



# Northern Grapes News

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## Necessary Evil: Chemical Deacidification for High Acid Wines

Chris Gerling, Cornell University

Acid is an essential part of the wine experience, contributing necessary balance to the mouthfeel. Too much acid is a problem, since it will throw off the balance and make the wine much less enjoyable to drink. Grapes grown in cooler climates face two main challenges when it comes to acid concentration: 1) cooler growing conditions mean that the grapes will metabolize less acid and have a higher titratable acidity (TA) than those same grapes grown in a warmer place, and 2) the cultivars most suited to cold climates (especially the cold climate hybrids) are often inherently high in acid and will have a relatively high TA regardless of the season. If one or both of these factors happens to work against a producer, it will be difficult to create a balanced wine.

As part of the *Northern Grapes Project*, both microbiological and chemical means are being considered to find ways to reduce acid when necessary. The microbiological route, relying on yeast or lactic acid bacteria to consume malic acid, was covered in the January 8, 2013 webinar, "[Malolactic Fermentation](#)," by Sigrid Gertsen-Schibbye, while this article will deal with chemical deacidification.

**Acid in grapes.** Tartaric and malic acid are the two primary acids (hopefully\*) present in harvested grapes. Tartaric acid content is generally considered to be fixed, whereas malic acid is consumed as the season progresses and heat units accumulate. Those who measure a change in TA and pH as harvest approaches are most likely measuring the malic acid drop. From a winemaker's perspective, acid plays two major roles: 1) it contributes to mouthfeel, and 2) it keeps the pH low enough to discourage the growth of spoilage microbes. Tartaric acid is considered a "better" acid than malic because tartaric will keep the pH lower at the same g/L; that is, it takes less tartaric to do job #2. Tartaric acid is also easier to remove using the most common deacidification processes.

Wines that have "too much" acid due to season and/or variety almost always have disproportionately large amounts of malic acid. In these cases, a malolactic fermentation (conversion of malic acid to lactic acid by bacteria) will most likely result in an unacceptably high lactic acid content. There-

fore, deacidification methods that favor the "direct" removal of malic acid would be beneficial to cold climate producers.

**Deacidification.** Traditional chemical deacidification involves the removal of tartaric acid simply by chilling the wine, by chilling along with seeding with potassium bitartrate, and/or by adding carbonates (potassium or calcium). There are fewer options for removing malic acid chemically, however, and there is really only one traditionally used technique: the so-called "double-salt" procedure.

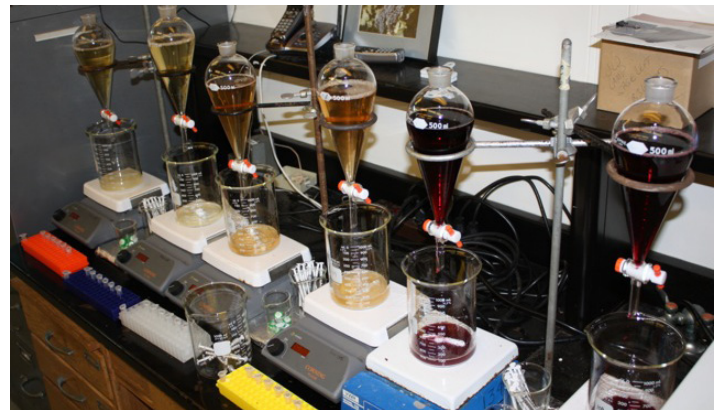
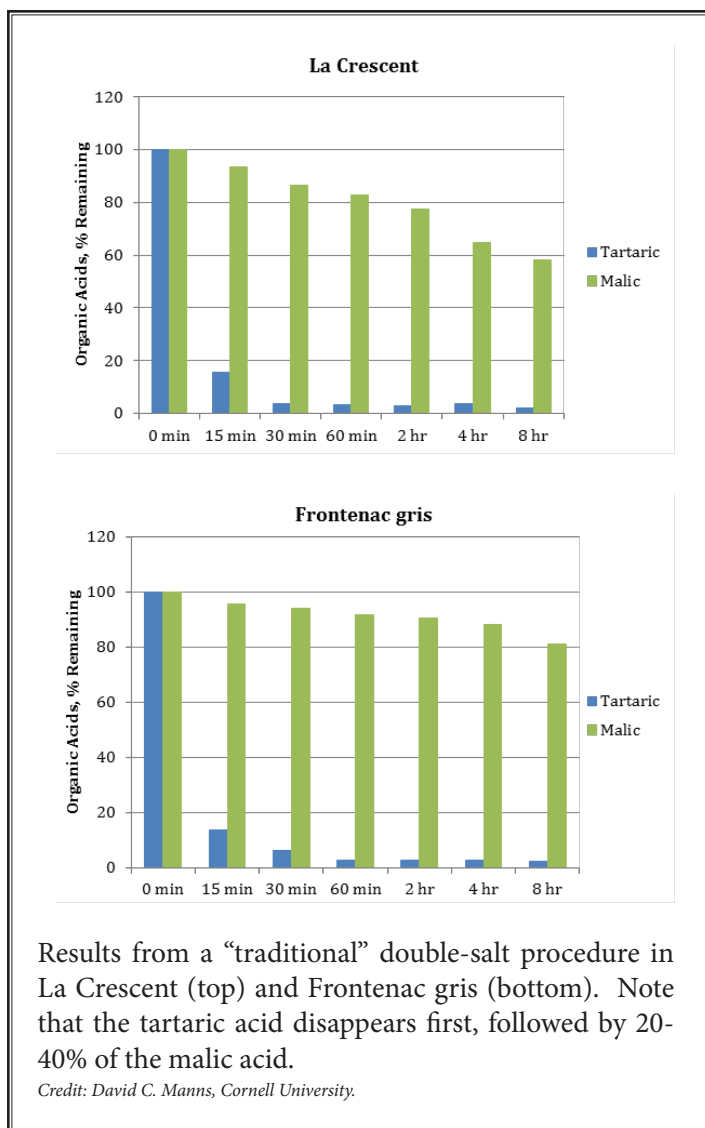


photo: Chris Gerling, Cornell University

A laboratory set-up as shown above is used to compare multiple treatments or multiple wines with one treatment. In this photo, the effectiveness of seed crystals is being evaluated in *La Crescent*, *Frontenac*, and *Frontenac gris*.

The double-salt procedure is intended to remove both acids simultaneously and quantitatively by forming a calcium malo-tartrate double salt. Crystallography has shown that this salt is not actually formed, and time-course work shows that tartaric acid is removed first, followed by a portion of the malic. While this method does remove malic acid, it doesn't appear to be a way to preferentially target it by any means. We plan to continue to look at ways to affect the solubility of malic acid salts so we can more efficiently remove them.

**Current research.** Our work on the cold-hardy cultivars has so far focused on repeating what we think of as the "traditional" double salt method, i.e. what winemakers are actually able to do in their cellars, and investigating the



basic procedures to see how much they affect the process. For example, the method calls for adding the liquid to be deacidified to the carbonate powder (as opposed to vice versa). This order might increase the pH at the beginning, favoring the removal of malic acid. We are also looking at the importance of using seed crystals (calcium malate), which can make reactions happen more quickly and easily by providing a site for the larger crystals to “grow.” Potassium bitartrate is used in cold stabilization for just this purpose.

We are also comparing the relative efficacy of the treatment in juice vs. wine. We have found some differences to date, but still nothing that favors the removal of malic acid over tartaric. There are a few reasons for this, but the primary one seems to be solubility. In most every circumstance in which we place the system, tartaric acid is less soluble than malic, meaning it will precipitate more readily. Further work is planned to try and reduce the solubility of malic acid relative to tartaric in a juice/ wine matrix.

For those who struggle with high acidity, there are plenty of winemaking options aside from chemical treatments. Along with the aforementioned malolactic fermentation, which will replace malic acid with the weaker lactic, there are also other approaches. Keeping in mind that acid is part of the wine balance equation, one way to counter higher perceived acidity is to increase other parameters, such as sweetness. The classic way of explaining this idea is lemonade. Adding sugar to lemon juice makes it much more palatable. We haven’t actually lowered the acid, however — we’ve just changed the perception. More sugar, therefore, won’t necessarily result in a sweet wine. The name of the game is balance.

*\* Acetic acid, if present in large quantities, indicates rot/ spoilage problems.*

## The National Clean Plant Network for Grapes – What is it doing for you?

R. Keith Striegler, Outreach Coordinator, National Clean Plant Network, Flint Ridge Wine Growing Services;  
Sue T. Sim, NCPN-Grapes Coordinator, Staff Research Associate, Foundation Plant Services, University of California, Davis;  
Deborah A. Golino, NCPN-Grapes Chair, Director, Foundation Plant Services, University of California, Davis

Healthy planting stock is key to the cost-effective production of horticultural crops such as tree fruits, berries, and grapes. Growers must have healthy planting stock if U.S. agriculture is to remain internationally competitive and economically viable. The most efficient approach to producing healthy planting stock is through programs which screen new and existing cultivars for viruses and other diseases that can be spread via contaminated plant stock. Quarantine services provided by clean stock programs reduce the chance of introduction of exotic pests that can be difficult and costly to control.

**The risks.** Grapevines are susceptible to >30 viral pathogens that can reduce productivity and longevity of a vineyard. Established grape production regions are riddled with

examples of infected vines unintentionally spread through infected propagation wood (see box at the end of the article). Once infected, there is no cure, and infected vines can serve as a source for infecting clean vines, through insects and nematodes that feed on infected vines. So keeping the pathogens out by starting with virus-tested clean planting stock is the key to limiting spread of these pathogens.

**Producing and maintaining clean planting stock.** It takes many years to establish the healthy live plant collections that are the core of clean stock programs. Clean planting stock programs use disease detection, pathogen elimination techniques, and isolation strategies to produce, maintain, and propagate healthy planting stock. Clean stock programs have



historically been located at land grant universities because of available expertise. As interest in agricultural sciences at land grant universities declines and agricultural faculty members retire, the ability to produce adequate supplies of clean planting stock in the US for several key horticultural crops has been in jeopardy due to lack of funding.



photo: Tim Martinson

*The photo above shows a nursery field in Minnesota which has recently been planted with cuttings.*

The technology used to create healthy planting stock is becoming faster, more accurate, and more expensive. U.S. clean plant programs must use state-of-the-art technology to ensure that producers stay competitive in the global market. Program continuity is critical because these collections must be continually protected from infection, monitored for disease, farmed, and documented. It would take decades of work to recover from disruptions in funding for a single year because of the risk to these collections.

**National Clean Plant Network-Grapes.** Therefore, the National Clean Plant Network (NCPN) was established as part of the 2008 Farm Bill. The NCPN's mission is to provide high quality asexually propagated plant material free of targeted plant pathogens and pests that cause economic loss to protect the environment and ensure the global competitiveness of specialty crop producers. Currently, the NCPN serves the berry, citrus, hops, grape and tree fruit industries. NCPN-Grapes was established at an organizational meeting in 2008 at Davis, CA and is an association of clean plant centers, scientists, educators, state and federal regulators, and nurseries and growers from the wine, table, raisin and juice grape industry concerned with the health of grapevine budwood and rootstock. The network operates under the umbrella of the United States Department of Agriculture (USDA). NCPN-Grapes centers are located at University of California-Davis, Washington State University, Cornell University, Missouri State University, and Florida A&M University. Additional extension efforts are being conducted by Texas A&M University. The headquarters for the NCPN-Grapes is at Foundation Plant Services at the University of California, Davis.

Funding to support the NCPN-Grapes has been approximately \$7.981 million from 2008-2012. Funding supports centers with the expertise, facilities, and desirable climates to efficiently produce, maintain, and distribute healthy planting stock for those crops.

NCPN-Grapes works to maintain high-quality plant material by:

- Providing clean, tested propagation material to grapevine nurseries and growers throughout the United States and the world.
- Rigorously testing vines for viruses and other graft-transmissible agents (GTAs) for at least two years using testing standards that are stricter than state and federal requirements.
- Importing and quarantining new grape cultivars and selections from overseas to reduce the risk of bringing in pests and diseases that can be difficult and costly to control.
- Eliminating viruses and other GTAs using microshoot tip culture.
- Developing state of the art techniques for detecting pathogens.
- Developing education/outreach materials and economic studies and delivering them to stakeholders.
- Establishing and maintaining extensive foundation vineyards with regular disease monitoring. Foundation vineyards are those which contain plants which have tested negative in the most extensive battery of virus tests available and are then maintained in isolation to prevent re-infection.



*Waclawa Pudlo, Staff Research Associate at Foundation Plant Services, performs microshoot tip culture.*

**New standards.** In 2009, work began on development of a new, much more rigorous standard for grapevine foundation material in the United States. The standard is known as the "2010 protocol" and cultivars meeting this standard have become known as "2010 protocol vines" by industry personnel. To qualify for the 2010 Protocol standards, grapevines must be generated using microshoot tip tissue culture techniques

and test negative for an extensive list of over 30 pathogens. Details on the 2010 Protocol can be accessed at <http://fps.ucdavis.edu/WebSitePDFs/Protocols/Protocol%202010.pdf>.

**Foundation Blocks.** In 2011, a new grape foundation planting consisting of vines that met the 2010 Protocol standards was established by FPS at UC Davis on the Russell Ranch property. As of fall, 2012, there are 224 selections planted; more are being planted each year. Additional foundation blocks are located at the Northwest Grape Foundation Service at Prosser (over 280 selections of wine, juice, table grape, and rootstock) and Missouri State University. The foundation vineyard at Missouri State University maintains cultivars important for Midwestern growers.

At the request of nurseries, growers, and viticulture extension specialists, 44 cultivars of interest to the Midwestern, Eastern, and Texas industries are being cleaned up and will be included in the Russell Ranch planting. Furthermore, all new cultivars released from the grape breeding programs at the University of Minnesota and Cornell University are being cleaned up prior to release and will also be included in the Russell Ranch planting. Availability of pathogen tested cultivars and status of cultivars “in the pipeline” can be found at the National Grape Registry (<http://ngr.ucdavis.edu>).

Further information on NCPN-Grapes can be found at <http://NCPNGrapes.org>.

## Leafroll & Tomato Ringspot Viruses Detected on Frontenac in New York

Tim Martinson, Cornell University

The threat of virus diseases to cold-hardy grape producers is not just a theoretical one. Cornell virologist Marc Fuchs and I have already confirmed the presence of tomato ringspot virus and grapevine leafroll-associated virus 1 (GLRV-1) in vineyards here in New York. I spotted vines with symptoms leafroll (Fig. 1) and tomato ringspot virus (Fig. 2) on Frontenac in two different vineyards. Dr. Fuchs followed up with laboratory tests that confirmed the presence of GLRV-1 and tomato ringspot.

Both viruses reduce the amount of fruit and delay ripening, and once infected, vines remain infected for life. The only cure is to replace infected vines with healthy ones.

**New cultivars, new opportunity.** Because both the Northern Grape varieties and areas where they are planted are new to viticulture, growers and nurseries have a unique opportunity to limit the spread of these pathogens before they become widespread. Doing so will require a concerted effort by nurseries and growers alike to 1) identify symptoms of leafroll and tomato ringspot in existing plantings, 2) avoid collecting propagation wood from infected vines, and 3) promptly mark, remove and replace vines showing symptoms of these diseases.

### Further reading:

- Schilder, A. Tomato/tobacco ringspot virus decline, Michigan State University. <http://www.grapes.msu.edu/ringspot.htm>
- Fuchs, M. Grape Leafroll Disease – Grapevine Leafroll-Associated Viruses. NYS IPM Grape Disease Factsheet, Cornell University. [http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape\\_leafroll.pdf](http://www.nysipm.cornell.edu/factsheets/grapes/diseases/grape_leafroll.pdf)



photos: Tim Martinson, Cornell University

**Figure 1.** Leafroll virus on 'Frontenac'. Yellow, cupped leaves (top) in the fall are symptoms, and infected vines show delayed ripening and reduced fruit set (bottom).



photos: Tim Martinson, Cornell University

**Figure 2.** Young Frontenac vine with tomato ringspot virus. Basal leaves turn golden/yellow after veraison, and infected shoots are often stunted and 'zig zag' like.



# NGP Team Profile: Paul Domoto



*Paul is a Professor in the Department of Horticulture at Iowa State University. He conducts research in viticulture and pomology and serves as the state-wide extension specialist for fruit crops. Paul leads the Northern Grapes Project viticulture studies team and evaluates cold climate cultivar performance by conducting on-farm research and demonstration studies on training systems, canopy management and crop load management.*

## **1. How did you find your way into fruit horticulture and viticulture?**

I grew up on a vineyard near Sanger, California, a small farming community east of Fresno. My father grew Thompson Seedless and Palomino grapes for wine, and my uncles grew stone fruits and oranges. I helped my father whenever needed and got paid working for my uncles. When I started college at Fresno State, I had the option to study either pomology or viticulture, but when the majority of the in-coming students chose viticulture, I opted for pomology. As an undergrad, I spent three summers working as a fieldman for a shipping fruit packinghouse that specialized in nectarines, peaches, plums and table grapes.

## **2. For a good part of your career at Iowa State, you primarily focused on tree fruits. When and why did you start working on grapes?**

I was originally hired to teach and conduct research in tree fruits and with apples being the only commercial crop being grown in the state, it allowed me to concentrate on a single crop. Over time my position has evolved from teaching and research, to research on tree fruits and extension for all fruits, and finally to include grape research.

When I joined the faculty in 1974, grapes were a very minor crop being grown in the state, but at one time Iowa was a major producer of grapes. However, with the development of 2,4-D, advances in agronomic crop production, and programs to take land out of production, grape production dwindled to about 30 acres. In 1999, three winemakers obtained a block grant to conduct seminars to promote growing grapes. Those seminars attracted large audiences and caught the attention of the State Secretary of Agriculture who formed a Wine and Grape Advisory Council to which Dr. Gail Nonnecke and I were appointed. The advisory council met in 2000 with one of the charges being to develop strategies for assistance to growers through research and outreach. In 2001, we conducted the first ISU Extension sponsored grape growing workshop, helped form Iowa Wine Growers Association and launched the ISU Viticulture Home Page.

In 2002, we established a grape cultivar by management system trial at two sites, and a winegrape cultivar trial at four sites in 2003. That led to participation in the NE-1020 "Multi-state Evaluation of Winegrape Cultivars and Clones" project and the establishment of a NE-1020 cold hardy wine grape cultivar evaluation in 2008, and finally the *Northern Grapes Project* when Tim and Murli held their first planning meeting in Ames.

## **3. What do you enjoy most about working with the relatively new grape and wine industry in Iowa?**

The people I have met and the enthusiasm exhibited by both growers and winemakers in working to succeed and improve their product.

## **4. What are some of the biggest challenges to growing grapes in Iowa?**

The two biggest challenges are coping with the weather and our soils. We can grow cold-hardy northern hybrids that can withstand winter temperatures below -25 °F, but it is often the early fall frost that causes just as much injury as a mid-winter low, particularly on our fertile soils. Also, some of our northern hybrids, such as La Crescent and Marquette, break bud very early, and I have observed vines that have suffered severe injury to the spurs and trunks when temperatures drop into the 20's following bud break.

## **5. In your opinion, what is the most exciting research-based information that will come out of the Northern Grapes Project?**

We can characterize our northern hybrids as being vigorous vines whose fruit retain high levels of acid and experience a rapid rise in pH during maturation, and the wines made from them often have herbaceous characters. These same characteristics have been associated with fruit from overly shaded canopies or over-cropping. As a viticulturist, I'm excited to find out if we can cost-effectively improve fruit and winemaking quality through cultural practices that include training systems to disperse vine vigor, canopy management practices and managing the crop load. Though the efforts of our viticulture and winemaking teams, I am confident that we will see improvements in wines made from our northern hybrid cultivars.

# NGP Team Profile: Murli Dharmadhikari



*Murli is the Director of the Midwest Grape and Wine Industry Institute at Iowa State University. His experience in the midwest grape and wine industry spans 35 years. Murli will help to benefit the Northern Grapes Project through research on organic acids, phenolics and flavor profiles of cold hardy grapes and development of a wine quality certification program.*

## **1. You indicated that when you were in graduate school, your studies focused on viticulture more than enology. How did your career in enology begin?**

I was interested in grape nutrition, but during my post graduate years, Ohio State University started a grape and wine program. While doing grape research, I travelled to many vineyards and wineries in Ohio and had some good contacts with winemakers. I became interested in winemaking but my main focus was research. My enology career began when I was offered a job as winemaker at Golden Rain Tree Winery in St. Wendel, Indiana. I accepted the position with the idea of gaining practical experience in making wine, in case someday I would want to start a winery in India. At the time I thought of working for few years and then returning to India. The work at Golden Rain Tree

winery was a pleasant and a rewarding experience. I got involved in planting vineyards and made various types and styles of table wines from Native American as well as French Hybrid grapes.

## **2. After you left Golden Rain Tree Winery, you took a job as Enology Advisor at Missouri State University (formerly Southwest Missouri State University). What made you decide to transition from industry to academia?**

Even though I was doing well as a winemaker I felt that I could professionally contribute more in the area of wine research and education. Such an opportunity came to me when the Missouri wine industry approached me with a potential job that would allow me to do research and outreach education. I applied for the position and was hired. As an enology advisor I was involved in various activities such as publishing an industry newsletter, conducting workshops and short courses, establishing a wine analytical laboratory, and evaluating cultivars for adaptation to Missouri. In 2003, the Mid-America Viticulture and Enology Center was created and I was appointed as director. In this capacity, I developed a strategic plan for the Mid America wine region, determined research and education needs, and recruited key personnel. I also established a commercial winery and a commercial distillery on campus to provide workforce training as a part of a National Science Foundation (NSF) grant, which started the Viticulture and Enology Science and Technology Alliance (VESTA) program

## **3. You were very involved with developing and initiating the VESTA program. How do you think VESTA has benefited and will continue to benefit the cold-climate grape industry?**

During my visit to a research and industry meeting in Australia, I became aware of the of the online education program offered by many Australian institutions to their wine industry. When the grant opportunity from NSF came to my attention, I developed a proposal for online grape and

wine education in collaboration with community colleges in Illinois, Iowa and Missouri. The proposal was funded and we initiated arrangements with Charles Sturt University in Australia as a model for the VESTA program. As a part of VESTA, we offered wine production courses and workshops in several states in the region. Later on, VESTA was expanded to a regional and now national level.

As national center, VESTA is in a position to address the educational needs of the cold climate grape and wine industry. With the introduction of cold hardy grapes, a new wine industry has emerged in the past decade and it has a great potential to grow in future. One of the constraints to the growth and sustainability is the shortage of skilled workforce. The VESTA program is offering many wineries in the cold climate region the opportunity to educate/train their work force.

## **4. In your positions at Missouri State University and Iowa State University, you've played a big role in establishing the grape and wine industries in those states. What have you enjoyed most about that aspect your career?**

I enjoy working with people and have been fortunate to build the core research and outreach program to provide research-based information to the newly emerging Midwest wine industry. In this area of the US, many wineries are small-scale family operations, and the owners work very hard to make a living through growing grapes and making wines. I admire the entrepreneurial spirit of these individuals. I feel rewarded and happy when I see them grow and prosper in their business. I must note that whatever I was able to achieve was largely due to the help of many of my colleagues. This was also an enjoyable part of my work.

**5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?**

I am keenly interested in research findings that will enable us to develop a type and style of red table wine that can be considered a signature red wine of the cold climate region. Making red wine from these cold hardy grapes is challenging because their fruit composition is very different than vinifera varieties. At ripening they have high acidity, high pH, high malate levels, low tannin content and a different pigment profile. I hope that the enology research trials will generate new information that will allow us to produce high quality red wines from cold hardy grapes.

## Herbicide Drift in the News

*Northern Grapes Project* Advisory Council Member Tom Zumpfe, who owns Dove Landing Vineyard in Lincoln, Nebraska, is passionate about herbicide drift, and with good reason. For the past two years, his vineyard has been damaged due to drift from nearby 2,4-D applications. Recently, Grant Gerlock, a reporter for Harvest Public Media (Nebraska Public Radio) visited Dove Landing to report on Tom's story. Click here to read and listen: <http://tinyurl.com/HerbDrift>

## 2012 Michigan Wine Tasting Room Research - A Series Issue #1, Wine Tasting Room Visitors' Behaviors and Visit History

Don Holecek and Dan McCole, Michigan State University

An understanding of one's customers is an important step in developing, pricing, positioning and promoting any successful product or service. It is also critical in selecting the location where the product or service will be offered if the intent is to have a "brick and mortar" store. Since the majority of smaller wineries rely on tasting room sales, it behooves them to understand their frequent customers. As nearly all wineries that sell cold-hardy wines are relatively small, marketing experts on the *Northern Grapes Project* team designed a study to gain insights about tasting room visitors. Given that the acreage of cold-hardy grapes and volume of wine produced is small, we assumed that the initial success of producers of these wines would rely heavily on how well they served the customers in their tasting rooms.

**Study Design.** We decided that a good way to study tasting room visitors' behaviors was to survey them. Given cost and logistical considerations, the survey was limited to Michigan. Connecting with prospective interview subjects at tasting rooms was deemed more cost-effective than other options. Due to budget constraints, we could not travel statewide to conduct interviews in person. So, we recruited a good geographic distribution of wineries to make the initial contact with subjects who we interviewed by mail or online.

About 70% of the wineries that operated tasting rooms in Michigan were contacted in February 2012 to query them about what they would like to know about their customers and potential customers, and to recruit potential research partners. About half of those contacted indicated willingness to serve as our research partners by engaging subjects in their tasting rooms. We selected 15 of these wineries as research partners since they provided adequate geographic coverage and we deemed that number of wineries to be manageable within our resource constraints.

Through the late winter and spring of 2012, we developed questionnaires and made orientation visits to each of our 15 tasting room research partners. Over the summer and early fall of 2012, 1,552 questionnaires were gathered by U.S. mail and email. Overall response rate was about 40%. This large set of completed questionnaires is an especially extensive data set to explore a multitude of questions about Michigan tasting room visitors. This report is the first in a planned series to be published in the *Northern Grapes News* that will review the survey results of the topics deemed to be of priority interest to tasting room operators.

**Visitors Tasting Room History.** Only 8.5% of respondents reported that this was their first visit to a winery. Another 30.8% had made more than 21 visits during their lifetime. Thus, these tasting room visitors have accumulated a relatively modest range of tasting room experiences. Another measure of the level of visitors' tasting room experience is indicated by the year they made their first visit to a tasting room. Over 85% of respondents indicated that they had visited a tasting room prior to 2010; 40% made their first visit prior to 2000. It appears that the majority of tasting room visitors captured in this study has long been familiar with the tasting room product but are not heavy consumers of it. Further support for this conclusion surfaces from respondents' reported mean (5.7 trips) and median (3.0 trips) wine tasting trips over the past five years.

Given this wide range of visitors' experience with tasting rooms, creating a tasting room presentation that fits "all comers" is problematic. The best option would be to create alternative presentations (one for first time visitors, another for tasting room "experts," etc.) that can be delivered once the visitors' level of experience is determined.



The average tasting room customer isn't a frequent visitor and won't be the winery's most profitable consumer. The more profitable patrons will be found among the approximately one third who are the most experienced and most frequent visitors. Among the most serious of these are those who have visited a tasting room outside the US, which accounted for almost 25% of respondents in this study. Italy, France and Germany were the most frequented non-US tasting room venues. We believe that tasting room staff could be trained to use a couple of screening questions to identify prime (i.e., most profitable) visitors to receive extra special attention.

**Visitors' Tasting Behaviors.** Tasting room fees was an issue that surfaced in talks with Michigan winery owners and managers prior to developing study questionnaires. About 30% of the respondents reported that they do typically avoid tasting rooms that charge a fee, so there is some basis for the industry's concern about charging a fee. A number of respondents suggested that they would find tasting fees more acceptable if it were rebated to those who make a purchase.

When looking at the reasons customers chose to visit tasting rooms, respondents assigned the highest rankings to "wine-related" activities available at a winery (i.e. wine tasting, learning about and purchasing wine), as one would expect. And, "wine tasting" was by far the most dominant activity pursued at wineries. However, these wine-related activities were less often reported to be the primary purpose of visits to wineries. In fact, experience-related activities (i.e., socializing, relaxing, engaging in a unique experience) were cited more than twice as often (60% vs. 30%) as were wine-related activities as the primary purpose of the visit (see table).

Clearly, simply offering visitors quality wines is only part (and arguably a smaller part) of meeting tasting room visitors' expectations. This finding leads to the conclusion that the most successful tasting room operations will include offering "quality wines" (wide ranging tastes result in similar wide ranging perceptions of what constitutes quality) and a wide range of experience enhancements (friendly staff, fast and professional service, attractive facility, etc.)

## Reported Primary Purpose of Visit to the Winery

Visit purpose	% of respondents
Purchase wine	21.4
Meet the winemaker	1.1
Learn about wine	7.5
<b>Subtotal of wine-related activities</b>	<b>30.0</b>
Socialize with friends	20.3
Have a relaxing day	27.9
Have a unique experience	11.8
<b>Subtotal of experience-related activities</b>	<b>60.0</b>
<b>Misc. other</b>	<b>10.0</b>
<b>Total</b>	<b>100.0</b>

In conclusion, in another subproject in New York under the *Northern Grapes Project* umbrella, Miguel Gomez and Erin Kelly of Cornell University reported that there is a positive relationship between the level of visitors' satisfaction with their tasting room experience and the quantity of wine purchased on their visits. The results from our Michigan study imply that visitor satisfaction is linked to attributes beyond those that are wine-related and suggests that screening visitors to assess their level of tasting room experience would help to better target presentations by the tasting room staff. A tailored presentation would hold customers' attention, enhance their overall experience, and encourage them to purchase more wine



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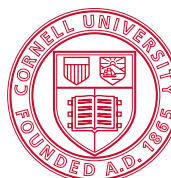
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