



# Northern Grapes News

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## Using Enological Tannin Additions to Enhance Red Wine Structure and Mouthfeel

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Tannins are important to the quality of red wines, particularly to the color stability and the structure (body and mouthfeel) of the wine. They are also involved in complex wine aging reactions and thus are important to the aging potential of red wines. The source of tannins in wine is numerous, as they can come from the grapes themselves (skin, seeds, and stems) and/or the barrels the wines are aged in. Tannins and their extraction, and proper integration, are essential to making a premium red wine.

**Enological tannins.** Typically, cold-hardy cultivars have low tannin levels even when enological techniques and practices are used to maximize tannin extraction. Thus, winemakers may still fall short of making premium fuller-body red wines with color stability and long aging potential. Enological tannins are “commercial tannins produced by extraction of tannin from oak, chestnut, or birch woods and other suitable plant sources, including grape seeds.” [Jancis Robinson, *The Oxford Companion to Wine*]. These powders can be added as treatments during the winemaking process, and have become a popular way to increase tannin levels in wine.

This study was undertaken to evaluate the effects of tannin additions on the phenolic composition and mouthfeel improvements of Marquette and Frontenac wines.

**Enological Tannin Additions.** As part of the *Northern Grapes Project*, the Midwest Grape and Wine Industry Institute conducted enological tannin addition trials in Marquette and Frontenac wines. Tassel Ridge Winery (Oskaloosa, IA) graciously provided grapes and space for the experiments. We investigated five tannin treatments (T1-T5) using four different commercial tannin products, added alone and in combination, at different times and in varying amounts (Table 1). Treatments were compared to the control (T6). The four tannins used fall into the categories of fermentation (FT Rouge Soft and Uva'Tan Soft), cellaring (Tannin Estate and Uva'Tan Soft), and finishing (Tannin Riche) tannins, which refers to when the tannin additions are made during the winemaking process.

**Results: Wine Chemistry.** The tannin additions do not appear to have an effect on pH, titratable acidity, volatile acidity, residual sugars, and alcohol between treatments for each wine type. These results indicate that enological tannin additions have little to no effect on yeast performance and the basic chemical properties of the wines.

**Results: Phenolic Profile.** Wines were analyzed for phenolic content after six and nine months of aging. At six months, the main results observed between the control and the various tannin addition treatments in Marquette and Frontenac were an overall increase in the concentration of tannins compared to the control (Figure 1). As expected, those wines that received the highest concentration of tannin additions (T1 and T5) had the greatest concentration of quantifiable tannins. The other difference in the phenolic profile of these wines can be observed by measuring the total anthocyanin concentration (Figure 2). Statistical analysis of this data (one-way ANOVA) revealed that in young Marquette wines (6 months), there was no statistically significant difference in tannin or anthocyanin content between the treatments.

Jessamy Adams, left, and Tammi Martin of the Midwest Grape and Wine Industry Institute at Iowa State University assist with the tannin addition trials, which were conducted at Tassel Ridge Winery.



photo: Jennie Savits, Iowa State

Even though the difference observed between the raw numbers was not mathematically significant, it could still affect the sensory characteristics of the wines. There was no increase in anthocyanin levels in the young Frontenac wine.

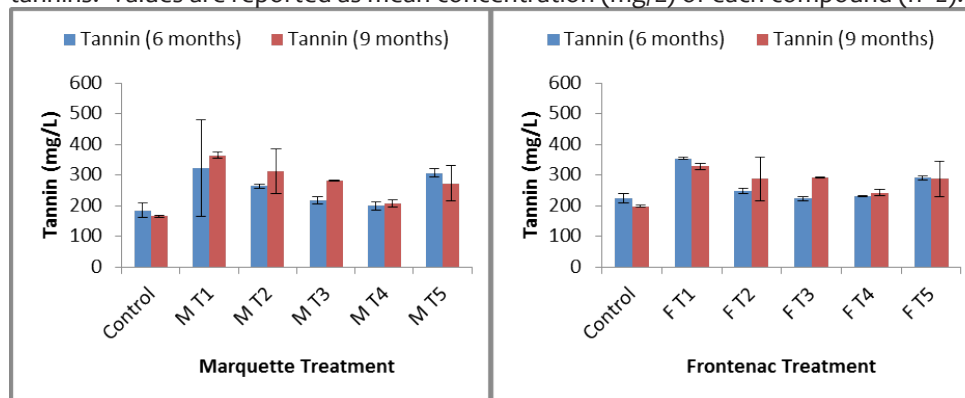
The phenolic profile was measured again after nine months of aging. Compared to the samples taken at six months, a similar trend in the phenolic profiles was observed for tannins and total anthocyanin concentration (Figures 1 and 2). At nine months, a significant difference in the tannin levels was observed between treatments for the Marquette wine ( $p > 0.05$ ). This may indicate that the tannin levels are increasing with age depending on the treatment, as observed in treatments M T1, M T2, M T3, and M T4 (Figure 1). The decrease in total anthocyanins, in both Frontenac and Marquette, observed at nine months may be a result of the formation of complexes with other phenolic compounds or oxidation reactions.

**Results: Industry Evaluation.** The young Marquette wines underwent sensory evaluation to determine the effects of tannin additions on body (thin to full) and mouthfeel (harsh to soft). The panelist were untrained industry members who rated the wines on a scale of 1-5 (1 being thin and 5 being full; 1 being harsh and 5 being soft). The overall trend of the sensory analysis showed that for all treatments the tannin additions lead to a fuller body wine (Figure 3). However, due to lack of aging and integration of the tannins, all of the treated wines were rated as harsher than the control. It is expected that this effect should soften with time. We will be taking another phenolic profile measurement at 18 months and performing another industry tasting to verify these results. In terms of preference, the industry panel preferred treatment 4 (Tannin Riche) to the control and the other treatments. Tannin Riche is derived from 100% toasted French oak.

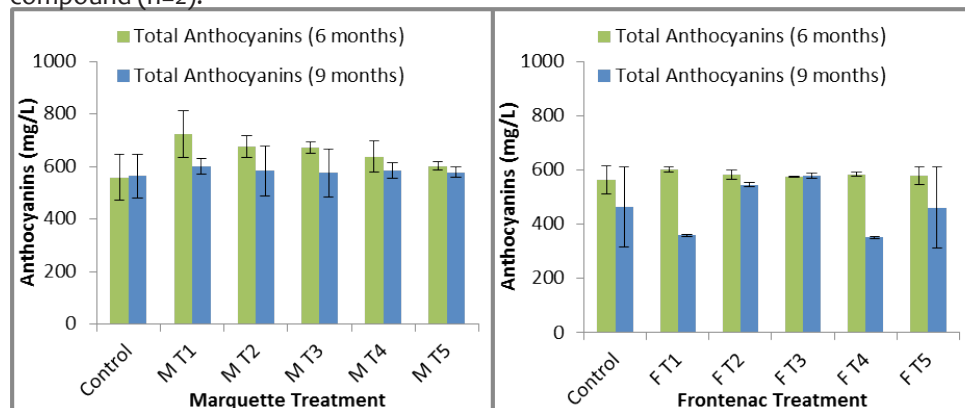
**Table 1.** Enological tannin additions, treatments, and timing.

Treatment	Tannin Type	Concentration (mg/L)	Timing of addition
<b>T1</b>	FT Rouge Soft	1200	beginning of fermentation
<b>T2</b>	a. Uva'Tan Soft	400	beginning of fermentation
	b. second dose	400	after first racking
<b>T3</b>	Tannin Estate	400	after first racking
<b>T4</b>	Tannin Riche	400	after second racking
<b>T5</b>	a. FT Rouge Soft	600	beginning of fermentation
	b. Uva'Tan Soft	200	beginning of fermentation
	c. Tannin Riche	200	after second racking
<b>T6</b>	No tannin addition (control treatment)		

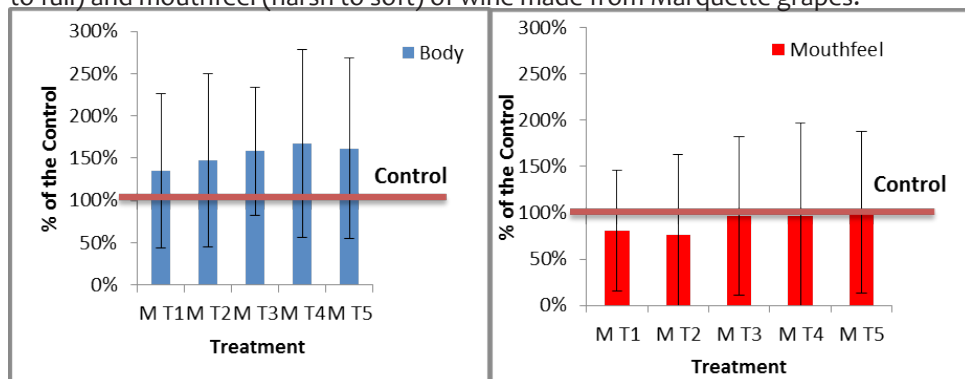
**Figure 1.** Tannins in young (6 months) and aged (9 months) wines treated with enological tannins. Values are reported as mean concentration (mg/L) of each compound (n=2).



**Figure 2.** Total anthocyanins in young (6 months) and aged (9 months) wines treated with enological tannins. Values are reported as mean concentration (mg/L) of each compound (n=2).



**Figure 3.** The effect of enological tannin additions on sensory perception of body (thin to full) and mouthfeel (harsh to soft) of wine made from Marquette grapes.



*Members of the Iowa wine industry participate in a tasting and evaluation of Marquette wines treated with enological tannins at the annual Iowa Wine Growers Association meeting in March 2013.*



photo: Tammi Martin, Iowa State

**Conclusions:** In our tannin trials, the addition of enological tannins at different levels and times during the fermentation in Marquette and Frontenac wines was evaluated. Phenolic profiles for all treatments showed slight variations in the levels of tannins and total anthocyanins. The wine's chemical properties (alcohol, pH, titratable acidity, volatile acidity and total SO<sub>2</sub>) were not impacted by the additions, indicating they have little if any effect on the fermentation kinetics. An industry tasting of treated Marquette wines indicated that the additions for all treatments resulted in a fuller bodied wine. If a winemaker wishes to employ enological tannin additions to make premium red wines, they should work closely with the supplier to determine which type or combination of tannins and the timing of the additions that will work best for their application.

## NGP Team Profile: Anne Fennell



*Anne is a Professor in the Department of Plant Science at South Dakota State University. She has worked with the physiology, cold hardiness and functional genomic analyses of cold climate grapevines since 1992. Anne's research for the Northern Grapes Project is to conduct a molecular analysis of the berry development and ripening process.*

### **1. When did you first develop an interest in horticulture?**

I grew up on a small mixed crop farm (quarter section) in southwestern Iowa. I picked grapes and apples for a local orchard during high school, starting fresh and speedy in the morning and tired when it came to lifting the crates up to the truck. The grapes, predominately Concord, went to Council Bluffs Grape Growers Association cooperative winery and juice processing facility. At that time, it was the last grape processing unit still open in Iowa (outside of the Amana Colonies). When I was filling out the application for Iowa State University my older brother told me that if I really liked plants I should take Horticulture. He said that Introduction to Horticulture was the best class he took in his first year. I wrote Horticulture on the line; Ed was right and here I am.

### **2. You first conducted research on grapes as an undergraduate student at Iowa State University. Can you tell us a little bit about this project?**

I worked for Dr. Denisen, the fruit breeder (strawberries), at Iowa State University. Dr. Denisen also had a wine grape cultivar planting and talked to me about the decline in the grape industry because of 2,4-D. In the early 1900s, Iowa ranked sixth in the nation in grape production. The western bluffs, where I grew up, were the major production area. Increasing corn production and 2,4-D herbicide use in the 1940's resulted in a decline in grape production. This interested me as I could see the differences in 2,4-D damage among the cultivars in the vineyard, tomatoes and box elder trees. I needed a thesis project for my undergraduate Honors Program and decided to look for differences in grape leaf characteristics (cuticle and stomata arrangement), that might contribute to the differential responses. It was a self-guided/funded project. I discovered a cryomicrotome in the

food science lab and realized I wouldn't have to fix my tissue but could go right from field to sectioning. Dr. Brown, Food Science professor, told me to go right ahead and use it, thus he became my project advisor. While working on grapevine cold hardiness with Dr. Emily Hoover at University of Minnesota, we published the survey: "2,4-D damage in grapes" in *Vinifera Wine Growers Journal* (1987 14:84 – 89).

### **3. Your position at South Dakota State is quite unique, in that it allows you to do both applied and basic research projects. What do you like most about this, and does it present any unique challenges?**

I am able to work across traditional boundaries and I like the synergism between the applied and basic projects. Having applied projects keeps me in contact with the vineyards environment and production problems. My location and my interest played a role in my project structure. When I started at SDSU, although not having an extension appointment, I



was the go to person for fruit grower questions. I could not just hide in the lab; I needed to be able to change hats and the field projects helped keep me in touch. I like being able to see the genetics at work in the field and in the lab while I am trying to understand molecular pathways that promote winter survival and greater freezing tolerance. I go to meetings and mingle with grower or extension professionals and meetings where there are only genetics and genomics researchers. I have two different homes so to speak. The greatest challenge is maintaining focus and a funding balance, as the intertwining of these projects definitely contributes to my project success.

**4. When you first started at South Dakota State, you also worked with apples and raspberries. Why and how did you decide to focus on grapes?**

Grapevines have haunted my whole life. *V. riparia* is part of my sensory memory. I grew up picking and eating the wild grapes (*V. riparia*) for jam, jelly and syrup and climbed the vines down by our creek. They are a fascinating and beautiful plant, a perfect example of sound plant development, tuned

for risk management. These plants are engineered to grow: a prompt lateral and every bud with multiple shoot meristems. Tendrils so it is not essential to develop extensive woody architecture – more energy for fruit. The plasticity of growth provides the basis for architectural diversity in training systems. They are just plain cool from a developmental biology perspective. Oh yes, they produce fruit also.

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

What is exciting is that this project is truly a systems biology approach. We are providing information on emerging cold climate cultivars that it has taken years to develop for other major wine grapes. The coordination between teams provides vine nutrition, fruit sensory information, wine development and fruit chemistry/metabolite analyses that are connected to the cultivar's genetics. It is a project that will keep on giving as information on signature characters can be used to feed back into breeding programs or as potential biomarkers for bench marking cultural practices.

## NGP Team Profile: Rhoda Burrows



*Rhoda is a Professor and Horticulture Extension Specialist at South Dakota State University, working with both commercial fruit and vegetable growers and homeowners throughout the state. Her role in the project is to help facilitate on-farm research, particularly in the area of mineral nutrition and soil management. She will also help to convey the viticulture knowledge that is gained through the Northern Grapes Project to growers and educators throughout the state.*

**1. As an extension specialist with responsibilities in fruit and vegetable production, your scope is extremely broad. What are some of your other current projects besides the Northern Grapes Project?**

I also work with food safety education for fruit and vegetable growers, high tunnel production, training for beginning vegetable growers, and local foods issues.

**2. You are in the process of creating an on-line learner's group for South Dakota grape growers. Can you tell us more about it?**

We're using our University online course software to serve as a home for discussing topics, sharing links and files, hosting web-meetings, etc. The goal is to have an interactive networking among growers that will allow them to discuss real-time production issues and seek answers. My role is to keep the site active, provide resources, and guide them to pertinent research and expertise. We're just getting going, but it's already fun to see some of the interaction between growers. Some of our first discussions have focused on vineyard floor management. Many of our more arid (rainfall under 18 inches/yr) vineyards just leave the native vegetation and spot-control perennial invaders.

**3. You had "real jobs" in between your BS and MS, then again between your MS and PhD, which offers you a somewhat unique perspective, especially when it comes to advising students. What would you tell a student who was struggling to decide whether or not to pursue a graduate degree?**

My personal experience was that having an MS greatly expanded my access to a wide variety of interesting, living waged positions where I could apply my knowledge and skills. It wasn't a difficult choice for me to go back to school for my MS, because the graduate student assistantship paid about what I was earning with a BS, but even if it had not, it was well worth it. After obtaining my MS, I worked primarily in research, and enjoyed the intellectual challenges so much I decided to go back and obtain my PhD. It was very helpful

to me to have the years of work experience between the MS and the PhD, as it gave me a broader perspective in both my coursework and my future position with SDSU.

**4. What do you like the most about working with grapes?**

Coming from a part of the country where commodity crops rule, I've always liked "oddball" crops – I worked with another perennial, asparagus, for my MS thesis research. Grapevines respond strongly to our management (pruning, training, etc.) on an almost personal level, and it's intriguing to find out how/why.

**5. In your opinion, what is the most exciting research-based information that will come out of the Northern Grapes Project?** On the broad view, how vineyard management impacts fruit quality of specific cultivars, because fruit quality is critical for the continued growth of the industry. I've been involved with the nutrient management (soil & tissue testing) portion, and look forward to having data from the northern hybrid cultivars on which to base our recommendations. The research on the training systems is also very helpful, providing us with strong evidence of the effects of fruit load as well as training system. Growers will be able to better manage their vineyards knowing more about the various factors influencing both yield and quality, as well as management intensity (knowledge and labor) involved.

## NGP Team Profile: Harlene Hatterman-Valenti



*Harlene is a Professor of High Value Crop Production in Department of Plant Sciences at North Dakota State University. She oversees the grape germplasm enhancement project at NDSU and conducts research and outreach programs on cold-hardy grapes as well as many other crops. Her emphasis is weed science, but she has conducted numerous production related field trials. Harlene's work with the Northern Grape Project focuses on vineyard management practices.*

**1. When and how did the grape and wine industry in North Dakota get started, and at what point did you start conducting research on grapes?**

North Dakota was the last state to allow domestic wineries. This occurred May 20, 2001 with regulations of no more than 50,000 gallon of wine per year. There is also a majority ingredient utilization requirement or a percentage of ingredients by volume of wine produced by a domestic winery that must be grown and produced in ND. This percentage increases from 10% in the second year of licensure to 51% in the sixth and subsequent years of licensure. My project started working with grapes in 2003 after securing funding for a variety trial in the eastern and western part of the state. We

continue to evaluate cold-hardy grapes and have had over 50 cultivars transplanted into a field experiment. In addition, our research has focused on ways to reduce winter dieback, maintain consistent fruit production, and improve fruit quality for winegrapes.

**2. You've recently started a grape breeding project. Can you tell us a little bit about it?**

Almost four years ago the NDSU grape germplasm enhancement project was initiated after Senate Bill 2373 was passed, making funds available on a four-to-one match for research grants aimed at developing more varieties for the North Dakota climate. The bill resulted from the difficulties and winter dieback that many of the growers in the western and northern part of the state repeatedly reported with the hardiest of hybrids currently available. We started small making crosses in the greenhouse as well as the field and have steadily increased our numbers to where last year we grew over 6,000 seedlings and transplanted approximately half of them into one of two field nurseries near Minot and Fargo, ND. We've received wonderful advice and help from

a number of private breeders in the region and had our first fruit production and advanced selections this past year. It's all very exciting, but only possible due to dedicated hard work of John, Collin, Tom, and many others associated with the project.

**3. You have a strong background in herbicides and spray drift – how have you incorporated your past work into the work you now do with grapes?**

Understanding spray drift and/or volatility injury to grapes is extremely important as grapes are very sensitive to plant growth regulator herbicides. Not only do you need to consider the loss of productivity the current year, but also the following year as several of these effects are carried over in the perennial vine. The North Dakota Department

of Agriculture has a page on its web site with location and contact information for over 50 North Dakota grape growers as a proactive measure to try to reduce herbicide injury to grapes. Much of my spray drift research has dealt with glyphosate injury to seed potatoes, which has shown growers the potential injury the year following off-target movement. Similarly, I've had to explain to grape growers the potential injury the following year when glyphosate is applied around grapes and unintentionally contacts grape green tissue.

**4. In addition to grapes, you also work with juneberries, potatoes, and onions; everyone is familiar with the latter two, but many of our readers might not know about juneberries. Can you tell us about them?**

I consider juneberries the blueberry of North Dakota, since our soils and climate pretty much eliminate blueberry field production, yet everyone is familiar with blueberries. Actually, juneberries are more closely related to apples than blueberries. Imagine a miniaturized purple apple about the size of a blueberry. The species (*Amelanchier alnifolia*) is a native fruit-bearing shrub of the Northern Great Plains that has high adaptability to all well-drained soils. In Canada,

it is commonly known as Saskatoon berries. Historically, the hardy native shrub was widely used by many North American Indian tribes and the fruit was a staple food. When considering health attributes, the average juneberry antioxidant levels, specifically anthocyanins and flavonols, are higher when compared to blueberry, strawberry and raspberry. So basically it's a healthy native fruit that few people know about.

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

Wow, what a difficult question. I don't think one can isolate any specific area because it all fits together, just like pieces of a puzzle. You have three corners (viticulture, winemaking, and marketing) that make the triangle, but if one piece is missing, the picture is incomplete. I may want to focus on viticulture because that is my area of interest and in ND consistent production of cold-hardy high-quality winegrapes is our biggest obstacle, but viticulture needs winemaking and marketing in order to be successful.

## Assessing the Nutrient Status of Cold-Hardy Wine Grapes

Carl Rosen and James Crants, University of Minnesota

### Editor's Note:

One goal of the *Northern Grapes Project* is to determine optimal mineral nutrition and soil management practices for cold climate cultivars. Currently, growers rely on information developed for *Vitis vinifera* or *V. labrusca* grown in milder climates. Soil and tissue samples, as well as yield data including juice chemistry analysis were collected from 15 sites in IA, MN, NY, ND and SD, focusing on Frontenac, La Crescent, and Marquette.

The results for the 2012 growing season suggest that juice YAN increases with leaf tissue N, that juice pH increases with tissue K, that juice TA increases with tissue Cu, and that sandier soils produced juices with lower pH and higher TA. Analysis for the 2013 season is ongoing.

A more detailed report of the 2012 growing season can be found at: <http://tinyurl.com/NGPnutrition>

Correctly assessing grapevine nutrient status is the essential first step in optimizing vine nutrition, which, in turn, is essential for producing a crop with high yield and quality. There are three general approaches to monitoring vine nutrient status: (1) diagnosing visible symptoms in the vines, (2) measuring soil nutrient concentrations, and (3) measuring tissue nutrient concentrations. An ideal nutrient monitoring program involves a combination of these three approaches.

**Visual symptoms.** The advantage of this approach is its low cost. However, the disadvantages of relying on visible symptoms alone greatly outweigh the advantage. Different deficiencies and toxicities may look alike or like problems unrelated to nutrient concentrations. Also, any visible nutrient

stress means that yield and quality have likely already been negatively affected. Detecting problems before they occur will ensure healthier vines and better quality grapes.

**Soil analysis.** The second approach, soil analysis, is most important before the vineyard is planted. Soil testing several months to a year or more before planting is valuable in site selection. It also gives the grower a chance to amend and fertilize the soil properly before there are vine roots that can be damaged by soil disturbance. Testing well in advance of planting is especially important for amendments such as lime (to reduce soil acidity) that take months to have their full effect or for phosphorus and potassium, which are relatively immobile in the soil.



**Tissue analysis.** The third approach, tissue nutrient analysis, has been found to be a much better predictor of grape yield and quality and vine survival than soil analysis. Because it can diagnose nutrient problems before they produce symptoms, and because it provides information relevant to vine performance, tissue testing is an essential tool for assessing the nutrient status of established vineyards.



photo: Harlene Hatterman-Valenti, North Dakota State University

*Iron chlorosis due to high soil pH.*

Standard practice is to determine petiole nutrient concentrations annually, but the optimum time of year to sample is debatable. Some authorities prefer veraison because tissue nutrient concentrations are stable then, and tissue concentrations of some nutrients like potassium may be more closely related to fruit characteristics at harvest. Others argue for sampling at bloom, when the leaf is more responsive to external nutrient supply and there is more time to take corrective action.

The use of petioles instead of whole leaves is also not without controversy. Use of petioles may not be the best practice for all growing regions. Researchers in the Pacific Northwest found that relying on petiole analysis led to over-application of nitrogen fertilizer in their region, while whole-leaf analysis did not have similar issues.

It is generally agreed that consistency in sampling time and tissue is more important than the specific time or tissue. Regular testing not only helps in diagnosing problems early, it also makes it possible to tell whether any given result is an anomaly or something that should influence your fertilization program.

**Putting it together.** While tissue nutrient analysis has advantages over both visual inspection and soil analysis, all three methods of monitoring vine health are valuable. Visual inspection is important because it provides information on individual vines. If symptoms indicate a deficiency or toxicity, tissue analysis can help to confirm or identify the problem. Soil tests are useful in distinguishing problems with nutrient concentration from problems with nutrient availability. For example, problems associated with high soil pH like iron deficiency may be more easily diagnosed by soil analysis and visual inspection compared to a tissue sample.

Consistent use of all three monitoring methods will make it much easier to maintain optimum vine nutrition. Optimizing vine nutrition is an important step in maximizing the quantity and quality of your grapes – an undeniably essential component of terroir and good wine.

## Proper Collection of Soil and Tissue Samples

### Soil samples:

1. Obtain soil information from your NRCS county soil survey (<http://websoilsurvey.nrcs.usda.gov/app/>) or the Canadian Soil Information Service (<http://sis.agr.gc.ca/cansis/>). The information should include texture by depth, drainage, fertility, degree of erosion, structure, permeability, available water holding capacity, and organic matter content typical for the soil series found on your property. This information may allow you to rule out a site without testing. If not, it will help you develop your sample collection strategy.
2. Divide the vineyard area into separate sampling areas based on cropping history and soil type. If there are other major variations in the soil you believe to be important, those should also be used to divide up the vineyard area. No sampling area should be larger than 10 acres.
3. Collect when soil moisture is low.
4. Sample from at least 20 places per sampling area, in a zig-zag pattern, well dispersed throughout the area.
5. Scrape off surface residue from the sampling site before collecting the soil.
6. Collect separate samples for the plow layer (0 to 8 inches) and the subsoil (8 to 16 inches deep).
7. Put the samples for each depth within a sampling area into a clean plastic bucket and mix them thoroughly. Discard plant litter and stones.
8. Fill a sample bag or box to the fill line (1 pint).
9. Label the bag or box according to the analytical lab's instructions.
10. Note the sample label and a description of the area it represents for your own records.
11. Send the samples to the lab as soon as possible. If the samples are very wet, they can be dried at less than 97°F (36°C).
12. At a minimum, have the lab test for pH, P, K, Mg, Zn, and organic matter. All of these variables are important for grapevine health and often at non-optimal levels. For the deeper samples, in established vineyards, knowing the pH is useful for interpreting tissue analysis results, but it is less important to analyze other variables for this depth.

### Petiole samples:

1. Follow step 2 of the soil sampling protocol. In addition to dividing the vineyard based on soil series and history, the vines in one sampling unit should be of the same age, variety, and rootstock.
2. For routine testing, collect samples at bloom or veraison – the times for which sufficiency ranges are established. Be consistent about the timing from year to year. If visible symptoms are showing, samples can be collected at any time of the growing season. In this case, send in petiole samples from vines showing symptoms and petioles of the same physiological age from vines not showing symptoms.
3. Collect a representative sample of leaves – 1 to 2 per vine (not from the same shoot) for each sampling unit, from at least 25 vines, and collect a total of at least 50 leaves (more for smaller-leaved varieties like Marquette). Choose leaves from both sides of the row, as well as the canopy. Collect from vines in typical health; reserve atypical vines for separate analyses to diagnose problems.
4. For sampling at full bloom (when 30 – 60% of the clusters are in flower), take leaves opposite the basal flower cluster of a shoot (Figure 1). For sampling at veraison (40 – 60% of clusters changing color), take the fifth, sixth, or seventh fully expanded (i.e., flat) leaf from the tip of an unpruned shoot (Figure 2).
5. Separate the petioles from the blades (Figure 3) and discard the blades.
6. If the petioles are dusty or dirty, rinse them while fresh in distilled or deionized water. Do not let them soak, or nutrients will leach out. Dried petioles should not be washed.
7. Place the petioles in a clean paper bag. Label the bag and note the sample label and a description of the area it represents for your own records.
8. Dry the petioles at room temperature or send them to a laboratory immediately. Do not use plastic bags unless the samples have been previously dried.



The basal flower cluster (circled) and the opposite leaf (asterisk) of a shoot with two flower clusters. The leaf with the asterisk should be collected when sampling leaf tissue at bloom.



When sampling after bloom, collect the fifth, sixth, or seventh fully-expanded (i.e. relatively flat) leaf from the end of an unpruned shoot.



Blades (left) and petioles (right) of grape leaves. Note that the sampling bag for the petioles is labeled with the vineyard block, cultivar, location of the sampled vines, tissue sampled, and collection date.

## 2012 Michigan Wine Tasting Room Research - A Series Issue #3, Awareness and Perceptions of Cold Hardy Grape Wines

Don Holecek and Dan McCole, Michigan State University

**Introduction:** Wines made from cold hardy grapes are relatively new. Neither individual varieties nor the group of cold hardy grape varieties have been assessed from consumer's perspectives employing well-designed survey research methods. Both knowledge of consumers' level of awareness of a product and their perceptions of it are basic information required to develop effective product marketing strategies. They are also needed for tracking market penetration over the long run. In the context of the *Northern Grapes Project*, positive change in cold hardy wines brand awareness and in how they are perceived by consumers are useful measures of the success of the overall project in achieving its goal of sup-

porting the sustainable development of the emerging cold hardy wine industry. Measuring change requires establishing a time zero/ baseline measure(s) and one or more subsequent measures. The results reported herein are baseline measures that can be used for tracking cold hardy wine's brand awareness and consumer's perceptions of them over time.

**Study Design:** As was reported in the first two articles in the 2012 Michigan Tasting Room Research Series (see [Vol. 2, Issue 3](#) and [Vol. 2, Issue 4](#)), a total of 1,552 completed surveys were gathered by U.S. mail and email from a sample of Michigan tasting room visitors. Potential respondents were qua-



si-randomly recruited in 15 Michigan wine tasting rooms throughout the summer and fall of 2012. About 40% of visitors who expressed interest in participating in the study returned the questionnaire that was mailed or emailed to them after their visit to the winery where they were contacted.

The results from the Michigan tasting room survey indicated that about 70% reside in Michigan. Their level of awareness and perceptions of cold hardy wines may or may not be representative of the wider geographic region where cold hardy grape wines are produced and sold to both residents of and visitors to the region. Thus, it was deemed important to conduct a comparable study of consumer’s level of awareness and perceptions of cold hardy wines over a wider geographical area. Due to limited resources to invest in such a study, we drew a random sample from the following six states: Michigan, Ohio, Indiana, Illinois, Wisconsin and Minnesota. The sample consisted of a total of 4,750 randomly selected household mailing addresses, 1000 from Michigan and 750 from the other five states. The response rate achieved after one mailing and one reminder postcard was about 9%. This response rate is far lower than achieved in the tasting room survey, but it is in line with random household surveys of this type. About 75% of total respondents (400) indicated that they drink wine. The results in the regional wine drinker column in the tables below are based only on wine drinker respondents, about 300 in total. Of these, only about 25% are Michigan residents. The household survey respondent group is less dominated by Michigan residents than is the tasting room survey.

**Awareness of Cold Hardy Wines:** The level of brand awareness of cold hardy wines isn’t currently very high (Table 1). Over 50% of tasting room visitors aren’t familiar with them and even more respondents, (70%) from the six state household survey region are unaware of cold hardy wines. Even more telling of consumers awareness of the brand, those “familiar” and “very familiar” with these wines is very low.

**Have Tasted Cold Hardy Wines:** Considerably more Michigan tasting room visitors have had the opportunity to taste cold hardy wines than have wine drinkers from the broader six state geographic region. About 65% of the former and only about 27% of the latter have tasted these new types of wines (Table 2). About 70% of respondents to the regional household survey reported that they drink wine. This result in combination with that in Table 2 suggests that only about 11% of the adult population in the six states study region has ever tasted cold hardy wine.

**Types of Cold Hardy Wines Tasted:** Respondents in both surveys who reported tasting cold hardy wine were asked about the content of the wine(s) they tasted. As can be seen in Table 3, over a third of both groups of respondents se-

**Table 1.** Reported level of awareness of cold hardy grape wines.

Reported level of awareness	Tasting room visitors (MI)	Regional wine drinkers (six states)
Not familiar	55.5%	70.8%
Somewhat familiar	26.3%	21.7%
Familiar	14.3%	5.7%
Very familiar	3.9%	1.8%

**Table 2.** Percent of respondents who have tasted wine made from cold-hardy grapes.

	Tasting room visitors (MI)	Regional wine drinkers (six states)
Have tasted a cold hardy wine	65.3%	26.8%
Haven’t tasted a cold hardy wine	11.2%	12.1%
Don’t know	23.5%	61.1%

**Table 3.** Grape content of cold hardy grape wine tasted.

	Tasting room visitors (MI)	Regional wine drinkers (six states)
Blend of cold hardy and other	26.9%	41.9%
Cold hardy varietal (only one varietal)	20.8%	24.2%
Blend of cold hardy grapes	19.2%	17.7%
Don’t know	33.1%	37.1%

**Table 4.** Reported perception of cold hardy grape wine tasted

Perception	Tasting room visitors (MI)	Regional wine drinkers (six states)
Liked a lot	41.9%	39.3%
Liked a little	29.9%	31.1%
It was okay	23.9%	27.9%
Disliked	3.4%	1.6%

**Table 5.** Awareness of cold hardy grape varieties.

Variety name	Tasting room visitors (MI)	Regional wine drinkers (six states)
Snow Bird*	5.0%	10%
Brianna	3.7%	18%
Edelweiss	21.3%	44%
Frontenac	20.2%	39%
Alpino Rouge*	1.1%	2%
Crystal Lago*	2.8%	0%
La Crescent	3.0%	13%
Marquette	7.9%	20%
St. Pepin	3.3%	13%
La Crosse	4.3%	26%
Haven’t heard of any	53.2%	26%

\* These are made up variety names  
**Note:** Column sums > 100% due to multiple responses

lected “don’t know” in response to this question. By far the most common wine type tasted was a “blend of cold hardy and other.”

**Perceptions of Wine Tasted:** While the level of awareness of cold hardy grape wines is low and presents a challenge to be overcome, consumers who have tasted cold hardy grape wines generally like them. About 70% of both survey groups liked them “a lot” or “a little” as can be seen in Table 4. It is especially encouraging that only a small percentage of respondents in both survey groups reported that they “dislike” the wine(s) they tasted.

**Awareness of Cold Hardy Grape Varietals:** We expected that consumers would be as likely, if not more likely, to be aware of a named cold hardy grape varietal as they are of the cold hardy grape group description. Thus, respondents in both the tasting room and in household survey were asked if they were aware of 10 named cold hardy grape varietals. The ten are listed in Table 5. Of these 10, seven are some of the most common cold-hardy varietals while the remaining three are made-up varietal names. They were included as a test of the validity of respondents’ responses to this question. In other words, the made-up varietal names helped us learn more about the credibility of the data generated by this question. Over 50% of tasting room visitors and 25% of

regional wine drinkers couldn’t recognize any of the 10 varietals. “Edelweiss” and “Frontenac” were selected by both respondent groups. The most often selected bogus varietal was “Snowbird.” Between 10 and 15 percent of respondents to the survey who selected at least one varietal (i.e., they didn’t select “haven’t heard of any”) selected “Snowbird.” This suggests that the high reported varietal awareness levels are likely biased by 10 to 15 percent. Although this is a relatively high rate of bias, it isn’t so high as to limit the utility of the awareness results in this table as well as in Table 1 (overall, cold hardy grape awareness).

**Conclusions.** In interpreting these results, it is important to keep in mind that cold hardy grape wines are very new relative to long established French, German and California wines made from grape varieties that even novice wine consumers can readily identify. And, in addition to being new to the wine scene, the total average planted of cold hardy grapes is very small relative to long established cultivars. Hence the supply of other wines dwarfs that produced from cold hardy grapes and the low level of awareness registered in these two surveys isn’t at all surprising. By far, the most encouraging finding from these two consumer surveys is that the vast majority of those who have tasted one of the new types of wines judged them as being okay or better.



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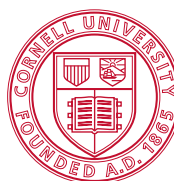
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