Viticulture, enology and marketing for cold-hardy grapes

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Downy Mildew in Cold Hardy Grapes

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As part of the *Northern Grapes Project* viticulture team, we are conducting an in-field, fungicide-free screening for disease susceptibility in cold hardy grapes. Previous efforts at rating new cultivars for disease have not been conducted in absence of fungicides or at multiple randomized sites, leading to inconsistent or absent disease ratings in extension material and outreach publications. Two identical vineyards are being studied, one in Sturgeon Bay WI, at the Peninsular Agricultural Research Station (PARS) and the other in Madison WI, at the West Madison Agricultural Research Station (WMARS), USDA zones 5a and 5b respectively. No fungicides are being applied at either site, and weekly disease ratings and photos of each vine are taken from bud break through harvest. Vines are trained to vertical shoot positioning and maintenance of the vineyards is the same as in a commercial vineyard in all other respects.

Our goal is that these efforts will lead to a greater understanding of the disease risks associated with growing specific cultivars in various regions of the Midwest, as well as to more reliable and consistent ratings within grower extension materials, such as the *Midwest Small Fruit and Grape Guide*. The findings presented in this article are not finalized and do not represent the whole scope of our efforts; rather, this article is limited to the difference in susceptibility to downy mildew in eight cultivars we are evaluating. More complete reports with information about other diseases will follow in the coming year.

Marquette. Marquette had little to no downy mildew at both WMARS and PARS, despite season-long outbreaks on other cultivars at both sites and wet weather at the beginning of the season. Rupestris speckle, which can be mistaken for old downy mildew lesions, was prevalent at both sites, particularly late in the year. Older leaves also developed chlorotic spots in the late season that were attributed to micronutrient deficiency.

Left: late season leaf discoloration and rupestris speckle on old Marquette leaves at WMARS. Right: underside the same leaf - note the absence of spores, which would indicate downy mildew infection.

Underside of LaCrescent leaf (right), with downy mildew spores, growing side by side with a Marquette leaf (left), which is free of infection. This photo was taken in mid-August 2015, nearly three months after sporulation was first seen on other cultivars.

Despite being grown in close proximity to actively sporulating cultivars, Marquette did not appear to be infected with downy mildew, even when its leaves touched leaves of other cultivars that had active spores. Even young shoots that are highly susceptible to downy mildew in other cultivars remained free of infection.

Marquette ripened a full crop at both sites, and was in such good condition at the end of the season at WMARS that it was sold to a local winery, and the money used to fund plot maintenance in the next growing season.

In This Issue:

Frontenac. Frontenac leaves resisted infection from downy mildew in the early season at WMARS and PARS. Like Marquette, leaves stayed free from sporulation even when directly next to actively sporulating leaves from other cultivars.

However, later in the season, resistance appeared to break down in older leaves in the fruiting zone - they showed some lesion formation starting in early August at the WMARS site, pictured below.

Top: Top side of leaf with "oil spotting." "Oil spotting" is a symptom of downy mildew infection that was be seen on the upper surface of infected Frontenac leaves in early August at WMARS. Bottom: As the disease develops, sporulation of the downy mildew will occur on the underside of these spots.

The PARS site developed similar infection levels and identical symptoms, but not until late August and early September. Young shoots and clusters stayed free of disease. In spite of late-season sporulation on some older leaves, the Frontenac vines at WMARS and PARS did not lose any leaves or clusters.

Left: Late season canopy and clusters of Frontenac at WMARS, September 2015. In spite of light sporulation on old leaves, the canopy remained lush and green through the end of the season at both sites. Right: Healthy Frontenac cluster; vines produced over 30 pounds of salable fruit per plant.

Frontenac gris. Frontenac gris had nearly identical downy mildew pressure to that Frontenac. Leaves remained resistant until late July at WMARS and late August at PARS, when sporulation occurred on older leaves in the fruiting canopy region.

Left: Oil spots on the top side of an old Frontenac gris leaf. Right: Sporulation on the underside of an old leaf. Both photos taken at WMARS in early August.

Like Frontenac, Frontenac gris ripened a full crop and retained a lush, green canopy through the end of the season in spite of some sporulation on old leaves. Clusters and young shoots remained free of disease.

Left: Ripe clusters and healthy canopy on Frontenac gris. Right: Healthy Frontenac gris cluster; like Marquette, the Frontenac gris crop was of excellent quality, so was sold to a local winery. Vines had an average of 30 lbs of fruit. Both photos taken at WMARS in September.

Valiant. Valiant showed early and severe downy mildew susceptibility at both PARS and WMARS, which could be in part due to the wet and humid climate in Wisconsin. Symptoms were visible by early June and progressed rapidly. Both berries and leaves of Valiant proved to be highly susceptible, and close to 100% of clusters were damaged beyond recovery at both sites. The disease progressed rapidly, destroying both fruit and leaves. Severely infected berries began to dry, and in extreme cases the entire rachis became infected and died.

Top: Downy mildew sporulation on a Valiant cluster in early June at WMARS. Bottom: Downy mildew symptoms at early veraison at PARS. Note the early coloring on several berries, a common result of Downy mildew infection.

By the middle of August, leaves were so infected that they began to fall off prematurely, resulting in an empty canopy for the remaining fruit.

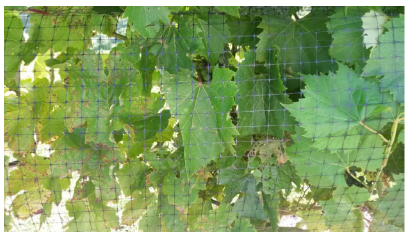
Left: Cluster damage on Valiant in August at WMARS. No clusters escaped damage at either WMARS or PARS. Left: Damaged clusters and canopy at WMARS in September.

LaCrosse. LaCrosse also showed early and severe foliar susceptibility to downy mildew at both sites equal to what was seen on Valiant. However, unlike Valiant, the clusters did not appear to be susceptible. Leaf lesion formation and sporulation started in early June, similar to Valiant.

Sporulating downy mildew infection on the underside of a LaCrosse leaf in early June at WMARS.

Despite an early onset of downy mildew, clusters on LaCrosse continued to develop normally throughout the season. However, canopy damage was quite severe.

LaCrosse (left half) and Frontenac (right half) growing side by side. Notice the yellowing leaves and lesions on the LaCrosse compared to the green, healthy Frontenac. Photo taken in late July at WMARS.



Like Valiant, the canopy of LaCrosse was decimated by the end of August. However, the clusters remained free of downy throughout the season.

Left: LaCrosse canopy, with significant damage, and clusters in late August at WMARS. Right: LaCrosse clusters in early September at WMARS; clusters at both sites did not become infected, despite the heavy infetion on the canopy.

La Crescent. La Crescent did not show the same early sensitivity to downy mildew as Valiant and LaCrosse, but instead had a severe breakdown in resistance beginning in early July at WMARS and late August at PARS. Infection was widespread on all leaves and shoots, with no difference between old and new foliage. Heavy sporulation was visible on the undersides of all infected leaves.

Left: Top side of a La Crescent leaf showing "oil spotting" symptoms at WMARS. Right: Underside of the same leaf. Note the heay sporulation, found in patches underneath each "oil spot" on the top side of the leaf.

Although the berries of La Crescent were unaffected by downy mildew at both sites through the duration of the growing season, foliage developed severe downy mildew infection at both PARS and WMARS by the end of the season. By early September, vines had become severely defoliated.

Left: La Crescent canopy defoliating prematurely due to heavy foliar downy mildew infection. Right: Despite the severe foliar infection La Crescent clusters were not affected at either site. Both photos were taken at WMARS in early September

Brianna. Brianna resisted downy mildew until late July at WMARS, and at PARS, infection did not develop until early September, and stayed at a low or moderate severity through the end of the season. Unlike Frontenac and Frontenac gris, which showed downy sporulation and damage only on old leaves, infected Brianna vines had lesions and sporulation on leaves of all ages at both sites. However, berries did not appear to be susceptible to infection.

Downy mildew lesions on the upper surface (left) and lower surface (right) of a Brianna leaf in late July at WMARS.

In spite of heavy infection at WMARS, the disease did not defoliate Brianna, and vines retained leaves at both WMARS and PARS through the end of the season.

Ripe Brianna cluster, free from downy mildew infection, at WMARS in September.

St. Croix. St. Croix followed a similar pattern to that of Brianna at both sites, and remained free of downy mildew until late July at WMARS, and until early September at PARS. At WMARS, disease advanced to severe levels by late mid to late August. At PARS, disease advanced to a light to moderate level by the end of the season, but never reached severe levels. After disease developed at both sites, St. Croix also showed symptomology for downy mildew on all vegetative portions of the vine, regardless of location or age, but the berries did not appear to be susceptible.

Left: Downy mildew sporulation on the underside of a St. Croix leaf, taken in early August at WMARS. Right: Downy mildew damage on a sucker from a St. Croix vine in August. Damage was spread evenly througout old and young vine tissue.

St. Croix also retained its foliage in spite of heavy infection at WMARS and light to moderate infection at PARS, staying lush and green through the end of the season.

Left: St. Croix cluster in September at WMARS; clusters remained entirely free of downy mildew and ripened a full crop at both sites. Right: Canopy and clusters at PARS in September; leaf undersides had widespread sporluation for several weeks when this photo was taken, but vines did not suffer leaf loss despite the infection.

Conclusion. The data that we collected so far suggest that Valiant and LaCrosse have the highest level of susceptibility for the longest period of the growing season; infection can occur almost immediately after leaves expand in the spring. Severe defoliation and, in the case of Valiant, wholesale loss of fruit, were observed at both sites. These cultivars should be considered severely susceptible to downy mildew.

La Crescent, although often considered to be a severely susceptible variety, appears to be resistant to early season downy mildew and did not become severely infected at PARS in spite of heavy infection in other cultivars. However, it can develop severe infection by mid to late summer and can suffer from defoliation equal to that of Valiant and LaCrosse. We believe that this cultivar can be considered moderately to severely susceptible to downy mildew, depending on the environment.

Brianna and St. Croix both exhibited moderate to heavy sporulation at both sites by the end of the growing season, but did not suffer premature defoliation or loss of clusters. Additionally, degree of infection and sporulation was similar between old and new foliage. However, the canopy at both sites remained green and set through the end of the season, and fruit ripened normally. For this reason, we propose that these two cultivars should be considered moderately susceptible to downy mildew.

Frontenac and Frontenac gris never reached severe levels of infection at either PARS or WMARS, and infection and sporulation were limited to the oldest leaves in the fruiting canopy. No clusters were affected at either site, and the canopy remained lush and green through the end of the season, ripening a full crop at both sites for both cultivars. We believe that these two cultivars can be considered lightly susceptible to downy mildew.

Marquette displayed impressive resistance to infection and sporulation at both sites. In spite of severe infection of other cultivars at both sites, no sporulation was observed on any leaves of any plant at either site. While symptoms resembling "oil-spotting" were sometimes observed on old leaves near the end of the season, no sporulation was present on the leaf undersides. We propose that Marquette can be considered relatively resistant to downy mildew.

In addition to our observation in differences between disease pressures, it is also evident that timing is of great importance in the onset of this disease. A cultivar that does not show early season susceptibility to downy mildew is not necessarily safe from the disease for the duration of the season. It is also important to note that well-timed sprays can control downy mildew effectively, particularly when growing a variety with minimal susceptibility to the disease. Finally, we must reiterate that these findings are preliminary, and are based on only one season of work, but more reports, which will include other diseases and results from more seasons, will follow.

NGP Team Profile: Terence Bradshaw

Terry serves as tree fruit and viticulture specialist at the University of Vermont, working primarily with apples and grapes. Terry's research, teaching, and outreach programs cover horticultural, pest management, and business management topics. As part of the Northern Grapes Project, Terry contributes to cultivar evaluation, outreach instruction, and with his colleague Ann Hazelrigg, disease susceptibility assessment of cold-hardy grape cultivars.

1. How did your interest in horticulture and viticulture develop?
I was raised on a small, seventh-generation dairy farm in Vermont, and when I went to college, I had no interest in animal-based agriculture. The Plant and Soil Science department at UVM had opportunities to work outdoors in food production without the animal component. While in the program, I worked in the apple program under Dr. Lorraine Berkett, who was my supervisor until her retirement in 2014, minus a few years I spent in the commercial sector. The growth in the wine industry in Vermont presented opportunities for our team to support an entirely different clientele from our traditional apple growers.

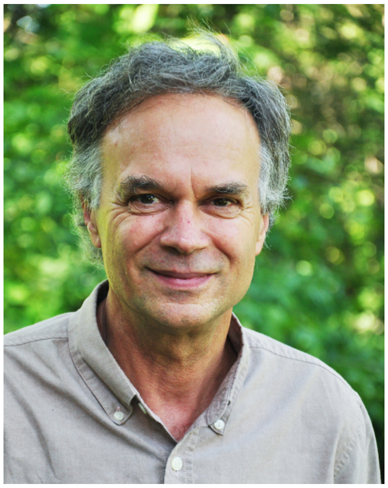
2. You were involved with the first research plantings of grapes in Vermont. What were some of the key lessons learned from this plot?
We initially began our viticultural research at UVM on grower sites around 2003. Many vineyards at that time were still planted to older French hybrid and even vinifera cultivars, which proved too cold-tender and not disease-resistant enough for widespread planting in the state. In 2007, we established out test planting at UVM in coordination with the NE-1020 Winegrape Cultivars and Clones trial. The plot consisted mostly of Minnesota hybrids, including Frontenac, La Crescent, Marquette, Prairie Star, and St. Croix. In addition, we included some less cold-hardy cultivars including Corot Noir, Traminette, and Vignoles. Some key lessons were not entirely unexpected, but were proven through data collection. Traminette and Vignoles were not sufficiently cold-hardy for the site and Corot Noir has performed surprising well in the planting. Disease susceptibility ratings were also collected, which led to development of an initial IPM strategy.

3. You have worked with the Vermont grape and wine industry since the beginning. In your opinion, what are some challenges and opportunities that are unique to Vermont?
Vermont grape growers are largely new to production agriculture, so they often face a steep learning curve, Once growers get acquainted with the seasonal cycle and management needs, they find good market opportunities for high-quality fruit. Prices in Vermont for bulk grapes are higher than for many areas of the country, but are only offered for top-quality fruit, making the usual canopy and crop management tasks critical. A significant challenge is the high cost of land and labor in the region. A recent analysis conducted by Mark Cannella at UVM Extension concluded that payback period for a typical vineyard in the state is around twenty years, although significant variation may be had based on grower resources and management.

4. Much of your current and past research is on organic apple orchard management. Several of the information requests we get via the *Northern Grapes Project* involve organic vineyard management. What key pieces of advice would you give someone who is interested in growing grapes organically in the Eastern US?
I have a line that I use in my courses: "Just because you're organic, that doesn't mean the pests and diseases got the memo." Cold-hardy grape cultivars have North American species in their backgrounds are generally more disease-resistant than *V. vinifera* or older French hybrids. However, there are a few diseases that absolutely must be managed, and some, particularly black rot, are very difficult to manage using organic materials. A modest, well-timed, four to five spray, disease management program using synthetic, but relatively low-impact, materials can produce a high-quality crop in most years. Relying on mineral fungicides such as copper and sulfur, which may require a dozen or more applications to approach a commercial level of control, just doesn't seem sustainable to me. Any organic management program also needs to include a strict sanitation program including weekly vineyard walks and removal of inoculum and diseased tissue. I think growers with organic intentions may underestimate the amount of time that will take.

5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?
I have worked in horticultural research for twenty years now, and know that the post-harvest component of a crop, especially grapes, is just as important to commercial viability. The research on winemaking has been critical in improving the quality of wine produced from these grapes, and has been useful to me as an amateur winemaker. By studying the unique properties of northern winemaking, we are making better northern grape growers and significantly extending the economic impact of this industry.

NGP Team Profile: Carl Rosen



Carl is a professor and chair of the Deaprtment of Soil, Water, and Climate at the University of Minnesota. He is a soil scientist specializing in soil fertility and nutrient management for horticultural crops. For the Northern Grapes Project he leads an on-farm effort in five states to determine optimal mineral nutrition and soil management practices for cold climate cultivars.

1. After you graduated from high school, you spent a year on a farm in Ireland. Tell us a little about that experience, and how it influenced you to study horticulture.
Although I grew up in a suburb of Philadelphia, I always had an interest in growing plants and gardening. So, when my father took a sabbatical leave from Swarthmore College to teach in Cork, Ireland the year I graduated from high school, I tagged along to learn more about farming. I was hired to work on a dairy and potato farm where I bagged potatoes, cleaned the barns, milked the cows, and even planted a field of oats. After returning to the U.S., I attended a liberal arts college in upstate New York for one year, but that experience in Ireland convinced me to transfer to Penn State where I could learn more about agriculture. I enrolled in their horticulture program, as my interests were primarily in vegetable and fruit production. Originally, my goal was to work as an extension agent or even buy land to farm, but that changed once I got my BS degree.

2. What sparked your interest in plant nutrition?
My undergraduate advisor, Dr. Ernie Bergman, was very encouraging and offered me a fellowship to work an MS degree at Penn State under his guidance. His only stipulation was that if I wanted to pursue a PhD, it would have to be at a different university. Dr. Bergman's expertise was plant nutrition so obviously my thesis work was going to be related to that subject. He was conducting research on the interrelationships between virus infection and mineral nutrition. My MS research focused on how bean yellow mosaic virus infection affected the mineral nutrition of snap beans. I took a number of soil science classes and became interested in soil fertility and chemistry, particularly as it related to nutrient uptake by plant roots. To that end, I looked for universities that offered a Ph.D. in soil science and was accepted into the Land, Air, and Water Resources program at UC Davis. There, I worked with Dr. Robert Carlson, who was a soil chemist by training, but was housed in the Department of Pomology. My Ph.D. work dealt with potassium nutrition of prune trees. While at Davis, I made many trips to the Napa Valley and developed a taste for Cabernet Sauvignon and Chardonnay wines. Little did I know back then that I would eventually be moving to Minnesota and have the opportunity work on nutrition of newly-developed cold hardy grapes.

3. You also work quite a bit with nutrition of potatoes and sweet corn, as well as traditional agronomic crops such as field corn and soybeans. Some farmers who grow these crops are now also growing cold-hardy grapes. What are some of the key differences, in terms of plant nutrition, that they should be aware of?
In general, optimum yields of most annual crops like corn, sweet corn, and potatoes require much higher nutrient inputs than perennial crops like grapes. Some growers that have traditionally produced corn or potatoes and then start growing grapes tend to over fertilize. Excessive nutrient application, especially with nitrogen, can result in excessive vine growth and lower the quality of grapes for making wine.

4. What tools or information do you hope to develop for growers of cold-hardy grapes as a result of your grapevine nutrition work?
Use of tissue analysis as a nutrient diagnostic tool for cold hardy grapes is currently based on data from Concord (*Vitis labrusca*) or French hybirids, which may not be appropriate for the new cold hardy cultivars. The diagnostic criteria have also been based on petiole tissue, which is a predictor of future nutrient needs during the growing season, but may not be as appropriate for diagnosing overall nutrition of the vine. The leaf blade tissue tends to integrate the nutrition of the plant and may be a better indicator for overall nutrient diagnostic purposes. In this project I hope to develop and fine-tune nutrient diagnostic criteria and interpretations for cold hardy grape varieties and to determine the relationship between petiole/leaf nutrient levels and grape quality characteristics such as Brix, pH, titratable acidity, and yeast assimible nitrogen.

5. In your opinion, what is the most exciting research-based information that will come out of the *Northern Grapes Project*?
This is the most comprehensive and detailed study ever conducted on cold hardy grapes in North America, so the data collected will most certainly help the industry improve on production and wine making practices. It's very rewarding for me to be part of such a unique project. Of course I'm a bit biased, but I think the most exciting information that will come out of this project will be the revised nutrient diagnostic criteria for cold hardy grapes as well as how vine nutrition affects the quality of these grapes for wine making.

Low Temperature Response in Grapevines

Shanna Moore, Cornell University; Hans Walter-Peterson, Cornell Cooperative Extension; and Jason Londo, USDA-ARS
Adapted from *VitisGen Voice*, Spring 2015

Editor's note: The VitisGen Project was launched in September 2011 after being awarded a five-year grant by the USDA-NIFA Specialty Crops Research Initiative. The goal of the project is to develop new genetic markers that are closely associated with certain traits such as powdery mildew resistance, low temperature responses, and various fruit quality characteristics. These markers can then be used to identify or select plants as seedlings that have these high priority traits, which will speed up the breeding and evaluation process, so these traits can get incorporated into new grape varieties more quickly, benefiting both consumers and the grape industry.

The grapevine genus (*Vitis*) has evolved over a wide range of environmental conditions, from warm and humid conditions in the subtropics to dry, desert-like climates, to extreme cold in the northern US and Canada. Because of its superior fruit quality, commercial production has been historically dominated by a single grape species, *Vitis vinifera*, which evolved, and is traditionally grown in, milder Mediterranean climates. When *V. vinifera* is planted in regions with significantly different climatic conditions, such as very cold temperatures in the winter or highly variable temperatures in the early spring, these vines can be severely damaged or killed.

Interest by potential growers and consumer demand for locally-produced grapes and wine has led to an expansion of grape cultivation into non-traditional growing areas in less favorable climates. One of the most important decisions for growers in these areas is selecting varieties that will withstand severe winters, mature during short growing seasons, and still produce a good crop. Winter injury can result in significant losses, and consequently impact wine production and sales; for example, a single cold event in the Finger Lakes region of New York during the winter of 2004 caused over $63 million in lost revenue (Martinson and White, 2004).

At a glance...

- One of the biggest challenges faced by growers in colder climates is selecting varieties that will withstand severe winters, yet still produce a good quantity and quality of fruit and mature during short growing seasons.

- Some grape varieties can survive low temperature events like extreme cold winter temperatures and early spring frosts due to multiple, complex, physiological adjustments (acclimation) in response to decreasing day length and the onset of low temperatures.

- *VitisGen* scientists are working to develop a better understanding of the genetic mechanisms involved in acclimation, dormancy, and freezing tolerance, with the goal of giving breeders better information to help them develop new varieties that can thrive under climatic conditions that previously made grape growing a major challenge.

Further, this expansion into non-traditional grape growing regions has resulted in the need for broader information regarding the genetic and physiological mechanisms that impact survival and productivity, including an understanding of how some grape species can survive extreme low temperatures or break bud later in the spring. Depending on cultivar, dormant *V. vinifera* buds and canes can be damaged at temperatures just below 0°F, while species that evolved in colder climates, like *V. labrusca* and *V. riparia*, can tolerate much colder temperatures with no significant damage. However, the fruit quality of these more hardy species is generally not valued as highly by consumers as that from *V. vinifera* cultivars. Thus, a greater understanding of the mechanisms underlying low temperature tolerance could allow for the development of new cultivars as well as improve cultural practices for existing varieties.

Survival at low temperatures is dependent upon multiple, complex physiological adjustments (acclimation) to events such as decreasing day length and the onset of low temperatures. Exposure to short days and colder temperatures initiates protective biochemical measures within the vines to minimize cellular damage and initiate dormancy. Acclimation and dormancy, while closely interrelated, are distinct phenomena. Grape bud dormancy is an adaptive strategy for survival that has multiple stages, including paradormancy, endodormancy, and ecodormancy. Each of these stages is crucial for bud and vine survival, but in this article we will focus primarily on endodormancy and ecodormancy.

In fall, the vine begins to prepare for winter conditions by ceasing vegetative growth and developing periderm (the outer layers of woody stems/roots) along the one year old shoots. The dormant buds that are left behind on the vines are in a state of endodormancy. Endodormancy is a biological state that prevents new growth from occurring in buds while early winter temperatures fluctuate. As the season progresses, extended periods of extreme temperatures promote increased freezing tolerance, protecting the vines from environmental extremes—in this case, mid-winter low temperatures.

Like many other fruit crops, grapes require a certain number of "chilling hours" during the dormant season in order to conclude endodormancy and properly break bud and grow the following spring. Chilling hours start accumulating in endordormant vines when temperatures occur between 0 and 7 ^{o}C. Chilling hours may accumulate quickly (mild winter with lots of days above freezing) or slowly (cold winter with lots of days below freezing). Different grape species and cultivars have varying chilling requirements (from 500–2000 hours) that must be met before bud break can successfully occur. This adaptation helps to ensure that new bud growth does not happen during short temperature fluctuations (midwinter warming) that can occur throughout the winter. If a particular winter is mild and the chilling requirement of a vine is met early, the vine will quickly emerge from dormancy in response to warm weather, leaving the new growth vulnerable to spring frosts. Although some cultivars can produce a crop on secondary buds if primary shoots are killed, the yield will be lower. Conversely, if chilling requirements are not met by spring, bud break will be erratic, desynchronized, and extended in the spring.

Dead primary (lower) and secondary (upper) grape buds due to winter cold injury.

photo: Jim Monahan, Cornell Cooperative Extension

Once the chilling requirement is satisfied, the plant enters a different state of dormancy, ecodormancy. In this state, the buds are held dormant due to temperatures that are too low to allow growth. In late winter and spring, vines become responsive to increases in temperature, and will break dormancy and begin to grow.

Vocabulary

Chilling requirement
The minimum period of low temperature required before dormancy can be broken.

Paradormancy
Temporary cessation of growth due to conditions within plant but outside bud; for example, apical dominance.

Endodormancy
Temporary cessation of growth due to conditions within the bud. Period when the vine is accumulating chilling hours.

Ecodormancy
Temporary cessation of growth due to conditions outside plant; winter dormancy. Period after fulfillment of chilling requirements.

There are some techniques growers can use to reduce the chance that their vineyards will suffer low temperature damage in winter and spring. They can choose cultivars adapted to local conditions, select sites well-adapted for grape production, use cultural practices such as canopy and crop load management, or bury portions of vines during winter.

Because these techniques are not always successful and can be costly, the ability to identify markers linked to genes that improve low temperature survival and delayed bud break could have a significant impact on further expanding grape production in less-favorable climates. Grapevines' responses and acclimation to low temperature events is a complex process that is influenced both by the environment (where and how they are grown) and by their genetic makeup.

VitisGen scientists are developing a better understanding of the genetic mechanisms involved in acclimation, dormancy, and freezing tolerance, with the goal of giving breeders information that will help them develop new varieties which will survive and thrive in an increasingly wider range of climatic conditions. This work will allow scientists to more objectively evaluate a vine's cold hardiness or resistance to early bud break independent of environment, and develop new varieties that can thrive under climatic circumstances that previous made grape growing a major challenge, or even impossible.

Reference: Martinson, T. and G. White. Estimate of Crop and Wine Losses Due to Winter Injury in the Finger Lakes. http://www.fruit.cornell.edu/grape/pdfs/Cost%20of%20Winter%20Injury-%20Finger%20Lakes%202004.pdf

2015-2016 Northern Grapes Project Webinar Schedule

December 8, 2015
"The Big Chill: Cold Acclimation and Recovery from Spring Frost in Grapes in New York"
Jason Londo, USDA-ARS and Tim Martinson, Cornell University

January 12, 2016
"Terroir and Typicity in Cold-Hardy Grapes"
Anna Katharine Mansfield, Cornell University

February 9, 2016
"Branding and Best Management Practices for Cold Hardy Wines and Wineries"
Bill Gartner, University of Minnesota and Dan McCole, Michigan State University

March 8, 2016
"Cold-Hardy Grape Breeding at the University of Minnesota and North Dakota State University"
Matt Clark, University of Minnesota and Harlene Hatterman-Valenti, North Dakota State University

April 12, 2016
"Northern Grapes Project Research Results: Fungicide Sensitivity and Vine Nutrition of Cold-Hardy Cultivars"
Patricia McManus, University of Wisconsin-Madison and Carl Rosen, University of Minnesota

May, 2016
"From Vine to Glass: Understanding the Flavors and Aromas of Cold-Hardy Grapes and Wine"
Anne Fennell, South Dakota State University; Adrian Hegeman University of Minnesota; and Somchai Rice, Iowa State University

For more information, visit http://northerngrapesproject.org/?page_id=12

The end-of-project survey will be distributed in January 2016.

We value your response!

Visit our sister site

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

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Cornell University