk Factors
Paula Grossi*, Connie Liu, and Misha T. Kwasniewski
*Corresponding author: University of Missouri, Grape and Wine Institute, 135 Eckles Hall, Columbia, MO 65211, USA, pgk99@mail.missouri.edu
While there have been numerous studies on individual wine faults and their risk factors little is know about their incidence and overall relationship to risk factors when purchased. To assess this relationship 100 wines produced in Missouri were randomly selected from the approximately 2500 available for sale in 2015-2016. Wine condition at purchase was recorded including incidence of haze, precipitation, neck volume and closure type. Risk factors for fault development such as SO_2 content (free and bound), pH, TA, organic acids, alcohol, and residual sugar were measured. Aroma compounds known to cause, or be related to faulted wine were quantified via GC-MS and include 4-vinylphenol, 4-EP, 4-EG, 2-ethoxy-3,5-hexadiene (geranium taint), ethyl-acetate, TCA and mouse taint. Acetaldehyde was quantified by enzymatic test and H_2S by detection tube. In the first 48 samples tested risk factors have varied greatly with wines having a pH value from 3.00-4.11, and free and total SO_2 varying from 0-39.6mg/L and 6-324mg/L respectively. While none of the wines exceeded current US legal limits for SO_2, 21.4% (±15%, for all Mo wines at 95% CI) exceeded EU limits for total SO_2. Conversely, 82.9% of the wines did not meet the free SO_2 concentration requirement given their pH to obtain 0.8mg/L of molecular SO_2. H_2S was detected above the 1.25µg/L LOQ in 39.6% of wines. At a fault recognition ≥10 µg/L for H_2S 27.1% of the wines exceeded acceptable levels with no significant differences between categorical variables (e.g. red or white wine, closure type, fill volume etc.).

An Ecological Survey of Native Riesling Microflora in the Finger Lakes Region
Marie Guido-Miner*, Jenny Kao-Kniffen, and Anna Katharine Mansfield
*Corresponding author: Cornell University, 129 Stocking Hall, Ithaca, NY 14853, USA, mrg256@cornell.edu
Spontaneous fermentations are increasingly popular in wine production, but little is known about the native yeast populations that drive these fermentations. This ecological survey of the native microflora of Riesling grapes in the Finger Lakes region is a preliminary investigation of the possible existence of distinct microflora that contribute to regional wine characteristics. In 2015, single-vineyard Riesling wines were followed through harvest and spontaneous fermentation at two wineries in the Finger Lakes. For each wine, microbial sampling was performed in vineyards prior to harvest, on equipment prior to use, and in juice and the evolving wine at every 5° Brix reduction (or at least once a week). Samples were plated onto differential media and counted after incubation for an estimate of population density. The types of colonies present changed over the course of fermentation, and over twenty unique types of colonies were identified. The ITS region of each unique colony type was sequenced for species-level identification, and additional analysis of five-locus variable number of tandem repeats (VNTR) was performed on all identified Saccharomyces cerevisiae for strain-level identification. S. cerevisiae strains were compared to known commercially available strains, and the population density and sequential dominance of microflora for each wine's fermentation was tracked. Over 10 unique yeast species were identified, with the S. cerevisiae being a mix of commercial and unknown strains. This regional microbiome study adds to our understanding of New World yeast populations.

Understanding and Developing Management Solutions for Sour Rot in Grapes
Megan Hall*, Gregory Loeb, and Wayne Wilcox
*Corresponding author: Cornell University, Plant Pathology and Plant-Microbe Biology, School of Integrated Plant Sciences, New York State Agricultural Experiment Station, 630 West North Street, Geneva, NY 14456, USA, meh338@cornell.edu
Sour rot is a disease characterized by oxidation of the berry skin and pulp, accompanied in the vineyard by the smell of acetic acid and the copious presence of *Drosophila* fruit flies. We first reproduced the visual and olfactory symptoms in the lab in 2014, by wounding healthy berries, inoculating them with *Saccharomyces cerevisiae* and *Acetobacter aceti*, and exposing them to *D. melanogaster* adults. These symptoms were associated with ethanol production shortly after inoculation and its conversion to acetic acid within days thereafter. However, whereas inoculation without exposure to flies similarly promoted initial ethanol production, acetic acid was not generated subsequently over the 5-day course of the experiment, indicating that acetic acid production was dependent upon a factor or factors introduced by the flies. In field trials conducted on the interspecific hybrid cv. 'Vignoles' in 2013-15 in the Finger Lakes region of New York, both insecticide and antimicrobial treatments significantly reduced sour rot development. In 2015, untreated vines averaged 20.5% sour rot severity, which was reduced by 73-81% on vines treated prophylactically post-veraison with weekly sprays containing a combination of the insecticide zeta-cypermethrin (Mustang MAX) plus the antimicrobial potassium metabisulfite or hydrogen dioxide (Oxidate 2.0), although control was reduced significantly when either the insecticide or antimicrobial component was omitted from the mix These results support the hypothesis that sour rot is caused by a complex of yeast, bacteria, and *Drosophila*, and that targeting these organisms can reduce disease development.

Student Competition Abstracts

Effects of Variable Rooting Volume on Growth, Crop Yield, and Berry Composition of Cabernet Sauvignon

Brycen T. Hill, Tony K. Wolf*, and Amanda C. Stewart
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Surplus moisture is common in Eastern U.S. vineyards and the impacts on grapevine vegetative growth can increase canopy management costs, increase disease incidence, and decrease wine quality potential. Two experiments were conducted to evaluate the use of root-restrictive fabric bags on canopy architecture, plant nutritional status, components of yield, and fruit chemistry of *Vitis vinifera* cv. Cabernet Sauvignon. The first experiment examined the combination of root restriction (0.015 m3 bags), under-trellis cover cropping, and three different rootstocks. The second experiment evaluated different sizes of root restricting bags (0.026 m3, 0.035 m3, 0.058 m3, compared to unrestricted control) and their effects on canopy growth and fruit components, to gauge an optimal rooting volume based on vine size response. In the larger, long-term project, vine pruning weights of root-restricted vines averaged 0.36 kg/m of cordon, whereas non-root- restricted vines averaged 0.91 kg/m (2008-2015). Crop was reduced by root- restriction by an average of 10% in the 2012-2015 seasons. Pruning weights were positively and linearly related to rooting volume in the smaller experiment, while greatest crop yields were achieved with the 0.035 m3 treatment (26% greater than the unrestricted control during 2012-2015). Total phenolic content and anthocyanin concentration of berries were increased compared to the unrestricted control. Root restriction has the potential to serve as an effective management strategy to growers aiming to optimize fruit and wine quality, while concurrently reducing labor and input costs.

Yeast and *Botrytis cinerea* Considerations for the Development of Regional Appassimento Wines in Ontario

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Appassimento winemaking is a classic method traditionally employed in Northern Italy, with benefits to a wine region like Ontario's that experiences extreme climactic fluctuations that can impact fruit maturity and subsequent quality. Appassimento grapes, further ripened and dried post-harvest in a protected environment, may contain high starting concentrations of oxidative compounds that can negatively affect organoleptic quality of the wine, so care must be taken to minimize these compounds. This project aims to assist the industry in developing this wine style by assessing the impact of *Botrytis cinerea* on the dried grapes, as well as yeast strain choice for the fermentation on final wine quality and consumer preference. Appassimento wines derived from dried grapes at 27.5 °Brix that were vinified with a locally isolated *Saccharomyces bayanus* yeast differed from wines vinified with the industry standard, *Saccharomyces cerevisiae* EC1118. The sensory profile of the *S. bayanus* wines were defined by increased black fruit and earthy/toast flavour, and decreased acidity and bitterness. Sensory evaluation of wines vinified from grapes at 28.0 °Brix with 10% *Botrytis* infected berries indicated no significant differences in flavour, aroma or trigeminal sensations from wines vinified with control berries lacking *Botrytis* infection. Thus, wine flavour was not moderated with this percentage of *Botrytis* infection. Consumer preference (n=153) was assessed by rating wines vinified with *S. cerevisiae* without *Botrytis* versus *S. cerevisiae* with *Botrytis* versus *S. bayanus* without *Botrytis* on a 9-point hedonic scale. Results showed good consumer acceptance of the wines with no significant preference among the products.

Assessing Vine-Groundcover Competition Using Infrared Thermography in a Midwestern Vineyard

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In most Midwestern vineyards a three to four-foot weed-free strip is maintained directly beneath the vines to reduce vine-weed competition. Conventionally, this strip has been conserved with repeated applications of herbicide, mainly glyphosate. The necessity for this weed-free strip to reduce vine-weed competition has been well documented in more arid climates. However, in areas with higher soil fertility and adequate rainfall the need for this strip may be unnecessary. Moreover, stand establishment and early vine growth have not been well documented when planting groundcovers immediately following the vine planting. The main objective of this project is to assess the severity of competition for water between 'Edelweiss' grapevines and neighboring permanent native grass and legume groundcover combinations. The project is currently in its third and final year. In year one (2014), the vineyard and groundcovers were established. In the summer of year two, water stress measurements began by means of mid-day leaf water potential (LWP) and infrared thermography (IRT) to measure leaf temperature. In warm and arid regions leaf temperature has been shown to be highly correlated with plant water stress through the use of the crop water stress index (CWSI). Moderate to low correlations between the LWP and CWSI were observed in 2015 (R2 = 0.23) using single leaf images. In 2016, images will be taken of the complete canopy to get a better representation of the entire plant's water status. This method should intensify correlations between LWP and the CWSI. If water stress can be assessed using non-destructive thermal imagery, grape growers will be able to rapidly evaluate the water status of the vines over large areas.

Student Competition Abstracts

Discovery and Analysis of Grapevine Vein Clearing Cirus in Ampelopsis Cordata

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Missouri played a significant role in the history of viticulture as a source of valuable grapevine rootstocks, and continues to maintain thriving vineyards today. A recent threat to the sustainability of grape production is *Grapevine vein clearing virus* (GVCV), the first DNA virus discovered in grapevines. Infection with GVCV leads to vine decline, lower quality berries, and eventual death of the grapevine. The epicenter of GVCV appears to be in the Midwest with cases of infection confirmed in Missouri, Illinois, Indiana, and Arkansas. Since GVCV was discovered in cultivated grapevines, much research has been dedicated to investigating its range and origin. The entire genome of the first GVCV isolate from a grape cultivar 'Chardonel' has been deposited in GenBank and is used as a reference genome. More recently, two GVCV isolates were found in native sand grapes (*Vitis rupestris*) in Missouri. In this project, we applied polymerase chain reaction (PCR) assays to screen for GVCV in *Ampelopsis cordata*, which is in the same *Vitaceae* family as cultivated grapevines, from two locations in Missouri. We found GVCV in this species. We sequenced the entire genomes of the two GVCV isolates from *A. cordata*. Comparative genomic analysis indicated that they are new isolates with signature 9-base inserts in open reading frame II in comparison to the reference genome. Our results demonstrated that GVCV spreads among species across genera in native habitats, and yielded crucial clues on origin and epidemics of GVCV, which will prompt new strategies for the management of GVCV-associated disease.

The Effects of Hyperoxidation and Storage Temperatures on the Flavor Profiles of Riesling Wine

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Exposure to oxygen in the process of white wine production is generally considered to have a negative impact on color, aroma, flavor, and shelf-life. However, the method of hyperoxidation, the intentional exposure of high levels of oxygen to recently pressed juice, has been used to initiate enzymatically-controlled oxidation cascades that remove the phenolic precursors of oxidizable compounds. Removal of these precursors prior to vinification may lead to a product with improved color over time, greater shelf-stability, and less harsh or bitter flavors. Optimized storage temperatures can also increase the shelf-life of white wines by maintaining terpene and ester contents, and preventing the formation of new detrimental flavor constituents. The overall effects of hyperoxidation and storage conditions on white wine quality is still in dispute, and has created a need to critically evaluate the combined effects of hyperoxidation and storage temperatures on Riesling wines. This study examines control and hyperoxidated wines in three storage temperatures (63°F, 75°F, 90°F) through chemical and sensory evaluations over time. Initially, a trained sensory panel detected no significant differences in aroma or flavor characteristics between hyperoxidated and control wines before entering storage treatments. After one year of storage, wines held at 63°F have retained significantly higher sensory ratings for overall aroma intensity, fruit aroma, and fruit flavor than wines stored at the higher temperatures. Wines stored at 90°F developed darker colors, oxidized aroma characteristics, and a loss in varietal flavor attributes. These detrimental characteristics were first detected in the control wines before they were observed in the hyperoxidated wines. The sensory results of this study were compared with SPME-GC-MS analyses of the aromatic volatile compounds. The successful determination of optimized hyperoxidation treatments could potentially benefit both wineries and consumers with longer lasting white wines in challenging storage conditions.

Effects of Early Leaf Removal and Cluster Thinning on Yield Components, Fruit Composition, Bud Cold Hardiness, Wine Chemistry, and Sensory Perception in French-American Hybrid Chancellor

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Leaf removal performed at trace-bloom (ELR) has been studied as an alternative to cluster thinning (CT) to reduce crop load and improve fruit ripening in high-yielding *Vitis vinifera* varieties in Mediterranean climates. To evaluate the efficacy of fruit-zone ELR for yield-regulation on high-yielding Chancellor (*Vitis* hybrid), two ELR treatments, a low intensity (3 basal leaves removed; LELR) and high intensity (5 basal leaves removed; HELR), were compared with CT and an un-treated control (C) in 2014 and 2015. ELR and CT effectively decreased yield and yield components in 2014, however, not in 2015 due to a decline in cluster number in the C vines. Cluster compactness, a predisposing factor for bunch rot infections, was lower in HELR as compared with other treatments. Crop regulation treatments significantly increased soluble solids up to 3.3 °Brix (CT) in 2014 juice; however there were no relevant differences in wine chemistry in either 2014 or 2015. A ranked preference sensory test of 2014 wines did not indicate pronounced impacts of the treatments on perception of wine characteristics. Bud cold hardiness determined by differential thermal analysis was significantly higher in the LERL and HELR treatments as compared to the C and CT in January 2015, with no differences between treatments the following winter (2015-2016). An economic assessment indicated the cost of bottle prices associated with implementing crop regulating practices would need to increase by $0.83 (HELR) to $2.14 (CT), but could decrease $0.65 (LELR) depending on the year.

Investigating Vine Phenology, Growth, and Yield of Three Pierce's Disease Resistant *Vitis vinifera* L. Selections in Central Alabama

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In Alabama, production of *Vitis vinifera* grapevines has not been an economically viable option due to Pierce's Disease (PD), caused by the endemic bacterium, Xylella fastidiosa. Nonetheless, preparation for future commercial release of PD resistant *V. vinifera* cultivars from the UC Davis grape breeding program warrants an in-depth investigations into the performance of *V. vinifera* vines in Alabama's humid subtropical climate. In 2010, three PD resistant 87.5% V. vinifera selections developed at the UC Davis were planted at the Chilton Research and Extension Center. Vines were grafted on 'Dog Ridge' rootstock to enable explorations into viticultural characteristics of Alabama grown V. *vinifera*. During vineyard establishment, PD infection symptoms were not detected in the three selections ('U0501-12', 'U0502-01', and 'U0502-10'). Consequently, thorough examination of the plants' phenological development was initiated for the 2015 and 2016 growing seasons. Bud break occurred first for selections 'U0502-10' and 'U0502-01', with leaf emergence by March 30th in both seasons. 'U0501-12' was later in its progression through bud break stage and canopy formation, but by the end of April all three selections had fully developed canopies. 'U0502-10' was the highest yielding and earliest ripening selection with 10.9 kg/vine harvested on August 14th. The two later ripening selections were harvested in the final two weeks of October. 'U0501-12,' the lowest yielding selection, had the lowest Growth-Yield Relationship of 4.4. All vines exhibited high vigor in the 2015 growing season as indicated by dormant pruning weights. Continued assessment of the performance of these PD resistant *V. vinifera* selections in Alabama's conditions will aid in gaining knowledge about their response to the hot and humid climate in the Southeast and help in development of management strategies for commercial production.

Student Competition Abstracts

Cane Morphology Influences Bud Freezing Tolerance in *Vitis vinifera* Cabernet Franc

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Ohio vineyards sustained significant cold damage due to exposure to extremely low temperatures in 2014 and 2015. The grape species *Vitis vinifera* sustained the most damage to all aboveground vine parts. Recovering grapevines were retrained from the newly emerged shoots for trunk replacement. Trunk renewal, by retraining 1-year old canes, is a key cultural practice to manage grapevines following freezing injury. Preliminary results showed that freezing tolerance (FT) of the newly trained canes was affected by cane morphology (cane size). The purpose of this study was to confirm the impact of cane morphology on FT of Cabernet franc in relation to cane anatomical structures, its water content and carbohydrate concentrations during the dormant season. Canes emerged above the graft union, with large (~12 mm internode diameter) and medium (~8 mm internode diameter) size, were collected monthly in August 2015 through January 2016 for determination of FT of bud and vascular tissues. Water content, sugar concentrations, and anatomical features of the cane tissues were determined as well. Medium canes had higher (up to 5 degrees Â°C) bud FT than large size canes throughout the fall season. Water content did not differ between canes of different sizes. In August, medium canes had higher concentrations of glucose and fructose than those in large canes. Even though sugar concentrations increased during the fall, there were no differences between large and medium canes in October and November. As expected, medium canes had smaller surface area of xylem and phloem tissues than large canes. These results demonstrate that medium canes can withstand more severe low temperatures than large canes and are preferable for trunk renewal. This knowledge will advance our understanding of FT and help develop new strategies to mitigate freezing damage in grapevines by knowing the best practices for trunk renewal and successful vine recovery.

Effect of Biochar on Soil Quality and Grapevine Growth in a Greenhouse Experiment

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Biochar is a carbon-rich material yielded by pyrolysis of various biomasses (wood chips, manure, pruning residues). A number of studies have indicated great benefit using biochar as a soil amendment and enhancer of plant growth. In this study, the short-term effect of biochar and other soil amendments on soil and plant growth parameters in a potted greenhouse experiment were evaluated. The trial was a factorial combination of 4 factors-(SYP biochar, compost, peat-based media as control, and mixtures) with several application rates along a time sequence of 60-120 days after planting on 1-year-old bare root cuttings of grapevine, organized in randomized blocks. Each amendment was analyzed for elemental composition and functional groups by using FT-IR spectroscopy. pH and electrical conductivity (EC) were measured in via Pour-Through method. Chlorophyll (CHL), flavonoids (FL), anthocyanins (ANT) content and nitrogen balance index (NBI) were determined using a portable leaf-clip device Dualex (Force-A, Orsay, France). Biochar differed from other amendments for pH, organic C content, and C:N ratio where EC and nutrients were highest in compost. Biochar increased the soil pH one unit over control, whereas the biochar plus compost mixture had an impact on the EC. pH and EC decreased at the increased application rate. At 75 dap the pH and EC were the lowest and highest, respectively. In the amended potted plants, application rate and time significantly affected CHL, FL, ANT and NBI. In particular, biochar induced a NBI 1.3-fold to control and an ANT 1.9-fold to control. ANT *ca* doubled from the lowest to the highest application rate, while CHL and FL were higher at lower dosages. In conclusion, the short-term effects of biochar led to an increase in pH and EC and improved growth parameters like the amount of anthocyanins and nitrogen balance index.

The Composition of Exogenous Tannins Affects Malolactic Fermentation Rates and Tannin Retention

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Red wines made from cold-hardy interspecific hybrids have poor tannin retention properties in part due to high levels of pathogenesis-related proteins. This deficiency often prompts winemakers to add large amounts of exogenous tannins, but related work has suggested that exogenous tannins can affect LAB cell growth and MLF kinetics, which may impact sensory characteristics. To determine whether the phenolic composition of exogenous tannins affects MLF kinetics, wine phenolic content, and sensory outcomes, experiments were performed in which tannin fractions were added to wines at the beginning of MLF. Tannin fraction 1 (T1) consists of 80% condensed tannin, 10% anthocyanins, and 10% monomeric and dimeric catechin. T3 is 97% condensed tannin. Wines were made from three cultivars: Marquette, Corot noir, and Noiret. Following alcoholic fermentation the wines were inoculated with *Oenococcus oeni* and one of two tannin fractions: T1 at 250 mg/L or 500 mg/L, or T3 at 250 mg/L. Differences in the rate of MLF between tannin treatments were observed in Corot noir and Noiret. MLF proceeded more quickly in Corot noir when 500 mg/L of T1 or 250 mg/L of T3 were added. Both high and low additions of T1 accelerated MLF in Noiret, while T3 had no effect. No MLF kinetics effects were seen in Marquette, possibly due to ~80% of tannin being precipitated during MLF. Corot noir precipitated ~50% of tannin and Noiret precipitated ~15% of tannin during MLF. These results suggest that the composition of exogenous tannins affects MLF and the phenolic composition of resulting wines.

Technical Session Abstracts

Effect of Leaf Removal Timing and Duration on Rotundone Content in Noiret Grapes and Wine

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Rotundone was recently identified as the compound which imparts a spicy, black pepper aroma in many wine grape varieties. The aim of this two-year study was to identify the presence of rotundone in the Noiret (interspecific hybrid of *Vitis*) variety and determine whether timing and duration of cluster sunlight exposure impact rotundone concentration in the fruit and the perceived black pepper aroma intensity in the vinified wines. Sun exposure timing was assessed through comparison of pre-veraison (LR) and post-veraison leaf removal (PVLR) treatments while duration was assessed through comparison of the un-defoliated control (C) and maintained sunlight exposure (MSE) treatments. EPQA was used to evaluate the impact of each treatment on fruit sunlight exposure and vine canopy density. Rotundone concentration was quantified using SIDA-SPE-SPME-GC-MS. During both seasons, the MSE treatment reduced canopy density and increased light availability compared to the C. The leaf removal treatments did not result in canopy density or light availability differences at any time during 2014. In 2015, however, fruit sunlight exposure was increased in the leaf removal treatments, albeit only temporarily. Rotundone was not detectable in the fruit prior to veraison. No significant differences in rotundone concentration for either treatment comparison were observed in the 2014 fruit at harvest; however, rotundone concentrations after veraison were significantly higher in MSE (1.982 µg/kg, harvest) as compared to C (1.278 µg/kg, harvest) in 2015. Black pepper aroma intensity was positively correlated ($P = 0.020$, $r^2 = 0.625$) to rotundone concentrations in the wines produced from the vineyard treatments.

Ten Years of Cover Crops: Effects on Nematode Populations and Vegetative Parameters of Cabernet Sauvignon

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Vineyard cover crops have been frequently investigated in recent years, and are an accepted cultural practice in wine regions throughout the eastern US. In order to address grower concerns and questions regarding the long-term (>5 years) impact of complete vineyard floor cover crops on vineyard sustainability, we maintained an experiment block in a commercial Cabernet Sauvignon vineyard from 2005 to 2016. Treatments were five perennial grasses as complete vineyard floor cover crops and a vine row herbicide strip arranged in a split plot design with cover crops as whole-plot factor. Initially, we reported treatment effects on vegetative vigor and vine size, root distribution and density, and fruit composition. Our current objective is to assess the long-term performance of cover crops by biomass, stand density, % weed biomass and nematode occurrence and frequency. Vine vegetative response, after ten years exposure to cover crop treatments, is also evaluated. By 2015, KY-31 fescue and Elite II fescue exhibited greatest stand density (>80%) and biomass compared to Aurora Gold fescue, perennial ryegrass and orchardgrass, which had stand densities of <40% with ~60% of the corresponding vine row surface area either bare ground or supporting native cover (weeds). Helicotylenchus spp. (spiral), Mesocriconema spp. (ring) and Xiphinema spp. (dagger). Nematodes occurred in all plots, with the greatest number of dagger in the vine row associated with perennial ryegrass. In 2015, vines exposed to a cover crop had ~ 30% lower mean cane pruning weights and individual canes weights than did vines exposed to the herbicide strip.

The Mechanization of Early Leaf Removal in Pennsylvania

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The removal of fruit-zone leaves after fruit-set is an established cultural method that exposes ripening fruit to better light and aeration, improving bunch rot control in cool climate vineyards. More recently, an early fruit-zone leaf removal, at trace bloom, has been shown to improve bunch rot control by also reducing the compactness of grape clusters, which is a major predisposing factor for bunch rot susceptibility.
Currently early leaf removal is applied by hand, but mechanization can improve the cost effectiveness and adoption of this practice. In 2015 a study was initiated to compare mechanical early leaf removal (MLR), utilizing air-pulse technology, to hand early leaf removal (HLR) and a non-defoliated control (C) on several French hybrid and *Vitis vinifera* varieties in commercial and research vineyards in Pennsylvania.
MLR was 32 to 60% effective at removing leaf area along the basal five nodes of shoots when compared to HLR (100% effective), and was more effective on vertical shoot positioned trellis systems than on high-wire cordon systems. Mechanization did not damage inflorescences, but did generate many of the same intended, beneficial effects on cluster morphology as HLR. For example in *V. vinifera* Riesling, MLR was equally as effective as HLR at reducing the number of berries per cluster, cluster weight, yield, and cluster compactness when compared to C. However, there were no significant effects on fruit rot in Riesling or Vignoles. In *Vitis* interspecific hybrid Seyval, fruit rot levels and juice titratable acidity at harvest were significantly reduced by MLR.

Molecular Genetic Approaches to Norton Grape Improvement

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Vitis aestivalis-derived 'Norton' is the official grape of the State of Missouri grown in regions with high disease pressure and cold winter temperatures where *V. vinifera* is not adapted. Dormant cuttings of Norton are unfortunately difficult to root thus limiting commercial propagation. Norton is also sensitive to injury from sulfur and sulfur-based spray applications used to control fungal diseases. Desirable traits in Norton grape render it an ideal candidate to generate interspecific hybrids with improved viticultural performance and enological quality. Because of this, a mapping population of 184 individuals was constructed from a cross between Norton and *V. vinifera* 'Cabernet Sauvignon'. A consensus genetic map has been constructed with 411 simple sequence repeat (SSR) markers clustered in 19 linkage groups. In collaboration with VitisGen (www.vitisgen.org), 43,320 single nucleotide polymorphism (SNP) markers generated by genotyping-by-sequencing (GBS) have been identified, and a concensus map of 4,486 SNPs has also been developed in this population. In preparation for quantitative trait locus (QTLs) mapping on both SSR and SNP maps, phenotyping assays for downy mildew and *Botrytis* bunch rot resistance as well as rooting ability and sulfur sensitivity have been established and will be applied to the population. Careful genetic mapping of this population provides the foundation and tools to associate molecular markers with disease resistance and physiological traits of Norton. The ultimate goal of this program is to use genetic markers to rapidly deploy favorable alleles and accelerate breeding cycles for new cultivar release.

Technical Session Abstracts

Region and Organizational Role Interact with Cane Pruning Decision Preference

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On behalf of a larger project building toward an autonomous cane pruning robot, a survey was conducted throughout the New Zealand grape and wine industry during the 2015 pruning season. The survey asked participants evaluate a set of already-made cane pruning decisions for a vine, via Qualtrics software, as well as provide their own preferred pruning decisions for the same vine, by means of a highlighter pen and a color photo. Data collection took place primarily in the viticulture regions of Marlborough, Hawke's Bay, Waipara, and Central Otago. Chi-square testing revealed significant interaction between region and cane pruning preferences ($p<0.05$). Multiple Correspondence Analysis (MCA) has illustrated that those from Central Otago and Hawke's Bay tended towards a decision to restructure the vine by not leaving a right-hand spur selection. MCA also has revealed that those from Marlborough and Waipara tended towards a decision to retain two spurs and two canes from the subject vine. Chi-square analysis has revealed a similar interaction effect between an individual's organizational role and his or her decision preference ($p<0.05$). MCA was again performed, here illustrating that those identifying as managers or proprietors were more likely to prefer a restructuring of the vine, compared to those who identified as a laborer, exclusively. Results from MCA, however, suggest that vineyard supervisors may be an appropriate means of bridging the discrepancy in viewpoint observed between laborers and management.

Application of Remote Sensing by Unmanned Aerial Vehicles to Map Variability in Ontario Vineyards

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The objective of this investigation was to verify usefulness of proximal sensing technology and unmanned aerial vehicles (UAVs) for mapping variables e.g., vine size (potential vigor), soil and vine water status, yield, fruit composition, and virus incidence in vineyards. Twelve Niagara Peninsula sites (six each of Riesling and Cabernet franc) were chosen in 2015. Data were collected from a grid of vines (≈ 80 per vineyard) geolocated by GPS. Soil moisture and leaf water potential (ψ) data (three times during the growing season; June to September) and yield components/berry composition were collected. Ground based GreenSeeker™ data were likewise acquired June to September, while multi-spectral UAV data were obtained at veraison and processed into geo-referenced high spatial resolution maps of biophysical indices (e.g., NDVI). Following harvest, yield/berry composition maps were also prepared. These data layers in conjunction with growing/dormant season sentinel vine data [e.g. soil moisture, leaf ψ, vine size, winter hardiness (LT_{50})], were used for map creation. Soil and vine water status, vine size, LT_{50}, yield components, and berry composition data were correlated in several vineyards to NDVI and other data acquired with the UAV and GreenSeeker™, and spatial relationships were apparent from examination of the maps. Principal components analysis confirmed these relationships. Examination of the maps showed apparent spatial relationships, particularly with yield components, water status, fruit composition variables, along with the UAV-derived NDVI. Moran's I spatial autocorrelation index suggested map clustering patterns for the soil moisture and NDVI variables, which was further confirmed by *k*-means clustering. GreenSeeker™ derived NDVI values were considerably higher than the UAV flight data, which is highly attributable to the nature of obtaining the data. Water status zones, and those of several fruit composition variables, were correlated with UAV-derived NDVI. Preliminary conclusions suggest that UAVs have significant potential to identify zones of superior fruit composition.

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 efficacy in assessment of vine water status and berry composition. This project ~~was~~ intended to assess usefulness of a recently-introduced high resolution proximal sensing technology, GreenSeeker™ (Trimble Corp.) by correlating metrics it provides (horizontally accessed spectral reflectance, converted to NDVI) to yield components (e.g. yield per vine, cluster weight, berry weight), vine and soil water status, berry composition, and winter hardiness (LT_{50}). Three experimental sites were chosen (Lambert Vineyards, Virgil, ON; Coyote's 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 ≈ 80 geolocated sentinel vines comprised each study block. Soil moisture and leaf water potential (ψ) measurements were collected three times during the 2014 and 2015 seasons between fruit set and veraison. NDVI measurements were likewise collected on corresponding dates. LT_{50} values were collected during three sampling periods in late January to late March. Yield and berry composition measurements were collected from each sentinel vine. Data acquired by the GreenSeeker™ established strong correlations with yield components and berry quality composition variables. Linear correlations and spatial correlative relationships were apparent between NDVI data and both soil moisture and leaf ψ, in addition to yield components and berry composition. Principal components analysis confirmed these relationships. Associations with *k*-means clustering, in conjunction with Moran's I spatial autocorrelation index, demonstrated that soil moisture and NDVI exhibited the strongest clustering patterns in maps. The latter was profoundly verified by the maps produced for all the variables, which extensively confirmed the statistical findings. Furthermore, zones indicative of virus infection (grapevine leafroll 3) could be identified using this technology. Tentative conclusions are that GreenSeeker™ technology will be a practical tool for delineation of management zones within vineyards for ultimate application in precision viticulture for vegetative growth surveys, and for grape composition inferences.

The Use of Geotextiles to Reduce Freeze Injury in Vineyards

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Cool Climate Oenology and Viticulture Institute, Freeze injury is one of the greatest threat to growing grapes. In some regions, cold sensitive *V. vinifera* grapevines cannot survive without some form of protection and are commonly buried with soil over the winter months for protection. There are many issues associated with burying vines so an alternative method using geotextiles was investigated. Geotextiles are permeable fabrics that are used in association with soil to help mitigate damaging cold temperatures. The purpose of this study was to determine the effectiveness of geotextile fabrics on mitigating damaging cold temperatures; to examine vine microclimate below the geotextiles and how these materials impact bud hardiness and bud survival and; to examine how these materials impact vine performance and yields. Trials were performed during winters of 2011-12, 2012-13 and 2015-16 in order to test these objectives on different *V. vinifera* cultivars. Geotextiles greatly reduced minimal temperatures even when vineyard temperatures were below -30Â°C. Monthly average temperatures were higher as were both maximum and minimum temperatures compared to control or buried vines. Temperatures were most consistent under the soil with buried vines. The type of geotextile fabric and timing of application/removal had some impact on bud hardiness. The process of hilling soil over the entire grapevine reduced bud viability, vine health and yield potential. As a result, yields/vine were considerably lower in comparison to vines protected with geotextiles. Therefore, this study demonstrates that geotextile materials can be an effective alternative method for protecting grapevines from freeze injury while concomitantly improving vineyard production and uniformity.

Poster Session Abstracts

Genetic Study of Cold Hardiness in *Vitis aestivalis*-derived 'Norton' Based Population

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Vitis aestivalis-derived 'Norton' is an American grape species common throughout the Midwest. Norton grapes are known for their disease resistance, high antioxidant content and cold hardiness; however, they typically have a lower wine quality than European varieties like *V. vinifera* 'Cabernet sauvignon'. Thus, there is a desire for new grape varieties that combine the durability of native grapes with the quality of European grapes. In view of this, a mapping population of 184 individuals was constructed from a cross between Norton and Cabernet Sauvignon. In collaboration with VitisGen (www.vitisgen.org), approximately 43,000 single nucleotide polymorphism (SNP) markers generated by genotyping-by-sequencing (GBS) have been identified, and a consensus map of 4,486 SNPs has also been developed in this population. This study focuses on the cold hardiness of Norton and Cabernet sauvignon hybrids. Buds were collected from both parents and 150 F_1 progeny once per month from December, 2015 to February, 2016. Eight buds were collected from each genotype and stored at 4 °C overnight. Buds were then removed from the cane and attached to a sensor. All eight buds from a single individual were placed on a single sensor. The sensors were placed into a freezer that went from 4 °C to -40 °C over the course of 12 hours. As the buds froze, they released heat which was converted to an electric signal by the sensors. The signal strength was recorded in a spreadsheet and analyzed to find the average freezing temperature for each hybrid. The goal of this project is to find the quantitative trait loci (QTLs) that control for cold hardiness and use that information for future grape breeding projects.

Vineyard Floor Management Impacts Soil and Grape Microbial Communities in a New York State Riesling Vineyard

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Under-vine management practices of glyphosate (GLY), cultivation (CULT), and native vegetation (NV) were established in a randomized complete block design with four replications in a mature, vigorous Riesling vineyard in Ovid, NY in 2014. The fungal communities of vineyard soil and grapes at harvest were profiled with Illumina MiSeq sequencing of the fungal ITS region. Soil health was generally improved by NV upon second year of establishment at harvest. NV soil had greater Mg, Mn and Zn content and a 70% higher microbial respiration rate than that of GLY. The soil fungal community from both years showed the same pattern based on principal coordinates analysis (PCoA), where NV separated from the CULT and GLY treatments. The dominant (>5% relative abundance) fungal classes in soil included the *Sordariomycetes*, *Leotiomycetes*, *Dothideomycetes* and *Tremellomycetes*. The *Dothideomycetes* and *Sordariomecetes* were also dominant classes in grapes, along with *Eurotiomycetes* and *Microbotryomycetes*. The NV grape fungal community was also distinct from the other two treatments based on PCoA.

Performance of 'Frontenac' and 'Marquette' Grapevines Grown on Four Training Systems

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Choosing the right training system is vital to commercial grape production. A training system should allow for optimal light interception, optimal air movement, and aid in in-season crop management. In addition, the training system should be constructed to withstand the environment (i.e. wind) and the potential crop load. While there are many reports on *Vitis vinifera* training systems, there has been limited research conducted on appropriate training systems for cold hardy grape cultivars. In cooperation with 5 other institutions, we evaluated the performance of cold hardy grape cultivars on various training systems in Iowa. Vegetative growth and fruit characteristics of 'Frontenac' and 'Marquette' vines trained to one of four training systems: single curtain, Geneva double curtain, mid-wire cordon with a split canopy (Scott-Henry), and a mid-wire cordon (vertical shoot position) were evaluated. Treatments were applied to three-vine panels and replicated four times in a randomized complete block design. Time to perform each practice per vine was recorded in addition to yield and fruit quality characteristics (Brix, pH, and titratable acidity) in 2013, 2014, and 2015. Labor and yield variables were analyzed using Tukey's adjustment for multiple comparisons. Early in the trial, 'Frontenac' trained to upright systems (Scott-Henry and vertical shoot position) tended to require more labor than single curtain and Geneva double curtain systems. However, as the vines aged, time required to prune vines trained to Geneva double curtain surpassed the time required to prune 'Frontenac' trained to vertical shoot position. Overall, training system did not affect fruit quality variables.

Identifying Key Parameters for Berry Ripeness and Regionality in Missouri Norton Grapes

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Accurately determining ripeness in hybrid grapes is a concern for winemakers. Commonly used parameters, such as degrees Brix and pH, may not correctly model optimal berry ripeness. The objective of this research was to identify optimal parameters for monitoring berry ripeness in Norton grapes. Representative berry samples (3 kg) were collected at weekly intervals four times prior to harvest from three established vineyards. In addition to traditional parameters, organic acids were analyzed by HPLC. Total phenol, tannin and anthocyanin profiles were determined using an acetone extraction of grape skins and Harbertson-Adam's assay. Experimental design was randomized with 12 assay replications per sample. Collections were normalized using growing degree-days (GDD_{50}) data for each sampling site-date. Berry samples from all vineyard sites had increasing sugar levels, decreasing titratable acidity, and increasing pH with increasing GDD_{50}. Differences in these parameters were evident between sites. Tartaric and malic acid concentrations also differed by site, ranging from 6.9–9.0 and 4.8–7.8 g/L, respectively at harvest. While individual phenolic classes fluctuated, there was no difference in total phenol concentration between sites. Short and long polymeric pigment concentrations followed similar parabolic ripening for two sites over GDD_{50}, though the third site did not follow the same trend. Anthocyanin and tannin concentrations at harvest ranged from 1.0–2.5 and 5.1–6.2 mg/g grape skin respectively, and each site exhibited a unique ripening pattern. None of the phenolic parameters examined showed an overall increase with increasing GDD_{50}, and so they did not follow trends common in *V. vinifera*.

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"Kicker" Canes removed at Bloom affects Hedging Weights in Cabernet Franc, Chambourcin and Chardonnay in Southern New Jersey
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Kicker canes were retained then pruned off at bloom to evaluate their effects on hedging weight in Cabernet Franc, Chambourcin and Chardonnay in southern New Jersey. Mature vines trained to a bilateral cordon VSP system were used for the experiment. Four treatments were applied; no kicker canes retained, one kicker cane at the distal end of each cordon, one kicker cane at the proximal end of each cordon, one kicker cane each at the distal plus proximal end of each cordon. A completely randomized design was employed with four replicates of the four treatments. Two hedging removed excess shoot growth after which air dried hedged shoots were weighed. In Cabernet Franc, hedging weights of 'distal plus proximal' treatment after the first hedging and that of 'proximal only' and 'distal only' after second hedging were significantly lower compared to 'control'. In Chambourcin, the first hedging weight of 'distal plus proximal' and 'proximal only' were significantly lower than the 'control', however all treatments had similar hedging weights at the second hedging. Conversely, combined hedging weight of 'distal only' was significantly reduced compared to 'control'. In Chardonnay, hedging weights, after the first hedging was significantly lower in all three treatments compared to control, however hedging weights of all treatments were comparable after second hedging, still, the combined hedging weight in all treatments were lower compared to 'control'. There was inconsistency of hedging weight reduction due to treatment, however, kicker cane retention and its removal at bloom reduced hedging weights in all three varieties.

Effectiveness of Closure Methods on Preserving Wine Quality after Resealing
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Numerous products exist to address concerns of wine quality degradation over a period of days after opening a bottle. These closures vary in material, sealing mechanism, or strategy to adjust headspace pressure or gas content. To determine the optimal system, headspace and dissolved oxygen levels were monitored during a three day storage period in partially consumed bottles that were resealed using several popular closure options (Rabbit stopper, flip top, Vacu Vin, FoodSaver vacuum stopper) and the original closures (natural cork or Stelvin), as well as using inert gas to sparge the headspace. Changes in free and total SO_2, acetaldehyde, tannins, anthocyanins, and key volatile aromas were monitored. In both red and white wine, resealing with a vacuum closure resulted in headspace and dissolved oxygen levels that were significantly less than all other closure types at the end of storage (e.g. 2.12±0.58 mg/L HS O_2, 1.16±0.29 mg/L DO in vacuum treatment versus 7.44±0.03 mg/L HS, 5.01±0.27 mg/L DO in Stelvin Reseal). Headspace oxygen was saturated in all other closures when not sparged. Oxygen ingress through the remaining closures was not statistically different from each other. Vacuum treatment had no impacts on white wine aroma, but decreased vitispirane A&B and linalool in red wine. Free and total SO_2 values after the storage period showed differences in some treatments, but these changes did not follow clear trends based on treatment effects. The only differences in acetaldehyde observed were between white wine under Stelvin closure that had not been opened and all other treatments (22mg/l versus 29-31mg/L).

Impact of Clone and Rootstock Selection on Riesling and Sauvignon Blanc Winter Hardiness
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Vine damage caused by cold events is well researched, but little is known about the impact of clone and rootstock selection on winter hardiness of *Vitis vinifera*. To achieve this, buds were collected biweekly from a commercial vineyard in the Niagara region during the 2015-16 dormant season to perform differential thermal analysis and determine the temperature required to kill 50% of the buds (LT_{50}) from vines with different clone and rootstock combinations. Clones grafted on the same rootstock (Sauvignon blanc clones 242, 297, 376 and 530 on SO4 rootstock; Riesling 49 and 239 on Riparia Gloire rootstock) were compared, as well as the same clone on different rootstocks (Riesling clone 49 on SO4 and Riparia Gloire rootstocks). There were some hardiness differences with respect to clones. LT_{50} for Riesling 239/Riparia Gloire remained lower than 49/Riparia Gloire for the entire dormant season. Differences of ≥2°C were observed during acclimation and deacclimation, with a maximum difference of 2.7° C (Apr. 8). LT_{50} differences of Sauvignon blanc clones were >2°C during acclimation (Oct 27.) and maximum hardiness (Jan. 4), with clone 376 and 520 being generally more hardy than 242 and 297 over these periods. Small LT_{50} differences (≤0.9°C) were observed during deacclimation. In comparing rootstocks, 49/Riparia Gloire was less hardy than 49/SO4 during the entire dormant season with maximum differences of 2.6°C during acclimation (Nov. 18) and 2.3°C during deacclimation (Apr. 20). This project will expand our knowledge of the roles of clones and rootstocks in winter hardiness and will provide the industry with new information for better selection.

Optimization of Enzymatic Release and Stabilization of Glycosidically Bound Aroma Compounds for Analysis by SPME GC-MS
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To assess the ways in which growing conditions impact wine aroma it is necessary to have ways to mimic vinification with high throughput. Methods for measuring the pool of aroma precursors in grapes can be laborious, or in some cases, destructive to certain compounds. Hampel et al. 2015, compared methods to release glycosidically bound aroma compounds found that while Rapidase 2000, was effective many aroma compounds were lost. Alternatively, Glucanex, was suggested but not optimized. We determined optimum conditions of pH 4.5, with incubation at 45°C, maximum production of several compounds known to glycosidically bound in grapes (linalool, TDN and beta-damascenone) could be achieved with 1 hour of incubation, while further incubation at 45°C hurt recovery. Other compounds observed to be degraded with Rapidase where tested by subjecting pure standards to enzymatic digestion and no significant change was found between digested and undigested samples for ethyl succinate, ethyl decanoate or 2- octanol, a common internal standard. Another challenge in enzymatic digestion is the ability to batch digest samples and load onto an autosampler with representative results throughout. When samples were placed at ambient temperature for about 24 hours, Rapidase showed a loss in recovery of ethyl succinate and β-damascenone of 1.1%/hour and 0.9%/hour respectively. However Glucanex had no loss of ethyl succinate and β-damascenone recovery lowered at a rate of 0.21%/hour. With glucanex, 2-octanol recovery loss over 24 hours was also minimal, and when

Poster Session Abstracts

Changes in C_6 Compounds and Fatty Acids during the Ripening of Maréchal Foch Berries

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C_6 compounds occurring from berries contribute to herbaceous notes perceived in interspecific hybrid wines. In previous studies, we have shown that concentration of C_6 compounds increased during the ripening of certain hybrid varieties. C_6 compounds directly occur from the oxidation of unsaturated fatty acids (UFA) such as linoleic and linolenic acids. The level of UFA in living organisms is directly related to growing temperature as UFA contribute to maintain cell membrane flexibility. We hypothesized that changes in UFA may occur in reaction to low temperatures arising during Fall in northern areas and contribute to rise the level of C_6 compounds in ripening berries. Contents in C_6 compounds and fatty acids were monitored during the development of Maréchal Foch berries at véraison (from 1059 to 1323 growing-degree days; last sampling at one week after commercial harvest), in St. Paul-of-Abbotsford, QC, Canada. C_6 compounds were analyzed in juice using GC-MS-SPME. Total lipids were extracted from whole berries without crushing the seeds, using $CHCl_3$:MeOH 2:1. Fatty acid were analyzed as their methyl esters derivatives by GC-FID (C_{10} to C_{22}). The ratio of UFA to saturated fatty acids (SFA) increased significantly ($P \leq 0.0004$) from 0.4 (1059 GDD) to 1.4 (1323 GDD), due to a significant increase in linoleic acid (18:2Δ9,12) and a decrease in stearic acid (18:0) as berries ripened. Both hexanol and *trans*-2-hexenol peaked at commercial harvest (1269 GDD) and decreased significantly the following week (1323 GDD). Significant correlations were found between temperature data (Tmin, Tmax, Taverage) and C_6 compounds (hexanol; *trans*-2-hexenol) and linoleic and stearic acids. The concentration of linolenic acid degradation products in juice (*trans*-2-hexenol + *cis*-3-hexenol) significantly ($P \leq 0.0404$) and negatively correlated with the ratio of UFA/SFA.

Impact of White Hybrid Grape Pomace Addition on the Proanthocyanidin Composition of Red Hybrid Wines

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High anthocyanin but low tannin content are characteristic of red hybrid wines (RHW) and impact their quality. Recent results from our research activities showed that certain white hybrid grapes such as Vidal contain moderately high tannin concentrations, making them suitable candidates to increase tannin concentration in RHW without increasing anthocyanin content, while valuing significant winemaking by-products. The potential for white hybrid grape pomace (WHGP) to modulate the tannin and anthocyanin content of RHW cv. Frontenac was therefore evaluated. Treatments included 0 to 23% w/w WHGP cv. Vidal and 0 to 30% w/w red grape pomace co-fermented in grape juice that had been cold-soaked for 24 hours. Traditional fermentation with 50% w/w Frontenac pomace in red juice constituted the control. Tannin (HPLC-fluorescence), anthocyanin (UPLC-MS/MS) and volatile compound (GC-MS-SPME) profiles, and color (CIELAB) of experimental wines were determined 395 days post bottling. Wines from treatments with 12 to 23% w/w WHGP, contained up to 1.8 times more tannins than the control. These higher values related to increases in short tannins (≤4 flavanol units) rather than into desirable polymeric tannins. Highest WHGP proportions resulted in rosé wines with high levels of floral volatile compounds such as linalool, geraniol and ethyl phenylacetate. In conclusion, WHGP may contribute to balance the tannin/anthocyanin ratio in RHW but more research is needed to practically achieve the extraction and/or the retention of polymeric tannins (≥8 flavanol units). On the other side, WHGP additions proved to be a very promising avenue for the production of high quality rosé wines from deeply coloured hybrid varieties.

HPLC Analysis of Microvinified Deacidified Cold Climate Grape Wines

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High acidity is a general characteristic of wine grapes grown in northern regions. Too much acid is problematic, as it can result in unbalanced and unpleasant wines. Present research investigated the deacidification ability of biological and chemical treatments on cold climate grape wines. The 2013 and 2014 vintages of 'Fronteac', 'La Crescent', and 'King of the North', grown in Absaraka and Linton, North Dakota were microvinified and deacidified. Biological treatments included the selected wine yeast species Saccharomycetes cerevisiae (Maurivin B and 71B) and bacteria starter culture of the species *Oenococcus oeni* and their capacity to reduce malic acid concentration. The ability of the chemical deacidification treatment (cold stabilization) to reduce the concentration of potassium bitartrate, the naturally occurring salt of the grape's tartaric acid, was also determined. Wines were analyzed by HPLC. As expected, titratable acidity of all treatments were significantly lower than the control, with the greatest reduction from the combined biological and chemical treatments. Titratable acidity reduction was greatest (59%) with Maurivin B, malolactic fermentation, and cold stabilization, followed by 55% reduction with 71B, malolactic fermentation and cold stabilization. Yeasts were not significantly different for malic concentrations post malolactic fermentation. However, prior to malolactic fermentation, Maurivin B had significantly less malic acid than 71B. Better acid separation was achieved through sulfonic acid buffered with sodium sulfate and a silica column. Future studies should involve modifying the current conditions to achieve better resolution. This project and future research will contribute to the optimization of winemaking within our region, and to the production of sustainable high quality wines.

ASEV-ES Conference Planning in Missouri
Misha Kwasniewski, Grape and Wine Institute and Tammy Jones

Poster Session Abstracts

The Role of Protein Concentration on Sparkling Wine Foaming Properties and Sensory Attributes

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Sparkling wine production continues to increase in the region of Niagara, Ontario. The objective of this study was to evaluate and observe the role grape and/or yeast proteins have on sparkling wine foaming properties and sensory attributes. Juice and wine treatments were; no bentonite as the control, sodium bentonite treated juice (1g/L), sodium bentonite in only the *tirage* (0.95ml/L), sodium bentonite in the juice (1g/L) and *tirage* (0.95ml/L). Protein and chemical analyses were evaluated at every stage of winemaking. The final protein concentrations were determined using protein precipitation and BCA assay. The control had the highest concentration (25.2 ± 11.0 µg/mL), followed by the bentonite treated juice (17.1 ± 10.5 µg/mL), the bentonite in the *tirage* (14.5 ± 5.9 µg/mL) and lowest in the bentonite treated juice and *tirage* (9.9 ± 3.3 µg/mL). SDS-PAGE was used to capture the protein profile over the course of production to illustrate the differences between treatments. The control reached the predetermined maximum evaluated time for foam persistence of 10 minutes while the remaining 3 treatments had shorter foam persistence and thus faster dissipation of bubbles. Sensory analysis was carried out using Partial Napping® with Ultra Flash Profiling and found that bentonite treated juice produced sparkling wines described with more "fruity" attributes, while wines treated with bentonite in the *tirage* were described as "yeasty" and "autolytic". The use and timing of bentonite to remove proteins impacts the sensory and foaming properties of sparkling wine and can be used as a tool in winemaking.

Vineyard Response to Reduced Mowing Frequency

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Currently vineyard floor management decisions aren't made on biological, soil, or vine based needs. Growers fail to consider the costs associated with excessive mowing. Today vineyard floor management decisions are made primarily upon aesthetic value rather than on biological needs thus increasing erosion, compaction, labor, operation and maintenance costs. This project investigates three different mowing frequencies, measuring the responses of vineyard soil structure, mineral content and nematode population. Three treatments were applied: grower control (mowed at two and a half week intervals), one year (not mow for one year), and 7 year (not mow for seven years), and were arranged in a randomized complete block design. The treatments to vineyard aisles of own rooted vines in a high bilateral cordon system. In fall 2015, soil compaction (0-3", 4-8", and 9-12" depths) was measured. Plant parasitic nematodes were sampled in the aisle (0-8" depth), categorized and enumerated. Soil nutrient levels were sampled (0-8" and 8-16" depth). Vineyard floor aisle biomass was collected in a 20 inch square. Three varieties, Chancellor, Chambourcin, and Marechal Foch were sampled for impact on vine size. Not mowing for seven years reduced soil compaction 42% and 50% less than control at the 4-8" and 0-3" depths, respectively. The seven year treatment also increased soil P, K, and Mg. Reduced mowing frequencies have the potential to not only decrease fuel and labor costs, and compaction and erosion of topsoil, but also increase longevity, yield, and fruit quality of a vineyard, provided competition of ground cover with the grapevines is managed.

Construction of High Density Linkage Maps and Detection of Downy Mildew Resistance Locus in *Vitis aestivalis*-derived 'Norton' Population

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Grapevine downy mildew is one of the most widespread and destructive diseases of grapevine, particularly in viticultural areas with warm and wet conditions. This disease is caused by the oomycete *Plasmopara viticola*, which damages green tissues and defoliates vines. Traditional *Vitis vinifera* wine grape cultivars are susceptible to downy mildew whereas several North American and a few Asian cultivars possess various levels of resistance to this disease. To identify genetic determinants of downy mildew resistance in *V. aestivalis*-derived 'Norton', a mapping population was developed in 2005 from a cross between 'Norton' and *V. vinifera* 'Cabernet Sauvignon' at the Missouri State Fruit Experiment Station, resulting in 95 hybrid progenies. This population was further expanded to 182 individuals by repeating the same crosses in 2011. A haploid Norton genetic map was constructed with 379 simple sequence repeat (SSR) markers clustered in 19 linkage groups. In collaboration with VitisGen (www.vitisgen.org), a high density linkage map of Norton and the consensus map was constructed with an additional 1,591 single nucleotide polymorphism (SNP) markers generated by genotyping-by-sequencing (GBS). Disease progression and resistance reaction in response to *P. viticola* was studied 8 days post- inoculation in the given population for two years. A quantitative trait loci (QTL) analysis indicated a resistance locus on chromosome 18 explaining 40% of the total phenotypic variation. Flanking markers closely linked with the trait can be used for marker-assisted selection in the development of new cultivars with resistance to downy mildew.

Poster Session Abstracts

Glyphosate and Phenoxy Herbicide Symptomology in Grapes

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In the immediate future grape vineyards located throughout the Eastern corn and soybean belt will likely be exposed to a very toxic combination of herbicides. Both Monsanto and Dow AgroSciences will be releasing corn and soybeans that are resistant to both glyphosate and phenoxy herbicides. The phenoxy herbicide resistance will be to dicamba in Monsanto's Xtend products and 2,4-D in Dow AgroSciences Enlist products. Damage to grapes from phenoxy herbicide drift is not new. Grape growers are very familiar with symptomology caused by phenoxy herbicides. However, grape growers have not been educated on the degree and variability of symptomology from the mixture of glyphosate plus dicamba or glyphosate plus 2,4 -D. Although the literature has shown that glyphosate and the phenoxy herbicides can be very damaging to grapes, the literature falls short in documenting herbicide combination symptomology that can have practical diagnostic application. The objective of this research was to document herbicide symptomology using time lapse photography on greenhouse grown grapevines to foliar applications of glyphosate, dicamba, 2,4-D, and the combinations of glyphosate plus dicamba and glyphosate plus 2,4-D. Herbicide use rates were 1/100 the label rates. Three different grape cultivars were evaluated including Valiant, Norton, and Muscat Ottonel. The experimental design was randomized with 3 replications. The research provided a pictorial of herbicide symptomology over time that may provide insight in diagnosing future herbicide drift damage to grapes from combinations of glyphosate plus dicamba and glyphosate plus 2,4-D.

Vineyard Floor Management Analysis using Nematode Colonizer-Persister Index as a Bio-indicator of Soil Health

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Soil health is the capacity of a soil to function as a dynamic living system. Reductions in soil health through traditional vineyard floor management systems (herbicide bare driplines and mown aisles) create erosion and depletion of soils and decreased grapevine capacity, yield, and longevity. Alternative systems, i.e., reduced mowing, cover crop, and mulch systems are currently being investigated and even adopted by growers. However, further research of these systems is required to develop a better understanding of their impact on soil health. Current literature suggests monitoring of soil nematode presence can give a comprehensive indication of soil health through observing positive shifts in the colonizer-persister index (CP1-CP5). In 2013, four main-plot ground cover treatments (grower control, red fescue, successional, and compost) and two split-plot grapevine fertility treatments (no nitrogen, 60 lb N/acre/year) were applied in a randomized complete block design with five replications to GDC trained Norton, (planted in 2006 in Union County, Illinois, on eroded Hosmer silt loam soil). In fall of 2015, eight subsample cores were taken at 0-8" depth from both drip and aisle locations from each experimental unit of the four ground cover and two fertility treatments. The vermiform nematodes were extracted with standard sugar flotation methods. Nematodes were then diluted (1:5) and identified by species for each nematode found. 2015 results indicate compost and successional treatments had the greatest positive shift in the CP index, in comparison the grower control (particularly in drip location) showed the lowest CP index.

Training Systems for Cold Hardy Wine Grape Cultivars

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The introduction of new cold-hardy wine grapes bred from *Vitis riparian* lineages has catalyzed the recent growth of the Wisconsin wine industry. Such cultivars have been bred to tolerate extreme winter temperatures and have shown some degree of tolerance to pests. In addition to these traits, these cultivars are characterized by high vegetative vigor, a downward/procumbent growth habit, and yielding fruit of poor quality. A proper training system choice can help control vigor and positively influence yield, fruit quality, as well as reduce labor inputs through its resulting canopy arrangement, ability to provide an adequate number of carbon sinks, and lenience towards mechanization. The objective of the present study is to evaluate the degree to which three different training systems affect yield, fruit quality, and labor requirements for four different cold-hardy grape cultivars. The treatments consisted of three training systems: Vertical Shoot Positioning (VSP), High Wire Cordon (HWC), and Scott Henry (SH); and four cultivars 'Brianna', 'Frontenac', 'La Crescent', and 'Marquette' cultivars. Required labor hours put towards each system was recorded; berry samples were collected and profiled for soluble solids, pH, and acid content starting at veraison until harvest. Total yield was recorded at harvest. Preliminary statistical analyses indicate that the SH training system yielded higher for all varieties, except Marquette, which yielded similarly on all three systems. Higher yields in SH negatively impacted soluble solids (°brix) accumulation for Brianna and La Crescent as compared the HWC system only. Results indicate that overall labor input for SH was twice as high as the VSP and nearly one fourth greater than HWC. Profit levels inferred from the data are subjective and dependent upon factors such as vineyard management costs, trellis dimensions, total yield, as well as received buyer revenue.

A Survey of Grapevine Vein Clearing Virus in *Vitis* Species in the National Plant Germplasm Collection

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Grapevine vein clearing virus (GVCV) is a DNA virus discovered in a 'Chardonel' cultivar in a Missouri vineyard in 2009. GVCV is associated with various symptoms including the signature translucent veins of the leaf, deformed and discolored berries, and a decline of vine vigor and fruit yield. Because the color and texture of the berries are affected, wine quality is reduced. GVCV is widely distributed in commercial vineyards in the Midwest. Novel GVCV isolates have recently been found in wild *Vitis rupestris* and in *Ampelopsis cordata* in their native habitats. We conducted this study to investigate if GVCV is present in other *Vitis* species by screening a collection of 384 samples of 30 *Vitis* species maintained in the USDA National Plant Germplasm repositories at Geneva, NY and Davis, CA. In a polymerase chain reaction (PCR) assay, we applied three sets of primers for conducting this survey; one specific for grapevine, 16s rRNA for inspecting DNA quality, and two for GVCV. We did not detect GVCV in any of the germplasm samples including cloned samples from *V. rupestris* collected between 1945-1990. The results along with evidence from companion studies imply that GVCV has not affected the *Vitis* germplasm sampled from the National Plant Germplasm at two locations and the virus most likely originated in the Midwest in recent years.

2016 ASEV-ES Outstanding Achievement Award

Dr. Bruce Bordelon

Professor, Purdue University

The American Society for Enology and Viticulture-Eastern Section (ASEV-ES) has awarded Dr. Bruce Bordelon the 2016 ASEV-ES Outstanding Achievement Award. Bordelon is a professor of viticulture at Purdue University where he has been part of the Purdue Wine Grape Team since 1991. He provides statewide extension support for the grape and small fruit industries in Indiana through a series of workshops, symposia, newsletters and web-based educational materials. His research interests include evaluation of new varieties and selections, matching varieties to sites, integrated pest management, and vineyard management to improve fruit quality. Bordelon co-teaches courses in fruit production (HORT 421), Commercial Grape and Wine Production (HORT/FS 506), and guest lectures in several other courses. Bordelon works closely with colleagues in surrounding states through the Midwest Fruit Workers Group. He is editor of the Midwest Fruit Pest Management Guide (revised annually and used by 13 states), and co-author of the Midwest Grape Production Guide (2005) and Midwest Small Fruit Pest Management Handbook (1997). Bordelon received a B.S. in plant pathology from Oklahoma State (1978), M.S. in plant pathology from Montana State (1981) and Ph.D. in fruit breeding and genetics from the University of Arkansas (1991). Bruce has been an active member of the ASEV-ES since 1988 where he has served as Chair (2005-2006), Chair Elect, Technical Program and Symposium Chair (2004-05), Board of Directors (2000-02, 2004-07) and as the Student Paper Award Judge (2002-04).

2016 ASEV-ES Distinguished Service Award (in Memoriam)

Dr. William (Bill) Nail

The American Society for Enology and Viticulture-Eastern Section (ASEV-ES) has awarded the late Dr. William (Bill) Nail the 2016 ASEV-ES Distinguished Service Award (in Memoriam). Bill was a valued member of our ASEV-ES family for decades, as a member, an officer, and a board member. To commemorate his quiet passion for grapes and wine, and his hopes for the future of the industry, ASEV-ES accepted donations for a student scholarship in Bill's memory.

Bill was born on June 14, 1956 and raised in Dallas with his sister, Nancy, by his parents, Will and Sue Gilbert Nail.

After earning his B.M. degree from Southern Methodist University, he earned an M.S. in Horticulture at Texas A&M and a Ph.D. in Horticulture at Michigan State University. He retired from the Connecticut Agricultural Experiment Station after a career in teaching and government research in viticulture and enology. Bill passed away on April 10, 2016 at the young age of 59.

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