



American Society for Enology and Viticulture- Eastern Section

42nd Annual Conference

July 10-12, 2017

Charlottesville, Virginia

Workshop

**Pioneering Wine Grape Varieties
Adapted to the Challenges of the East**

Email: info@asev-es.org

Website: <http://www.asev-es.org/>



Conference Overview

Conference Events: Omni Hotel Charlottesville

212 Ridge McIntire Road, Charlottesville, VA 22903

Monday, July 10, 2017

Conference Registration	Omni Hotel West Ballroom	7:00-7:45 am
Tour Virginia Vineyards & Wineries	Meet in Omni Hotel Lobby	7:45 am-5:30 pm

Tuesday, July 11, 2017

Conference Registration	Omni Hotel West Ballroom	7:30 am-5:00 pm
Welcome and Overview	Omni Hotel West Ballroom	8:00-8:30 am
Student Competition and Flash Talks	Omni Hotel West Ballroom	8:30-11:00 am
ASEV-ES Award Presentation	Omni Hotel West Ballroom	11:00 am-12:00 pm
Lunch and ASEV-ES Business Meeting	Omni Hotel East Ballroom	12:00-2:00 pm
Technical Sessions	Omni Hotel West Ballroom	2:00-4:30 pm
View Posters	Omni Hotel West Ballroom	4:30-5:00 pm
Oenolympics & Reception	Omni Hotel East Ballroom	6:00-7:30 pm

Wednesday, July 12, 2017

Conference Registration	Omni Hotel West Ballroom	7:30-11:00 am
Welcome and Announcements	Omni Hotel West Ballroom	8:00-8:15 am
Student Competition and Flash Talks	Omni Hotel West Ballroom	8:15-10:30 am
Technical Sessions	Omni Hotel West Ballroom	10:30 am-12:00 pm
Lunch	Own Your Own	12:00-1:30 pm
ASEV-ES Board Meeting/Lunch	Omni Hotel Ashlawn	12:00-1:30 pm
Pioneering Wine Grape Workshop	Omni Hotel West Ballroom	1:30-5:30 pm
View Posters	Omni Hotel West Ballroom	5:30-6:00 pm
Sparkling Wine Reception and Banquet	Omni Hotel West Ballroom	6:30-9:00 pm

ASEV-ES Conference Sponsors

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Monday, July 10, 2017

Tour Virginia Vineyards & Wineries

Meet in Omni Hotel Lobby	7:45 am
Depart for Barbourville Vineyards Vineyard Tour 8:30-9:45 am	8:00 am
Depart for Trump Winery Vineyard and Winery Tour 10:30 am-12:00 pm	9:45 am
Depart for Lunch at Carter Mountain Orchard Discussion and Lunch 12:30-2:00 pm	12:00 pm
Depart for King Family Vineyards Vineyard and Winery Tour 2:30-4:45 pm	2:00 pm
Depart for Omni Hotel	4:45 pm
Arrive at Omni Hotel	5:30 pm



Tuesday, July 11, 2017

Welcome

8:00-8:15 am

Harlene Hatterman-Valenti, North Dakota State University and ASEV-ES Chair
Denise Gardner, Penn State University and ASEV-ES Chair Elect

Overview of Enology and Viticulture in Virginia

8:15-8:30 am

Tony Wolf, Professor Viticulture, Virginia Tech, Winchester, Virginia

Student Oral Presentation Competition

8:30-9:30 am

Sour Notes on the Finish: Malic Acid Behavior during Ripening of Wild *Vitis* spp.
Elizabeth A. Burzynski, Elizabeth J. Brown, and Gavin L. Sacks

Under-vine Floor Management Impacts the Fungal Community Structure of Soils, but Not Grapes and Wine
Ming-Yi Chou, Terrence Bell, Jenny Kao-Kniffin, and Justine Vanden Heuvel

Finger Lakes Riesling Microflora: Analysis of Ecological Survey Results Over Time and Distance
Marie Guido-Miner, Anna Katharine Mansfield, and Jenny Kao-Kniffin

Zoning the Vineyards by NDVI Data from Unmanned Aerial Vehicles (UAVs) and Mapping Variability of the Vineyards in Ontario, Canada

Andrew G. Reynolds, **Hyun-Suk Lee**, Ralph Brown, Marilyne Jollineau, Adam Shemrock, Emily Aubie, Marnie Crombleholme, Emillie Jobin Poirier, Wei Zheng, and Maxime Gasnier

Flash Talks-Poster Summaries (3 minutes each)

9:30-10:00 am

An Untargeted Metabolomics Identification of Bound Aroma Compounds Differences between Norton and Cabernet Sauvignon Grapes

Mani Awale, Connie Liu, and Misha T. Kwasniewski

Determining Fruit Ripening Characteristics of Missouri Norton Grapes

Courtney E. Duncan, **Misha T. Kwasniewski**, and Dean S. Volenberg

The Identification of Interspecific Hybrids, Jaeger 70 x Vignoles Grapes Using SSR Markers

Carl W. Knuckles, Li-Ling Chen, Surya Sapkota, and Chin-Feng Hwang

Co-fermentation vs. Post-fermentation Blending of an Interspecific Hybrid with a *Vitis Vinifera*: Effects on Wine Tannin

Erin L. Norton, Somchai Rice, Maureen R. Moroney, and Gavin L. Sacks

Effects of Harvest Time on Aroma of Wines Made from Brianna and Frontenac Gris Grapes using Gas-Chromatography-Mass- Spectrometry and Olfactometry

Somchai Rice, Madina Tursumbayeva, Murlidhar Dharmadhikari, Anne Fennell, and Jacek A. Koziel

Genetic Study of Dormant Rooting Ability in Grapes

S. Jacob Schneider, Logan Duncan, Surya Sapkota, Shanshan Yang, Li-Ling Chen, Lance Cadle-Davidson, and Chin-Feng Hwang

Ampelometric Characterization of Historic North Dakota *Vitis* Specimens

Andrej Svyantek, John Stenger, and Harlene Hatterman-Valenti

Identification of Foliar Resistance QTL to Phylloxera and the Planking Markers in a F1 Grape Population

Lu Yin and Matthew Clark

Impact of Saignée Treatment on Chambourcin Fermentation Microbiology and Final Wine Quality

Mani Awale, Xxx Chenggeer, Courtney E. Duncan, Alan P. McClure, and Misha T. Kwasniewski

Break/View Posters

10:00-10:30 am

Student Oral Presentation Competition

10:30-11:00 am

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

Lisa Robbins, Todd Steiner, and Joseph Scheerens

Yeast Assimilable Nitrogen Source and Fermentation Temperature Impacts the Chemistry and Sensory Properties of Cool-Climate Riesling

Seth A. Urbanek and Anna Katharine Mansfield

ASEV-ES Outstanding Achievement Award Presentation

Reflections on Viticultural Collaborations

11:00 am-12:00 pm

Tony Wolf, Professor Viticulture, Virginia Tech, Winchester, Virginia

Lunch and ASEV-ES Annual Business Meeting

12:00-2:00 pm

Technical Sessions

2:00-4:30 pm

Investigation into Impacts of Frozen Material-Other-Than-Grapes (MOG) on Aroma Compounds of Red Wine Cultivars

Emily Aubie and Andrew Reynolds

Mechanizing Pre-bloom Leaf Removal on Wine Grapes in Pennsylvania

Bryan Hed and Michela Centinari

Fruit-zone Leaf Removal Impact on the Temperature and Anthocyanins of Cabernet Sauvignon Grapes Grown in Northern Virginia

Cain C. Hickey and Tony K. Wolf

Evaluation of Grapevine Rootstocks in the Texas Gulf Coast and Texas Hill Country

Justin Scheiner and Jim Kamas

An Assessment of Winery Tasting Room Marketing Strategies Based on Mid-Atlantic (New Jersey, New York, and Pennsylvania) Consumer Surveys

Jennifer Zelinskie, Kathleen M. Kelley, Denise M. Gardner, Ramu Govindasamy, Jeffrey Hyde, Bradley Rickard, and Karl Storchmann

Break/View Posters

4:30-5:00 pm

Adjourn

5:00 pm

Oenolympics & Reception

6:00-7:30 pm



Sponsor of ASEV-ES Hospitality Suite
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Wednesday, July 12, 2017

Welcome and Announcements

8:00-8:15 am

Harlene Hatterman-Valenti, North Dakota State University and ASEV-ES Chair
Denise Gardner, Penn State University and ASEV-ES Chair Elect

Student Oral Presentation Competition

8:15-9:30 am

Clone and Rootstock Interactions and their Influence on Cold Hardiness
Andréanne Hébert-Haché, Mary Jasinski, James J. Willwerth, and Debra Inglis

Fine Mapping and Detection of Downy Mildew Resistance Locus in Norton-based Population
Surya Sapkota, Shanshan Yang, Li-Ling Chen, Katie E. Hyma, Lance Cadle-Davidson and Chin-Feng Hwang

Pre-Fermentation Protein Fining Increases Tannin in Red Hybrids
Mark R. Skoglund and Anna Katharine Mansfield

Removal of Five Basal Leaves at Trace-bloom and Fruit-set is Less Effective for Yield Regulation than Cluster Thinning in *V. vinifera* L. Grüner Veltliner
Maria S. Smith and Michela Centinari

Early Leaf Removal in Tight Clustered *Vinifera* Cultivars Improves Fruit Technological Maturity in Cool Climates
Josh VanderWeide, Zhongli Ma, and Paolo Sabbatini

Flash Talks-Poster Summaries (3 minutes each)

9:30-10:00 am

Abscisic acid (ABA) and Gibberellic acid (GA₃) Applications Change Cluster Architecture Without Impacting Fruit Set and Fruit Composition of *Chardonnay* Grape in Southern New Jersey
Hemant Gohil and Daniel Ward

Evaluation of the Potential for Processing Strategies to Influence Health-Promoting Properties of Wine
Laura E. Griffin, Brianna L. Ewing, Sean F. O'Keefe, Andrew P. Neilson, Anthony K. Wolf, and Amanda C. Stewart

Characterization of Thiol Precursors in Interspecific Hybrid Grape Varieties Grown in Eastern Canada for Wine Production
Alina Gerzhova, Aurélie Roland, Stéphane Delpech, Laurent Dagan, Karine Pedneault*

Changes in Free and Bound Volatile Compounds during the Ripening of Riesling Berries Grown in Quebec
Alix Jourdan, Mireille Didjou, Andrew Reynolds, Frédéric Pitre, Caroline Provost, Karine Pedneault*

Impact of Grapevine Grafting for Hybrid Varieties Grown in Quebec, Canada
Caroline Provost and François Dumont

Potential of Swiss Fungal Resistant Varieties under Climatic Conditions of Quebec, Canada
Caroline Provost and François Dumont

Enology Analytical Services Laboratory Overview
Ann M. Sandbrook and E. Kenneth Hurley

Pestalotiopsis: In-vivo and In-vitro Methods to Culture an Emerging Grape Fungal Disease
Dean S. Volenberg and Patricia Hosack

Break/View Posters

10:00-10:30 am

Technical Sessions

10:30 am-12:00 pm

Rejection Threshold Estimates Differ for *V. labrusca* Odorants in Wine Evaluated by Wine Consumers and Wine Experts
Demetra M. Perry, Nadia K. Byrnes, Hildegard Heymann, and John E. Hayes

Performance of Euvitis Hybrid Grape Cultivars in South Mississippi
Eric T. Stafne

Development of a Multi-scale Grape Varietal Observation Database
Peter Sforza

Lunch Own Your Own

12:00-1:30 pm

Industry Workshop

1:30-5:00 pm

Moderator: Tony Wolf, Professor Viticulture, Virginia Tech, Winchester, Virginia

Pioneering Wine Grape Varieties Adapted to the Challenges of the East

Presentations, Interactive Discussions, and Tastings

This workshop is sponsored by the Virginia Vineyards Association and features grape breeders that will discuss new wine grape selections and cultivars from three diverse breeding programs.

**‘Opportunity’ and ‘Enchantment’,
Wine Grapes for the Mid South**

1:30-2:30 pm

John Clark, Distinguished Professor, University of Arkansas
Renee Threlfall, Research Scientist, University of Arkansas

‘Itasca’, A Winemaker’s Grape for Cold Climates

2:30-3:30 pm

Matthew Clark, Assistant Professor, University of Minnesota

Vinifera Hybrids and Resistance to Pierce’s Disease

3:30-4:30 pm

Andrew Walker, Professor, University of California, Davis

Panel Discussion

4:30-5:30 pm

View Posters

5:30-6:00 pm

Adjourn

6:00 pm

Sparkling Wine Reception

6:30-7:00 pm

ASEV-ES Grand Awards Banquet

7:00-9:00 pm

**Donation of Wine Glasses for ASEV-ES Banquet
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Virginia Vineyards Association**

Workshop Speakers

Matthew Clark has a MSc and a PhD in Plant Breeding and Genetics from the University of Minnesota, where he is now an assistant professor of Grape Breeding and Enology, and Extension Specialist. His research focuses on using both traditional and molecular plant breeding approaches to develop improved grape cultivars for cold climate wine production. One key area of research is studying the genetics behind the unique resistances to common grapevine pests such as powdery mildew, phylloxera, downy mildew, and black rot in the hybrid germplasm. The goal is to develop new cold-hardy grape varieties with multiple resistances so that growers can reduce the amounts of pesticides applied in a season.



John R. Clark is a distinguished professor of horticulture at the University of Arkansas and works in fruit breeding. His career focus has been primarily



on variety development of a range of crops including blackberries, table grapes, peaches, nectarines, and blueberries along with work on wine and muscadine grapes. He has develop or co-developed over 50 fruit varieties in his career since starting at the University in 1980. He received his Ph.D. from the University of Arkansas, Fayetteville



and his M.S. and B.S. from Mississippi State University.

Andrew Walker has been a faculty member of the Department of Viticulture and Enology University of California, Davis since 1989. His research program focuses on developing new



rootstocks with resistance to fanleaf, dagger and root-knot nematodes and phylloxera. His breeding program involves breeding table, raisin and wine grapes for resistance to Pierce's disease and powdery mildew using classical breeding and inheritance, the development of rapid resistance assays, field trials of promising rootstock and scion selections, DNA marker analysis and mapping, and genetic engineering. He teaches parts of Viticultural Practices, which instructs students in rootstock and scion selection and identification, propagation practices, pruning and training, trellising, and vineyard development. Dr. Walker received his

Bachelor's in Botany in 1975, a Master's in Horticulture/Viticulture in 1983, and a PhD in Genetics in 1989 from the University of California, Davis. In November 2000, he was appointed the Louis P. Martini Endowed Chair in Viticulture.



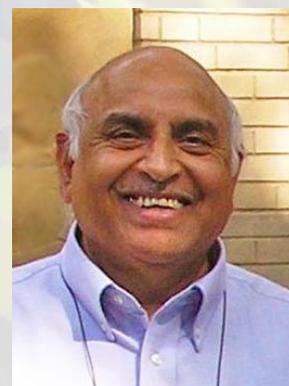
2017 ASEV-ES Outstanding Achievement Award



Dr. Tony Wolf
Professor, Virginia Tech

The American Society for Enology and Viticulture-Eastern Section (ASEV-ES) has awarded Dr. Tony Wolf the 2017 ASEV-ES Outstanding Achievement Award. Tony Wolf's viticulture education includes a MSc from the Pennsylvania State University and a PhD from Cornell University. He is a professor of viticulture at Virginia Tech where he has been employed since 1986. Dr. Wolf has conducted research to expand the grape varietal landscape in Virginia, to better understand the adaptation of grapes to Virginia's colorful biotic and abiotic challenges and, through collaboration with enologists, to improve grape and wine quality potential. Graduate student training has been an integral part of his research program. Dr. Wolf's extension program comprises workshops, development of web-based decision support tools, and publication of technical print and online media. Dr. Wolf has served as an Associate Editor of the American Journal of Enology and Viticulture, and has served as a director, secretary, and chairman of the American Society for Enology and Viticulture's Eastern Section. He has authored over 50 scientific papers and was senior author of the Mid-Atlantic Winegrape Growers Guide (1995), and was a principal author and editor of the Wine Grape Production Guide for Eastern North America (2008). His awards include Virginia Tech's Alumni Award for Extension Excellence (2009), and Virginia Tech's College of Agriculture and Life Science's "Andy Swiger Land Grant Award" (2011). In addition to his viticulture research and extension roles, Dr. Wolf teaches an online viticulture course and serves as Director of Virginia Tech's AHS Jr. Agricultural Research and Extension Center in Frederick County Virginia.

2017 ASEV-ES Distinguished Service Award



Dr. Murli R. Dharmadhikari
Retired, Midwest Grape and Wine Industry Institute

The American Society for Enology and Viticulture-Eastern Section (ASEV-ES) has awarded Dr. Murli R. Dharmadhikari the 2017 ASEV-ES Distinguished Service Award. Dr. Murli R. Dharmadhikari served as the first Extension Enologist, and Director of the Midwest Grape and Wine Industry Institute (MGWII) at Iowa State University from its inception in 2006 until his retirement in 2016. He has over 40 years of work experience in the Midwest grape and wine industry. He is a graduate of Ohio State University and worked as commercial winemaker for 10 years in Indiana. He joined Missouri State University in 1986 and served as enology advisor and later as Director Mid-America Grape and Wine Center. In Missouri, he was involved in establishing a research vineyard, experimental winery, commercial winery, commercial distillery, and distance education workforce training program. As an advisor he offered wine diagnostic services, organized technical meetings, workshops and international symposia. Over the years he has given enology presentations at industry meetings in many U.S. states and internationally. He conducted research on evaluation of grape wine cultivars for the Midwest climatic condition and on vinification of high acid, high pH grapes. He has authored a book "Microvinification" and published numerous articles in industry publications. He was elected twice and served as Chair of the American society for Enology and Viticulture Eastern Section. He held professional membership with the American Society for Enology and Viticulture, and the Australian Society of Viticulture and Enology. At the MGWII, he conducted research on resveratrol, developed courses in enology, offered outreach enology classes, and led the development of the Iowa Quality Wine Consortium and Cellar Worker Apprenticeship programs for the Iowa wine industry. Murli was also instrumental in developing the multi-state proposal for the USDA-SCRI funded grant "The Northern Grapes Project".

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.

AMERICAN SOCIETY FOR ENOLOGY AND VITICULTURE



EASTERN SECTION

Established 1975

AMERICAN SOCIETY FOR ENOLOGY & VITICULTURE - EASTERN SECTION

2017 SCHOLARSHIP FUNDRAISER RAISED \$17,000



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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 raised \$17,000 at the Live and Silent Auctions. Thanks to our 2017 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: 42nd Annual ASEV-ES Conference Charlottesville, VA - July 10-12, 2017

CONTACT ASEV-ES: 479-575-4677 OR INFO@ASEV-ES.ORG

2017 Scholarship Recipients



Natacha Cureau, University of Arkansas

Molly Felts, University of Arkansas

Jaclyn Fiola, Ohio State University

Andrew Harner, Penn State University

Andreanne Hebert-Hache, Brock University

Anne Kearney, Cornell University

Steven Schneider, Missouri State University

Maria Smith, Penn State University

Joshua Vanderweide, Michigan State University



Student Presentation Competition Abstracts

Sour Notes on the Finish: Malic Acid Behavior During Ripening of Wild *Vitis* spp.

Elizabeth A. Burzynski*, Elizabeth J. Brown, and Gavin L. Sacks

*Corresponding author: Cornell University, Stocking Hall, 411 Tower Road, Ithaca, NY 14853, USA, cab54@cornell.edu

Wild *Vitis* species (e.g. *V. riparia*, *V. cinerea*) and their interspecific hybrids are often reported to have high malic acid at sugar maturity, resulting in wines with unacceptably high titratable acidity and perceived sourness. However, it is not known if the high malic acid phenomenon results from slower malic degradation post-veraison, or greater malic accumulation pre-veraison in wild *Vitis* as compared to *vinifera*. In 2015, malic acid was measured at three time points for 60 accessions representing five *Vitis* species: *V. riparia*, *V. cinerea*, *V. aestivalis*, *V. rupestris*, and *V. vinifera*. Wild *Vitis* species were collected from the USDA ARS Cold Hardy Grape Germplasm Collection vineyard (Geneva, NY), and *V. vinifera* grapes were harvested from Silver Thread Vineyard (Lodi, NY). We observed that *vinifera* degrades malic acid (g acid per berry) faster than many wild *Vitis* spp., and that malic acid (g per berry) in wild *Vitis* accessions, particularly *cinerea*, can increase post-veraison (e.g. a *cinerea* accession increased from 2 g malic acid per berry at 5 °Brix to 13 g malic per berry at 17 °Brix). Similar results were found in a 2016 confirmation study of *riparia* and *cinerea* using seven sampling points. The slow (and, in certain cases, inverse) change in malic acid of wild *Vitis* during maturation likely explains the challenges of using these species in breeding programs and in commercial settings.

Under-vine Floor Management Impacts the Fungal Community Structure of Soils, but Not Grapes and Wine

Ming-Yi Chou, Terrence Bell, Jenny Kao-Kniffin, and Justine Vanden Heuvel*

*Corresponding author: Cornell University, 236 Tower Road, Ithaca, NY 14850, USA, jev32@cornell.edu

The impact of under-vine floor management practices (cultivation, native vegetation, glyphosate application) on soil and grape fungal assemblages was examined over a three-year period. Microbial DNA from soil and grapes was extracted, the fungal ITS barcoding region was amplified, and these products were sequenced using Illumina MiSeq. For both soil and grape fungal communities, vintage effects accounted for more variance than floor management practices, and day of fermentation accounted for the most variance for wine samples. The soil fungal community under native vegetation was distinct from those observed under cultivation and glyphosate treatment, based on principal coordinates analysis (PCoA) in each year of the study. Despite soil community structure shift under native vegetation, the fungal community on the grapes was not affected by the under-vine floor treatments, except that cultivation reduced overall grape fungal richness in the third year of the study. Since the fungal community on grapes was unaffected, the fungal community of simulated spontaneous fermentations did not differ among treatments, but the samples clustered by date on the PCoA plot. The resulting wines from the treatments did not differ aromatically when sorted using multidimensional scaling analysis. In contrast with the existing literature on soil and grape bacteria, fungal communities of grapes and simulated spontaneous fermentations were resilient to soil fungal community shifts in this study.

Finger Lakes Riesling Microflora: Analysis of Ecological Survey Results Over Time and Distance

Marie Guido-Miner, Anna Katharine Mansfield*, and Jenny Kao-Kniffin

*Corresponding author: Cornell University, Stocking Hall, 411 Tower Road, Ithaca, NY 14853, USA, akm87@cornell.edu

Ecological surveys documenting cultivar-specific microflora of a region can help determine if distinct populations contribute to regional wine characteristics. Over two harvest seasons (2015 and 2016), single-vineyard Riesling wines were followed through harvest and spontaneous fermentation at several Finger Lakes wineries. For each wine, microbial sampling was performed in the vineyards prior to harvest, on select equipment prior to use, on juice, and on the evolving wine. Samples were plated onto differential media and counted after incubation for an estimation of population density. The ITS regions of unique colony types were sequenced for species-level identification, and an additional five-locus VNTR analysis was performed on *Saccharomyces cerevisiae* for strain-level identification. *S. cerevisiae* strains were compared to commercially available strains to identify potentially unique strains. A majority of the observed *S. cerevisiae* strains did not match any commercially available strains. Comparisons of the wines from geographically distinct vineyards processed in the same winery showed different mixes of observed yeast species and minimal overlap in the *S. cerevisiae* strains observed. This suggests that resident winery microflora is not the primary source of *S. cerevisiae* strains isolated in the wine. Differences were also observed in the same vineyards over the two harvests, perhaps as a result of vastly different weather patterns. This regional microbiome study is the first in the Finger Lakes, and adds to a broader understanding of New World yeast populations.

Clone and Rootstock Interactions and their Influence on Cold Hardiness

Andréanne Hébert-Haché*, Mary Jasinski, James J. Willwerth, and Debra Inglis

*Corresponding author: Brock University, 1812 Sir Isaac Brock Way, St. Catharines, Ontario, L2S 3A1, ah10uq@brocku.ca

Clone and rootstock selection could be used as a tool to mitigate cold damage, but the impact of their interaction on cold hardiness remains to be investigated. Cold hardiness of selected clone and rootstock combinations were therefore evaluated biweekly during the 2015-2016 and 2016-2017 dormant seasons from October to April. Dormant buds were collected for Sauvignon blanc clones 242, 297, 376, and 530 (on SO4 rootstock), and Riesling clones 49 and 239 grafted to SO4 and Riparia Gloire rootstocks. The bud hardiness was assessed by differential thermal analysis and reported as LT₅₀. Vine balance was determined using the Ravaz Index (RI). For Riesling, the rootstocks appeared to be more important than the clones in influencing hardiness. Bud hardiness changes throughout dormancy for clone 49 and 239 were very similar for both dormant seasons when grafted on SO4 rootstock whereas bud hardiness of Clone 49 was reduced when grafted to the Riparia Gloire rootstock. The RI of all Riesling clone x rootstock combination were between 7.3 and 10.5, indicating general vine balance. 239/Riparia Gloire combination had the hardest buds and the highest RI for Riesling which demonstrates that specific clone x rootstock interactions exist. Trends for Sauvignon blanc clones were more variable. Clone 530 achieved greater cold tolerance in both dormant seasons. Bud hardiness was similar for all clones during acclimation and deacclimation (first year only), but important variability was observed during maximum hardiness. Results to date indicate that clone x rootstock combinations can optimize vine performance for a given cultivar.

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Student Presentation Competition Abstracts

Zoning the Vineyards by NDVI Data from Unmanned Aerial Vehicles (UAVs) and Mapping Variability of the Vineyards in Ontario, Canada

Andrew G. Reynolds*, **Hyun-Suk Lee**, Ralph Brown, Marilyne Jollineau, Adam Shemrock, Emily Aubie, Marnie Crombleholme, Emilie Jobin Poirier, Wei Zheng, and Maxime Gasnier

*Corresponding author: Brock University, 1812 Sir Isaac Brock Way, St. Catharines, Ontario, L2S 3A1, areynolds@brocku.ca

The hypothesis of this research is that the maps based on remotely-sensed images would create clear zones of different vigor, yield, water status, winter hardiness and berry composition and the wines from the unique zones would show different chemical and sensorial profiles. To determine the unique zones, we flew unmanned aerial vehicles (UAVs) with multispectral and thermal sensors through 12 different vineyard blocks (6 Riesling and 6 Cabernet Franc) in Ontario, Canada. The zoning was based on NDVI values and we examined the relevant spatial correlations between the NDVI and variables such as leaf ψ , soil moisture, stomatal conductance (G_s), winter hardiness (LT_{50}), vine size, yield, and berry composition. We also collected NDVI data from GreenSeeker (proximal sensing) and both NDVI data produced maps of similar configuration. Year1 (2015) results showed several direct correlations between UAV NDVI and vine size, berry wt., yield, cluster number, soil moisture, leaf ψ , and G_s . Inverse correlations of note included FVT/PVT (Riesling), color/ anthocyanins/ phenols (Cabernet franc), and LT_{50} . In most cases, zones of high NDVI were associated with high soil and vine water status, vine size and yield, and low Brix, but there were situations where this pattern was reversed. Overall use of UAVs may be able to delineate zones of differing vine size, yield, and berry wt., and possibly areas of different winter hardiness and berry composition. In year 2 (2016), all the field data collections other than vine size and winter hardiness were done and we created zoned maps by UAV NDVI data and harvested grapes by the separate zones (see figure). The chemical analysis of berries, wine making, and subsequent sensory analysis of wines from different zones are in progress.

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

Lisa Robbins*, Todd Steiner, and Joseph Scheerens

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An issue faced in the Ohio wine industry is lack of temperature controlled environments. White wines experience a short shelf-life, unstable colors, and variable aromas. Optimized storage temperatures can increase the shelf-life of white wines by maintaining terpene and ester contents, and preventing the formation of new detrimental flavor and aroma constituents. The method of hyperoxidation, the intentional addition of oxygen to pressed juice, could also increase the shelf-life of white wines by initiating enzymatically-controlled oxidation cascades that remove the phenolic precursors of oxidizable compounds. Removal of these precursors prior to vinification can result in less harsh or bitter flavors, improved color over time, and greater-shelf stability. 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) throughout time. Chemical flavor analyses via solid phase micro-extraction (SPME) is used to identify and quantify volatile flavor compounds in the wines. This technique allows for identification of compounds responsible for fruity/floral aromas and off-aromas throughout storage. The volatile compounds identified are then compared to sensory analyses performed by a trained qualitative descriptive analysis panel. Initially, the sensory panel detected no significant differences in aroma or flavor characteristics between hyperoxidated and control wines before entering storage treatments. Throughout 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. The identification of optimized storage conditions could benefit both wineries and consumers with longer lasting white wines in challenging storage conditions.



Student Presentation Competition Abstracts

Fine Mapping and Detection of Downy Mildew Resistance Locus in Norton-based 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, from which a consensus map was constructed via 411 simple sequence repeat (SSR) markers. Using genotyping-by-sequencing (GBS), 3,825 single nucleotide polymorphism (SNP) markers were generated. Of these, 1,659 SNP and 406 SSR markers were clustered into 19 linkage groups for a total of 2,065 markers spanning a genetic distance of 2,203.5 cM. Disease progression and resistance reaction in response to *P. viticola* was studied in this population for two years under both lab and field conditions. 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.

Pre-Fermentation Protein Fining Increases Tannin in Red Hybrids

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Red wines made from cold-hardy interspecific hybrids tend to be low in condensed tannin. Recent studies suggest that poor tannin retention is caused by high levels of pathogenesis-related proteins found in hybrid grapes. Efforts to increase tannin retention through fermentation processes or exogenous tannin addition have shown limited success. However, in a recent lab-scale study, pre-fermentation addition of bentonite removed 85% of protein resulting in a 30% increase in wine tannin. To confirm this finding, a larger scale pre-fermentation protein fining trial was conducted in 2016. Wines were made from interspecific hybrid cultivars Marquette and Corot noir, and the *V. vinifera* cultivar Lemberger. The fruit was crushed, immediately pressed off the pomace, treated with a maceration enzyme and cold settled. It was then treated with either 75 mg/L or 150 mg/L of bentonite or 400 mg/L of a condensed tannin fraction before being recombined with the pomace. While these treatments reduced must protein content by up to 60%, final wine protein concentrations were similar across treatments. Bentonite and tannin treatments increased wine tannin concentrations in Corot noir by 30-80 mg/L. Wine tannin did not increase significantly in Marquette or Lemberger. These results suggest that pre-fermentation fining can improve retention of endogenous tannin for some interspecific hybrid cultivars.

Removal of Five Basal Leaves at Trace-bloom and Fruit-set is Less Effective for Yield Regulation than Cluster Thinning in *V. vinifera* L. Grüner Veltliner

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Leaf removal applied at or before fruit-set has been reported as a potential management tool for reducing yield and *Botrytis* rot levels while improving berry composition in several high-yielding *Vitis vinifera* cultivars. In 2015 and 2016, trace-bloom (TBLR) and fruit-set (FSLR) removal of five basal leaves were evaluated against traditional cluster thinning (CT) and an un-thinned control (C) for effects on yield components, *Botrytis* rot severity, cluster compactness, and fruit composition in *V. vinifera* L. Grüner Veltliner. Across 2015 and 2016, TBLR and FSLR reduced yield by an average of 13.4% and 14.2%, respectively, compared with C, while CT reduced yield 48.9%. Yield reduction in CT vines was exclusively due to fewer clusters per vine. Compared to C, TBLR and FSLR had similar number of clusters per vine and average cluster weight across 2015-2016, but exhibited lower berry weight in 2015 by 34.5% and 36.2%, respectively. TBLR and FSLR had lower cluster compactness and severity of *Botrytis* rot compared with C and CT treatments. Fruit set levels did not differ between TBLR, FSLR, and C. Total soluble solids averaged across both years were higher in both the CT and TBLR treatments compared to C, with no impacts on pH and titratable acidity. Additionally, treatments did not consistently affect bud cold hardiness, assessed using differential thermal analysis. Our results suggest that TBLR and FSLR confer benefits for improving *Botrytis* rot control, however, removing five basal leaves is insufficient in Grüner Veltliner to reduce yield comparable to CT levels.

ASEV-ES Conference Planning in Virginia
Tony Wolf, Virginia Tech

Student Presentation Competition Abstracts

Yeast Assimilable Nitrogen Source and Fermentation Temperature Impacts the Chemistry and Sensory Properties of Cool-Climate Riesling

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Nitrogen plays a key role in yeast metabolism during alcoholic fermentation, but is often a limiting nutrient. Yeast Assimilable Nitrogen (YAN), the nitrogenous fraction available to *Saccharomyces cerevisiae*, regularly monitored and supplemented to ensure quality during commercial winemaking. While YAN concentrations between 200-350mg N/L are generally recommended for healthy fermentation, these values are drawn from work with warm-climate wine grape cultivars and conditions. More recently, studies have suggested that the need for supplementation may be lower than the current recommendations. It is also known that excessive YAN supplementation may lead to residual YAN, microbial spoilage, and negative sensory outcomes. Further, fermentation temperature is known to impact fermentation kinetics, nitrogen uptake, and organoleptic properties. This work sought to define the optimal level and ideal type of YAN supplementation for cool-climate Rieslings under varying fermentation temperatures by examining fermentation kinetics as well as chemical composition and sensory characteristics of the final wines. Fermentations supplemented with organic nitrogen showed more rapid fermentation kinetics than those supplemented with inorganic nitrogen, and kinetics increased as fermentation temperature increased. A panel of wine experts analyzed the sensory properties of the Riesling wines, using a projective mapping technique known as Napping®. Descriptors such as 'mineral', 'petrol', and 'balanced' were most closely associated with lower YAN supplementation levels, and with some organic nutrient types.

Early Leaf Removal in Tight Clustered *Vinifera* Cultivars Improves Fruit Technological Maturity in Cool Climates

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The short growing season depicted in Michigan's cool climate viticulture areas often leads to poor fruit quality in several important vinifera cultivars. In addition, precipitation events leading up to harvest increase the incidence of sour rot and dramatically reduce fruit technological maturity and yield. Leaf removal is a viticultural practice that has been utilized to increase fruit exposure to sunlight and increased temperatures. Performing early leaf removal (e.g. pre-bloom, bloom) effectively decreases the number of berries per cluster, reducing cluster compactness. Despite its effectiveness, leaf removal is timely and costly for grape-growers. In our study, early leaf removal (pre- and post-bloom) performed manually or mechanically are compared with manual treatments in Pinot Grigio and Merlot. Data showed that mechanical treatments removed less leaf area than manual treatments, however, mechanical clusters contained fewer berries, likely the result of flowers being removed directly by the machine. Results also revealed that pre-bloom mechanical leaf removal increased individual berry size, as well as Brix uniformity at harvest. All treatments lowered sour rot quantitative loss by approximately 0.5 kg/vine compared with the control, however, pre-bloom manual leaf decreased quantitative loss by 1.5 kg/vine. Taken altogether, yield was decreased slightly in all leaf removal treatments, with pre-bloom mechanical leaf removal yield being about 20% less than the control. These results provide valuable insight towards the viability of mechanization of leaf removal as a potential replacement for manual leaf removal in cool climates.



Technical Session Abstracts

Investigation into Impacts of Frozen Material-Other-Than-Grapes (MOG) on Aroma Compounds of Red Wine Cultivars

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As the effects of climate change progress, it is likely that more cultivars will be harvested later in the season than usual with inclusion of large volumes of frozen leaves and petioles [materials-other-than-grapes (MOG)]. As a result, undesired aroma compounds increase in concentration leading to a “floral taint” in red wines harvested after a frost event. Concentrations of key odor-active compounds were measured in several 2015 commercial Ontario wines (Cabernet franc, Cabernet Sauvignon, blends) produced from grape loads containing high levels of MOG, as well as low-MOG wines (mostly hand-harvested). Wines were assessed sensorially to quantify the intensity of floral taint. Gas chromatography-mass spectrometry (GC-MS) was used to identify and quantify main odor-active components. Concentrations of *cis*- and *trans*-rose oxides were highest in commercial wines produced with high amounts of frozen MOG at harvest. Most floral-tainted wines showed *cis*-rose oxide concentrations above the 0.2 µg/L sensory threshold. β-Ionone was also higher in floral-tainted wines and was above sensory threshold. Controlled experiments were conducted in 2016 based on 20-kg replicated fermentations of Cabernet franc and Cabernet Sauvignon. Treatments were: 0, 0.5%, 1%, 2% and 5% petioles, and 0.25%, 0.5%, 1%, and 2% leaf blades (w/w). These experiments demonstrated highly significant linear relationships between petioles and leaf levels vs 16 aromatic compounds including: *cis*- and *trans*-rose oxides, citronellol, geraniol, linalool, nerol, eugenol, and myrcene. Petioles were much greater contributors to methyl and ethyl salicylate concentrations while leaves contributed to β-ionone concentration. Notably, many of these compounds were present above their odor activity values in the high MOG treatments. Identification of the chemical basis for the floral taint in red wines will assist in defining potential harvest strategies to avoid accumulation of these compounds.

Mechanizing Pre-bloom Leaf Removal on Wine Grapes in Pennsylvania

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A two year study compared pre-bloom, fruit-zone defoliation by air pulse mechanical leaf removal technology (MD), to pre-bloom fruit-zone defoliation by hand (HD), and a non-defoliated check (ND) in wine grape vineyards in Pennsylvania. Averaged over two years, MD on vertical shoot positioned (VSP), four-arm kniffen (4AK), and high-wire cordon (HWC) trained vines was 42, 48, and 37% as effective at removing leaf area along the basal five to six nodes of shoots, when compared to HD (100% effective). Light penetration into the fruit zone was significantly ($P < 0.05$) increased by HD and MD on VSP and 4AK systems but only by HD on HWC systems, when compared to ND. Over two years, HD reduced bunch rot severity by 59% on Riesling (VSP), whereas MD reduced bunch rot severity by 42, 36, and 22% on Riesling (VSP), and Vignoles on 4AK and HWC, respectively, when compared to ND. However, these rot reductions were significant only in one season, for MD on Vignoles on 4AK (68% reduction). Among cluster effects, MD significantly reduced the number of berries per cluster, cluster weight, cluster compactness, and the retention of bloom trash in clusters (a potential focus of Botrytis in clusters) on Riesling, Vignoles, and Chancellor, when compared to ND. There were few significant effects on juice composition, but MD tended to increase Brix and reduce titratable acidity when compared to ND. In the year after treatment, HD and MD did not affect return clusters per shoot when compared to ND.

Fruit-zone Leaf Removal Impact on the Temperature and Anthocyanins of Cabernet Sauvignon Grapes Grown in Northern Virginia

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Excessive fruit exposure has been reported to increase sunburn incidence and reduce anthocyanins of grapes grown in the western US. These findings have arguably shaped fruit-zone leaf removal practices across several growing regions. However, since temperature and radiation patterns may differ between growing regions, so may the impact of fruit-zone leaf removal on grape temperature and anthocyanins. The aim of this work was to characterize how the removal of four to eight fruit-zone leaves affected the temperature and anthocyanins of Cabernet Sauvignon grapes grown in the Shenandoah Valley AVA in Virginia. There was little temperature difference between east- and west-exposed grapes. Grapes spent 3.0 - 30.4 hours above 35°C (a cited temperature threshold for grape anthocyanins) over the 2013 - 2015 post- veraison periods. Total grape anthocyanins were increased with fruit-zone leaf removal and were not different between east- and west-exposed grapes. These findings show that even impractically extreme fruit-zone leaf removal does not result in excessive grape temperature and anthocyanin reduction in all growing regions.

Rejection Threshold Estimates Differ for V. labrusca Odorants in Wine Evaluated by Wine Consumers and Wine Experts

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Wines vinified from *Vitis labrusca* grapes are often described as smelling “grapey” or “foxy” due to two key odorants, methyl anthranilate (MA) and 2-aminoacetophenone (2AAP). Though not a fault per se, there are anecdotal reports suggesting that these odors are offensive to some wine experts. To investigate this, MA and 2AAP were added, separately, to a neutral *V. vinifera* white wine in increasing concentrations to assess at what level, if any, participants would reject increasingly grapey or foxy wines. Both non-expert wine consumers and wine experts participated in a series of 2AFC preference tasks where samples were evaluated in the mouth, and resulting group level data were used to estimate rejection thresholds for the two odorants. Consistent with conventional philosophies among wine professionals, most wine experts from California rejected wine samples with high concentrations of methyl anthranilate while non-expert consumers from California rejected these wines less frequently. In contrast, non-expert consumers from Pennsylvania failed to consistently reject the wine with added MA, suggesting they may be habituated to odors characteristic of *V. labrusca* grapes. In contrast to the MA data, wines with added 2-aminoacetophenone were not rejected by any of the three groups, including the California experts, within a concentration range that one would likely encounter in a wine vinified from *V. labrusca* grapes. The performance of the participants suggests that rejection thresholds for *V. labrusca* odorants are dependent on an individual’s experience with wine aromatics, resulting in varying taste preferences.

Technical Session Abstracts

Evaluation of Grapevine Rootstocks in the Texas Gulf Coast and Texas Hill Country

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Grapevine rootstock selection is often based on soil adaptability, pest and disease resistance, and influence on scion vigor. Field studies were conducted in the Texas Gulf Coast and Texas Hill Country to evaluate the impact of rootstock cultivar on scion nutrition, vine vigor, and fruit composition. Eleven rootstock cultivars were tested at each site: Dog Ridge, Salt Creek, 1103 Paulsen, Kober 5BB, Teleki 5C, Florilush, UCD GRN-1, UCD GRN-2, UCD GRN-3, UCD GRN-4, and UCD GRN-5. Blanc Du Bois was utilized as the scion cultivar at the Gulf Coast site, and Sangiovese at the Texas Hill Country site. Over five years of study, Dog Ridge, Salt Creek, and Florilush consistently produced the largest vine size, and delayed fruit maturity at the Texas Hill Country site. Kober 5BB, Teleki 5C, and ungrafted Sangiovese maintained the lowest concentrations of potassium in shoot tissue and in fruit at harvest which resulted in significantly lower juice pH. At the Gulf Coast site, fruit maturity was delayed in ungrafted Blanc Du Bois.

Development of a Multi-scale Grape Varietal Observation Database

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A grape varietal observation database was developed to refine techniques for curating and normalizing historical grape observation data collected from multiple variety trials, grower records, and research publications. The database facilitates the use of legacy observations in order to synthesize and use the data for meta-analysis, validation and calibration site specific modeling approaches and region wide analysis of the performance of grape varieties. One outcome of this research is the design of a robust data/information model and computational infrastructure for recording variety trial results and grower observations. The system also allows for linking the normalized observations to site specific models such as heat accumulation models that estimate grape phenological stages. Grape growth stage, winter hardiness and disease susceptibility ratings were standardized and summarized for approximately 2000 unique observations across 15 states in the eastern US. Some observation types were normalized using physiological time (growing degree days) instead of calendar dates to account for weather impacts on phenological stage during the specific year of the observation. This allows for a more appropriate use of phenological observations in the calibration and validation of multi-scale models. In order to advance the science and quantitative analysis that can help to drive the success of eastern US viticulture and worldwide viticulture, researchers and growers should continue to evolve the information quality and reporting practices, and consider the observations and measurements as having value beyond the single site or initial purpose of making the observations.

Performance of Euvitis Hybrid Grape Cultivars in South Mississippi

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South Mississippi has a hot, humid climate with a mild winter and rainfall that often occurs during the harvest period. The region also has high incidence of Pierce's disease (PD) and its vectors along with fungal diseases such as anthracnose and various bunch rots. Finding Euvitis bunch grapes that will not only survive but thrive is a challenge. Seventeen bunch grape cultivars were chosen for testing in Poplarville, Mississippi at the USDA-ARS Thad Cochran Southern Horticultural Laboratory. Several reportedly PD-resistant and PD-tolerant cultivars were planted (Blanc du bois, Champanel, Conquistador, Daytona, FAMU-99, Lake Emerald, MidSouth, Miss Blanc, OK392, Victoria Red, and Villard blanc) as well as those with unknown or probable little tolerance (Cimarron, Cynthiana/Norton, Enchantment, Opportunity, Rubaiyat, and Sunset). Not all cultivars with reported tolerance have performed well. 'Victoria Red' and 'Villard blanc' have had problems with cane dieback and both exhibit symptoms of the disease. OK392 succumbed quickly and is not tolerant to PD. Although the others are alive they vary in their growth and productivity. 'Blanc du bois' is vigorous and yields well, but is extremely susceptible to anthracnose. Two Mississippi State University releases, MidSouth and Miss Blanc, do well but produce fruit with low sugars and high acids making them unsuitable for varietal wine production. Many of the Florida cultivars grow well but have other issues that make them less desirable, such as lack of fruit production, too much vine vigor, uneven ripening, and disease susceptibility. Among all cultivars tested, MidSouth shows promise for use in breeding and for homeowner use. All of the cultivars with unknown tolerance have died with the exception of Cynthiana/Norton. More cultivars will be added in the coming years to assess suitability for the Gulf South region.

An Assessment of Winery Tasting Room Marketing Strategies Based on Mid-Atlantic (New Jersey, New York, and Pennsylvania) Consumer Surveys

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Data were collected in 2015 and 2016 through three separate 15-minute Internet surveys administered to wine consumers, age 21 and older, who resided in New Jersey, New York, and Pennsylvania (n = 714 to 847). A majority, 71.8%, of participants purchased both "everyday" wines and wines served when entertaining/celebrating special occasions. More participants who drank wine at least once a week drank dry wines, while less frequent wine consumers favored sweeter wines. A majority (73.5%) who visited tasting rooms with a romantic partner were interested in a single set of samples that the couple could share. Those who visited with groups were interested in a fixed wine flight that would include the same wines and number of samples for each member (72.9%). Availability of food would motivate participants to visit tasting rooms; light snacks available for purchase (e.g., cheese and crackers) at a winery tasting room and restaurants in the local area were important to participants (60.6% and 63.2%, respectively). The majority (84%) of survey participants indicated that they used social media/email/review sites at least once a month, with a greater percentage of participants in the younger generations responded that they used these sources than their older counterparts. Of these participants, most (94%) used Facebook in general, with 64.5% of these individuals using it to engage with and/or learn about wineries and tasting rooms. A quarter of survey participants (24.1%) indicated they had applications installed on their mobile device that they used to learn about wine and tasting rooms, with 68.2% interested in an app feature that helped them navigate to the tasting room (e.g., location service, directions, and/or map). Research results can assist the industry with understating what products, activities/events, and methods of communication appeal to wine consumers in the three Mid-Atlantic states.

Student Poster Competition Abstracts

An Untargeted Metabolomics Identification of Bound Aroma Compounds Differences between Norton and Cabernet Sauvignon grapes **Mani Awale, Connie Liu, and Misha T. Kwasniewski***

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The aroma of the wine is primarily a characteristic of the cultivar i.e. the genotype, but influenced by environment, the viticultural practices and the wine making practices. While Norton is a disease tolerant and cold hardy hybrid grape that plays a significant role in local sales in some regions, globally it has an aroma profile less desired than Cabernet Sauvignon. While efforts have been previously made to identify targeted differences between hybrid and *V. vinifera* aroma concentrations, we opted for a more inclusive approach to identify any differences in the volatile profiles precursors. The direct treatment of grape extracts with a glycosidase allows for identifying primary grape aroma differences, as well as bound aroma compounds, without inducing the variability of small scale fermentations. 21 Norton and 21 Cabernet Sauvignon grapes from 12 different sites, vintages and states (Missouri and Virginia) were used to account for variability due to growing conditions. Following extraction and enzymatic incubation, samples were analyzed using HS-SPME-GC/MS. The data generated were analyzed by XCMS software for differences in features (m/z intensity, at a given time) between the two populations. The two cultivars were found to have differences in their volatile profile, with 35 features different at 0.05 level and with at least a 1.5-fold change between the two cultivars. Those features were used to identify several odor active compounds, including β -damascenone, 2-ethyl-hexenol, nonanal, 3-octanone, ethyl nonanoate and methyl salicylate. In all cases, the compounds identified were higher in Norton than Cabernet Sauvignon, however there are several features that were higher in Cabernet Sauvignon that have yet to have the compound responsible identified. Ultimately the differences in the aroma compounds identified may prove useful in future work related to producing varieties with the viticultural benefits of Norton but an aroma profile closer to Cabernet Sauvignon.

The Identification of Interspecific Hybrids, Jaeger 70 x Vignoles Grapes Using SSR Markers

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Jaeger 70 variety, is an interspecific hybrid of *Vitis lineececumii* x *V.*

rupestris, and has an interesting past. It was created by Hermann Jaeger from Neosho Missouri, who is most notable for saving the French wine industry by developing phylloxera resistant rootstocks in the mid-1800s. Traditionally the Jaeger 70 variety has been used in grafting with French wine grape cultivars to impart disease resistance and cold hardiness in plants and to retain desirable wine characteristics. *Vitis* interspecific hybrid 'Vignoles', is a cold hardy cultivar of largely unknown parentage which produces high quality sweet fruity wines. Vignoles, however, produces compact clusters that are susceptible to bunch rots. In comparison, Jaeger 70 produce a moderately compact berry cluster which is highly resistant to bunch rots. The purpose of this experiment was to screen a population of about 300 Jaeger 70 x Vignoles possible interspecific F1 hybrids using SSR (Simple Sequence Repeat) markers to determine if the plants are interspecific hybrids. Hybrid confirmation can result in a saving of time, money, labor and materials maintaining plants until they are mature. Developing this mapping population is an important first step in a breeding program.

Co-fermentation vs. Post-fermentation Blending of an Interspecific Hybrid with a *Vitis Vinifera*: Effects on Wine Tannin

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Interspecific hybrid grape cultivars produce wines that lack structure and mouthfeel. These cultivars often have low tannin alongside high protein in the grapes, which results in low levels of tannin in resulting wines. Tannin concentrations could potentially be increased by blending in a high tannin *V. vinifera* variety. Because protein-tannin interactions are cooperative, we hypothesized that fermenting hybrid and *V. vinifera* cultivars separately and blending post-fermentation would result in higher wine tannin wine than co-fermenting hybrid and *vinifera* grapes. To evaluate this hypothesis, Marquette grapes were co-fermented with Cabernet Sauvignon at ratios of 1:1, 3:1, and 9:1. Varietal Marquette and Cabernet Sauvignon wines were also produced. The tannin levels in the wines were analyzed using the Adams-Harbertson and methyl cellulose assays. The Adams-Harbertson assay was not sensitive enough to quantify tannin levels in varietal Marquette or Marquette: Cabernet Sauvignon blends. Based on the methyl cellulose assay, the 100% Marquette wine had undetectable tannin, while the 100% Cabernet Sauvignon wine had 1.4 g/L epicatechin equivalents. When the varietal wines were blended 1:1 just prior to the assay (no co-fermentation), the tannin level is higher than the co-fermented 1:1 wine (853 mg/L epicatechin equivalents vs. 523 mg/L epicatechin equivalents). This result suggests that higher tannin levels could be achieved by post-fermentation blending of hybrid wines. Ongoing work includes quantifying the protein levels in the wines and characterization of phenolic compounds with LC-TOF-MS.

Effects of Harvest Time on Aroma of Wines Made from Brianna and Frontenac Gris Grapes using Gas-Chromatography-Mass-Spectrometry and Olfactometry

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There is interest to link the aromas in wines to the berry chemistry at harvest. This study aimed to characterize key aroma compounds in Brianna and Frontenac gris wines, that are influenced by timing of berry harvest. Brianna grapes were harvested approximately 7 days apart, starting when the berries were analyzed at 14.4 °Brix and 3.09 pH and ending at 19.6 °Brix and 3.45 pH. Frontenac gris grapes were harvested in a similar time frame, starting when the berries were analyzed at 19.5 °Brix and 3.00 pH and ending at 23.6 °Brix and 3.18 pH. Research wines were produced from these grapes using the same winemaking techniques. Aroma compounds in wines were extracted from headspace and analyzed by gas chromatography-mass spectrometry and simultaneous olfactometry. Over 30 separated aroma compounds were detected in research wines the grapes. Aromas in Brianna wines showed development over the harvest period, ranging from 'cotton candy' and 'floral' to 'banana' and 'butterscotch' then finally to 'honey, caramel' and an unknown neutral aroma. Frontenac gris wine aromas changed from an unknown neutral aroma to 'fruity', then 'rose'. Findings from this research support the notion that aroma profiles of Brianna and Frontenac gris wines can be influenced by harvesting the fruit at different periods of ripeness.

Student Poster Competition Abstracts

Genetic Study of Dormant Rooting Ability in Grapes

S. Jacob Schneider, Logan Duncan, Surya Sapkota, Shanshan Yang, Li-Ling Chen, Lance Cadle-Davidson, and Chin-Feng Hwang*

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Vitis aestivalis-derived 'Norton' grows natively in the Midwest and is the official grape of Missouri. Adapted to the selection pressures of this region, it is resistant to most fungal pathogens, cold-hardy, and has other traits that non-native cultivars lack. For example, V. vinifera 'Cabernet Sauvignon' is a premium wine that is not adapted to the pressures of the region. Yet, hardwood cuttings of Cabernet Sauvignon can be induced to root, whereas it is very difficult for Norton. This negative factor in Norton propagation limits stock available to meet grower needs. Finding molecular markers associated with dormant rooting ability would be of great significance for commercial propagation. In view of this, a mapping population of 182 F1 individuals was established from a cross between Norton and Cabernet Sauvignon to study the genetic variation associated with rooting ability of dormant cuttings. A consensus map was constructed via 411 simple sequence repeat (SSR) markers. Using genotyping-by-sequencing (GBS), 3,825 single nucleotide polymorphism (SNP) markers were generated. Of these, 1,659 SNP and 406 SSR markers were clustered into 19 linkage groups for a total of 2,065 markers spanning a genetic distance of 2,203.5 cM. Five canes were propagated from each genotype and rooting data recorded with WinRhizo. This data was integrated with the consensus map in R/QTL to discover potential quantitative trait loci (QTL) for dormant rooting. Preliminary data on the segregation pattern for rooting ability in the mapping population suggests a QTL on linkage group 5.

Ampelometric Characterization of Historic North Dakota Vitis Specimens

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To investigate the diversity of leaf shape amongst *Vitis riparia* Michx. in the North Dakota State University herbarium, the entire collection of native *Vitis* specimens was digitized. The herbarium represents three centuries of collection across 26 ND counties. Within the herbarium 34% of specimens were classified as *V. vulpina* L.; the remainder were identified as *V. riparia*. For the purpose of this study, all samples were regarded as *V. riparia*. Additionally, with the first symptoms occurring in a 1961 sample from Cass Co., over 7% of specimens within the herbarium exhibited damage from 2,4-dichlorophenoxyacetic acid (2,4-D); specimens with herbicide injury were not analyzed as part of this study. The majority of specimens examined contained numerous incomplete leaves, degraded as a result of storage, posing a significant obstacle for ampelometric characterization of the *Vitis* samples; this prevented the use of elliptical Fourier descriptors, generalized Procrustes analysis, and other techniques for morphometric analysis. However, utilizing GRA.LE.D. software enabled the collection of landmarks along incomplete leaf samples, overcoming the challenges associated with disintegrating samples, and yielding data on 18 International Organisation of Vine and Wine (O.I.V.) descriptors and 19 non-OIV leaf distance parameters. Through these descriptors, it was possible to characterize leaf shape within this historical collection and to create an average, theoretical ND *Vitis* leaf.

Identification of Foliar Resistance QTL to Phylloxera and the Flanking Markers in a F1 Grape Population

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A hybrid grapevine population was evaluated for resistance to phylloxera in the field and greenhouse environment. Phylloxera (*Daktulosphaira vitifoliae* Fitch) has been a major viticulture pest and research in genetic resistance to phylloxera has been limited to roots. We report the first high-resolution study of foliar phylloxera resistance in a F1 grape population (N=125) with two University of Minnesota breeding selections with a complex pedigree of multiple *Vitis* species. A rating scale was developed to characterize foliar phylloxera severity in a multi-year field trial with endemic phylloxera and in a replicated greenhouse trial with artificial infestation. In addition to the visual rating, six other foliar related traits (number of galls per plant, area under disease progress curve, percent of leaves with galls, average number of galls per leaf etc.), as well as root infestation severity, were characterized in the greenhouse experiment. QTL for foliar related traits were routinely identified in the region spanning ~10-30 cM on linkage group (LG) 14, and the root resistance QTL on LG 5. We are in the process of identifying linked SSR and SNP markers to select recombinant seedlings in a larger F1 population in an effort to fine map the identified QTL and to be used for marker-assisted breeding.



Poster Session Abstracts

Impact of Saignée Treatment on Chambourcin Fermentation Microbiology and Final Wine Quality

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Saignée is the partial removal of must from grapes prior to fermentation to increase the skin to pulp ratio in the must. Saignée is commonly used in production of *Vitis vinifera* based wines to increase pigment concentration and tannins, however less is known about the impacts on wines produced from interspecific hybrids such as Chambourcin. The change in skin to pulp ratio can also induce united changes such as changes in pH and aroma profile and different fermentation microbiology. For this study, 15 gallons of crushed and destemmed Chambourcin grapes were separated into three treatments (A: control, B: 9.8% saignée, C: 14.7% saignée). Treatments were then co-inoculated with wine yeast and malolactic bacteria, and then subdivided into three one-gallon fermentations each, (9 total fermenters). Samples were taken for microbial counts of yeast and lactic acid bacteria on days 0, 7, 25, and 42. Upon completion of fermentation (day 42), wines were pressed from the pomace. The final volatile acidity, titratable acidity, pH, organic acids were measured as well as the phenolic and aroma profile measured by Adams-Harbertson and HS-SPME GC-MS respectively. Final tannin concentrations were higher in the 14.7% saignée treatment than the control (127mg/L versus 78mg/L catechin equivalents). Both control and the 9.8% saignée did not have any malic acid remaining at the end of 42 days, however, the high saignée treatment still had 1.7g/L remaining. While no differences were observed in the colony forming units of either malolactic bacteria or yeast, this may have been due to the space between microbial sampling. Saignée treatment did induce changes in any of the other parameters measured including the wine aroma constituents measured or pH, VA and TA. Ultimately the saignée treatment proved effective at increasing wine tannin, however, this treatment also inhibited malolactic fermentation.

Determining Fruit Ripening Characteristics of Missouri Norton Grapes

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Deciding to harvest hybrid varieties by sugar accumulation, TA, or pH may not correctly model optimal berry ripeness for wine quality. The objective of this research was to analytically characterize Norton berry ripening to assess harvest timing. Representative berry samples (3 kg) were collected at weekly intervals from three established vineyards 4 and 7 times prior to harvest in 2015 and 2016, respectively. 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-Adams' assay. Select free and bound volatile aroma compounds were quantified in triplicate using GC-MS on wine samples, and must samples incubated with a glycosidase enzyme. Time point within the season, site, and year were each assessed as potential sources of variance, as well as interactions between the three variables. All samples had increasing sugar levels, decreasing titratable acidity, decreasing malic acid and increasing pH over the growing season as expected. None of the phenolic parameters showed an overall increase over time, thereby not following trends common in *V. vinifera*. Concentrations of aroma compounds varied with time (eugenol: 17-300µg/L; β-ionone: 0.3-1.3µg/L; terpinen-4-ol: 28-91µg/L). TDN (0.6-0.8µg/L) and β-damascenone (0.2-1.5µg/L) concentrations varied by time in free, but not bound, form. Measured differences in some volatile compounds were dependent more on site and/or year (isoamyl acetate: range 900-4000µg/L; terpinolene: 5.4-6.5µg/L). Although longer time on the vine resulted in increased ripeness by traditional parameters, this did not hold true with aroma and phenolic development.

Abscisic Acid (ABA) and Gibberellic Acid (GA₃) Applications Change Cluster Architecture Without Impacting Fruit Set and Fruit Composition of Chardonnay Grape in Southern New Jersey

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Previously we found that Abscisic Acid (ABA) affects cluster architecture of the wine grape cultivar *Chardonnay*, grown in southern New Jersey. In 2016, we repeated the treatments to study their second year effects on fruit set and fruit composition. The trial was conducted at Rutgers Agricultural Research and Extension Center in southern New Jersey. A randomized complete block experimental design was employed with five blocks of six treatments. The same vines used the previous year were subjected to the same treatments. Treatments comprised of un-treated control, 100 ppm ABA applied once (80-90% bloom), 100 ppm ABA applied twice (80-90% bloom and 3 d later), 200 ppm ABA applied once (80-90% bloom), 200 ppm ABA applied twice (80-90% bloom and 3 d later) and 4% GA₃ applied once (pre-bloom). At harvest cluster looseness of whole clusters, number of berries per mm, and average berry weight of second true shoulder were measured. Fruit set and fruit composition were also measured from the treated vines. Cluster looseness was significantly increased by both ABA and GA₃ treatments. The untreated control had the tightest clusters compared to all other treatments. However, rate and number of ABA applications did not differentially affect cluster looseness. Also, neither of the PGRs (Plant Growth Regulators) affected number of berries per mm of the second true shoulder. Average berry weight was significantly lower in untreated control compared to other treatments. Lateral length of the second shoulder was similar for all the treatments. Fruit set, total soluble solids, pH, and total titratable acidity were not affected by PGRs.

Poster Session Abstracts

Evaluation of the Potential for Processing Strategies to Influence Health-Promoting Properties of Wine

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Associations of moderate wine intake with positive health outcomes are often hypothesized to be attributable to polyphenols in wine. Polyphenol size, or mean degree of polymerization (mDP) is related to bioactivity. This study examined the potential for processing strategies to impact the mDP and polyphenol concentration in young wines and wine-like products. *Vitis vinifera* cv. Cabernet Sauvignon grapes were fermented under standard red winemaking conditions and with cold-soak. From the same fruit, a standard rosé, rosé fermented with excess skins, with excess seeds, and with excess crushed seeds were produced. The extent to which these processing strategies influenced mDP, polyphenol profile, and polyphenol concentration of each wine-like product (n = 8) was determined by UPLC-MS, normal-phase HPLC, and the Folin-Ciocalteu and DMAC assays, respectively. Results indicated that all wines were predominantly rich in monomer flavanols. However, the rosé wines with excess seeds had the greatest amount of oligomer (DP = 2-8) and polymer (DP >10) compounds. Due to high concentrations of baseline monomers across samples, mDP was not significantly different between products (p > 0.05). mDP for each wine was approximately two, however larger polyphenol polymers were observed in some samples. Rosé wines with excess seeds and skins added during fermentation exhibited the highest overall concentrations of polyphenols. Cold soak winemaking techniques increased neither overall polyphenol extraction nor extraction of large polymer compounds. In conclusion, the processing parameters evaluated in this study, even when pushing the boundaries of winemaking practice, did not result in wine or wine-like products with significantly different mDP.

Characterization of Thiol Precursors in Interspecific Hybrid Grape Varieties Grown in Eastern Canada for Wine Production

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3-mercaptohexan-1-ol (3MH) and 4-mercapto-4-methylpentan-2-one (4MMP) are two powerful organosulfur aroma compounds that provide desirable tropical fruit notes to certain white wines. Thiols accumulate in berries as amino derivatives called thiol precursors containing one to three amino acids; amino residues are cleaved during winemaking, making the thiols volatile and fragrant in wine. The accumulation of thiol precursors in grape berries is highly affected by growing conditions, and the release of the corresponding thiols in wine depends on several factors including yeast strain and winemaking conditions. Therefore, their presence in varieties may go un-noticed until one finds the appropriate viticulture/winemaking treatments. In interspecific hybrids, free volatile thiols have only been reported in wines from Cayuga white and Niagara. Indeed, most white varieties grown in Eastern Canada for wine production have never been screened for the presence of thiol precursors. To fill this gap, we collected grape samples in three wine regions located in Quebec (Canada) and analyzed them by UPLC-MS/MS and Stable Isotope Dilution Assay (SIDA). Detection of target compounds was performed under Multiple Monitoring Mode (MRM) and three specific transitions were selected for each compound; the most abundant was chosen for the quantification and the two other ones were used for identification. In this study, we identified for the first time the presence of 3-S-cysteinylhexan-1-ol (Cys3MH) and 3-S-glutathionylhexan-1-ol (G3MH) in the interspecific hybrid varieties Frontenac blanc, St. Pepin, Seyval blanc, and Vidal. The concentration in G3MH ranged from 21 to 711 ppb, which is like values reported in *V. vinifera* varieties, whereas concentration of Cys3MH (6 ppb) were much lower than values reported for *V. vinifera*. 4-S-cysteinyl-4-methylpentan-2-one (Cys4MMP) and 4-S-glutathionyl-4-methylpentan-2-one (G4MMP), were not detected. These findings open avenues for further investigations on the biogenesis of thiol precursors in berries and on the improvement of wine quality in interspecific hybrid wine production.

Changes in Free and Bound Volatile Compounds during the Ripening of Riesling Berries Grown in Quebec

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Predictions are that eastern Canadian provinces such as Quebec will become more and more suitable for wine production over the next fifty years, due to global warming. Currently, more than 95% of grape varieties grown in Quebec are interspecific hybrid varieties, but an increasing number of growers are now growing cool-climate *Vitis vinifera* varieties such as Riesling. Despite its enological attributes, Riesling carries significant issues for Quebec growers: As most *V. vinifera*, it is cold-sensitive and therefore requires protection to survive Quebec winters that typically reach below -20°C. In addition, it may require a longer growing season than typically found in Quebec to ripen. So far, the performance of *V. vinifera* varieties in Québec, including Riesling, has not been studied, and the question is: Is it possible to produce high quality Riesling wines in Quebec? To answer this question, we studied the ripening of Riesling berries at a site located in the south of Quebec for four weeks until commercial harvest, and compared the composition with ripening Ontario berries. Berries were analyzed for basic must composition (total soluble solids, pH, titratable acidity). Free and bound volatile compounds were extracted from grape must and macerated skins, resulting in four different fractions. Free volatile compounds were analyzed by GC-MS. Bound volatile compounds were hydrolyzed using Rapidase Revelation enzyme (formerly AR2000) and also analyzed by GC-MS. The chronology of phenological stages was similar until bunch closure between the Quebec and the Ontario sites; in contrast, veraison and commercial harvest occurred much earlier in Ontario compared to Quebec. Free and bound aroma profiles showed the presence of aroma compounds typical of Riesling such as linalool in both juice and macerate, and changes were observed in free and bound volatiles profile from week 1 to week 4.

Poster Session Abstracts

Impact of Grapevine Grafting for Hybrid Varieties Grown in Quebec, Canada

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Grapevine production is relatively recent in Quebec, Canada, and several challenges constrain quality grape production. Indeed, rigorous climate of Quebec and short growing season are just some limiting factors in grape variety selection. Use of rootstocks adapted to growing conditions allows producers to plant varieties that are better adapted and more efficient in specific soil and climatic conditions. These variety / rootstock combinations would be better suited to growing conditions found in their vineyard, this would homogenize vegetative growth of the plant, reduce costs associated with management and allow to reach maturity and optimum berry quality. The main objective of this project was to evaluate the use of grafting as a technique to adapt hybrid vines to cold climate growing conditions found in Quebec, Canada. Thirty combinations were produced (6 grape varieties (Aldamina, Baltica, Frontenac, Frontenac blanc, Frontenac gris, Marquette), 4 rootstocks (101-14, 3309, Riparia Gloire, SO4) + ownroot). The experimental plot was implanted in 2013 in gravelly-loam soil. Several parameters were observed, such as frost tolerance, element deficiencies, yield and berries chemistry. Use of rootstocks showed a positive effect on the absorption of soil elements by vines, vine growth and grape production, but effects vary according to rootstock variety. Moreover, little impact on berries chemistry was observed for the growing season 2016. In Quebec, Canada, grafting is not a common practice, but it could be profitable to the producer to select rootstocks adapted to their soil and climate conditions to improve their profitability.

Potential of Swiss Fungal Resistant Varieties Under Climatic Conditions of Quebec, Canada

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Research in viticulture must favor the development of sustainable, economical and environmentally friendly production. Implantation of disease-resistant varieties adapted to regional soil and climatic conditions is essential to the development of the wine industry. The main objective of this project is to evaluate different agronomic parameters of disease-resistant varieties developed by Agroscope Changins-Wädenswil under the climatic conditions of Quebec, Canada. An experimental plot was implanted in 2013 in the experimental vineyard of the CRAM, Quebec, Canada. Four Swiss grapes varieties was selected: Wädenswil under the climatic conditions of Quebec, Canada. An experimental plot was implanted in 2013 in the experimental vineyard of the CRAM, Quebec, Canada. Four Swiss grapes varieties was selected: Gamaret, Garanoir, Divico (IRAC 2091) and IRAC 2060. The following agronomic parameters were evaluated: disease tolerance, winter frost tolerance, plant growth, lignification, yield and berries chemistry. Preliminary results show that the four varieties studied have different sensitivities to the diseases found in North America. In the field, the most sensitive variety is Garanoir, followed by Gamaret, IRAC 2060 and Divico. Winter frost tolerance is an important aspect of the adoption of these varieties in Canada. Following the winter 2014 and 2015, the rate of survival of vines bud was higher for Gamaret and Garanoir comparing with Divico and IRAC 2060. Vine development has shown that Gamaret and Garanoir have higher vigor than Divico and IRAC 2060. The vine takes few years to settle, the preliminary yields results showed differences in grape production. Observations in the coming years will be more representative and will provide an overall picture for the production of Swiss varieties in Quebec, Canada.

Enology Analytical Services Laboratory Overview

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The Enology Analytical Services Laboratory was established in 2006 in the Food Science Technology Department at Virginia Tech. Many beverage and food industries require testing services regarding alcohol, such as wine, beer, spirits, cider, hops, mead, kombucha, kefir and food items with alcohol added during the process. The laboratory offers analytical and sensory services to these industries in order for them to provide safe and quality products while complying with current federal and state regulations. Both lab employees, E. Kenneth Hurley and Ann M. Sandbrook achieved certification from the Alcohol and Tobacco Tax and Trade Bureau (TTB) as Export Chemists for wine, beer, and distilled spirits. This certification allows the lab chemists to report official results to customers when required. Products for export to specific countries, and low alcohol products (<7%) sold in New York State must have the appropriate testing conducted by TTB certified chemists. Legal regulations in wine include restrictions on alcohol, volatile acidity, sulfites, and copper content. To ensure compliance with federal parameters, winemakers request testing services from the Enology Analytical Services Lab. Other testing services offered include quality and sensory parameters. Lab results obtained by the Enology Analytical Services Lab are used by members in the industry to ensure that legal and quality products reach the consumers.

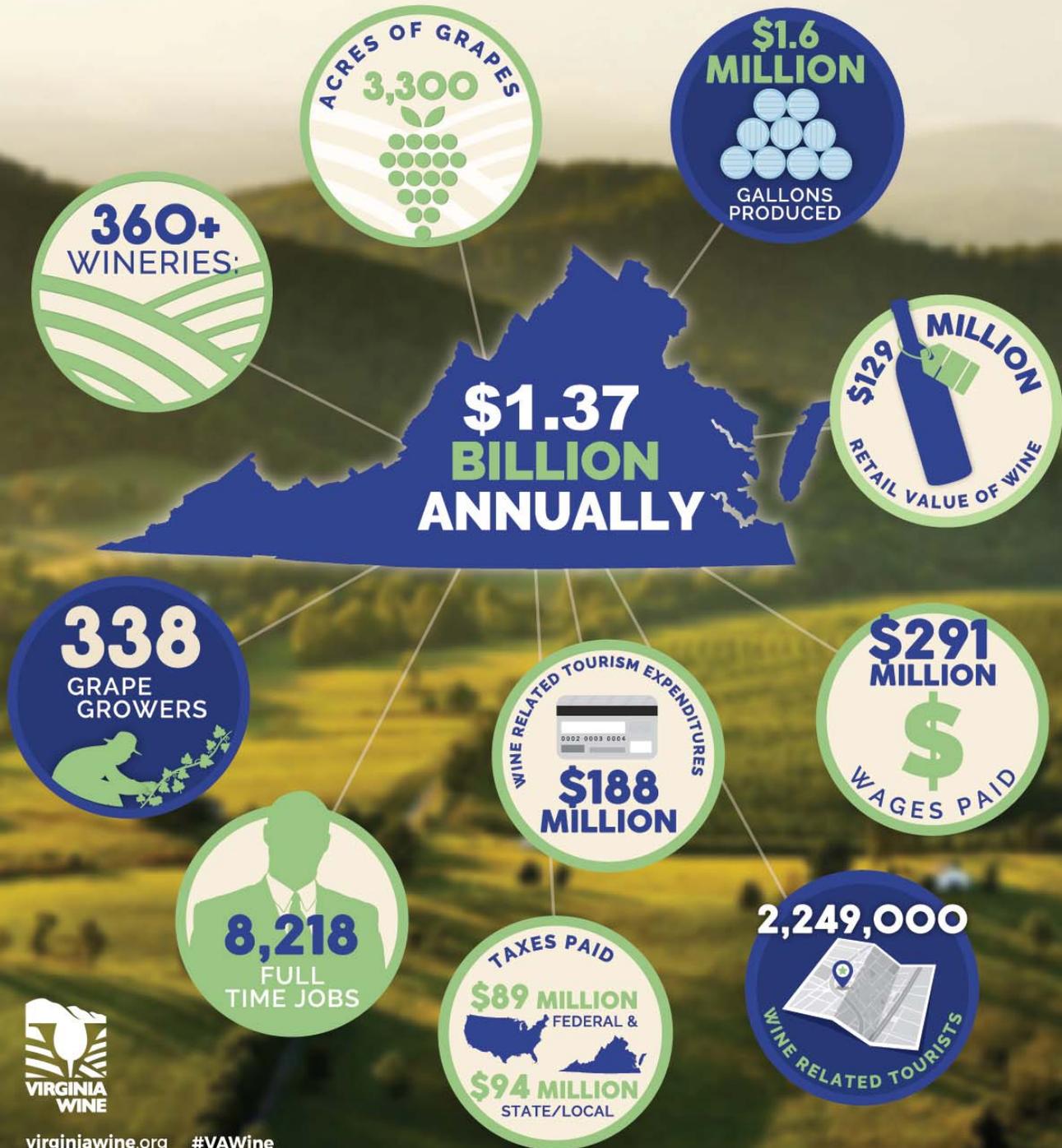
Pestalotiopsis: In-vivo and In-vitro Methods to Culture an Emerging Grape Fungal Disease

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An emerging fungal disease of *Vitis* spp. has been identified as *Pestalotiopsis* spp. The symptomatology on *Vitis* spp. can vary and often results in grape growers incorrectly identifying the causal agent. To further investigate the epidemiology of *Pestalotiopsis*, methods have been developed to grow and culture *Pestalotiopsis* both in-vivo and in-vitro, respectively. Symptomatic leaves were incubated adaxial side up in a humidity chamber at 21 to 24 °C under a 12-hour photoperiod. After 7 to 10 days a raised mat of conidiophores arose forming a cup-shaped acervuli. The acervuli is readily visible to the naked eye and are distinguishing characteristic of Coelomycetes. *Pestalotiopsis* was identified by viewing the conidia under optical microscopy. Conidia are fusiform, 5-celled with two or more apical appendages that arise from the translucent apical cells and the three median cells are brown. *Pestalotiopsis* was cultured on half and full strength potato dextrose agar (PDA) medium by aseptically transferring conidia from leaf tissue. On half or full strength PDA at 21 to 24 °C under a 12-hour photoperiod, *Pestalotiopsis* colonies grew but did not produce acervuli. A PDA medium containing dried and autoclaved carnation leaves and subsequent aseptic transfer of *Pestalotiopsis* resulted in acervuli formation in 5 to 10 days. Currently, to complete Koch's postulates, a conidial suspension of sterile water and acervuli was prepared. A hemocytometer was used to determine the concentration of conidia. The conidial suspension was sprayed onto grape plants contained within a closed chamber under natural light, 95 to 100% humidity, at 20 to 28 °C. Grape plants failed to produce leaf symptomatology that had been observed under field conditions in Missouri in 2016 and the current growing season. Early season leaf infections by *Pestalotiopsis* spp. often result in subsequent leaf fall under field conditions.

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