NORTHERN GRAPES PROJECT

Viticulture, enology and marketing for cold-hardy grapes

Northern Grapes News

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When Species Matters:
All Is Not Equal in the World of Wine Tannins

Anna Katharine Mansfield, Cornell University

I've worked closely with grape breeders for almost 15 years, so I know the thoughtful pause and faraway, dreamy look they get in their eyes when they pronounce their highest praise for a promising grape selection. "This one," they say with a nod and a faint smile, "this one is really good. It's so…*vinifera*-like!"

Of course, they really mean that the potential hybrid has growth habit and fruit chemistry similar to *Vitis vinifera*, but that all the desired hybrid traits – disease, pest and temperature resistance – are intact. This is the way we've thought about grape breeding for years – as a sequential culling designed to combine the positive production and sensory characteristics from *V. vinifera* ancestors with the hardiness of other, non-wine-worthy species. If the vines grew like *vinifera* and the grapes hit the same levels of sugar, acid, and phenolic compounds as their illustrious ancestors, all the winemakers would have to do is apply the same production methods to a hardy red hybrid as to a Cabernet Sauvignon, and we'd be making world-famous wines in new and previously unknown regions, right? Basically, we think that if it looks like a *vinifera* and smells/tastes like a *vinifera*, it must act like a *vinifera* in the winery.

The problem is this: it doesn't. Hybrid grapes don't shine when processed like their European cousins, and issues of tannin and color are a case in point.

The hit-or-miss of hybrid winemaking. Over the decades, winemakers have devised a multitude of ways to extract the polyphenolic compounds that give red wines their tannin backbone and distinctive color, from cold-soak, to extended maceration, to more complicated techniques like délestage. The effects of many of these methods have been studied in a handful of classic winemaking cultivars, but studies on hybrid red grapes are relatively rare. Subsequently, most winemakers have to guess the right way to make Maréchal Foch or Frontenac or Petite Pearl, trying to combine their knowledge of specific fruit chemistry with the traditional understanding of red wine production

In 2010, the Cornell Enology Extension Lab (CEEL) performed a survey of hybrid red producers in the Northeast and Upper Midwest, and (not surprisingly) found no agreement on preferred tannin extraction methods. In the same survey, winemakers ranked tannin and color as their top two concerns about red hybrid wines. (Coquard Lenerz, 2012). The results were illuminating: despite using every extraction method in the book, no one was seeing the tannins and color that they wanted. CEEL followed this up with a study evaluating the tannin extraction and retention in red hybrids with various red wine processing methods, and found little to no difference in final wine tannin concentration (Manns et al., 2013). In both the

Chris Gerling, Alex Fredrickson, and Lindsay Springer harvest Corot noir at Swedish Hill Winery in Romulus, NY for tannin addition timing trials.

photo: Anna Katharine Mansfield, Cornell University

In This Issue:

real world and the lab, processing hybrids like *vinifera* simply wasn't working well.

The reason? Because hybrids don't have *vinifera*-like phenolic chemistry. No matter how well a grape hides its hybrid nature with upright growth habit and balanced harvest chemistry, its tannins and anthocyanins are going to give it away. The problem has been that, like any good agent of disguise, science hasn't caught up with the masquerade until now!

Tannins. All grapes produce tannins in their skins and seeds. In absolute numbers, the concentration of tannins in seeds is much higher than in skins, but only a fraction of seed tannins can be extracted without strong chemicals and physical manipulation. Subsequently, most of the tannins found in wine come from grape skins.

All grape-derived or "condensed" tannins are long chains of smaller phenolic subunits, or monomers, called flavan-3-ols. There are specific types, combinations, and ratios of monomers found in wine, and individual tannin polymers vary by types of initiator units (the flavan-3-ol subunit that starts the polymer chain), elongator units (the subunits that build on to the initiators) and the ways that the polymers branch (or don't). One frustrating thing about these condensed tannins is that there's no good way to identify and quantify them. At present, all we can do is run some chemical reactions that cut the chains into little pieces, tag the ends of the pieces, and then measure their average size. This analysis gives us an idea of the Mean Degree of Polymerization, or mDP, of all the tannins in a wine, but doesn't tell us the concentration of any given size of tannin.

Why hybrid WINES are different. Hybrid red wines tend to have low tannin, and the tannins that they do have are generally smaller (<4 mDP) than those found in red *V. vinifera* wines (7-13 mDP). Since polymers with an mDP <5 are usually more bitter than astringent, the sensory impact of these small-chain tannins is likely to add unpleasant sensory characteristics to the wine.

Wine tannin ≠ grape tannin. The lower tannin concentration in red hybrid WINES led to a long-held belief that hybrid GRAPES also had low tannin concentration, because if the tannins were there, they would eventually be extracted with extended maceration, right? In fact, analysis shows that while many hybrid grapes may have lower tannin concentration than *V. vinifera* cultivars traditional responsible for 'big' red wines (e.g., Cabernet Sauvignon), there's no correlation between berry tannin and wine tannin (Springer & Sacks, 2014). To work around this difficulty, Springer and Sacks propose that cultivars be evaluated in terms of Tannin Extractability, using the following equation: [(wine tannin/grape tannin) X 100]. When tannin concentrations are plugged into this equation, the data makes a bit more sense. Cabernet Sauvignon, for instance, has very high tannin extractability, and almost all *V. vinifera* have higher tannin extractability than hybrid cultivars.

All bound up and no place to go. So the question is: What dictates tannin extractability? If there's not a direct path from grape tannin to wine tannin, understanding the factors that govern the movement of tannin from grape to wine can make a big difference in winemaking choices. Recent research suggests that the biggest factor isn't extraction method, but rather the re-uptake of tannin by compounds that occur naturally in the grape. Pectin plays a small part, but proteins - and likely the same ones that provide disease resistance - seem to have the largest binding effect. If this is found to be true, it suggest a big problem – namely, that the same attribute that allows hybrids to thrive in challenging environments inherently handicaps the winemaker.

Lauren Thomas, graduate student at Cornell University, is separating polyphenolic fractions in preparation for HPLC analysis of tannins and anthocyanins

photo: Anna Katharine Mansfield, Cornell University

Don't just throw tannin at the problem. The solution seems easy: just add tannin! As it turns out, just adding more tannin isn't enough; if the binding compounds are still in the wine, any tannin that's added will just be sucked right back out. In order to make good red hybrid wine, then, there are two challenges: First, tannin has to be added to the wine, and second, sorption activity has to be avoided or defeated so that the tannin STAYS in the wine – so CEEL set out to determine the best way to add tannin and keep it.

How much tannin should you add? Tannin vendors have always talked about 'sacrificial tannins,' or the percentage of any tannin addition that will be lost during wine processing. Empirical data from winemakers suggests that additions to hybrid wine fermentations should be anywhere from two to four times higher than the manufacturer's recommended addition, which is geared for *V. vinifera* wine production. In a study with Maréchal Foch, Corot noir, and Cabernet Franc (used as a representative *V. vinifera* control), a condensed tannin product was added at crush at the recommended rate and at 2x and 3x the recommended rate (Fig. 1). Re-

sults showed that Cabernet Franc retained more tannin at all levels than did Corot noir or Maéchal Foch, with the latter only retaining half as much as Cabernet Franc for the same addition concentration. Further, a sensory panel showed no sensory difference in any of the wines, despite the vast range of addition, which suggests that higher additions can be made without contributing unpleasant flavor compounds. Appropriate addition rates and sensory impact will vary by grape cultivar and tannin product, however, so bench trials are always a good idea.

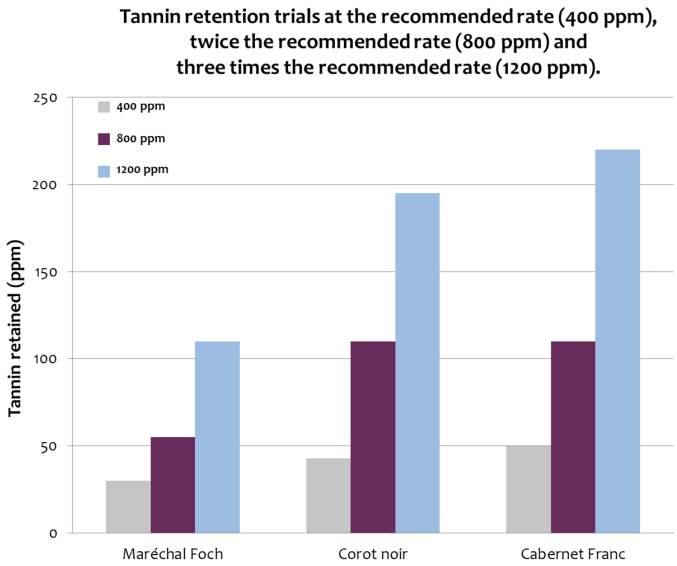


Figure 1.

And when should you add it? Traditional wisdom dictates that winemakers apply all additions as early in the process as possible to allow wine components to 'integrate.' While this seems to make sense, in the case of tannin sorption, it may run contrary to best practices. If the proteins that bind and remove tannin come from the grape, tannin sorption should decrease as more grape material is removed from the wine. In other words, sorption activity is highest at crush, and will decrease as pressing and subsequent rackings remove grape material. A series of studies at CEEL have shown this to be true, and that later tannin additions will result in a greater percentage of tannin retained. Sensory studies are planned to see how addition time impacts wine aroma.

But what about color? In addition to 'integration,' winemakers often voice concern over the formation of polymeric pigments, the anthocyanin-tannin complexes that are thought to provide stable color during wine aging. Since anthocyanins are at their highest concentration the first few days of on-skin fermentation, one would deduce that tannin additions made early in the process would bind the most anthocyanins, leading to the most stable color. This may be true, but primarily for *V. vinifera*. In addition to having different tannin compounds, most hybrid grapes have different anthocyanin compounds as well, and we're fairly certain that they don't bind with tannin nearly as much as their *V. vinifera* counterparts. While it hasn't been experimentally proven, chances are good that early tannin additions have little to no effect on stable color formation in red hybrid wines.

Know your tannin additive. Exogenous tannin additives are not created equal, but fall roughly into three categories: grape derived condensed tannins, plant (but non-grape) derived condensed or hydrolysable tannins, and any mixture of the two. Hydrolysable tannins, which don't occur in grapes, are commonly extracted from oak, acacia, or the South American Quebracho tree. Producing high-purity tannin extracts is very difficult, so exogenous tannin products range from 10-45% tannin, with the remainder consisting of inseparable non-tannin phenols, drying and solubility agents, and non-phenolic plant material. This residual plant material may have unknown sensory characteristics, and the tannin:nontannin ratio will vary from batch to batch, so it's important to run bench trials with any tannin product.

Treat your hybrids like hybrids, not *V. vinifera*. While the complexity of polyphenolic chemistry means that we have a long way to go before we find a foolproof method of boosting tannin in red hybrid wines, there are some general rules taking shape:

1. Red hybrid grapes have fewer and smaller tannins that are harder to extract and retain than do red *V. vinifera* grapes.
2. Add tannins as late as possible in the winemaking process to boost retention rate.
2. Double or triple the rate of addition, but with caution.
3. Understand the contents of the tannin you're using, and always perform a bench trial.
4. Don't expect early tannin additions to aid in stabilizing hybrid wine color.

The larger lesson, though, may be this: no matter how *vinifera*-like a hybrid cultivar may seem, there are a multitude of chemical differences that we can't easily measure, but that still have to be accommodated during winemaking. Instead of looking to traditional red winemaking practices for the answer, it's time to consider hybrid reds a different beast, and respect those differences.

Literature Cited

Coquard Lenerz, C.T. 2012. Phenolic Extraction from Red Hybrid Wine Grapes. Cornell University MS Thesis.

Manns, D. C.; Coquard Lenerz, C. T.; Mansfield, A. K. 2013. Impact of processing parameters on the phenolic profile of wines produced from hybrid red grapes Maréchal Foch, Corot noir, and Marquette. Journal of Food Science, 78:C696–C702.

Springer, L.F., and G.L. Sacks. 2014. Protein-Precipitable Tannin in Wines from *Vitis vinifera* and Interspecific Hybrid Grapes (*Vitis* ssp.): Differences in Concentration, Extractability, and Cell Wall Binding. Journal of Agricultural and Food Chemistry, 62(30):7515-7523

Impact of Spring Frost Damage on Marquette in Michigan

Paolo Sabbatini, Pat Murad, and Jake Emling, Michigan State University

Although a dormant grape bud looks like a simple structure, there are actually three primordia within each – a primary, secondary, and tertiary bud (Keller, 2010). When winter conditions have been ideal and no damage has occurred, the primary bud emerges first and produces a primary shoot, which is always fruitful. If the primary bud is damaged (e.g. low winter temperatures or mechanical means), the secondary bud will grow. The fruitfulness of the secondary bud varies among species and cultivars; most cold-hardy cultivars have fruitful secondary buds, but fruitfulness of the secondary buds tends to be reduced compared to primary buds (Mullins et al., 1992). Several research and grower observations indicate that the clusters from secondary shoots are smaller than the clusters from primary shoots (Keller, 2010). If both the primary and secondary buds are damaged, the tertiary bud will produce a clusterless shoot. Understanding the basic physiology of grape buds is important when studying how the weather that occurred throughout the Great Lakes region during the spring of 2012 affected the grape crop.

Early spring warmth. An extreme warm spell covered much of North America in March 2012. According to National Weather Service data, temperatures in southwest lower Michigan were over 50 °F higher than the normal 35 °F average, which caused cold-hardy grape cultivars at the Southwest Michigan Research and Extension Center (SWMREC) to break bud on March 25th. During this period, vines were exposed to 126 growing degree-days (GDD) (base 10 °C) (Fig. 1). Historically, it's the first or second week of May before 166 GDD have accumulated.

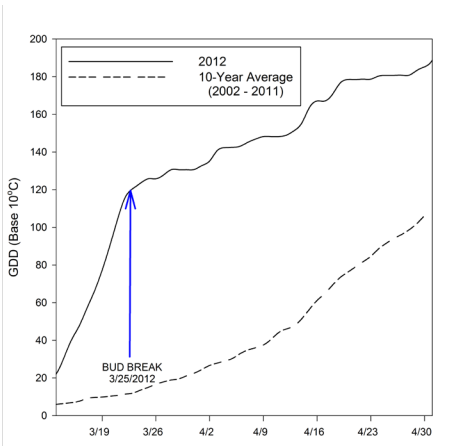


Figure 1. *Growing degree days accumulated in spring of 2012 at Southwest Michigan Research and Extension Center (Benton Harbor, MI).*

Early bud break. Cold-hardy cultivars like Marquette have *Vitis riparia* in their background. It, and other Native American species and cultivars often break bud earlier than cultivars with *V. labrusca* and *V. vinifera* genetic backgrounds (Reisch et al., 1993). Marquette typically does not break bud until the end of April at SWMREC, but in 2012, Marquette primary shoots were one to three inches long by the first of April. From April 7th to April 29th, six frost events occurred at SWMREC; each event caused varying degrees of damage, with the loss of most already-emerged primary shoots and other later emerging shoots. On May 1st, vines were evaluated for frost damage by recording if shoots that survived the frost events were from primary or secondary buds. In cases where a dead or damaged primary bud was not found, we were able to determine if it was a primary or secondary shoot by evaluating the angle that the shoot was coming off the branch (Fig. 2).

Figure 2. *The primary shoot, which emerges at a 45º angle from the cane, was damaged by spring frost. The secondary shoot is growing at a 90º angle from the cane.*

photo: Pat Murad, Michigan State University

Study design. After winter pruning, the 24 vines included in the study had an average of 135 buds; 53% of primary buds were still alive after the frost events. At the end of fruit set, three primary and three secondary shoots per vine (144 total) were tagged and shoot and cluster data were collected during the growing season. At harvest, fruit was collected from each of the tagged shoots and used for chemical analysis (total soluble solids, pH, and titratable acidity,).

What did we learn? The amount of spring frost damage was consistent across all of the vines, with approximately 50% primary bud mortality. From bloom onward, a 12-day difference in vine phenology was observed between the primary fruit (fruit on primary shoots) and the secondary fruit (fruit on secondary shoots), with the secondary always later than primary (Table 1).

The differences in bloom, fruit set, and veraison were evident at harvest, with primary fruit having very high brix and lower acidity compared to fruit harvested from secondary shoots (Table 2). However, the secondary fruit reached almost 25 brix and a TA of 7.59, which is a good ratio for red

wine production. The data indicates that Marquette is a very early ripening variety for this area of Michigan and that later-ripening secondary fruit still reached a good technological maturity at the harvest. Therefore, fruit on secondary shoots has the potential to achieve the same chemical parameters as the fruit on primary shoots that escaped the frost events.

Table 1. Major phenological stages, date of occurrence, and growing degree days for Marquette at the Southwest Michigan Research and Extension Center (Benton Harbor, MI) in 2012.

Phenologic Stage	Initial bud break	Bloom		Veraison		Harvest
	Primary	Primary	Secondary	Primary	Secondary	Primary & Secondary
Date	3/25/12	5/25/12	6/6/12	7/13/12	7/25/12	8/30/12
GDD (base 10 °C)	125.8	344.1	409.60	939.90	1127.3	1521.3
Days from bud break	-	61	75.00	110.00	122	158

Table 2. Basic fruit chemistry parameters of Marquette fruit produced by primary or secondary buds at the Southwest Michigan Research and Extension Center (Benton Harbor, MI) in 2012.

Date	Bud Type	TSS (°Brix)	pH	TA
08/30/12	Primary	28.9 a*	3.61 a	7.01 b
(harvest)	Secondary	24.8 b	3.51 b	7.59 a

** Treatment means within a column followed by the same letter are not significantly different at $p \leq 0.05$.*

Table 3. Yield components of Marquette vines grown at the Southwest Michigan Research and Extension Center (Benton Harbor, MI) in 2012.

Bud Type	Yield (kg/vine)	Cluster number	Cluster weight (g)	Berries per cluster	Avg. berry weight (g)
Primary	2.35 a*	61 a	37.3 a	51 a	0.75 b
Secondary	2.26 a	56 a	40.0 a	46 a	0.91 a

** Treatment means within a column followed by the same letter are not significantly different at $p \leq 0.05$.*

There were also a difference in single berry weight between clusters from primary and secondary shoots (Table 3). However, there were no differences between the number of clusters per vine, berries/cluster, cluster weight, or yield between the two different population of fruit. Previous research and grower observations indicate that clusters produced by secondary shoots are smaller than the clusters produced by primary shoots. Our results showing no differences between the primary and secondary clusters were likely due to cold temperatures during bloom and fruit set and potential bud damage in the primary buds caused by the several frost events.

Conclusions. In conclusion, the greatest addition to the understanding of cold climate viticulture was on the aspects of fruit chemistry of fruit from secondary shoots. For an early-ripening variety such as Marquette, the season length at warmer locations in Michigan is sufficient to ripen clusters on secondary shoots to levels that are acceptable for commercial winemaking. The information about the number of clusters produced by the vines after several post-budbreak frost events is also significant. Our results confirm that Marquette vines severely damaged by spring frosts were able to produce fruit on the secondary buds, which allowed for a good yield, especially when compared to other grape cultivars commonly grown in southwest Michigan. As well, there is sufficient time after harvest for vines to build carbohydrate reserves and properly harden off in advance of winter. (Howell, 2001). This information will enable growers to use different management tactics to help insure that fruit can be produced at the quality expected even after a devastating weather phenomena such as 2012.

Literature Cited

Howell, G.S. 2001. Sustainable grape productivity and the growth-yield relationship: A review. Am. J. Enol. Vitic. 52:165-174.

Keller, M. 2010. The science of grapevines; Anatomy and Physiology. Academic Press, Burlington, MA 377 pp.

Mullins, M. G., A. Bouquet, and L. E. Williams. 1992. Biology of the grapevine. Cambridge: Cambridge University Press.

Reisch, B., Pool, R., Peterson, D., Martens, M. and Henick-King, T. 1993. Wine and juice grape varieties for cool climates. Information Bulletin 233. http://www.hort.cornell.edu/reisch/grapegenetics/bulletin/wine/

Grape Disease Control 2015

Each year, Dr. Wayne Wilcox, plant pathologist at Cornell University, publishes a comprehensive summary of fungal diseases that grape growers in the Eastern US encounter. The document includes fungal resistance, in-depth information about individual diseases, and a "putting it all together" section. It's packed with great information: http://www.fruit.cornell.edu/grape/pdfs/Wilcox-Grape%20Disease%20Control%202015.pdf

NGP Team Profile: Anna Katharine Mansfield

Anna Katharine is an associate professor of enology at Cornell University. She first worked in the wine industry in North Carolina's Yadkin Valley and received her MS degree from Virginia Tech (see photo at left) and PhD from the University of Minnesota. Anna Katharine focuses on aiding small regional wineries through enology extension, wine sensory evaluation, and defining regional identity in developing winegrowing areas. She is the leader of the enology team for the Northern Grapes Project.

1. You have a BA in English Literature from Salem College; how did you end up in food science and enology?

Salem is a small liberal arts college for women; at the time it required all students to hold an internship in their major during the junior year and an internship outside their major during senior year. I had been working part-time at a specialty food and wine store for a few years, and was becoming convinced that I really wanted to own a wine shop. The shop owner helped me get an internship with Steve Shepard, who was then at Westbend Vineyards, and I loved it - it was the first job I'd had where I came home completely exhausted and still loved working! I realized that I wanted to switch careers, and really didn't want to work my way up from the very bottom, so I started looking for ways to get experience and a science education. I worked for two years at the Biltmore Estate winery while attending classes at UNC-Asheville. Oddly enough, when I took organic chem at Salem I barely passed with a D-, but at UNCA I flew through three semesters with high grades! That experience led me to believe that understanding the practical applications of science makes it easier to learn - which feeds into my love of extension work.

2. You were the first Extension Enologist at the University of Minnesota. What did you learn while developing that program that has helped you most in your position at Cornell?

I think the most important thing I learned at the U is that you have to meet people where they are, knowledge-wise, and that isn't always where they think they are! There's a wide range of knowledge and of learning styles in any stakeholder group, so extension programming has to be flexible and multi-faceted. I also honed my ability to correct people tactfully - if someone has a strongly-held belief that's factually or scientifically wrong, telling them so directly doesn't really make them willing to learn something new. I hope I've learned ways to help people challenge themselves without poking holes in their ego, which can be tricky.

3. Your PhD research project focused on Frontenac – what are some of the key findings from that research that you think will interest our readers?

The list of aroma attributes that we identified and defined during sensory analysis is pretty interesting, as it provides a starting point to think about wine style choices. I also think it's really interesting that our sensory panel identified and defined a geranium aroma in some of the wines - 'geranium taint' has traditionally been identified as a flaw in wines. That finding calls for a reexamination of geranium aromas - should they be considered stylistically appropriate when they occur in Frontenacs? Our panel found them to be pleasant, especially in rosés. I think this question highlights the fact that we're handicapping ourselves a bit by thinking that hybrid wines should always be made like *V. vinifera* wines - they're completely different beasts, and should be considered as such to maximize quality.

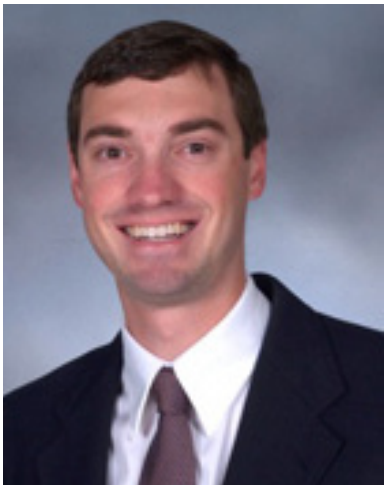
4. Outside of the work you do as part of the Northern Grapes Project, what are some of the research topics you are currently pursing?

Right now, my primary research areas are yeast assimilable nitrogen (YAN) and phenolic compounds in wines. With YAN, we want to fine-tune the concentration needed to produce the most expressive wine - too little YAN can result in stuck fermentations and sulfur off-odors, but too much can cause a rapid fermentation and a generically fruity wine that lacks complexity. Further, too much YAN provides extra nutrients for spoilage microbes post-fermentation. Since most YAN work has been performed in warm climates with warm climate cultivars, we'd like to learn if there are differences for cool- and cold-climate fermentations. The red hybrid tannin work has actually spilled over into our NGP work. Following Springer & Sacks' discovery that hybrid cultivars contain high levels of compounds that can remove tannin from wine solutions, we've focused on timing tannin additions to optimize retention and sensory profile. It's been rewarding to have such an applied project to focus on.

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

From our work, I think the tannin findings are pretty exciting - knowing that we need to be cognizant of and react to tannin sorption properties is game-changing for red wine production. In a more general sense, it's amazing and really gratifying that we've had federal funding and so much positive attention for this project - when I started working with the U of M grape breeding project in 2001, I never expected to see cold-hardy vineyards expand so rapidly and in so many places!

NGP Team Profile: Chris Gerling



Chris is an Extension Associate in the Food Science Department of Cornell University. He works with the New York wine industry to create educational programs that support the growth and improved quality of premium wines throughout the state. He assists with the outreach program for the Northern Grapes Project.

1. You have a BA in Communications and an MS in Food Science in Cornell University. What prompted you to change fields?
I reached my senior year as an undergrad and I just wasn't attracted to editing, advertising, journalism, etc. I also happened to take the Hotel school wine class during my senior year, and the class sparked my interest in the New York wine industry. I had worked at New York State Agricultral Experiment Station during summers, and through that connection I was able to learn winemaking at the enology lab. I also was lucky enough to work in the viticulture lab for a little while, and before long I had been working with wine and wine grapes for a few years and it was a natural choice for graduate school.

2. What did you learn during your two years as assistant winemaker at Anthony Road Wine Company that is most valuable in your current position?
Johannes Reinhardt taught me so much, but I'd say the most important thing I learned was that the secret to making good wine is that there are no secrets. People sometimes think that producing wine is about mystical elements and ancient rituals, but it's a lot more about hard work and attention to detail. In my current job I can teach people that there are some basic principals that make up 90-95% of what winemaking is (sanitation, bench trials and careful calculation and measurement are a big part), and anyone willing to be diligent can get there. It's definitely hard work, of course, but the path is relatively clear.

3. After two years at Anthony Road, you accepted the role of Extension Associate in Enology at Cornell. What drew you to this position?
This position provides an opportunity to work with lots of different people on lots of different projects. It also allows me to use my communications background to try and get concepts out to people. I really like the idea of helping people, especially people who like learning, to get the information they're seeking. I feel like I came to this industry a little later in life, so I think I can empathize with how most industry members feel. I also really like finding the most practical applications for research findings. I love being able to give people tools that will make their work easier, faster, more accurate, etc.

4. New York is somewhat unique in that it has both fairly established and emerging wine regions. What do you think are some of the biggest challenges and opportunities for the newer wineries?
I think it's interesting that we have new wineries starting up next to producers who have been here for 40 years and then we have new wineries that are the first wineries to ever set up shop within 100 miles of where they're starting. At the same time, those wineries that have been here for 40 years are just starting to gain national attention, so the newer places are in the position of being able to capitalize on some of this recognition. They also face all of the challenges new wineries in emerging regions face, however, including confused regulators, limited supply chain support and not necessarily being taken seriously at first. For the most part, I think that the newer producers have been able to use the more successful approaches employed by the established wineries quite effectively, and they have been able to capitalize on the attention given to pioneers.

5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?
Many of the newer release cultivars have different chemistry than we've seen before, including lots of sugar, lots of acid and very little tannin. How do we make commercially successful products from these grapes? Do we try to emulate more traditional wine styles, and what strategies are best for doing so? Can we find a strong consumer base for wines that are unlike what people are used to? What will people pay? I like that we have viticulturists, enologists and economists asking these questions.

Results from the Northern Grapes Project Baseline Survey - A Series

Growth & Development of Wineries

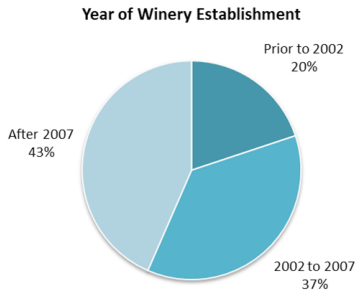
Brigid Tuck and Bill Gartner, University of Minnesota

Editor's Note: We are publishing a series of articles that summarize data from the *Northern Grapes Project* Baseline Survey. This survey was completed in 2012, and several bulletins have been published, which are available on our website (http://northerngrapesproject.org/?page_id=544). This series of articles will highlight key findings and conclusions from these bulletins.

Introduction: After the development of cold-hardy grape varieties, the number of new wineries in the *Northern Grapes Project* states grew exponentially. Only one in five of all wineries surveyed reported being in business more than 10 years (as of 2012). Survey results indicate winery owners are concerned about the long-term growth and development of their wineries – particularly regarding government policy and sales. Survey results also indicate opportunities exist for wine branding and increasing sales across marketing channels.

Study Design: In early 2012, University of Minnesota Extension personnel conducted the *Northern Grapes Project* Baseline Survey, which included all grape growers and winery owners in the 13 states participating in the project. In total, there were 611 total responses to the survey; a response rate of 21%. Of those, there were 442 useable responses. Fifty-six percent of respondents operated a vineyard only, 35% operated a combined vineyard and winery operation, and nine percent operated a winery only.

Rapid Growth: While the research indicates growth in the number of vineyards may be slowing, the growth in the number of wineries being established does not appear to be slowing. Only one of five wineries existed prior to 2002, and nearly half of the wineries were established after 2007.



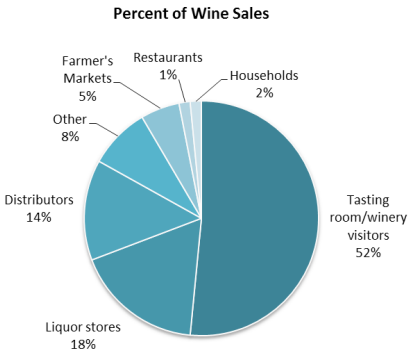
This trend may be key to the continued success of the Northern Grape industry. Rapid increases in the number of wineries may absorb the additional grapes being brought to market. Our research shows (as highlighted in the second article of this series) that grape production is expected to double between 2012 and 2016. New wineries will be an important market for these grapes. Growth in the winery industry is expected to continue. Forty-six percent of respondents said they plan to significantly expand their winery, while 36% plan to slightly expand their winery.

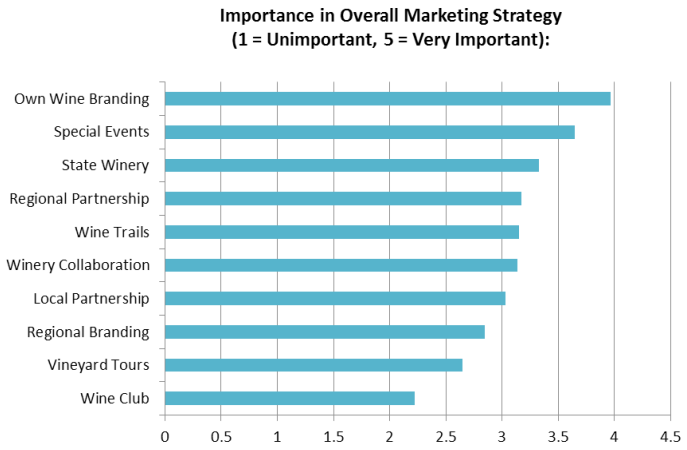
Wineries Have Long-Term Concerns: Wineries are concerned about the future of their industry. When asked about challenges to the growth and development of their winery, winery owners indicate government policy is their major concern, as it often dictates how wine can be sold and distributed in individual states. In many of the *Northern Grapes Project* states, wineries are regulated under a version of a "farm winery law." Farm winery laws typically require the wineries to remain under a certain size limit and to use a majority of grapes grown within their state to produce their wine. There are, however, local government policies such as zoning and taxation that must also be taken into account.

Sales are also a major concern of winery owners. In comparison, vineyard owners indicate their concerns are shorter in term and more focused on the production process (disease, pests, and insects ranked highest in their list of concerns). Another major concern is the cost of labor.

Untapped Markets Exist for Wineries: The research indicates there may be untapped markets for wineries. Tasting rooms and winery visitors are the main source of sales for wineries (52% of all sales). These figures vary by state. Wisconsin wineries, for example, report selling 71% of their wine through the tasting room while wineries in the New England states sell 37% of their wine through tasting rooms. It would appear sales could increase through other marketing channels, especially distributors and liquor stores. New England wineries, for example, sell 26% of their wine through distrib-

utors/wholesalers and 16% through liquor stores. Wisconsin wineries, in contracts, sell 15% of their wine through distributors/wholesalers and 3% through liquor stores.





Wineries also remain dependent on wine sales for their profits. Seventy-three percent of the average winery's sales are derived solely from wine sales. Other revenue sources include food sales, retail items, other beverage sales, and events (e.g. weddings).

Wine Branding is Key: Wineries indicate that branding their own wine is their most important marketing strategy. As mentioned, since some state laws often require wineries to produce the majority of their wine from locally produced grapes, wineries using cold-hardy grapes have to educate consumers about the unique and positive qualities of wines produced from those grapes. The winery industry ties into locally-grown efforts the importance of which should be emphasized.

In support of wine branding, special events are also critical to the overall marketing strategy. Special events support sales through the tasting room (the main source of revenue) and also reinforce individual winery branding efforts. After own wine branding and special events, wineries report the affiliation with a state winery organization is key to their marketing efforts. Wineries indicate wine clubs and vineyard tours are least important in their marketing efforts.

Conclusion: The development of cold-hardy grapes led to the development of an entirely new winery industry in the project states. Regulated in some states by farm winery laws, the wines are heavily influenced by the grapes produced within the state. Therefore, wine branding is critical to marketing strategies of wineries. Wineries, in the early days of winery development, have been dependent on sales from tasting rooms. Tasting room sales, meanwhile, are dependent on wine sales alone. There appears to be room for wineries to increase sales through different marketing channels and to increase the diversity of sales through the tasting room. Winery owners remained focused on overcoming long-term hurdles for their businesses, including government policies and regulation and wine sales.

The end-of-project survey will be distributed in late fall of 2015. We value your response!

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eViticulture.org is the national online viticulture resource containing the latest science-based information for viticulturists.

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