



AMERICAN SOCIETY FOR
ENOLOGY AND VITICULTURE
Eastern Section

American Society for Enology and Viticulture-Eastern Section

45th Annual Conference
Virtual
July 7-8, 2021

Email: info@asev-es.org

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



Conference Overview

Eastern Standard Time

Wednesday, July 7, 2021

Preconference	9:30-10:00 am
Introductions and Welcome	10:00-10:15 am
Invited Speaker	10:15-11:00 am
Encouraging Promotion and Success in Grape and Wine Industries Doniella Winchell, Ohio Wine Producers	
ASEV-ES Technical Sessions & Student Presentation Competition	11:00 am-12:00 pm
Break and View/Judge Posters	12:00-12:30 pm
ASEV-ES Business Meeting	12:30-1:30 pm
Break and View/Judge Posters	1:30-2:00 pm
ASEV-ES Technical Sessions & Student Presentation Competition	2:00-3:30 pm
ASEV-ES Poster Flash Talks & Poster Summaries	3:30-4:00 pm
Concurrent Poster Sessions Breakout	4:00-5:00 pm

Thursday, July 8, 2021

Preconference	9:30-10:00 am
Introductions and Welcome	10:00-10:15 am
Invited Panel	10:15 am-12:00 pm
Future Grape Cultivars for Eastern North American Growers Panel: Dr. Matthew Clark, University of Minnesota, Dr. Joseph Fiola, University of Maryland Extension, Dr. Oliver Trap, Institute for Grapevine Breeding, and Dr. Daniel Ward, Rutgers University	
ASEV-ES Technical Sessions & Student Presentation Competition	12:00-1:00 pm
Break and View/Judge Posters	1:00-1:30 pm
ASEV-ES Technical Sessions & Student Presentation Competition	1:30-3:00 pm
ASEV-ES Poster Flash Talks & Poster Summaries	3:00-3:30 pm
Break and View Posters	3:30-4:00 pm
Wines of the East Virtual Reception and Awards	4:00-5:00 pm

ASEV-ES Conference Sponsors

Sponsors are recognized throughout the program.

Past Conference Events



Wednesday, July 7, 2021

Preconference 9:30-10:00 am

Introductions and Welcome 10:00-10:15 am

Amy Bowen, Vineland Research and Innovation Centre and ASEV-ES Chair
Jim Willwerth, Brock University and ASEV-ES Vice Chair

Invited Speaker 10:15-11:00 am

Encouraging Promotion and Success in Grape and Wine Industries

Doniella Winchell, Director, Ohio Wine Producers

Technical Sessions &

Student Presentation Competition (15 minutes each) 11:00 am-12:00 pm

Metal Composition of Sparkling Wines Produced in the Niagara Region Varies with Production Method and Style

Hannah M. Charnock, Graham Cairns, Gary Pickering, and Belinda Kemp

Impact of Total Protein on Sparkling Wine Foam

Ryan M. Fifield and Anna Katharine Mansfield

Aging Sparkling Base Wines in Contact with Yeast Lees: Bottle (Pétillant Naturel) vs. Fermenter

Belinda Kemp, Fiona Kerslake, Hannah M. Charnock, Jacob Mederios, and Gary Pickering

Break and View/Judge Posters 12:00-12:30 pm

ASEV-ES Business Meeting 12:30-1:30 pm

Break and View/Judge Posters 1:30-2:00 pm

Technical Sessions &

Student Presentation Competition (15 minutes each) 2:00-3:30 pm

Soil Component of Terroir: Isolating the Contributions of Soil to Vineyards in the Humid Eastern U.S.

Jaelyn C. Fiola, Greg K. Evanylo, Tony K. Wolf, and Ryan D. Stewart

The Effects of Delayed Pruning Timing on Bud Break, Crop Yield, and Fruit Composition of 'Merlot' and 'Chardonnay'

Jack Bobo, Shane Breeden, Savithri Nambesan, Mark Hoffman, Cain Hickey, and Leonardo Lombardini

Impact of Pre-bloom Leaf Removal on Wine Grape Production and Quality Parameters - A Systematic Review and Meta-Analysis

Josh Vander Weide and Paolo Sabbatini

Identification of QTLs for Berry Acid and Tannin in a Vitis Aestivalis-derived 'Norton'-based Population

Karlene L. Negus, Li-Ling Chen, Jonathan Fresnedo-Ramírez, Heather A. Scott, Gavin L. Sacks, Lance Cadle-Davidson, and Chin-Feng Hwang

Leaf Blades are More Prone to Pesticide Contamination in Nutrient Analysis than Petioles

Justin Scheiner and Fran Pontasch

Poster Flash Talks (3 minutes each)

3:30-4:00 pm

Effects of Accentuated Cut Edges on the Volatile Aroma Composition of Various White Wines
Ezekiel R. Warren and Misha T. Kwasniewski

Can Saignée and Bentonite Treatments Enhance Phenolic Compounds Content of 'Marquette' Red Wine?
Yiliang Cheng and Aude A. Watrelot

Examining the Role of Fructose in Causing Stuck or Sluggish Fermentation
Glycine Zhujun Jiang and Patrick A. Gibney

Impact of Harvest Date on the Chemical Composition of Wines Produced from Interspecific Vitis sp. Cultivars Grown in Nova Scotia
Kumuduni Lakmali, Martine Dorais, and Karine Pedneault

Impact of Solo and Co-infections of Grapevine Red-blotch Virus and Grapevine Leaf-roll Associated Virus-3 on Fruit Quality
Nadia Skorupski, Wendy McFadden-Smith, and Belinda Kemp

Testing Efficacy of HydroShield Product on the Reduction of Rot and Phytotoxicity of European and French American Hybrid Wine Grapes in Georgia
Paula J Burke, Nathan Eason, Clark MacAllister, Ashley Hopper, Jacob Williams, Phillip Brannen, and Cain Hickey

Hybrid Trunk Disease Evaluation: A Serendipitous Opportunity
Paul E. Read, Stephen J. Gamet and Benjamin A. Loseke

Concurrent Poster Sessions Breakout

4:00–5:00 pm

Join us in Zoom breakout sessions to ask poster authors questions about their research.

Adjourn

5:00 pm

ASEV-ES Conference Planning

Amy Bowen, Vineland Research and Innovation Centre

Jim Willwerth, Brock University

Tony Wolf, Virginia Tech

Kyle Freedman, North Carolina State University

Renee Threlfall, University of Arkansas

Thursday, July 8, 2021

Preconference

9:30-10:00 am

Introductions and Welcome

10:00-10:15 am

Amy Bowen, Vineland Research and Innovation Centre and ASEV-ES Chair
Jim Willwerth, Brock University and ASEV-ES Vice Chair

Invited Panel

10:15 am-12:00 pm

Future Grape Cultivars for Eastern North America

Moderators: Tony Wolf, Virginia Tech and Cain Hickey, Penn State
Panel: Matt Clark, University of Minnesota; Joseph Fiola, University of Maryland; Oliver Trapp, Julius Kuhn-Institut; Daniel Ward, Rutgers University

Technical Sessions &

Student Presentation Competition (15 minutes each)

12:00-1:00 pm

A Time Course Study of Harvest Chemistry for Key Varieties in a Transect Across North Dakota and Minnesota
Matthew D. Clark, Drew Horton, Erin Treiber, Collin Auwarter, and Harlene Hatterman-Valenti

Rootstock Evaluation - Should We be Looking in Our Own Backyard?

K. Helen Fisher and Alireza Rahemi

Spotted Lanternfly Infestation Can Disrupt Vine Primary Metabolism and Leaf Gas Exchange

Andrew D. Harner, Michela Centinari, Lauren Briggs, Donald Smith, and Heather Leach

Marker-assisted Selection to Determine the Introgression of Rpv-3 Mediated Downy Mildew Resistance in 'Chambourcin' x 'Cabernet Sauvignon' Population

Kavya Sri Tummala, Li-Ling Chen, and Chin-Feng Hwang

Break and View/Judge Posters

1:00-1:30 pm

Technical Sessions &

Student Presentation Competition (15 minutes each)

1:30-3:00 pm

Does Color Affect Consumer Perception of Hybrid Red Wine Quality?

Catherine H. Dadmun, Josh I. Kessler, and Anna Katharine Mansfield

The Effect of Carbonation on the Sensory Attributes of Muscadine and Fruit Wines

Nick A. Wendrick, Charles Sims, and Andrew J. MacIntosh

Consumer Perceptions of Iowa Wine: A Sensory Evaluation Study to Aid in the Development of an Iowa Signature Wine

Erin L. Norton

Utilizing Accelerated Aging to Rapidly Assess Canned Wine Off-aromas

Austin Montgomery, Rachel B. Allison, and Gavin Sacks

Mild Temperature Increases during Early Growth Stages Impacts Benzene Derivatives Content in Vitis sp. cv. L'Acadie Blanc Berries at Harvest

Francisco Campos Arguedas, Guillaume Sarailhé, Martine Dorais, Nicholas J. B. Brereton, Frédéric E. Pître, and Karine Pedneault

Poster Flash Talks (3 minutes each)

3:00-3:30 pm

Molecular Investigation of Fruit Quality in the Cold Climate Adapted Wine Grapes (*Vitis* spp.)

Venkateswara Kadium, Andrej Svyantek, John Stenger, Collin Auwarter, and Harlene Hatterman-Valenti

'MidSouth': A Red Wine Grape for the Deep South

Haley N. Williams and Eric T. Stafne

Evaluating Harvest and Postharvest Potential of Fresh-market Muscadine Grapes Grown in Arkansas

J. Cody Rawls, Renee T. Threlfall, Margaret L. Worthington, and Luke R. Howard

Selective Shoot Removal in Blanc Du Bois Grapevines

Frances Pontasch, Justin Scheiner, and Laramie Naumann

How Does Geotextile Installation Height Impact Grapevine Growth in Cool-climate Conditions of Quebec, Canada

Caroline Provost and Alexander Campbell

Geotextile as a Winter Protection Method to Reduce Winter Injuries to Cold Sensitive Cultivars

Caroline Provost and Alexander Campbell

Death and Dying: Differential Thermal Analysis of Grapevine Cold-Hardiness and Assessment of Bud Mortality in North Dakota

Bülent Köse, Andrej Svyantek, Venkateswara Rao Kadium, Collin Auwarter, and Harlene Hatterman-Valenti

Determining the Optimal Planting Distance for Pierce's Disease Resistant Predominantly *Vitis Vinifera* Grape Selection in Alabama

Elina D. Coneva

Break and View Posters

3:30-4:00 pm

Wines of East Virtual Reception and Student Awards 4:00–5:00 pm

Grab a glass of your favorite wine and join us in Zoom to chat with attendees and to celebrate our ASEV-ES student scholarships and student presentation and poster competition winners

Adjourn

5:00 pm

ORIGINAL BY CULTURE



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Save the Date

46th ASEV-Eastern Section Annual Meeting

July 13-15, 2022
Bloomington, Minnesota

Hilton Minneapolis/Bloomington
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AMERICAN SOCIETY FOR
ENOLOGY AND VITICULTURE
Eastern Section

About ASEV-Eastern Section

Mission

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



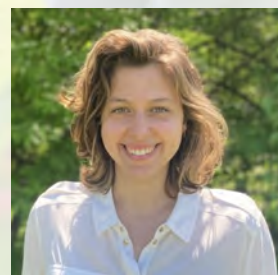
EASTERN SECTION

Established 1975

2021 ASEV-ES Scholarship Recipients



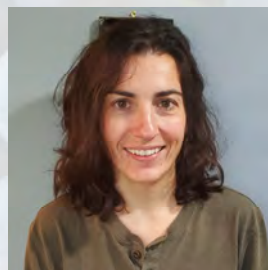
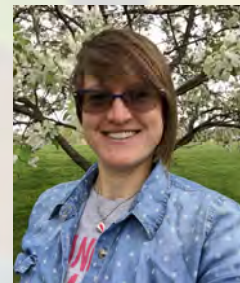
Hannah Charnock, Brock University
Amanda Fleming, University of Arkansas
Andrew Harner, Penn State University



Jennifer Neubauer, Cornell University



Demetra Perry, Cornell University
Meredith Persico, Penn State University



2021 Scholarship Fundraiser Raised \$2,500

Thanks Scholarship Donors

Scholarship Cash Donors

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Student Presentation Competition Abstracts

The Effects of Delayed Pruning Timing on Bud Break, Crop Yield, and Fruit Composition of 'Merlot' and 'Chardonnay'

Jack Bobo*, Shane Breeden, Savithri Nambesan, Mark Hoffman, Cain Hickey, and Leonardo Lombardini * Corresponding author: University of Georgia, 1111 Plant Science Building, Athens, GA 30606, USA, jbobo@uga.edu

Delayed pruning is used by growers to mitigate frost damage in vineyards by delaying bud break of lower count bud positions when spur pruning. However, questions remain about optimal timing of delayed pruning to effectively delay bud break yet maintain crop yield and fruit composition. We evaluated the effects of pruning timing (dormant pruning = DORM; delayed pruning when apical buds were at modified Eichhorn-Lorenz (EL) growth stage 4 (bud break, [Delay-1]) and EL-8 (short shoots with 2-3 leaves unfolded, [Delay-2]) on bud break, crop yield and fruit composition of Merlot and Chardonnay. Delay-1 and Delay-2 had on average 56.36% lower bud break percentage when compared to DORM in Merlot in 2019. In 2019, Chardonnay Delay-2 had 32.16% lower bud break percentage than Delay-1, and Delay-1 had 13.25% decrease when compared to DORM. In 2019, when no spring frost events occurred, DORM and Delay-1 had on average 32.56% greater crop yield when compared to Delay-2 in Chardonnay and 41.58% increase in Merlot crop yield. However, in 2020, when spring frost events occurred, crop yield was 221.80% greater in Delay-2 over DORM in Merlot; this effect was not seen in Chardonnay. Treatment effects on fruit composition were inconsistent. These preliminary data suggest that dormant pruning is a good practice to preserve crop yield when frost is not a threat. However, delayed pruning when apical cane buds are at EL-4 or EL-8 may refine frost mitigation strategies in frost-prone blocks. The data suggest that delayed pruning may result differently depending on cultivar.

Mild Temperature Increases during Early Growth Stages Impacts Benzene Derivatives Content in *Vitis* sp. cv. L'Acadie Blanc Berries at Harvest

Francisco Campos Arguedas, Guillaume Sarailhé, Martine Dorais, Nicholas J. B. Brereton, Frédéric E. Pitre, and Karine Pedneault*

* Corresponding author: Département des sciences, Université Sainte-Anne, Church Point, NS, B0W 1M0, Canada and Département de phytologie, Université Laval, Québec, QC, karine.pedneault@Usainteanne.ca

Northern viticulture areas are anticipated to extreme temperatures patterns due to global warming; these fluctuations affect vine growth, growing-degree-days (GDD) accumulation and berry biochemistry with consequences on grape aroma. Benzene derivatives (BD), biosynthesized by the shikimic-acid-pathway (SAP) tend to concentrate during ripening, but the factors affecting their production are still poorly understood. We tested the hypothesis that moderate and punctual temperature increases during berry growth would affect the production of BD and modify the chemical composition of berries at harvest. Three treatments were applied on L'Acadie blanc grapevines (Nova Scotia, Canada), using on-the-row greenhouses to create different temperature patterns: 1) Flowering to berry formation (pre-veraison), 2) Berry ripening to harvest (post-veraison), 3) whole-season and control. Berries were sampled and frozen with liquid nitrogen at three stages: early (EL-36), full (EL-37) and late (EL-38) maturity. Free and bound BDs were extracted by solid-phase extraction, bound fraction was enzymatically hydrolyzed, and both fractions were concentrated and analyzed by GC-MS. Greenhouse treatments significantly increased GDD accumulation in the "Whole-Season" treatment but, as expected, did not affect the other treatments. Benzyl alcohol ($\pm 50\%$) and 2-phenylethanol ($\pm 40\%$) were the main BD identified in berries. Their concentration was significantly higher in berries from treatments involving a temperature spike during the early developmental stages (Whole and Pre-veraison), regardless of the maturity. These results suggest that different GDD patterns can impact the SAP in berries, even when a similar amount of GDD is accumulated. These findings provide new venues about the impact of climate fluctuations on grape berries.

Metal Composition of Sparkling Wines Produced in the Niagara Region Varies with Production Method and Style

Hannah M. Charnock, Graham Cairns, Gary Pickering, and Belinda Kemp*

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Metal ions in wine originate from natural and human-derived sources, where factors including soil type, grape variety, climate, fertilizers, and production decisions can influence the elemental composition. Metals in wine can impact flavour development and stability and have been extensively studied in the context of table wines, however, limited literature exists on sparkling wine metal content where distinct processing steps may contribute to unique metal profiles. In the present study, we assessed the metal composition of 73 commercial sparkling wines from the Niagara Peninsula, Canada's largest wine producing region. A total of 28 metal ions were determined by inductively coupled plasma-mass spectrometry (ICP-MS), with the exception of potassium and boron, which were analyzed by inductively coupled plasma-optical emission spectrometry (ICP-OES). Bottle-fermented "Traditional method" and tank-fermented "Charmat method" samples were compared, as well as two sub-categories of sparkling wine styles defined as "rosé" or "non-rosé". Results identified higher total metal levels and potassium content in rosé sparkling wines of both production methods, associated with the increased extraction of minerals from grape skins and seeds during maceration. When comparing production methods, our results showed elevated chromium, nickel, and strontium levels as well as lower boron levels in Charmat method wines. Although many of these metals are soil-derived and show no clear relationship with production techniques, chromium and nickel are likely associated with extended stainless-steel contact during Charmat production techniques. The monitoring of sparkling wine metal content throughout production and regional variation are identified as important future areas of interest.

Student Presentation Competition Abstracts

Does Color Affect Consumer Perception of Hybrid Red Wine Quality?

Catherine H. Dadmun, Josh I. Kessler, and Anna Katharine Mansfield*

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Consumer perception is first established, whether subconsciously or consciously, through visual assessment. In red wine, visual stimuli can influence consumer expectation before the product is smelled or tasted. Because red hybrid wine color can differ in hue and intensity from those made with traditional *Vitis vinifera* cultivars, winemakers are concerned with consumer perception and liking of these products. Due to their disease resistance and cold hardiness, interspecific hybrid red wines are an important product in many non-traditional wine regions. To explore how consumers consider color when assessing red wine quality, prescreened consumers completed a hedonic sensory test of six commercial monovarietal red wines (including French- American, *Vitis labruscana*, and *Vitis riparia*-based interspecific hybrids, and two *Vitis vinifera* controls) to assess perceived quality. The wines were subsequently analyzed for CIEL*a*b* colorimetric parameters. Though more than 70% of panelists reported that they did not use wine color to assess quality, there was a correlation between hue liking and expected liking. Consumers overall preferred the wine with more blue than red hue and with those with higher intensity. This study suggests that color attributes may subconsciously influence expected, but not actual, wine liking, and that 'vinifera-like' color may not be the main determinant in color-based preference.

Impact of Total Protein on Sparkling Wine Foam

Ryan M. Fifield and Anna Katharine Mansfield*

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Foam is a crucial factor in the perception of sparkling wine quality. Empirical data suggests that sparkling wines produced from grapes other than *Vitis vinifera* show different foaming characteristics, but this factor has received limited research attention. To identify potential variables affecting foam quality in non-vinifera sparkling wine, Marquette, Cayuga, and Chardonnay grapes were used to produce traditional method and force-carbonated wine products. To assess the effects of total protein values and interactions between protein and malic acid, force-carbonated wines were treated with bentonite additions of 0.1 g/L, 0.3 g/L, and 0.5 g/L to create a range of protein concentration. Foam maximum volume, foam 50% collapse time, total protein, and malic acid were measured in all wines. Total protein had no significant impact on any foam parameters when traditional method and force-carbonated base wines were assessed together, but total protein had a significant effect on foam maximum volume in bentonite-treated wines, and foam stability showed a significant interaction between cultivar and total protein. Difference in cultivar response to bentonite additions and foam parameters may lead to a better understanding of desirable foam quality in non-vinifera sparkling wines.

Soil Component of Terroir: Isolating the Contributions of Soil to Vineyards in the Humid Eastern U.S.

Jaelyn C. Fiola*, Greg K. Evanylo, Tony K. Wolf, and Ryan D. Stewart

*Corresponding author: Virginia Tech, School of Plant & Environmental Sciences, 185 Ag Quad Lane, Blacksburg, VA 24061, USA,

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Terroir encompasses the influence of soil, climate, and vineyard management on grapes and wine. However, the relationship with soil lacks an empirical basis since many studies compare vineyards across geographic areas with climatic differences or by taking soil out of place. As a result, growers do not have sufficient information for choosing sites and managing soils for wine quality. In this project we isolated the soil component of terroir, completing an in-depth analysis of a western Maryland Albariño vineyard. Past land leveling activities created different soil profiles within the vineyard, and soil descriptions indicated that the main difference was thickness of the topsoil. Other variables were constant, including cultivar (clone, rootstock, vine age), climate (precipitation, heat accumulation), and vineyard management (vine spacing & training, spray schedule). We monitored vines and fruit from different soils throughout the 2019 and 2020 growing seasons. In 2019, cluster compactness (berries/rachis length), °Brix, and vine size (dormant pruning weights) were more strongly correlated with soil (topsoil thickness) than cluster exposure, yield, or other parameters. Fruit titratable acidity was strongly correlated with both soil and vine size. In 2020, vine size and titratable acidity were more strongly correlated with soil than other measured parameters. The strong correlations in both years between topsoil thickness and titratable acidity and vine size suggest that topsoil is influential during both fruit ripening and vine growth/capacity. This project is the first step in a larger-scale effort to develop better site selection and soil management criteria for wine production in Eastern vineyards.



Student Presentation Competition Abstracts

Spotted Lanternfly Infestation Can Disrupt Vine Primary Metabolism and Leaf Gas Exchange

Andrew D. Harner, Michela Centinari*, Lauren Briggs, Donald Smith, and Heather Leach

* Corresponding author: The Pennsylvania State University, Department of Plant Science, 218 Tyson Building, University Park, PA 16802, USA, mzc22@psu.edu

The Spotted lanternfly (*Lycorma delicatula* White; SLF) is an invasive phloem-feeding planthopper that was first detected in the U.S. (Pennsylvania) in 2014. Since its introduction economic losses and vine damage have been reported. Despite the major threat it poses to the grape and wine industry, to date no study explored how SLF feeding affects basic grapevine metabolism and physiology. To investigate these effects, we caged 16 Riesling field-grown vines (2019-2020) and 12 Marquette potted vines (2020) and exposed them to known populations of adult SLF from late August until the end of the season. Riesling vines were exposed to a range of infestation densities from 0-12 SLF/shoot in 2019 and 0-15 SLF/shoot in 2020. Marquette vines were randomly assigned to a control (0 SLF) or high infestation density treatment (80 SLF/vine). Above- and belowground tissues were sampled at the end of the season and concentrations of starch, soluble sugars, and nitrogen were quantified. Additionally, single leaf gas exchange was measured throughout the experiment. Results altogether indicate that SLF feeding significantly reduced late-season leaf nitrogen concentration and root starch and nitrogen concentrations when vines were exposed to high SLF populations. Additionally, infestation reduced leaf carbon assimilation, transpiration, and stomatal conductance, with exposure to high SLF populations yielding the strongest, quickest reductions. Potential year-after effects are currently being investigated. These results indicate that SLF feeding affected primary metabolism in two *Vitis* species and possibly did so through direct removal of metabolites and disruption of photosynthesis and translocation dynamics.

Utilizing Accelerated Aging to Rapidly Assess Canned Wine Off-aromas

Austin Montgomery*, Rachel B. Allison, and Gavin Sacks

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The fastest growing category of wine packaging, canned wines offer several advantages over glass-packaged wines in terms of recyclability, durability, and convenience. Aluminum cans contain a polymeric liner to protect the wine from the metal. However, storing wines in cans is reported to occasionally (and unpredictably) increase hydrogen sulfide (H₂S; “rotten egg” aroma) in certain wine × can liner combinations after several weeks or months. We report the development and validation of an accelerated aging test to predict H₂S formation for a wine × can liner combination over long term storage. The development of an accelerated aging test is of great interest. For the accelerated assay, coated Al coupons (1 × 5 cm) are incubated in 25 mL wine at 50 °C in crimp-topped glass vials and H₂S is measured after 3 days. Reliable control of oxygen during storage to < 1 ppm was critical for achieving reproducible H₂S results. To validate this accelerated assay, real wines were canned with a benchtop seamer and stored at room temperature. Good correlation was observed in H₂S production among wines between conventional and accelerated aging. However, dissolved Al(III), a common metric for characterizing corrosion, was not well correlated with H₂S formation, suggesting that different pathways are responsible for H₂S formation and the majority of Al(III) solubilization.

Identification of QTLs for Berry Acid and Tannin in a *Vitis Aestivalis*-derived 'Norton'-based Population

Karlene L. Negus, Li-Ling Chen, Jonathan Fresnedo-Ramírez, Heather A. Scott, Gavin L. Sacks, Lance Cadle-Davidson, and Chin-Feng Hwang*

* Corresponding author: Missouri State University, Department of Environmental Plant Science and Natural Resources, 901 South National Avenue, Springfield, MO 65897, USA, ChinFengHwang@MissouriState.edu

Grape berry quality traits such as acidity and tannins can influence wine quality. *Vitis aestivalis*-derived ‘Norton’ possesses, in addition to its advantageous environmental tolerances, acidity and tannin concentrations which often deviate from expectations set for *V. vinifera*. Characterizing the genetic determinants of important berry quality traits such as malic acid, tartaric acid, pH, and tannin can assist in the improvement of new hybrid cultivars. To further this objective, a ‘Norton’ and *V. vinifera* ‘Cabernet Sauvignon’ hybrid mapping population containing 223 individuals was used to construct a linkage map containing both simple sequence repeat (SSR) and genotyping-by-sequencing (GBS)-derived single nucleotide polymorphism (SNP) markers. The resulting map had a length of 1441.9 cM, average inter-marker distance of 0.75 cM, and spanned 19 linkage groups (LGs). Quantitative trait loci (QTLs) were detected for malic acid (LGs 8, 14, 18), tartaric acid (LGs 1, 6, 7, 9, and 17), pH (LGs 4, 6, 8), and tannin (LG 2). QTLs for malic acid on LG 8 and pH on LG 6 were observed across multiple years and represented effect sizes of 0.74 g/L and 0.14, respectively. QTLs observed in single years for tartaric acid explained between 8.8-14.3% and tannin explained 24.7% of the phenotypic variation. The markers linked to these QTLs can be used to improve hybrid cultivar breeding through marker-assisted selection.

Student Presentation Competition Abstracts

Marker-assisted Selection to Determine the Introgression of Rpv-3 Mediated Downy Mildew Resistance in 'Chambourcin' x 'Cabernet Sauvignon' Population

Kavya Sri Tummala, Li-Ling Chen, and Chin-Feng Hwang*

* Corresponding author: Missouri State University, Department of Environmental Plant Science and Natural Resources, 901 South National Avenue, Springfield, MO 65897, USA, ChinFengHwang@MissouriState.edu

Downy mildew caused by the fungus, *Plasmopara viticola* in the grapes is one of the major diseases affecting crop yield throughout the world. Breeding grapes via conventional methods for the downy mildew resistance will take approximately 25-30 years to fully evaluate and release new cultivars. Because of the long breeding cycle in woody plant species like grape, developing DNA markers linked to genes or quantitative trait loci (QTLs) for horticultural traits can greatly accelerate the breeding process and allow a much more accurate selection of progeny. This study aims to determine the presence of resistance in the 167 F1 genotypes developed by crossing the downy mildew resistant cultivar, 'Chambourcin', and the disease susceptible cultivar, 'Cabernet Sauvignon' using DNA markers. 'Chambourcin' has the Rpv3 downy mildew resistance locus and we have tested our 'Chambourcin' x 'Cabernet Sauvignon' mapping population using 4 simple sequence repeats (SSR) markers, UDV730, UDV734, UDV736, UDV737, to examine the Rpv3 resistance alleles among the hybrid progenies via marker-assisted selection. The data was analyzed to confirm which resistance allele sizes were passed down from the pedigree of the 'Chambourcin' to the hybrid progeny. This study will help provide the industry stakeholders from the grape and wine community with new cultivars that are adapted to Missouri.

The Effect of Carbonation on the Sensory Attributes of Muscadine and Fruit Wines

Nick A. Wendrick, Charles Sims, and Andrew J. MacIntosh*

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Sparkling wine has experienced a 5.2% annual growth rate in the US from 2014 to 2019, according to the International Wine and Spirit Research (IWSR). Carbonation is a value-added process that can affect the mouthfeel, perception of volatile compounds, and perceived sweetness of wine. The objective of this research was to create, evaluate, and educate winemakers on forced carbonated sparkling wine levels. Six finished wines from Florida wineries were obtained, then assessed for the sugar and alcohol content. Each wine was carbonated to four carbonation levels (2,3,4,5 vol/vol) and was presented to panelists at the University of Florida's food science sensory panel (n=68-89) with one uncarbonated sample as a control. The ranking questionnaire assessed the likeability, sweetness, comments, purchase intent, price, and preference of each sample. After completing six sensory panels with wine from four Florida wineries, the data illustrated panelists consistently preferred the carbonated samples over the noncarbonated sample. The majority of the data indicates a roughly even distribution of preference between the four carbonation levels; however, there were a few deviations from this generalization. The data also showed statistically significant differences between the original wine and the carbonated varieties with respect to likability, purchase intent, and ranking, which was supported by the comments for the most preferred and least preferred samples. Overall, this research serves to impact the wine industry by identifying the carbonation levels appropriate to successfully expand, diversify, and increase the product portfolio for wineries working with muscadine and fruit wines.



Technical Session Abstracts

A Time Course Study of Harvest Chemistry for Key Varieties in a Transect Across North Dakota and Minnesota

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Cold-hardy grape cultivars Brianna, Frontenac gris, La Crescent, and Marquette were evaluated for harvest parameters from vineyards representing different soil types along a NW to SE transect across North Dakota and Minnesota. Grapes were harvested weekly for three weeks to characterize ripening in 2019 and 2020 and samples were fermented into wines for sensory evaluation. Harvest parameters evaluated included juice soluble solids, juice pH, juice TA, berry weight, and cluster weight. These attributes were significantly different for each variety by vineyard and harvest date within each year. The Fertile, MN site had the lowest soluble solids for 'Marquette' and 'Brianna' with as much as 3 °Bx lower observation than from grapes harvested at Excelsior or Cannon Falls, MN. Average cluster weight for 'Marquette' was highly variable by site and ranged from 46.8 g to 126.3 g in 2019. In 2019, the 'Marquette' wines with the highest anthocyanin content were detected in Buffalo, ND (801 mg/L) whereas the lowest was in Cannon Falls, MN (376 mg/L). The 'Marquette' wine had the greatest change in tannin concentration with the lowest observation of 200 mg/L on 9/16/2019 and the highest of 353 mg/L on 9/30/2019 at Cannon Falls. At Fertile, MN the tannin concentration increased only from 218 mg/L to 221 mg/L over a similar three-week period. In 2020, there was very little variation in harvest traits among vineyard sites for 'Brianna', except for very large clusters at Excelsior, MN (307.5 g) but with average berry weights.

Aging Sparkling Base Wines in Contact with Yeast Lees: Bottle (Pétillant Naturel) vs. Fermenter

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Studies concerning the aging wine in contact with yeast lees have focused on still wines after fermentation and sparkling wines after the second fermentation. The aging of acidic, low pH base wine destined for sparkling wine on primary lees has received little attention. For this reason, in 2018 Chardonnay juice from a commercial winery was fermented in triplicate (40 L x 3) with IOC-2007 yeast. Juice analysis included standard chemical analysis as well as phenolic profiles by UV- Spectroscopy, and malic acid, tartaric acid and succinic acid by capillary electrophoresis (CE). Half of the fermenting base wine from each replicate was bottled with crown caps at 4g/L of residual sugar (Pétillant naturel) (to remove high pressure as a variable during aging). The remaining wine was transferred to finish fermentation in a fermenter (carboy). Total and viable yeast cell counts (cell/ml) were conducted prior to bottling. Wines were aged for 30 months at 14 – 15 °C. Standard chemical analysis and pressure (1 bar for bottled wines) was carried out in April 2021. Student's t-tests showed that Pétillant naturel wine had the lowest malic acid and total SO₂, but highest pH and degree of browning (P(t)<0.05). 5-(hydroxymethyl)furfural (5-HMF) content, derived from sugar degradation (and the Maillard reaction during sparkling wine aging), is currently being analysed to assess the impact of wine sugar composition. Results show that the chemical composition of base wine aged in contact with unstirred primary lees varies according to the vessel it is stored in.

Consumer Perceptions of Iowa Wine: A Sensory Evaluation Study to Aid in the Development of an Iowa Signature Wine

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The Iowa grape and wine industry has increased from several wineries to over 100 during the past 20 years. As the industry matures, members are looking for new ways to market their products to potential consumers. A study was conducted to determine consumer preferences regarding wine variety or style in order to inform the creation of an "Iowa Signature Wine". Industry members were surveyed to ascertain which varieties they grow and which wine styles they make. This was followed by selection and chemical analyses of 20 wines (5 varieties in 4 styles). Wines were presented blindly to participants (n ranged from 60-75, with 46 participants completing all tastings) over 5 weeks and acceptance ranking data was collected for each wine. Statistical methods were employed to identify correlations between demographic data, chemical analyses and Likert scores. White wines were preferred overall to the red wines and sweet or semi-sweet wines were preferred over off-dry and dry wines. As part of the extension portion of this project, participants were given a short presentation about the Iowa grape and wine industry before each tasting. Self-reported knowledge and intention to access Iowa wines increased from the time of the tasting to 4 weeks post-tasting.



Technical Session Abstracts

Rootstock Evaluation - Should We be Looking in Our Own Backyard?

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In the search for yield stability in high vigour vineyards suffering from chronic winter injury, rootstocks have been looked at as sources of vigour restraint. In addition, rootstock influences on acclimation and deacclimation have also been addressed, in hopes that, coupled with vigour restraint and better vine balance, production in these vineyards can be more consistent, in spite of high risk of winter injury because of their location. *Vitis riparia Michx* has been targeted as a potential source of these qualities, in particular Riparia Gloire de Montpellier (RGM), along with rootstock hybrids containing riparia (C3309, C161-49, Mgt 101-14). A 4 X 4, cultivar X rootstock trial was planted at two locations (Simcoe and St. Williams ON), to examine these effects, using Chardonnay, Riesling, Pinot noir and Cabernet franc as scions. In addition, a collection of native riparia clones was made in the sand plains of Norfolk and Haldimand counties of southern Ontario as well as other locations from Windsor to Kingston ON. Within this collection, 15 selections were chosen for a parallel study with Pinot noir as the scion and planted at the same two sites. Using production data (fruit, pruning weight, Ravaz index, Brix, pH, TA) and DTA data (LT10, LT50, LT90) over the 2018-19, 2019-20, 2020-21 growing seasons, the preliminary analysis of the effects of these rootstocks will be discussed.

Leaf Blades are More Prone to Pesticide Contamination in Nutrient Analysis than Petioles

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Tissue testing is routinely performed to monitor grapevine nutrition. The tissues of choice are leaf petioles and blades, and samples are most commonly collected at bloom and in late summer, timings that correspond with preventive fungicide applications, particularly in higher rainfall regions such as the southeastern U.S. This source of potential contamination must be removed from tissue prior to analysis either naturally with rainfall or by washing samples. This study compared the potential for fungicide contamination of petiole samples versus blades. A tank mix of mancozeb (Dithane F-45) and pyraclostrobin + boscolid (Pristine) was applied to 'Blanc Du Bois' and mancozeb (Dithane F-45) and phosphorous acid (Rampart) was applied to 'Camminare Noir' at labeled rates in 445 L/ha-1 water. Prior to application, whole leaf samples were collected from randomly selected shoots along the treated area. Samples were subsequently collected approximately 30 minutes after the fungicide spray application, and again 7 days later. Samples were washed using five different procedures that represent common recommendations on university websites and in tissue analysis texts. After washing, petioles were separated from blades and all tissue samples were analyzed for macro- and micronutrients at the Texas A&M AgriLife Extension Soil, Forage, and Water Testing Laboratory. No differences between the washing treatments and unwashed samples were observed for any nutrient in the petiole samples. However, in leaf blades, manganese, zinc, phosphorous, potassium, and sulfur were highest in the sprayed unwashed treatments, and most of the washing treatments did not effectively remove all contaminants.

Impact of Pre-bloom Leaf Removal on Wine Grape Production and Quality Parameters - A Systematic Review and Meta-Analysis

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Wine grape (*Vitis vinifera* L.) is the most widely cultivated fruit crop in the world. However, the climatic characteristics in some growing regions are suboptimal for grape production, including short season length and excess precipitation. Grape growers can utilize an array of methods to mitigate these issues, including "early leaf removal," a management practice involving the removal of leaves from selected basal nodes along shoots around bloom. This meta-analysis reviews the extensive literature on this practice, with specific regards to application at "pre-bloom" (PB). One hundred seventy-five publications on the topic of "early leaf removal" were identified using key terms and subsequently narrowed via eight data curation steps. The comparison between treated (PB) and control plants in these studies revealed two important results. First, PB lowered bunch rot disease (-61%), partially through reducing the compactness of clusters. Second, PB promoted a significant increase in fruit total soluble solids (°Brix, +5.2%), which was related to the increase in the leaf-to-fruit ratio. Furthermore, cultivar and rootstock were found to have a large influence on the success of PB, while the contribution of climate was smaller. In conclusion, PB significantly lowers yield and bunch rot disease and increases °Brix, both of which improve grape and wine quality.



Student Poster Competition Abstracts

Can Saignée and Bentonite Treatments Enhance Phenolic Compounds Content of 'Marquette' Red Wine?

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Saignée and bentonite are commonly used to improve wine quality by reducing the juice-to-skin ratio of red wines or removing proteins from wines, respectively. The content of tannin and phenolic compounds, positively correlated to high grade wines, is much lower in cold-hardy wines than in *Vitis vinifera* wines. This study aims to investigate the effect of saignée and/or fining with bentonite on phenolic compounds content of cold-hardy 'Marquette' red wine. After crushing, 'Marquette' grapes were processed under four conditions: control, saignée, bentonite, and saignée with bentonite. At bottling, the wine hue and color intensity were evaluated by UV-visible spectrophotometry and total iron-reactive phenolic compounds and tannin contents were determined using a protein-based precipitation method. Monomeric polyphenols were analyzed by high-performance liquid chromatography with diode array and fluorescence detectors. The hue, color intensity, and iron-reactive phenolic compounds content were the highest in saignée with bentonite treated wines. No significant difference in tannin content was observed between the treatments at bottling. Overall, the saignée treatment significantly improved the color intensity compared to the control wines but did not improve the extraction of free anthocyanins. These results suggested the formation of polymeric pigments in saignée and saignée with bentonite wines. Further analysis will be carried out on the wines after 5 months of aging.

Examining the Role of Fructose in Causing Stuck or Sluggish Fermentation

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Grape juice is fermented into wine in part by yeast cells converting sugar to carbon dioxide and ethanol. The sugar naturally present in grape juice primarily consists of glucose and fructose in approximately equal quantities. Despite being a carbon source for yeast, fructose has also been implicated as one of the many potential causes of stuck or sluggish fermentations. This is largely based on the observation that stuck fermentations have much higher residual fructose levels than glucose. However, no rigorous trials have been performed to determine whether this observation is causing the stuck fermentation or simply correlated with the stuck fermentation. Some evidence indicates that fructose levels simply correlate with stuck fermentations, including evidence from laboratory strains of yeast and characteristics of sugar metabolism in yeast. The goal of this study was to directly examine the role of fructose in stuck or sluggish fermentations. The results of this work will provide winemakers with tools to better deal with stuck or sluggish fermentations.

Molecular Investigation of Fruit Quality in the Cold Climate Adapted Wine Grapes (*Vitis* spp.)

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In North Dakota's short growing season, grape production is severely limited by winter injury, frost risk, and low fruit quality. Along with climate-driven abiotic challenges, the cultivar options are restricted due to disease risks and demands for early ripening phenology. Due to these needs, the North Dakota State University Grape Germplasm Enhancement Project (NDSU-GGEP) relies heavily on wild *Vitis* spp and interspecific hybrids as parental material. To investigate grapevine phenology, ripening dynamics, cold hardiness, and environmental adaptation in the context of North Dakota's challenging climate, an incomplete diallel population of 1064 unique individuals were planted in 2017 from three core, interspecific NDSU-GGEP breeding lines with diverse grapevine genomic backgrounds, including *V. amurensis*, *V. labrusca*, *V. riparia*, and *V. vinifera*. After trunk establishment, detailed phenotypic data was initiated in 2020 for the planting, with 255 individuals evaluated for fruit composition (soluble solids content, pH, titratable acidity, malic acid content, and yeast assimilable nitrogen content). To further investigate climate adaptation, phenology (bud break, bloom, and fruit ripening time), dormancy acclimation (wood and bud maturation), and cold hardiness (winter survival and differential thermal analysis of dormant buds) traits were monitored for all fruiting individuals. A genetic map of the population has been constructed using GBS markers. Using both phenotypic and marker information, we are able to identify some genomic regions controlling some of these traits. This knowledge eventually will help in Marker-assisted selection for fruit quality and cold hardiness.



Student Poster Competition Abstracts

Impact of Harvest Date on the Chemical Composition of Wines Produced from Interspecific *Vitis* sp. Cultivars Grown in Nova Scotia Kumuduni Lakmali, Martine Dorais, and Karine Pedneault*

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Nova Scotia shows variable yearly climatic conditions making it a challenging environment for grape production. Many factors affect the quality of the grapes and its final product, wine, including geographical origin (e.g., terroir), grape cultivar and berry ripening. In the current study, three *Vitis* varieties L'Acadie blanc, Seyval blanc and Osceola Muscat were harvested at three different phenological stages (EL-37, EL-38, EL-39, based on the Lorenz scale of *Vitis* sp. phenology), corresponding to different counts of GDD. Physicochemical data of berries (berry weight, cluster weight, crop load, total soluble solids (TSS), pH, titratable acidity (TA) and chemical composition of wine (TSS, TA, free volatile composition) were analyzed. Fermentation-related volatile compounds (free fatty acids, fatty acid ethyl esters and higher alcohols) accounted for the highest proportion of wine volatiles compared to variety-related volatiles such as C6 alcohols, terpenes, C13-norisoprenoids and volatile phenols. 3-Methyl-1-butanol was the main aroma compound found in wine from all analyzed cultivars, followed by 2-phenylethanol which showed a significant increase from EL-37 to EL-39 in all wines. Similar trend was observed in other fermentation-related compounds such as ethyl lactate, isobutyl acetate, α -butyrolactone, pantolactone whose concentration significantly increased with ripening. On the other hand, the concentration of fatty acid degradation products such as cis-3-hexanol and 1-hexanol significantly decreased with ripening. Aromatic esters such as phenyl ethyl acetates were detected at very low levels in wine, but significantly increased by 166% from stage EL-37 to EL-39.

Evaluating Harvest and Postharvest Potential of Fresh-market Muscadine Grapes Grown in Arkansas

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Major advances in muscadine grape (*Vitis rotundifolia* Michx.) breeding have resulted in unique traits emerging with commercial, fresh-market potential. Seven University of Arkansas System Division of Agriculture muscadine breeding selections and two cultivars were hand harvested in 2020 into clamshells. Physical attributes (berry weight, seed number, stem scar tear, and berry firmness) and composition attributes (soluble solids, pH, titratable acidity, and soluble solids/titratable acidity ratio) were evaluated at harvest, and postharvest attributes (weight loss and unmarketable berries) were evaluated at 0, 14, and 28 d at 2Å°C. Genotype impacted all harvest attributes except seed number (3.11/berry). Berry weights ranged from 4.76 g (AM 77) to 12.50 g (AM 70), stem scar tear ranged from 0% (AM 26) to 30.61% (Supreme), and berry firmness ranged from 6.53 N (AM 135) to 10.75 N (Summit). For the composition attributes, Supreme (17.43%) had the highest soluble solids, and AM 195 (3.80) had the highest pH. AM 77 had the highest titratable acidity (1.06%) and lowest soluble solids (11.37%), pH (2.81), and soluble solids/titratable acidity ratio (10.75). AM 70 had the highest soluble solids/titratable acidity ratio (35.17) and lowest titratable acidity (0.43%). The genotype x storage interaction was significant for both postharvest attributes. During storage, weight loss and unmarketable berries increased. AM 102 had the highest weight loss at 14 days (4.53%) and 28 days (7.83%). Supreme had the highest unmarketable berries at 14 days (7.02%) and 28 days (24.56%). The outcomes from this research demonstrate the potential for muscadines as a fresh-market crop.

Impact of Solo and Co-infections of Grapevine Red-blotch Virus and Grapevine Leaf-roll Associated Virus-3 on Fruit Quality

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Concentration of primary and secondary metabolites in fruit from virus positive grapevines has been shown to be atypical. In this study, we investigate how solo and co-infections of grapevine leaf-roll associated virus-3 (GLRaV-3) and grapevine red-blotch associated virus (GRBaV) affect primary and secondary metabolites in *Vitis vinifera*, c.v. Cabernet Franc and the hybrid c.v., Vidal. Fruit was harvested (2020 vintage) from vines confirmed (via PCR) to be either virus-free, GLRaV-3(+), GRBaV(+) or infected with both viruses and components of yield per vine were determined (fruit weight, number of clusters). Fruit was processed and standard chemical analyses were conducted (°brix, titratable acidity (g/L), pH), as well as enzymatic analysis for malic acid and yeast assimilable nitrogen (YAN). Hydroxycinnamic acids and anthocyanin concentrations were determined spectrophotometrically. Elucidating the effects grapevine viruses have on fruit quality will enable industry application of targeted practices to mitigate crop degradation and diminishing wine quality as a result.



Student Poster Competition Abstracts

Effects of Accentuated Cut Edges on the Volatile Aroma Composition of Various White Wines

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Accentuated Cut Edges (ACE) is a recently created method to change the characteristics in wines. This method has been mostly used on red *V. vinifera* grapes to increase the extractability of the polyphenols and tannins due to increased surface area by fragmentation of the skins. Little work has been done on the other effects of this method including how the volatile aroma composition changes in the final wine product. Five different white grape varieties, Cayuga, Riesling, Seyval Blanc, Swenson White and Vidal Blanc were vinified. Prior to fermentation the grapes were either processed with ACE or not (control) with both groups receiving a 48-hour cold soak. Solid-phase microextraction (SPME) GC-MS was used to measure the volatile composition of the wines. As many of the volatile profiles of these varieties are unknown untargeted analysis was done to determine any treatment differences. Tentative results show that across the multiple grape varieties, no volatile compounds were constitutively different between ACE and control treatments. However, several compounds generally regarded as imparting varietal character such as linalool, TDN were identified. In single variety comparisons however, numerous differences were observed in Cayuga and Seyval Blanc with 45 and 56 significant features identified respectively. Cayuga wine, beta-damascenone was tentatively found to decrease by 52% in the ACE treatment while in Seyval Blanc 2-methoxy-vinylphenol was tentatively found to increase by 42% in the ACE treatment. These results indicate that there are some significant differences between ACE and control treatments on specific volatile aroma compounds.

'MidSouth': A Red Wine Grape for the Deep South

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In the late 1930s, grape research began near Meridian, Mississippi to test and develop bunch grapes for home garden use. After decades of development, 'MidSouth' was released by Mississippi State University in 1981 and is still grown in Mississippi and surrounding states today. 'MidSouth' is a dark blue, self-fertile hybrid with *Vitis champinii*, *V. vinifera*, and other American species in its lineage. Although susceptible to fungal diseases and root knot nematodes, it is resistant to Pierce's disease (*Xylella fastidiosa*). While strictly a southern-adapted grape, recent exposure to below freezing temperatures in 2021 presented minimal cold damage to the primary buds, suggesting that it is somewhat cold hardy. 'MidSouth' berries ripen in late July to mid-August in south Mississippi and have good flavor and produce dark red juice. Due to its seeds and slip-skin, it is not often used as a table grape, but it is excellent for jams and jellies. Juice from 'MidSouth' typically has low total soluble solids and high titratable acid content, therefore its use as a red wine grape is still being evaluated. While these qualities may potentially be improved through canopy manipulation or other management practices, 'MidSouth' shows promise for use in red blends or as a rosé style wine.



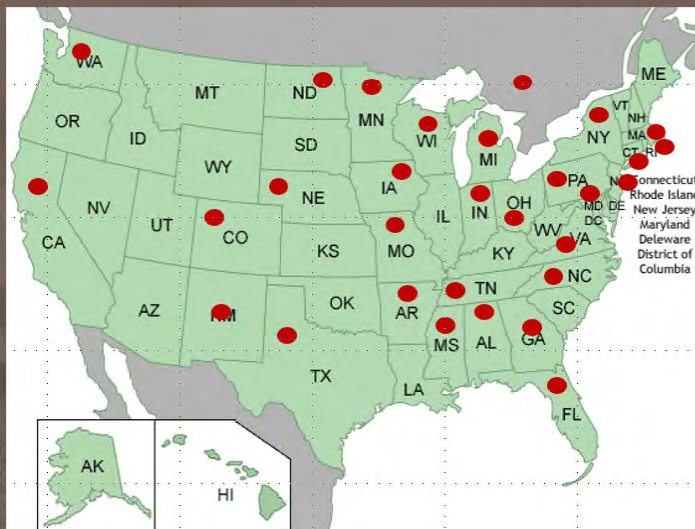
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Poster Session Abstracts

Testing Efficacy of HydroShield Product on the Reduction of Rot and Phytotoxicity of European and French American Hybrid Wine Grapes in Georgia

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Evaluate the effectiveness of the novel, food-grade, agricultural product “HydroShield”, a hydrophobic plant cuticle supplement, to manage the wine grape rot complex ‘sour rot’. Hydroshield produces a hydrophobic spray film around fruit, preventing water ingress during wetting events. It has also been reported to increase cuticular thickness and decrease spotted wing drosophila (SWD) penetration and oviposition in other commodities. Decreased drosophila activity in grapes would theoretically result in decreased sour rot. Two HydroShield formulations were tested for their effectiveness as indirect sour rot management tools in wine grape vineyards in Georgia. Hydroshield formulations were applied at a 0.5% v/v rate, calculated to deliver 50 gallons of total spray volume per acre. Five replications of each treatment were applied to a randomized complete block with a CO2 backpack sprayer to runoff. Untreated control was included. Applications were initiated on pea-sized fruit at approximately two-week intervals till shortly before harvest. Where observed, sour rot incidence (% infected clusters) and severity (average % damage per cluster) were rated at commercial harvest on all clusters within an experimental unit. Efficacy of Hydroshield against sour rot was not consistently observed. No phytotoxic responses were observed on fruit at any location, but significant leaf damage was observed on Blanc du Bois and Vidal blanc hybrids, and very minor damage was confirmed on Pinot grisio. Marginal leaf burn was observed with all three varieties where damage occurred, but other symptoms, such as yellowing and bronzing of leaves, was also observed on some varieties.

Determining the Optimal Planting Distance for Pierce’s Disease Resistant Predominantly *Vitis Vinifera* Grape Selection in Alabama

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Recently the UC Davis grape breeding program has developed new cultivars and selections with resistance to PD that are expected to produce high quality yield in regions with PD pressure where the *Vitis vinifera* production was previously not a viable option. An experimental research vineyard was established at the CREC, Alabama to assess the performance of PD resistant predominantly *Vitis vinifera* grapevine ‘U0502-20’ planted at in-row distance of 6’, 7’ and 8’ and a between row distance of 12’. The experimental design is a RCBD with seven blocks. Grapes are trained to the Watson trellis system. Data were collected during 2019-2020 to determine plant phenology and fruit quality characteristics. Total yield/vine was recorded at harvest and fruit cluster were collected. Our results suggest planting distance did not affect dormant pruning weight and total yield/vine of ‘U0502-20’ grape during the initial years of vine establishment. Results for total yield/vine suggest similar cropping level regardless of planting distances with the 6’ X 12’ and 7’ X 12’ treatments producing a cumulative yield of 16.7 kg/vine, and the 8’ X 12’ distance resulting in 16.4 kg/vine. Planting distance of 7’ X 12’ resulted in the largest mean cluster size of 332.2 and 394.3 g in 2019 and 2020 respectively, which was not statistically different from the rest of the treatments. The highest number of clusters/vine were produced by the 8’ X 12’ treatment. Studies will continue to evaluate the planting distance effect on yield and fruit quality of ‘U0502-20’ grape during vine establishment.

Selective Shoot Removal in Blanc Du Bois Grapevines

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‘Blanc Du Bois’ represents the most widely planted white wine cultivar in Texas, typically trained to a Watson high wire system. ‘Blanc Du Bois’ tolerates high temperatures, wet feet, and high relative humidity. In this environment, the vines are typically vigorous, producing an expansive canopy of shoots that originate from basal, latent, primary, secondary, tertiary, and prompt buds. The proliferation of shoots and clusters result in a disorganized crowded canopy of shoots, clusters, and tendrils within a microclimate favorable to fungal diseases. Tendrils begin to anchor at pea size. This growth habit necessitates an aggressive canopy management strategy. Over a four-year period, from 2017-2020 shoot thinning was performed on own-rooted ‘Blanc Du Bois’. Unfruitful and lateral shoots were removed before bloom and compared to control with all shoots left intact. Data recorded per vine were average crop weight, average cluster number, average cluster weight, and soluble solids. In 2019 and 2020, percent loss to disease was also recorded. In 2017-2020, shoot thinning consistently increased crop weight and cluster weights. Soluble solids increased in shoot thinned vines in 2019 and 2020, decreased in 2017, and were equal in 2018. Fruit rot was reduced in shoot thinned vines in both 2019 and 2020. The results of this study highlight potential benefits of selectively shoot thinning ‘Blanc Du Bois’.

How Does Geotextile Installation Height Impact Grapevine Growth in Cool-climate Conditions of Quebec, Canada

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Growing grapes in cold climates have several challenges to overcome. Cold injury to grapevines is an important problem, especially at the northern limit of culture, where extensive damage to bud and cane tissues can result in severe economic losses. The main objective is to acquire specific knowledge on the installation height of geotextiles to optimize winter protection. Two parameters were evaluated for installing the geotextiles: the fruiting wire installation height at 8, 12 and 16 inches and insulation (padding) of the mid row posts. The trials were carried out on three grape varieties (Vidal, Pinot, Chardonnay) in four vineyards during the 2019-2020 winter months. Preliminary results show that the installation height affects the temperature under the geotextile, but insulation does not. Physiology and vine yields were not affected by the treatments either. Winter survival was most affected by the vineyard site and grape varieties rather than geotextile treatments. These results reflect only the first winter of the trial and additional data in the coming years will provide further insight. Several other projects are also currently underway at CRAM that assess several parameters (e.g. types of geotextile and their timing of installation and removal, fall vine pruning) which will help to optimize geotextile practices under the climatic conditions of Quebec, Canada.

Poster Session Abstracts

Geotextile as a Winter Protection Method to Reduce Winter Injuries to Cold Sensitive Cultivars

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Winter protection methods have been developed to use concomitantly with tender and semi-hardy wine grapes that are less resistant to extreme cold in cool climate regions. The use of geotextiles to protect semi-rustic and non-rustic vines is increasingly practiced in Quebec, though without specific knowledge for optimal installation and outcome. The main objective is to provide methods to reduce cold injury on cold-sensitive cultivars under eastern Canada's climatic conditions in order to support the development of the wine industry. The project evaluated three types of geotextiles (Hibertex 2.2 mm, Hibertex 3 mm, and Texel Arbo Pro) and four moments of installation/removal. Three grape varieties were evaluated: Vidal, Chardonnay, and Pinot noir. The trials were carried out in four vineyards across Quebec during the 2018-2019 and 2019-2020 winter months. We observed that protecting the vines with geotextile maintains significantly higher temperatures under the tissue during the coldest months while a greenhouse effect is noticed as temperatures rise in the spring. Thus, the late geotextile removal period favoured vine development in the spring, but minimal effects were noted on the various parameters at harvest. Temperature did not differ significantly between the three tested material. CRAM is currently developing two other follow up projects using geotextiles that will complement current understanding and help lead to optimal methods for protecting tender grapevines under cold-climate conditions found in Québec, Canada.

Death and Dying: Differential Thermal Analysis of Grapevine Cold-Hardiness and Assessment of Bud Mortality in North Dakota

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North Dakota's short growing season and extreme winter temperatures severely restricts grapevine cultivar options for commercial production. Severe winter injury to many grapevine plantings was observed following a -36.8°C minimum temperature event in January 2019. To increase the understanding of regional grapevine acclimation and mid-winter cold-hardiness throughout the 2019-2020 dormant season, cane and bud samples of 14 different grapevine accessions (13 cultivars, 1 breeding line) were collected for differential thermal analysis (DTA) of cold-hardiness from two vineyard locations in eastern North Dakota. Sampling was conducted twice per month, starting in mid-October 2019 and concluding in mid-April 2020. Multiple freeze events resulted in temperatures lower than the anticipated bud and phloem lethal temperatures based on DTA results. To further investigate bud survival, primary and secondary buds were manually investigated for percent survival from buds one to eight along sampled canes for each grapevine accession. Overall, 'Valiant' had the highest survival of primary (69%) and secondary buds (79%). Of the remaining accessions, 'Baltica', 'Bluebell', 'Frontenac', 'La Crescent', 'Marquette', MN1131, 'Petite Pearl', 'Prairie Star', and 'Sabrevois' all had less than 20% primary bud survival, while 'Crimson Pearl', 'Frontenac gris', 'John Viola', and 'King of the North' had between 20 and 30% primary bud survival. This extensive dormant bud damage exhibited by most grapevine accessions evaluated indicates a potential need for use of winter protection methods or new cultivar development for North Dakota winter conditions.

Hybrid Trunk Disease Evaluation: A Serendipitous Opportunity

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Declining yields in Nebraska vineyards and for the Midwest in general have been variously attributed to aging of the vine, winter injury or other environmental factors. Only recently have trunk diseases become suspect, largely because of the concerns raised by Richard Smart in a June 2018 visit. A serendipitous opportunity arose for the University of Nebraska Viticulture Program (UNVP) to investigate trunk disease symptoms when a 20-year-old cultivar research planting was terminated in August, 2018. This planting was on a commercial vineyard at Nebraska City, NE containing 36 cultivars with the oldest vines planted in 1999. The vines were "destructively harvested" above the ground and evaluated for grapevine trunk disease symptoms a minimum of two replicates of 21 cultivars of hybrid grapevines, most of which had been in the ground for nearly 20 years. All were trained to a high-wire double cordon system. Evaluations were based upon observations of both visible staining and dead wood symptoms found in cross-sections at five locations: 15cm from the distal end of the cordon, at mid-cordon, at the juncture of the cordon and the trunk (crown), and two locations on the trunk at 90cm and 10cm above the ground. All of the cultivars evaluated exhibited recognizable symptoms of TD, and some cross sections also exhibited text-book symptoms of Eutypa and/or Botryosphaeria wedge-shape cankers. Severity of cross section symptoms was rated on a scale of 1 (no visible symptoms) to 10 (cross section completely stained or dead) using visual assessment.



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