

# Ohio Grape-Wine Electronic Newsletter

Edited by: Dr. Maria Smith

January | 2019



Photo: 25 Jan. 2019 One-year old *V. vinifera* in northeast Ohio; Photo credit: Dr. Maria Smith

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## Frigid start to 2019

A new year, a new Polar Vortex. The first few weeks of 2019 brought extreme cold, snow, and ice to most of the state. Moving forward from these events, the best case is to **be patient** and anticipate potential injury to cold-sensitive varieties.

Early winter pruning of these varieties may be detrimental to yields in the coming season. Waiting until the end of winter to prune is advised so that **bud injury can be assessed** and **proper pruning adjustments can be made.**

For any additional questions or assistance, please feel free to reach out to me (smith.12720), Dr. Imed Dami (dami.1) or Andy Kirk (kirk.197).

- Maria and The OSU V&E team

# Grapevine injury after two deep freeze events in January

By: Dr. Imed Dami and Diane Kinney, HCS-OSU

## In January, we experienced two major freeze events that led to bud injury of grapevines.

The 1<sup>st</sup> event occurred on January 21<sup>st</sup> and 22<sup>nd</sup> and the lowest temperatures ranged between 1 °F and -14 °F across the state (**Table 1**). The coldest spots were in central, northwest, and some counties in northeast Ohio. The 2<sup>nd</sup> event, from the infamous “polar vortex”, occurred on January 30<sup>th</sup> and 31<sup>st</sup> and minimum temperatures ranged between 0 °F and -13 °F with the majority of regions averaging a minimum of -6 °F. Unlike the 2014 polar vortex, temperature lows did not drop below -14 °F, as the brunt of the 2019 polar vortex fortunately missed Ohio to the west.

**Table 1.** Dates of two freeze events in January 2019 and corresponding lowest temperatures recorded in different regions in Ohio.

Region	Weather Station Location	Date of lowest temperature from 1 <sup>st</sup> event	Lowest Temp. (°F) from 1 <sup>st</sup> event	Date of lowest temperature from 2 <sup>nd</sup> event	Lowest Temp. (°F) from 2 <sup>nd</sup> event
<b>Central</b>	Columbus/Bolton FLD	21-Jan	-5	30-Jan	-5
	Knox County	21-Jan	-5	30-Jan	-5
	Marion Muni ARPT	21-Jan	-9	30-Jan	-9
	New Philadelphia	22-Jan	-6	31-Jan	-6
	Ohio State University	21-Jan	-6	30-Jan	-6
	Rickenbacker ANGB	21-Jan	-2	31-Jan	-6
	Zanesville Municipal	21-Jan	-5	31-Jan	-7
<b>Northeast</b>	Akron/Akron-Canton	21-Jan	1	30-Jan	-5
	<b>AARS-Kingsville**</b>	<b>22-Jan</b>	<b>4</b>	<b>31-Jan</b>	<b>-7</b>
	Burke Lakefront	22-Jan	8	30-Jan	-2
	Cleveland	21-Jan	6	30-Jan	-3
	Cleveland Hopkins	22-Jan	3	30-Jan	-5
	Cuyahogo CO	21-Jan	6	30-Jan	-5
	Elyria/Lorain CO	21-Jan	-6	30-Jan	-6
	Mansfield	21-Jan	-9	30-Jan	-10
	<b>OARDC-Wooster (D-WS) **</b>	<b>21-Jan</b>	<b>-7</b>	<b>30-Jan</b>	<b>-5</b>
	Youngstown	22-Jan	-5	31-Jan	-7
<b>Northwest</b>	Defiance Memorial	21-Jan	-14	30-Jan	-13
	Findlay Airport	21-Jan	-9	30-Jan	-9
	Lima Allen CO ARPT	21-Jan	-9	30-Jan	-11
	Metcalfe Field	21-Jan	-8	30-Jan	-8
	South Bass Island	21-Jan	1	30-Jan	-7
	Toledo Express A	21-Jan	-8	30-Jan	-10
<b>Southeast</b>	Athens	21-Jan	-3	30-Jan	-4
	Lancaster	21-Jan	-9	31-Jan	-6
<b>Southwest</b>	Cincinnati Municipal	21-Jan	1	30-Jan	0
	Dayton	21-Jan	-5	30-Jan	-8
	Hamilton	21-Jan	-2	30-Jan	-2
	Hook FLD MUNI	21-Jan	-1	30-Jan	-5
	Springfield/Beckley	21-Jan	-6	30-Jan	-7
	Wilmington Airborne	21-Jan	-2	31-Jan	-9
	Wright-Paterson AFB	21-Jan	-3	30-Jan	-7

Source: \*Weather Underground: [www.wunderground.com](http://www.wunderground.com); \*\*OARDC weather system: [www.oardc.ohio-state.edu/weather1/](http://www.oardc.ohio-state.edu/weather1/)

# January injury (continued)

Even though grapevines are typically at their maximum cold hardiness in January, the minimum air temperatures could be lower than the critical temperatures for bud survival, which would lead to injury. In Ohio, *Vitis vinifera* are the most tender grapevines and varieties within this species have different cold hardiness levels, expressed as LT50 (lowest temperature that kills 50% of primary buds).

To determine the status of cold hardiness prior to the 1<sup>st</sup> deep freeze (January 21-22), the OSU Viticulture group conducted a freeze test of selected varieties grown at OARDC-Wooster on January 18<sup>th</sup>. Cabernet franc was the least cold hardy (LT50 = -2.2 °F) and Frontenac the most cold hardy (LT50 = -13.7 °F; **Table 2**). The lowest air temperature was -7 °F at the research vineyard in Wooster, meaning it was lower than the LT50 values of most varieties. Thus, most vinifera varieties sustained bud injury, some significant like Cabernet franc. We have also noted that most varieties are generally less hardy than expected by 2 °F to 8 °F. This is likely due to the mild December (mean temperature ~5 °F above average, see [OGEN December 2018](#)), which is not conducive for varieties to reach their maximum cold hardiness potential.

On January 28<sup>th</sup>, we conducted a 2<sup>nd</sup> freeze test of varieties grown at the AARS-Kingsville (**Table 3**). The lowest temperature of -7 °F was recorded on January 31<sup>st</sup>. Again, the minimum air temperature was lower than LT<sub>50</sub> of some varieties such as Cabernet franc and Sauvignon blanc, both likely sustained >50% primary bud injury. Note that Cabernet franc was more cold hardy in Kingsville (LT<sub>50</sub> = -5.3 °F) than in Wooster (LT<sub>50</sub> = -2.2 °F). This is likely due to location differences (more cooling units in Kingsville than in Wooster). Also, air temperature was barely above freezing between January 18 and 28, which might have led to a gain of few degrees in cold hardiness of the buds collected 10 days later in Kingsville. This phenomenon of re-acclimation is another survival mechanism utilized by grapevines to deal with temperature swings during the winter.

**Table 2.** Cold hardiness (LT50) of selected varieties grown at the OARDC research vineyard in Wooster. Canes were collected on 18 January prior to the occurrence of the 1<sup>st</sup> freeze event (-7 °F) on 21 January.

Variety	LT50 (°C)	LT50 (°F)
Cabernet franc	-19.0	-2.2
Chambourcin	-21.9	-7.4
Chardonnay	-22.3	-8.1
Frontenac	-25.4	-13.7
Regent	-19.8	-3.6
Riesling	-22.7	-8.9

**Table 3.** Cold hardiness (LT50) of selected varieties grown at the AARS research vineyard in Kingsville. Canes were collected on 28 January prior to the occurrence of the 2<sup>nd</sup> freeze event (-7 °F) on 31 January.

Variety	LT50 (°C)	LT50 (°F)
Cabernet franc	-20.7	-5.3
Chardonnay	-22.5	-8.5
Pinot noir	-21.6	-6.9
Regent	-22.4	-8.3
Sauvignon blanc	-19.2	-2.6

# Managing grapevines after winter injury

By: Dr. Imed Dami, HCS-OSU

So what's next and what to do to find out about the extent of winter injury of varieties in your vineyard? Information on assessing winter injury and pruning adjustment are described below. Most of this information is from the book titled “**Winter Injury to grapevines and Protection Methods**”, which I strongly recommend (online order: [msue.anr.msu.edu/resources/winter\\_injury\\_to\\_grapevines\\_and\\_methods\\_of\\_protection\\_e2930](https://msue.anr.msu.edu/resources/winter_injury_to_grapevines_and_methods_of_protection_e2930)). Also, check out this link: [Impact of the Polar Vortex on Grapes](#), with several articles published on managing winter injury after the 2014 polar vortex:

- Winter is not over yet and the threat of further bud injury, though diminishes, still exists between now and budbreak.
- Be patient: based on the above reason, it is too early to go out and collect canes to assess the extent of bud injury unless you want to practice cutting buds. **Assessment of bud injury is best conducted just prior to pruning.**
- When ready to prune, **you MUST collect canes to assess bud injury so you could make good decisions on how to adjust pruning for each variety.** Last year was a good reminder of how important pruning adjustment was for producing a crop. I will discuss this topic at the 2019 Ohio Grape and Wine Conference (OGWC).

## 8 STEPS FOR ASSESSING VINE INJURY

1. Prune cold hardy varieties first and most tender varieties last.
2. Collect enough canes to yield 100 “representative” nodes (or buds) per variety. By representative, I mean to evaluate nodes that you would otherwise retain as spurs or canes when pruning.
3. Conduct bud injury assessment for each variety separately and sometimes for each block of same variety separately (for example one block of chardonnay on top of the hill will likely have different bud injury than a block of same variety at the bottom of the hill). In this case, collect 1 sub-set of canes from the lower area and another sub-set from the upper area. Record bud injury of each sub-set. Pruning adjustment may be different.
4. Place canes indoor to thaw for 48-72 hours.
5. Using a sharp razor blade, cut across the bud tip at a third or half of its height.
6. Visually assess if the primary bud (largest size) is alive (green color) or dead (brown). You may also evaluate the status of secondary buds if many primary buds are dead (**Figure 1**).

# Managing injury (continued)

8. Use a spread sheet to record and compute percent of bud injury.
  - If primary bud injury = 0 to 14%, then no adjustment of pruning is needed.
  - If primary bud injury = 15 to 34%, then leave about 35% extra buds. For example, if you prune to retain 30 buds/vine, and bud injury = 20% then leave an extra 35% or 40 buds/vine.
  - If primary bud injury = 35 to 50%, then double the number of buds retained. If primary bud injury >50%, then it is best to minimally prune vines by hedging. Over the years, we find rough pruning (hedging to 5-bud spurs) of varieties with >50% primary bud injury, to be an effective practice for yield recovery. The first round of pruning is quick thus not labor intensive. We follow with a 2<sup>nd</sup> round of fine-tune pruning, just after bud break and the threat of spring frost.
  - If primary bud injury = 80-100% injury, then trunk injury is also likely. In this case, do nothing, and wait until May-June to assess trunk injury. Trunk renewal will involve retraining suckers.

We have added photos and links to YouTube videos to assist with assessing bud winter injury (see below).

Generally, basal buds (buds on the basal positions of the cane) are more cold hardy than distal buds (buds on the top positions of the cane). **Thus, it is best to increase the number of spurs per vine than buds per spur when adjusting bud number per vine.** Also, cane pruning is not wise when retained canes have dead distal buds. In this case, switching to spur pruning is recommended.

Note that hybrids with fruitful secondary and base buds will produce a normal crop even with relatively high % primary bud injury. Examples include, DeChaunac, Seyval, and Vidal.

## **Video links for assessing bud injury:**

Part 1 (cane collection): [www.youtube.com/watch?v=\\_RHJ5mY3fAs](http://www.youtube.com/watch?v=_RHJ5mY3fAs)

Part 2 (bud assessment): [www.youtube.com/watch?v=eWtr0jzI2Dk](http://www.youtube.com/watch?v=eWtr0jzI2Dk)

Assessing bud injury: [www.youtube.com/watch?v=rMav5zmGagg](http://www.youtube.com/watch?v=rMav5zmGagg)

Assessing bud injury: [www.youtube.com/watch?v=vv5axzMkYuY](http://www.youtube.com/watch?v=vv5axzMkYuY)

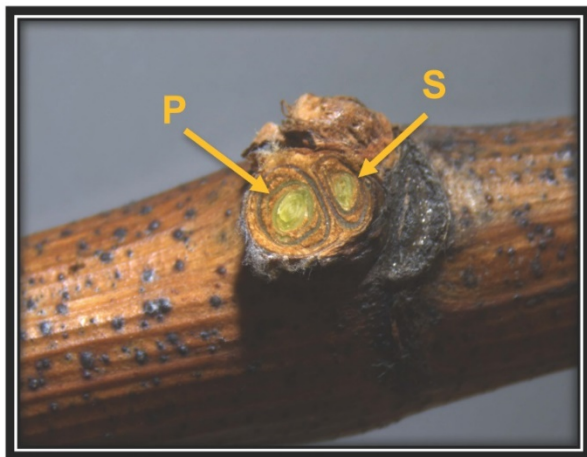
# Managing injury (continued)



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## Grape Bud Winter Injury Assessment



Bud cross section: Live (green) primary (P) and secondary (S) buds (Photo by Imed Dami).



Bud cross section: Dead (brown) primary (P) and live (green) secondary (S) buds (Photo by Imed Dami).

**Figure 1.** Assessing primary and secondary bud injury.

# A Tale of Two Cold Events, January 22<sup>nd</sup> and January 31<sup>st</sup>

By: Andy Kirk, AARS-OSU

## Radiative versus Advective Cold Events

It was noticeably quiet in the Grand River Valley during the early morning hours of January 31<sup>st</sup>. There was very little fog, and the most audible noise was the wind brushing up against the frame of our Ford F-250 pickup truck. Notably absent was the sound of wind machines in the area. This was no coincidence, as the low temperatures experienced that morning were the result of an **advective** cold event.

An advective freeze event, is one characterized by the invasion of an air mass with temperatures near or below a critical threshold. These air masses may arrive in the winter, spring, or fall, although the threshold for vine injury will naturally be different at various points in the yearly cycle of the vine. Advective events often feature strong winds, which prevent inversion layers from forming, thus rendering wind machines ineffective [1]. Numerous works in viticulture literature generally suggest that unsheltered sites with higher elevation are most vulnerable to advective cold events [1, 2, 3].

**Table 1.** Summary of Radiative and Advective Cold Events

Type of Cold Event	Typical Wind	Effect of Elevation	Inversion Layer	Improved by Wind Machine
Radiative	Calm	Positive to a point	Generally, Yes	Yes
Advective	Strong	Generally negative	No	No

These events stand in contrast to **radiative** freeze events, which arise due to heat loss from the surface of the earth due primarily due to long-wave radiation. Radiation events are typically associated with clear, calm nights and the formation of temperature inversions. It is during these conditions that wind machines are most effective. It is also during these conditions that the mechanisms of cold air drainage are activated on a regional scale, with colder, heavier air sinking to areas of lower elevation (i.e., relative elevation; [4]). In contrast to an advective event, the sheltering effects of tree lines and obstructions may prevent cold air drainage during radiative freeze events and therefore result in colder temperatures at the plant canopy level [1].

In the last two weeks of January, growers throughout the state were unfortunate enough to see both types of cold events. On the morning of January 21<sup>st</sup>, some parts of the state saw temperatures as low as -15F, on the back of a crisp, cold day on the 20<sup>th</sup> and clear nighttime skies to follow. Another night of clear skies followed on the 21<sup>st</sup>, and I took the roadways of Ashtabula, Lake, and Geauga counties, to log GPS-located temperature data throughout the region.

### References

- [1] Shaw, AB. 2002. *J Wine Res* 13, 143-164.
- [2] Evans, RG. 2000. *Proc. ASEV 50th Anniversary Annual Mtg.*, Seattle WA, 60-72.
- [3] Wolf TK & Boyer, JD. 2005. Vineyard site selection. Virginia Cooperative Extension Publications, 463-020.
- [4] Dami, I et al. 2005. Midwest Grape Production Guide. <https://extensionpubs.osu.edu/midwest-grape-production-guide/>

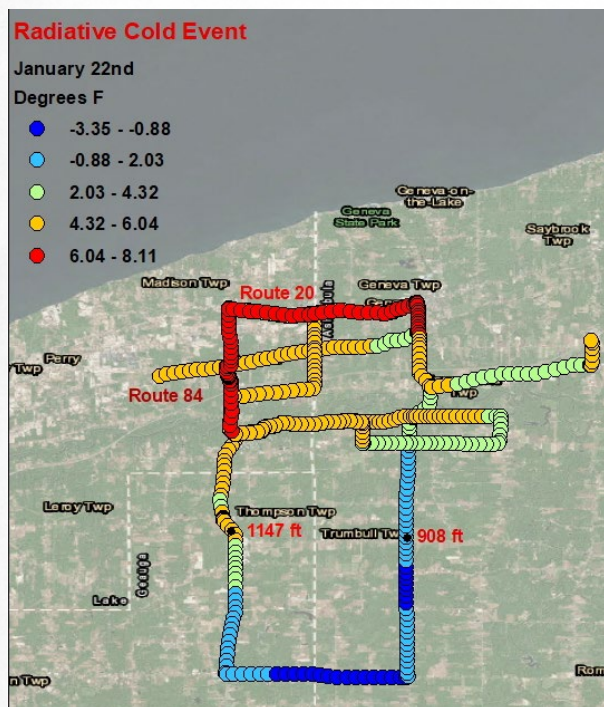
### Acknowledgements

The data collection and instrumentation for this project is funded by the OARDC SEEDS Partnership grant program. Thank you to the growers who also provided matching funds for the SEEDS project last year with their purchase of weather stations to collect data for the project.

# Two Cold Events (continued)

The pattern that emerged from this data exhibited clear signs of a radiative cold event (**Figure 1**). Areas downslope (e.g Orwell, Rock Creek) from higher elevation saw temperatures below zero, while those at the same latitude but higher elevation saw temperatures that were up to 6 °F higher. This night also highlighted the influence of Lake Erie during cold events, with its ability to supersede the typical principles governing cold air drainage. In this event, the data held that distance from Lake Erie was the strongest predictor of observed temperatures, evidenced by the relative warmth of Route 20. Elevation, however, was also moderately predictive of higher temperatures, after controlling for distance from Lake Erie. AARS will continue this work in the coming months to reach a more precise understanding for our grower community as to how radiative cooling events play out against the backdrop of our regional topography.

Little more than one week later, a wave of polar air descended on the region, bringing high winds and brutal temperatures on January 30<sup>th</sup> and 31<sup>st</sup> (**Figure 2**). At the start of this event, Lake Erie was roughly 80 per cent frozen according to the NOAA, but our measurements suggest the lake leveled a moderating effect throughout the event. On the other hand, elevation had a consistent negative relationship to temperature in our measurements, meaning higher areas were colder. Some areas in Northern Geauga county that were relatively protected from lows during the radiative cold event on January 22<sup>nd</sup> experienced extreme low temperatures during the January 31<sup>st</sup> event. The lowest temperature of -7.3 °F was recorded on Dewey Rd in Thompson at an elevation of 1137ft. Conversely, many lower elevation areas, including ones known to be prone to radiative frost injury, experienced comparatively warmer temperatures during the Jan 31<sup>st</sup> event



**Figure 1.** Radiative Cold Event on January 22, 2019



**Figure 2.** Advective Cold Event on January 31st

## Conclusions

These efforts are part of the “Functional Terroir” project at AARS, which is in its beginning stage. Further investigation will be required to determine whether the conditions observed during these events were typical of radiative and advective events in our region. Lake Erie provided a demonstrable moderating effect during these events, and we will examine whether its influence may limit the applicability of site evaluation literature produced for more general audiences.

Future work will also seek to clarify the relative importance of elevation in protection against cold events, given the risk profile for advective and radiative frosts in the region.

# Post Fermentation Workshops: All wrapped up!

By: Dr. Lisa Dunlap and Todd Steiner, HCS-OSU

**Four regional workshops were held throughout the past two months across the state by The OSU Enology program. These post fermentation workshops continue to be very popular and educational for our industry.**

The 2018 Post Fermentation Workshops were focused on evaluating wines made from the current vintages. Each workshop aims to evaluate wines from our industry that range in quality levels. These workshops provide an opportunity to learn how to improve wines with fining or blending trials, and to evaluate flawed wines and distinguish how to identify specific off flavors, aromas, or precipitates. Most faults detected at these workshops can be remedied, however, these workshops can provide the education of how to detect and prevent these faults from developing in future vintages.

Four wineries typically host these workshops across Ohio, allowing for all parts of the state to attend a nearby workshop. At each workshop, a brief overview of the harvest season is discussed from both the Enology and Viticulture teams at OSU, and then the hosting winery gives a tour of their facility. These tours are a great way for other industry members to see their colleague's facilities and they often generate many important questions and conversations throughout the workshop.

We were pleased with the overall attendance received at near 100 people at the regional workshops representing winery owners, winemakers or cellar staff. Excellent discussions were observed at all locations with the wines driving the context of the conversations covering winery best practices and procedures in addition to some potential troubleshooting and further enhancement recommendations.

## The 2018 Post-fermentation workshops:

- Paper Moon Vineyards on December 11, 2018 with 45 wines and 25 people in attendance
- Vinberige Vineyards on December 18, 2018 with 25 wines and 16 people in attendance
- Valley Vineyards on January 8, 2019, with 33 wines and 19 people in attendance
- Laurentia Vineyard and Winery on January 22, 2019 with 32 wines and 37 people in attendance



Photo: Paper Moon Vineyards (Lisa Dunlap)



Photo: Vinberige Vineyards (Diane Kinney)



Photo: Valley Vineyards (Maria Smith)



Photo: Laurentia Vineyard and Winery (Diane Kinney)

# 2019 Ohio Grape and Wine Conference Preview

By: Dr. Maria Smith, HCS-OSU

**The annual Ohio Grape and Wine Conference is just 3 weeks away on February 18-19... here are few highlights of this year's conference program.**

### 3 Keynote speakers:

- ✓ Dr. Michela Centinari, Assistant Professor of Viticulture, The Pennsylvania State University
- ✓ Steve DiFrancesco, Head Winemaker, Glenora Wine Cellars, Dundee, NY
- ✓ Dr. James Kennedy, President, Canandaigua Concentrate and Polyphenolics, Constellation Brands



*Dr. Michela Centinari*



*Steve DiFrancesco*



*Dr. James Kennedy*

Topics covered by the 2019 OGWC will include:

Monday – Pre-conference workshop	Tuesday – Viticulture	Tuesday – Enology
<ul style="list-style-type: none"><li>✓ Ohio industry status update</li><li>✓ Best viticulture practices</li><li>✓ Ohio Quality Wine (OQW) program update</li><li>✓ Update on new grape/wine varieties and clones</li><li>✓ Developing regional grape and wine identity</li></ul>	<ul style="list-style-type: none"><li>✓ Cover crop use</li><li>✓ NEWA as a tool for IPM</li><li>✓ Canopy management</li><li>✓ Vine winter injury</li><li>✓ Mapping vineyard terroir</li><li>✓ Disease and insect management updates</li><li>✓ Weed management</li><li>✓ 2-4D drift mitigation</li></ul> <p><i>*Program provides 3.5 total hours of Pesticide Education Recertification credits (2.5 hrs commercial 2B, 1 hr commercial 2C)</i></p>	<ul style="list-style-type: none"><li>✓ Food Safety and Modernization Act (FSMA) training</li><li>✓ Department of Liquor Control updates</li><li>✓ Commercial red wine production in the East</li><li>✓ Cellar Aging</li><li>✓ Phenolic management</li><li>✓ Commercial perspectives of the 2018 vintage</li></ul>

**For registration information, visit:** <https://ohiograpeweb.cfaes.ohio-state.edu/events/2019-ohio-grape-and-wine-conference>

# GRAPE PRUNING WORKSHOPS

MONDAY, FEBRUARY 25, 2019 | 1pm to 4pm

TUESDAY, MARCH 12, 2019 | 1pm to 4pm

**Hosted by: Dr. Maria Smith, Dr. Imed Dami, and  
Diane Kinney**



The aim of this workshop is to provide experience in assessing grapevine winter injury and pruning techniques. Weather permitted, we will travel to the vineyard, so please dress appropriately. **Please feel free to bring your own canes for bud dissection and pruning shears.**

## **Locations:**

February 25 • Vines on Hillside | 25600 Hillside Dr., Quaker City, OH 43773

March 12 • OARDC-Fisher Auditorium | 1680 Madison Ave., Wooster, OH 44691

**Cost:** \$10 per person • **Details:** Fee covers refreshments and handouts

**Pre-register:** Maria Smith | [smith.12720@osu.edu](mailto:smith.12720@osu.edu) or 330-263-3825

[ohiograpeweb.cfaes.ohio-state.edu/events](http://ohiograpeweb.cfaes.ohio-state.edu/events)



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# Save-the-Date

Monday, March 25, 2019

## Ohio Agritourism Conference & Trade Show

**Location:** Maize Valley  
6193 Edison Street NE  
Hartville, Ohio 44632

**Details:** Agritourism is proving to be an successful enterprise for many farms looking to diversify their farm revenue streams. Join us to learn about the latest trends and topics impacting the industry and explore options for your farm, all while visiting a premier Ohio agritourism operation; Maize Valley = Winery, Craft Brewery, Farmers Market, and Family Fun Zone.

**Contact & Registration Information:**

Christie Welch [welch.183@osu.edu](mailto:welch.183@osu.edu) 740.289.2071 ext. 234

Charissa Gardner [gardner.1148@osu.edu](mailto:gardner.1148@osu.edu) 740.289.2071 ext. 132

[go.osu.edu/agritourismconference2019](http://go.osu.edu/agritourismconference2019)



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Name & Address	Phone	Email & Website	Area of Expertise & Assistance Provided
<b>Dr. Imed Dami, Professor &amp; Viticulture State Specialist</b> Dept. Of Horticulture & Crop Science 216 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3882	e-mail: <a href="mailto:dami.1@osu.edu">dami.1@osu.edu</a> Website: <a href="http://BuckeyeAppellation.com">Buckeye Appellation</a>	Viticulture research and statewide extension & outreach programs.
<b>Dr. Doug Doohan, Professor</b> <b>Dept. Of Horticulture &amp; Crop Science</b> <b>116 Gourley Hall – OARDC</b> <b>1680 Madison Avenue</b> <b>Wooster, OH 44691</b>	330-202-3593	Email: <a href="mailto:Doohan.1@osu.edu">Doohan.1@osu.edu</a> Website: <a href="http://OARDCWeedLab.com">OARDC Weed Lab</a>	Vineyard weeds and control. Recommendation on herbicides.
<b>Dr. Gary Gao, Small Fruit Specialist and Associate Professor</b> , OSU South Centers 1864 Shyville Rd, Piketon, OH 45661 OSU main campus, Rm 256B, Howlett Hall, 2001 Fyffe Ct Columbus, OH	740-289-2071 Ext. 123 Fax: 740-289-4591	Email: <a href="mailto:gao.2@osu.edu">gao.2@osu.edu</a> Website: <a href="http://OSUSouthCenters.com">OSU South Centers</a>	Viticulture Research and Outreach in southern Ohio
<b>Dr. Melanie Lewis Ivey, Assist. Professor</b> Dept. of Plant Pathology 224 Selby Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3849 330-465-0309	Email: <a href="mailto:ivey.14@osu.edu">ivey.14@osu.edu</a> Website: <a href="http://OSUFruitPathology.com">OSU Fruit Pathology</a>	Grape Diseases Diagnostics and Management. Recommendation on grape fungicides and biocontrols. Good Agricultural Practices and Food Safety Recommendations.
<b>Diane Kinney, Research Assistant</b> Dept. Of Horticulture & Crop Science 218 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3814	Email: <a href="mailto:kinney.63@osu.edu">kinney.63@osu.edu</a> Website: <a href="http://BuckeyeAppellation.com">Buckeye Appellation</a>	Vineyard and Lab Manager – Viticulture Program. Website manager for Buckeye Appellation website.
<b>Andrew Kirk, AARS Station Manager</b> Ashtabula Agricultural Research Station 2625 South Ridge Road Kingsville, OH 44048	440-224-0273	Email: <a href="mailto:Kirk.197@osu.edu">Kirk.197@osu.edu</a>	Viticulture Research and Outreach in northeastern Ohio.
<b>Dr. Elizabeth Long, Assist. Professor</b> OSU/OARDC Entomologist 105 Thorne Hall 1680 Madison Avenue Wooster, OH 44691	330-202-3556	Email: <a href="mailto:long.1541@osu.edu">long.1541@osu.edu</a>	Fruit and vegetable insects.
<b>Dr. Erdal Ozkan, Professor &amp; Extension State Specialist</b> Food, Agriculture & Biological Engineering Dept, OSU 590 Woody Hayes Drive Columbus, OH 43210	614-292-3006	Email: <a href="mailto:ozkan.2@osu.edu">ozkan.2@osu.edu</a>	Pesticide application technology, Sprayer calibration
<b>Patrick Pierquet, Research Associate</b> Dept. Of Horticulture & Crop Science 220 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3879	Email: <a href="mailto:Pierquet.1@osu.edu">Pierquet.1@osu.edu</a>	Wine Cellar Master Enology research, micro-vinification, sensory evaluation, and laboratory analysis
<b>Dr. Lisa Robbins Dunlap, Research Associate</b> Dept. of Horticulture & Crop Science 218 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330- 202-3543	Email: <a href="mailto:Dunlap.352@osu.edu">Dunlap.352@osu.edu</a>	Cellar assistant Enology research, sensory evaluation, and laboratory analysis
<b>Dr. Maria Smith, Viticulture Outreach Specialist</b> Dept. of Horticulture & Crop Science 205 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3825	Email: <a href="mailto:Smith.12720@osu.edu">Smith.12720@osu.edu</a> Website: <a href="http://BuckeyeAppellation.com">Buckeye Appellation</a>	Maria is the primary contact for viticulture extension and outreach. Evaluation of site suitability for vineyard establishment and all aspects of commercial grape production.
<b>Todd Steiner, Enology Program Manager &amp; Outreach Specialist</b> Dept. Of Horticulture & Crop Science 118 Gourley Hall – OARDC 1680 Madison Avenue Wooster, OH 44691	330-263-3881	Email: <a href="mailto:Steiner.4@osu.edu">Steiner.4@osu.edu</a> Website: <a href="http://BuckeyeAppellation.com">Buckeye Appellation</a>	Todd is the primary research and extension contact of the enology program. Commercial wine production, sensory evaluation, laboratory analysis/setup and winery establishment.

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