Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

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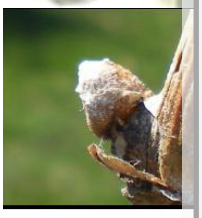
Grape News

In this issue of Grape News:

Phenology

In both the Champlain Valley and the Hudson valley the vines are still dormant



Dormant

March Temperatures and Rainfall, 2017

Weather Station	Avg Temp (F)	High Temp (F)	Low Temp (F)	Rainfall (in)	DD Base 50 [Jan 1 - Mar 31]
Chazy	24.7	57.4	-4.7	1.45	1.5
Peru	25.5	64.2	-2.6	1.58	6.7
Willsboro	26.0	60.9	-3.2	1.07	4.6
Clifton Park	29.9	62.9	2.9	2.88	25.4
Hudson	31.8	62.9	5.9	2.54	23.7
Highland HVL	33.9	63.4	8.2	2.06	34.1
Riverhead	39.1	60.4	17.3	7.40	43.1

Are you ready for the growing season?

Jim O'Connell– ENYCHP

Athough still a little cool, it won't be long before the temperatures warm, and grape buds break. Before that happens, it's a good idea to think about your vineyard needs. Here is a checklist/to do list of important tasks to think about and get done before getting started in the vineyard.

EQUIPTMENT

Tractor
- ☐ Ready to go?
  - No flat tires?
  - Changed the oil?

Sprayer
- ☐ Is it clean?
  - No leaks?
  - Hoses, nozzles all function properly
  - Calibrated to your vineyard?
  - Test run to make sure all is well?

Pruning Tools
- ☐ Sharpened?
  - Cleaned and oiled?
  - Do you have enough?

Bird Netting
- Last year's nets still good?
- ☐ Need repair?
  - Have enough ties/clips?

CHEMICALS

Fungicides/Insecticides/Herbicides
- Enough on hand or order more?
- ☐ Need any newly registered materials
  - Have all the labels you need?
  - Proper storage space?

Posts/wires
- All secure?
- ☐ Any need replacing?
  - Have enough vine ties?

Inspecting the vines:
- What's the percent bud mortality?
- ☐ Adjust pruning based on bud counts

Pruning
- Crew trained and ready?
- ☐ Spur or cane?
  - Crown gall?

SCOUTING

INSPECTING

Serving the educational and research needs of the commercial small fruit, vegetable and tree fruit industries in Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Putnam, Rensselaer, Saratoga, Schoharie, Schenectady, Ulster, Warren and Washington Counties

Another Early Sprig? Too Early to Tell

Anna Wallis – ENYCHP

The warm temperatures in February this year have things off to an early start in many places. In Washington DC, cherries were in bloom in the first week of March (as well as Bradford pears, magnolias, daffodils, and forsythia), about 4 weeks earlier than normal. The South Carolina Department of Agriculture has reported approximately 80% loss in peach crop this year due to early warming followed by frost. We experienced a similar warming trend in February in Eastern NY. Fortunately, grapes in our region are still dormant and have avoided any spring frost injury.

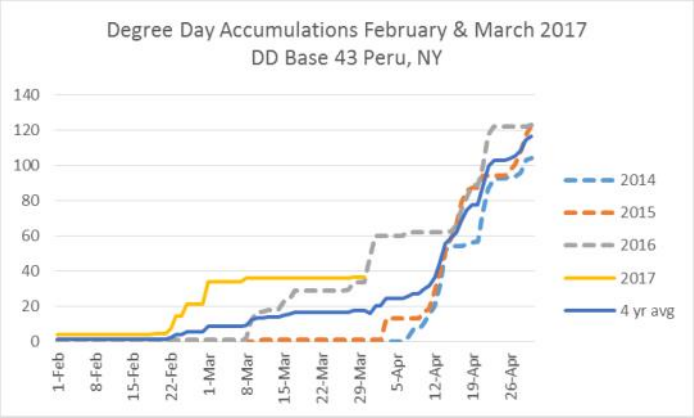
So when will spring arrive? In commercial agriculture, time is measured in many ways. If you trust calendar days, the official first day of Spring was last Monday. There is also the Julian calendar, which counts the days from the first of the year from 1 to 365, without starting over at the beginning of each month. More frequently, in agriculture we go by the physiological development of the crop, day length, and weather.
One of the most reliable measurements of the season is the accumulation of heat. Heat accumulation is measured as 'Growing Degree Days' or GDD for short. The most basic way to calculate GDDs accumulated in a day is to average the daily high and low; then subtract a base temperature (a common one, which I'll use, is 43°F). GDDs can also be accessed on the NEWA weather page http://newa.cornell.edu/ .

In both the Hudson Valley and the Champlain Valley of NY, Degree Day accumulations (base 43F) in February were much above the norm. Historical data is only kept in DD Base 50, which does not reflect this in the Champlain Valley (Table below). However, looking at DD Base 43 in Peru, show the obvious abnormal warming in February over the past 5 years (Graph below). Fortunately, March weather across ENY dipped back into cooler temperatures, and Degree Days are back to relatively 'normal' values.

What does this mean for grapes? Not much. Because vines are still dormant, they should have been relatively unaffected by the unusual temperatures. You should proceed as normal for now, checking buds for cold damage (see Jim's article below) and adjusting your pruning accordingly.

GDD Base 50, at end of month

	February		March	
	2017	**30 yr avg**	**2017**	**30 yr avg**
Peru	0.0	0.0	5.6	4.0
Highland	26.8	0.0	34.1	10.0



Insect and Disease Pest Management

While vines are still dormant, take the opportunity to prepare for the coming season. Practicing good sanitation can significantly reduce disease pressure in your vineyard: remove disease inoculum *before* spores are active and susceptible green tissue is visible. Prune out damaged and diseased wood, mummies, and leaves from last season. Both from the canopy and the vineyard floor.

Now is also an excellent time to be planning your pest control strategy. Look back at your records from previous years. Ask questions like:

-Which diseases have been present & problematic?

-On which varieties? In which locations?

-What control measures were taken (cultural, mechanical, chemical)

-What defines 'adequate control' in your vineyard?

-Was adequate control achieved in previous seasons? If not, why?

-What adjustments need to be made this year for adequate control?

-What actions are taken to prevent development of pest resistance?

-How much has it cost in past seasons? Is this sustainable?

Predicting Bud Break in the Hudson Valley

Jim O'Connell, ENYCHP

This past winter was relatively mild for grape growers in the Hudson Valley. Winter low temperatures in the Hudson Valley remained above zero and for part of the winter, there was adequate snow coverage, to help insulate the soil and prevent early warming. The lowest recorded temperature at the Hudson Valley Research Lab was 1°F, recorded on December 17, 2016.

Now that winter is over, the snow is gone and temperatures are beginning to warm, the next concern for growers is bud break. Trying to accurately predict bud break can be difficult. I recently came across an article, which used a growing degree day (GDD) model to calculate when bud break would occur. At first glance, it seemed like an easy tool that could be passed on to growers. After discussing this article and the topic of bud break further with my grape and tree fruit colleagues, I came to understand that GDD's alone are not an accurate predictor of bud break in grapes or tree fruit. There are many other factors including (and certainly not limited to) soil temperature and cultivar that also influence timing of bud break.

In the March issue of the ENYCHP Produce Pages, I wrote an article about monitoring bud hardiness using a process called differential thermal analysis (DTA), in which buds are collected, placed in a thermal chamber with decreasing temperatures until the buds freeze. This freezing temperature is recorded and compared to the daily low ambient temperature. In addition to measuring bud hardiness, this tool can serve as a guide for growers when trying to estimate bud break. The data for this year and previous years are located on the Cornell Grapes and Wine webpage (https://grapesandwine.cals.cornell.edu/extension/bud-hardiness-data/2016-2017-data).

The question remains, though, when will bud break occur for grapes in the Hudson Valley? I discussed this question further with Tim Martinson, the statewide viticulture extension educator. Based on comparisons of this year's data from the DTA, particularly the LT50s, which are generally a reasonable indicator of bud development in terms of bud swell and bud burst, Tim feels this year may be an average year for bud break, similar to what was seen in 2014. Comparing the Hudson Valley data from this year (2016-2017), to last year (2015-2016) and the previous year (2014-2016), what Tim said makes sense. Using Cabernet Franc as an example and comparing the last sample date in each year (see table), we can see the lethal temperature (LT) for bud mortality for 2016/2017 is similar to 2014/2015.

Year	LT10	LT50	LT90
2014-2015	-3.1°F	-5.3°F	-6.9°F
2015-2016	12.6°F	9.1°F	1.8°F
2016-2017	-2.0°F	-4.2°F	-8.9°F

Overall, it looks like an average year, at least for bud break, in the Hudson Valley. However, it's still advisable to get the tractors and equipment ready, just in case!

Dormant Liquid Lime Sulfur Treatment

By Mike White, Iowa State University Extension, 3/30/2017

Editor's note: Liquid Lime sulfur is a very useful tool for disease and insect management, including in IPM and organic vineyards. We received several questions about it following the NENY & VT Winter Grape School this year, and hope that this article will provide some follow up information. However, it is a Very corrosive, unpleasant material to work with. At CCE, we do not recommend LLS as the first line of defense. Other control tactics should be attempted first. Please proceed with caution.

******Liquid Lime Sulfur is a restricted purchase and use pesticide in NY State. To apply or this product you must have a pesticide applicator license or be supervised by a someone who does.******

Liquid Lime Sulfur (calcium polysulfide) is used in vineyards primarily as a dormant application to disinfect the cordons and canes just prior to bud break to get early season Anthracnose control. Whether-or-not an early season lime sulfur application is needed should be based on past experience and the susceptibility of the grape cultivars being grown.

The potential of Anthracnose infections is much greater during wet springs. Experience here in Iowa has shown that many of the Elmer Swenson cultivars like Brianna, Edelweiss, Esprit and others seem highly susceptible. You can review the Relative Disease Susceptibility chart on pages 100 & 101 of the 2017 Midwest Fruit Pest Management Guide. You will see that Cayuga White, Fredonia, Frontenac, Marquette, Marquis, Reliance, Steuben, Vidal Blanc and Vignoles are listed as highly susceptible. You may also find out that you may be growing cultivars that are fairly tolerant to grape Anthracnose and do not need a special spray for Anthracnose control.

Application during the first week of April in Iowa would be a good time-frame to get this done. [A similar time frame is appropriate for NENY.] Liquid lime sulfur is also toxic to the overwintering inoculum of Phomopsis and Powdery Mildew that reside in the bark crevices, canes and buds of the grape plant. Applying liquid lime sulfur just prior to bud break provides excellent control of Anthracnose, good control of early season Phomopsis and some control of Powdery Mildew. Reducing the amount of overwintering inoculum can dramatically reduce and delay the infection rate of these diseases as the new shoots and leaves emerge from the buds. Rain splash and runoff down the cordon and canes are the primary methods of infection of the new shoots.

Most liquid lime sulfur labels (27-29% calcium polysulfide) are very vague as to the exact product rate and water carrier rate to use for dormant applications to grape cordons and canes. They often recommend mixing anywhere from 4-20 gallons of liquid lime sulfur in 100 -200 gallons of water when using an airblast sprayer. Many vineyard operators will mix 1 gallon of liquid lime sulfur to 10 gallons of water and spray their recently pruned cordons and spurs or canes with a sprayer handgun. They make sure to completely cover the cordons and canes. They typically will end up using only 2.5-3 gallons of liquid lime sulfur per acre when applying it in this fashion. Others are using only 1 to 2 nozzles of their air blast sprayer directed at the cordon. This normally requires higher amounts of liquid lime sulfur per acre because of the overspray that misses the cordon. Liquid lime sulfur in 5 gallon jugs normally runs around $16 per gallon. Many forms of liquid lime sulfur are approved for organic grape production.

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NovaSource Sulforix (27.5% calcium polysulfide) is a liquid lime sulfur product that contains proprietary wetting agents intended to have better spreading and retention than the common liquid lime sulfur products. Many commercial vineyards have been using this product instead of the typical liquid lime sulfur product. The Sulforix label recommends a rate 1 – 2 gallons of Sulforix per acre applied as a dormant application. Many growers are mixing around 1 gallon of Sulforix per 25 gallons of water and spraying through a hand-gun spray nozzle. Sulforix costs approximately $25 per gallon in 2.5 gallon containers. Sulforix is NOT approved for certified organic production.

These dormant applications can be applied to both sulfur tolerant and intolerant grape varieties prior to bud break

Note: Liquid lime sulfur is very corrosive. Suggest spraying the sprayer vehicle with a light coating of PAM, diesel fuel, kerosene or mineral oil to protect the paint and metal surfaces.

"I don't want to apply Liquid Lime Sulfur, what else can I do?" This is a common question. Many do not like to spray a messy and corrosive sulfur mixture. I understand. My second suggestion would be to use a preventative fungicide or fungicide mix that is effective on anthracnose as soon as the shoots begin to emerge. Manzate / Penncozeb would come to my mind first due to their low cost and additional effectiveness on Black Rot and Phomopsis. Other fungicides that are also listed as highly effective on Anthracnose can be found on pages 95 & 96 of the 2017 Midwest Fruit Pest Management Guide.

Experience has shown that cordon pruned vines tend to have a higher amount of Anthracnose and Phomopsis disease pressure than cane pruned vines. Cane pruned vines have much less old wood that can harbor these early season diseases.

Individual pesticide labels can be found here: http://www.cdms.net/label-database

Remember! – Always Read and Follow Label Directions!

Additional Notes on Lime Sulfur from UVM Grape Program – The growing season looms…
Terence Bradshaw, UVM

LS is typically labeled for application at "15-20 gallons per acre in sufficient water for coverage" (Miller Liquid Lime Sulfur). That is a very high amount of LS, and would be difficult to apply and very costly when applied to large acreages. The key is to fully soak all woody tissues in the vineyard. This may mean aiming all nozzles at the cordons, but that would leave the trunks uncovered. Alternatively, the sprayer could be operated to cover the whole zone from the fruiting wore down, which would waster a tremendous amount of spray. The best application may come from a careful handgun application, which will take a long time and should be done with full protective gear including heavy nitrile gloves, full face shield and respirator, and Tyvek or other chemical-resistant, disposable coveralls. It is hard to say how much you would apply per acre in a directed spray, since that would be much more efficient with less wasted spray than an airblast application. My suggestion would be to apply a 10% solution (1 gallon LS to 9 gallons water) by handgun to cordons and trunks in a very thorough soaking spray. If you need to use an airblast to cover more ground, I would concentrate my nozzles toward the cordons but leave one or two directed toward the trunks, that will waste spray between vines but will allow you to cover ground much quicker. Because of the reduction in efficiency, I would calibrate to apply ten gallons of LS per acre in at least fifty gallons of water.

Remember, this stuff is caustic, stinky, and degrades just about everything it touches. It's also quite phytotoxic- application at these rates to vines after bud break will cause leaf damage if not outright defoliation. I have used a lot of LS during the growing season in organic apple production, and don't recommend it there unless absolutely necessary. I do not have experience using it in-season (post-bud break) on grapes, so this recommended spray must be applied during the window between pruning and bud break. The spray, if left on tractors and in sprayer plumbing, will corrode hoses, gaskets, and even stainless steel. It must be thoroughly rinsed from sprayer systems and the rinsate applied back out in the vineyard, not dumped on the ground. Some growers have applied a film of vegetable oil via backpack prayer to tractors and sprayers before an LS application to prevent it from soaking into and corroding steel and other materials on equipment. It's that bad, and I could show you sprayer hitches, mix screens, and ceramic nozzles that have been degraded by it.

With all that said, LS is extremely effective as a preventative practice to reduce disease inoculum, and I still recommend its use in vineyards where anthracnose and/or phomopsis have gotten a bit out of control. Just be careful out there and treat it with the same (and a little more) respect that you should retreat any pesticide.

Willsboro Cold Climate Grape Variety Trial

Anna Wallis, Tim Martinson, Lindsey Pashow, Kevin Iungerman, CCE

The introduction of cold-climate grape varieties largely in the 1990s facilitated grape and wine production industries in many cold-climate regions in the US, including the North Country of NY. These varieties include selections primarily from the breeding programs of Elmer Swenson, the University of Minnesota (UMN), and Cornell-Geneva. Performance of individual varieties can depend on specific climate, therefore, field testing within specific regions is necessary to provide sound recommendations for growers. In 2005, 25 varieties were planted at the Cornell Willsboro Research Farm in NY to test the suitability of select varieties specifically for the North Country NY. Seven years of data on phenology, vine vigor, winter injury, yield, and fruit quality, indicate that most of these varieties are appropriate for production in the North Country NY, though success will depend on the unique microclimate of the individual vineyard site.

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North Country NY Industry

The introduction of cold climate grape varieties largely in the 1990s has enabled the creation of a cold climate grape and wine industry in regions where grape production was not previously possible including Northeastern NY, Iowa, Minnesota, Michigan, and Vermont. The grape and wine industry in the North Country of NY is located in two narrow regions north of Albany and Syracuse, running north-south between the Adirondack Mountains and Lake Champlain in the East and between the Adirondacks and Lake Ontario on the West. Winter temperatures regularly reach lows of -20°F and the growing season is extremely short with less than 170 frost free days and 2000 growing degree days (GDD). The climate is more temperate than surrounding regions due to water moderation by the Lakes, and soils are the product of glacial till, ranging from heavy clay to sandy loam with various degrees of fertility. This is not an appropriate climate for production of traditional wine grapes (Vitis vinifera), but it is suitable for cold-climate varieties.

Since the introduction of cold climate hybrids in the 1990s, the grape industry in the North Country of NY has grown from almost zero acres of vineyards in production to over 200 acres, 67 commercial operations, and 32 licensed wineries, with continuous growth and several more winery licenses currently pending. The majority of production is located in three distinct regions: the Champlain Valley or Adirondack coast region (Clinton and Essex Counties), the Upper Hudson Valley region (Saratoga, Washington, Rensselaer, and Albany Counties), and the Thousand Islands Region (Jefferson and St. Lawrence Counties) each with associated wine trail and associations. In September 2016, the 'Champlain Valley of NY' was designated as the state's newest American Viticultural Area (AVA) and is the first cold climate AVA in the state. Producers in the Upper Hudson Valley have also submitted a petition the TTB to create an AVA for this region, which is expected to be approved in spring 2017.

Despite this growth, there has been a lack of variety recommendations for the North Country of NY based on replicated field testing. Growers have made vine selections based recommendations from other regions, and personal trial and error.

Willsboro Research Planting

To address this need, the Willsboro cold climate grape variety trial was established in Spring 2005 by Kevin Iungerman, CCE Regional Specialists, Steven Lerch, Research support technician for Dr. Justine Vanden-Heuvel's program, and many volunteers from the industry. The ~0.6 acre plot is located on the Cornell Willsboro Research Farm, formerly the E.V. Baker Research Farm in Willsboro, NY on the shore of Lake Champlain. The site is located on a gently sloping hill, with excellent sunlight, air drainage, and well-drained sandy-loam soils.

Infrastructure includes deer fencing, 10' end posts and 8' in-line posts, and 2-wire trellis system with 6' top wire. Vines are planted in a replicated complete block design with 3 vines per plot, and 4 replications. Vine spacing is 8' within the row and 10' between rows. In 2008-9 vines were trained to Umbrella Kniffen, and in 2010 re-trained to Top Wire Cordon. Regular maintenance included dormant pruning, standard weed and pest control program (pesticide application, bird netting, raccoon fencing), canopy management, and harvest.

The planting and associated outreach efforts have been supported by the Northern NY Agricultural Development Program (NNYADP) and the Northern Grapes Project, a multistate effort funded by the USDA NIFA Specialty Crops Research Initiative.

Cold Climate Varieties

25 cold climate grape varieties were included in the trial, selected from both private and university funded breeding programs (Table 1). Several selections are from the private breeder, Elmer Swenson, who is credited with being the 'Godfather of Midwest Winemaking.' Born in Osceola, WI on a dairy farm, Swenson pioneered the cold-climate grape industry, making crosses between French American hybrids and Vitis riparia as early as the 1940s. In 1969 he took a position with the University of Minnesota (UMN) as caretaker of the research farm, where he helped to revitalize the grape breeding program. He has released many cold climate cultivars, including several joint releases with UMN, five patented varieties, and many others, of which he liberally shares plant material with other breeders.

Other varieties were chosen from the UMN and the Cornell-Geneva (CG) grape breeding programs, two of the oldest and well-recognized in the country. The UMN program was launched in 1908 and revitalized in the 1970s with the goal of developing high-quality, cold-hardy, and disease resistant grape cultivars, and has grown to 12 acres and over 12,000 experimental vines. Its first cold-hardy grape vine, Frontenac, was released in 1996. The Cornell-Geneva Grape Breeding Program, released its first named variety, Goff, in 1906. It was also revitalized in the 1970s, to focus on developing wine and table grape varieties that reduce the risk of winter injury in cool climate areas, combine winter hardiness with desired wine flavor attributes, and display high levels of disease resistance.

Most of the Minnesota selections are complex hybrids with Vitis riparia parentage. These vines are more cold hardy, but also have differing growth habits than traditional V. vinifera cultivars. They also develop high soluble solids (sugars) at harvest, while retaining high acidity. Moreover, the acid composition is different from standard wine cultivars – with often a high proportion of malic acid and lower proportion of tartaric acid. This presents unique winemaking challenges. The Cornell selections have less riparia, and tend to have lower brix at harvest (for example, Cayuga White optimal harvest at 17 to 18°Brix) and lower titratable acidity at harvest.

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Variety Performance

Data was collected from 2008-2015 on phenology according to the Modified Eichhorn-Lorenz system, pruning weights (2008, 2009, 2014, 2015 only), yield (# clusters, size of clusters), maturity metrics (soluble solids (°Brix), pH, TA), and winter injury (2015 only). Benchmarks that were used to determine 'successful performance' included winter survival and bud injury, yield, phenology related to climate (timing of budbreak and spring frosts), and fruit quality metrics.

Winter Survival. When the planting was established, it was expected that the first test of success would be winter survival. However, none of the vines were lost to winter kill. On the other hand, winter bud injury evaluated in March 2009 & 2015 for all 25 varieties revealed differences in hardiness (Table 3). In 2009, seven varieties experienced between 10-30% bud injury; from highest to lowest being Noiret, Landot, Niagara, Leon Millot, Adalmiina, Prairie Star, and Geneva Red. These levels of injury are negligible, as vines can usually compensate for 20% or less bud mortality without notable effects on yield, and dormant pruning adjustments can be made for vines with 30% or higher bud mortality.

During the winter of 2014-15, the Willsboro Research Farm experienced low temperatures of -20.5°F in late February. The pattern of bud injury was very inconsistent with 2009 evaluations. Edelweiss experienced the highest bud mortality at 51%. Louise Swenson, Vignoles, Sabrevois, and St. Pepin experienced between 10 and 30% injury. All other varieties experienced 10% or less injury. At this site, it appears that winter hardiness is not consistently a problem for these varieties, possibly with the exception of Edelweiss

Phenology.

The region of NENY where the cold climate grape and wine industry exists is predominantly USDA Hardiness Zone 5a & 4b. In these zones, average last frost date is considered April 15th & May 15th respectively. Between 2008 and 2016, spring frost did not pose a problem for any of the vines in this planting. However, considering the narrow margin between budburst and last frost, growers should take appropriate precautions.

Optimal harvest date spanned considerably more time than other phenological stages, typically occurring between mid and late-September. In some years fruit was left on the vine until the first week of October. Effort was made to harvest individual varieties based on maturity, but specific date was influenced by circumstances outside of our control such as weather conditions and labor availability. On average, the earliest varieties were Baco Noir, Marechal Foch, GENEVA RED, Niagara, Leon Millot, and MN1200 (Sept. 14-18). Latest varieties included St. Croix, Sabrevois, St. Pepin, and Vignoles (Sept. 25-27). Harvest date will also depend on winemaker's preferences as some of these varieties develop a more labrusca type qualities when harvested slightly later.

	Vigor (kg/vine)	Yield (kg/vine)			Soluble Solids (Brix)			pH Avg			TA (g/L)		
Variety	Avg	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Niagara	1.38	16.0	8.3	24.0	13.3	8.6	15.0	3.2	3.0	3.5	7.1	4.3	12.4
Geneva Red	1.68	11.3	5.8	16.4	17.0	10.3	20.2	3.4	3.2	3.5	11.4	5.5	21.1
Frontenac	1.43	11.2	6.4	17.4	21.6	20.5	23.0	3.2	2.9	3.5	14.6	13.3	16.4
Frontenac Gris	1.33	11.2	7.2	13.8	21.7	19.8	23.6	3.2	2.9	3.4	14.4	12.4	15.8
La Crosse	1.05	10.8	4.2	14.3	16.7	10.6	19.0	3.1	2.8	3.2	11.8	7.2	18.5
Aromella	1.35	10.6	5.8	14.6	16.5	10.3	22.0	3.2	3.0	3.3	10.9	7.5	16.7
Louise Swenson	0.62	10.5	4.9	15.0	16.9	9.1	20.0	3.3	3.1	3.4	8.0	5.2	15.4
Cayuga White	0.81	10.4	6.0	14.8	15.6	10.0	18.0	3.1	2.8	3.3	10.4	6.7	16.5
Leon Millot	1.46	9.6	4.6	13.3	18.7	8.8	22.0	3.5	3.3	3.7	10.4	6.3	20.9
Marechal Foch	0.68	9.4	4.9	13.1	19.5	11.3	22.0	3.3	3.1	3.5	11.4	8.0	20.5
Baco Noir	1.39	9.4	4.4	12.0	18.9	13.8	21.0	3.3	3.1	3.4	12.3	9.1	15.1
Edelweiss	1.18	9.3	4.2	16.4	15.5	8.0	18.0	3.5	3.3	3.7	8.2	4.9	17.1
La Crescent	0.98	9.2	6.9	11.5	22.5	19.6	24.0	3.2	3.0	3.5	12.8	11.4	15.7
Vignoles	0.90	9.2	4.2	12.2	17.7	12.6	20.4	3.1	2.9	3.2	14.9	10.1	20.1
Sabrevois	1.54	8.7	2.9	14.1	17.2	9.9	20.0	3.4	3.2	3.5	11.5	9.0	18.5
St. Pepin	1.04	8.6	4.7	12.0	18.2	10.8	21.0	3.2	3.0	3.3	11.9	8.6	21.4
Marquette	1.29	8.6	4.7	13.5	23.2	21.8	25.8	3.1	2.9	3.3	10.9	10.2	12.3
Petite Amie	0.28	8.3	3.1	11.5	16.0	9.0	18.2	3.4	3.2	3.5	9.6	5.8	18.8
Noiret	1.45	8.3	4.6	10.1	14.6	10.8	17.1	3.2	3.1	3.2	11.4	6.3	18.3
Praire Star	1.45	8.0	5.3	15.0	17.3	10.1	19.3	3.5	3.3	3.6	11.3	9.5	18.3
St. Croix	1.11	7.8	2.9	9.9	18.9	17.8	20.0	4.3	3.2	3.1	9.9	7.1	18.0
Adalmiina	1.20	6.9	2.5	11.6	16.8	7.1	20.3	3.4	3.3	3.5	9.2	5.7	19.6
MN 1200	0.93	6.6	1.9	10.3	18.9	10.3	21.8	3.3	3.1	3.4	11.3	7.9	22.6
Landot Noir	0.87	5.3	1.7	7.8	16.7	9.0	19.7	3.3	3.1	3.4	10.9	7.7	19.8
Average	**0.5**	**9.4**	**4.7**	**13.5**	**17.9**	**12.1**	**20.5**	**3.3**	**3.1**	**3.4**	**11.1**	**7.9**	**17.9**

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Fruit Quality. Average fruit quality measurements at harvest for years 2010-14 (soluble solids, pH, and TA) are displayed in Table 4. Despite the relatively short growing season, we were able to achieve desirable soluble solids (sugar) levels, which for most of the varieties is 18 -22°Brix. Varieties with the highest soluble solids were Marquette (23.2), La Crescent (22.5), Frontenac gris (21.7), and Frontenac (21.6); lowest were Niagara (13.3), Noiret (14.6), Edelweiss (15.5), and Cayuga White (15.6). The high acidity of cold climate varieties is a significant challenge. The majority of the varieties tested were harvested with TA above 10 g/L.

Compared to other regions, soluble solids (sugars) tend to be low and TA (acids) tend to be higher at this site. This is most likely attributable to the shorter growing degree days at the site. Fruit quality will be a significant challenge for grape and wine producers using fruit grown in this region. Efforts to reduce acid, both in the vineyard and winery, are generally necessary to produce a quality wine. Viticultural experiments have demonstrated that increasing sunlight exposure of clusters through canopy management and leaf pulling can increase fruit quality, but may be specific to variety. Further research is necessary to evaluate vineyard management practices that can further improve fruit quality. Ongoing experiments at the Cornell Enology lab are testing solutions for managing quality postharvest.

Yield & Vigor. Yields were measured in lbs per vine; T/acres was estimated based on a planting density of 545 vines/acre, which corresponds to an 8x10' vine spacing (Table 4, Figure 1). Yield for all varieties, from 2008-2014 averaged 9.4 kg/vine. At 545 vines/acre this corresponds to approximately 5.7 T/acre. Average yield per variety ranged from Niagara at the highest with 16.0 kg/vine (9.6 T/acre) to Landot Noir at the lowest with 5.3 kg/vine (3.2 T/acre).). However, there was a great deal of variation in yield between years for most varieties. Clusters per vine and weight per cluster varied greatly between varieties. Cluster numbers averaged 60 clusters/vine and cluster weight averaged 100g/cluster for all varieties and seasons. Overall, average yields were very good, well above 3 or 4 T/acre, which is can be considered an economically sustainable yield.However, yield will vary considerably based on variables including vine spacing, pruning, vine balance, and site. Growers will need to take this into consideration when cropping vines. Pruning weights were taken in 2008, 2009, 2014, and 2015 as a way to measure vigor and evaluate vine balance. Weights per meter averaged 1.14 kg/vine overall, 1.19, 1.12, 0.99, and 1.27 kg/vine in respective years. These weights fall within acceptable standards for vine vigor and demonstrate vines were well balanced. Shoot vigor varies, but many of the varieties showed moderate to high vigor at this site (fairly deep, gravelly soils). Growth habit tends to range from semi-erect to trailing (procumbent), so many of the varieties are well suited to high-wire training systems (Top wire cordon, Umbrella kniffin, and Geneva double curtain), which have the fruiting zone exposed at the top of the trellis. Shoot thinning, removal of lateral shoots and basal leaves to expose the cluster zone, and shoot combing are canopy management practices that can improve fruit quality and minimize acidity.

Phenology. Vines were rated weekly from 2008 to 2015 for phenological stage based on the Modified Lorenz-Eichenhorn system. Average dates of phenological stages were calculated using Julian dates, then converted back to calendar days. Dates for budburst, flowering, verasion, and harvest for all 25 varieties for 2010-2014 are displayed in Table 2. Average budbreak of earliest and latest varieties was only 5 days apart with Baco Noir, Marechal Foch and GENEVA RED breaking bud earliest (May 5) and Cayuga White, Noiret, Vignoles, and Landot Noir the latest (May 9-10). Budbreak was as early as the last week of April (all varieties in 2014) and as late as May 15th (all varieties in 2011).

Conclusions.

All 25 varieties tested at the Cornell Willsboro Research Farm performed adequately for commercial production. Overwinter survival was 100% and bud injury less than 20% with only a few minor exceptions. Yields were above economically sustainable standards for nearly all varieties and fruit quality parameters were all acceptable.

Vineyard site selection will need to be a priority when establishing a vineyard. It should be noted that the location of the research vineyard at the Willsboro farm is an especially good site. The vineyard is located in very close proximity to Lake Champlain providing excellent water-moderated climate, providing less extreme high and low temperatures and slightly delayed phenology. It is on a gently sloping hill, with excellent sun exposure, air drainage, and well-drained sandy-loam soils. Special consideration should be made to establish vineyards in optimal sites to achieve adequate yield and fruit quality in NENY.

Canopy management and vine balance should also be a major priority for commercial growers. Canopy management is considered one of the most labor intensive and therefore expensive practices for cold climate vineyards, which so far are mostly non -mechanized and require hand labor. This is especially important considering the small size of most commercial vineyards in NE-NY, which currently operate with minimal hired labor. In light of this, excellent vine management—including training, pruning, and nutrient management—should not be compromised. These are necessary to achieve proper vine balance, and consequently an economically sustainable yield, high quality fruit, adequate vine health, and hardening off for winter survival.

Future research will need to investigate vineyard management and winemaking methods that may help to improve fruit quality. Also, increasing efficiency of vineyard management will be a priority as many of the vineyards in the region are small, and employ minimal off-farm labor. As breeders continue to develop and release new selections, additional variety trials will be necessary to test the performance of these varieties in the region.

The varieties tested here show great promise for the cold climate grape industry developing in the North Country of NY with regard to the winter survival, yield & vigor, phenology, and fruit quality attributes we used to evaluate successful performance.

This project was financially supported by the Northern NY Agriculture Development Program, the Northern Grapes Project, the Eastern NY Commercial Horticulture Program, and equipment donations by OESCO.

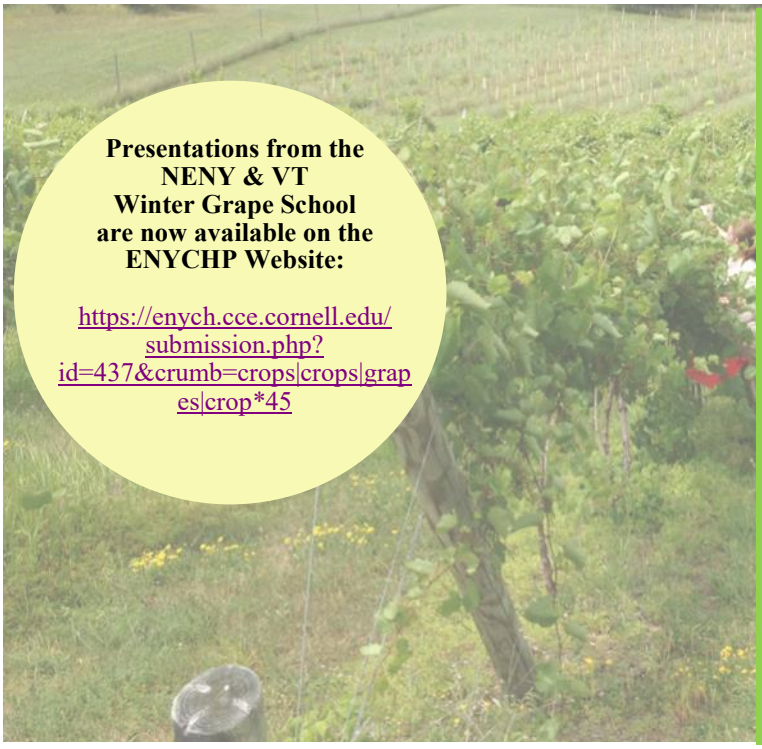
Thank you to the CCE technicians Emelie Morton, David Wilfore, and Richard Lamoy, and the many volunteers that made this work possible!

Cabernet Franc Research at Hudson Valley Research Lab

Dana Acimovic, Hudson Valley Research Lab

In February 2016, Hudson Valley Wine and Grape Association has announced a new signature variety for the Hudson Valley American Viticultural Region – Cabernet Franc. Soon after, Hudson Valley Cabernet Franc Coalition has been formed to promote the new signature wine and encourage more vineyard plantings with Cabernet Franc. Our goal at the Cornell University Hudson Valley Research Lab is to help HVCF Coalition on their mission and give to the current and future Cabernet Franc growers recommendations about clonal and rootstock selection for this AVA. Therefore, for 2018 we have planned to establish one acre of an experimental vineyard, which would encompass five Cabernet Franc clones planted on 3 different rootstocks. "Double A Vineyards" has confirmed to provide us with the certified virus free custom grafted plants by April 2018. Since, the vineyard's full yield was expected to begin in 3rd year, our research would be conducted starting with 2021 and continued for at least two years or longer if funds were available. The research would focus on yield, fruit quality, disease resistance, cold tolerance, vegetative growth and vineyard management.

The biggest challenge in growing Cabernet Franc in cool climate growing regions is related to the use of different vineyard practices by which growers try to achieve high fruit quality. The compounds responsible for low fruit quality, giving the wine vegetal or bell pepper aromas, are known as methoxypyrazines (MPs). Enological methods during wine fermentation or after cannot successfully remove MPs without interfering with other compounds of the wine. On the other hand, viticultural practices have shown potential to control MPs by manipulating the factors that have direct impact on MPs accumulation or its degradation. Among them, removing the leaves in the cluster zone after fruit set is the most recommended one. However, for the growers who do not use mechanical leaf removal this practice can be labor intensive and time consuming. Therefore, in the next two years we would test and compare leaf removal practice with increased crop load achieved by leaving more buds per vine during pruning and conclude what method had better control over MPs accumulation. This experiment would be carried out in 3 commercial vineyards: "Whitecliff Vineyard & Winery" in Gardiner, "Glorie Farm Winery" in Marlboro and "Millbrook Winery" in Millbrook, NY and would provide us with the preliminary results that would certainly help us to set the stage for the future research at HVL regarding the quality of Cabernet Franc wine and vineyard management strategies.



Presentations from the NENY & VT Winter Grape School are now available on the ENYCHP Website:

https://enych.cce.cornell.edu/submission.php?id=437&crumb=crops|crops|grapes|crop*45

Northern Grapes Project Webinar – 4/11

Title: "Put a cork in it? An update on wine closures" by Anna Katharine Mansfield, Cornell University

When: 12 Noon and 7 PM EST, Tuesday April 11, 2017

More information available on the NGP Website: http://northerngrapesproject.org/

Resources for Cold Climate Vineyard IPM

Cornell IPM Fact Sheets for Grapes
http://nysipm.cornell.edu/factsheets/grapes/default.asp

New York and Pennsylvania Pest Management Guidelines for Grapes (published annually)
http://store.cornell.edu/p-189430-2015-new-york-and-pennsylvania-pest-management-guidelines-for-grapes.aspx

Grape Disease Control, 2015. Dr. Wayne Wilcox (published annually)
http://rvpadmin.cce.cornell.edu/uploads/doc_308.pdf

Cornell Vineyard Spraying Website
http://web.entomology.cornell.edu/landers/pestapp/grape.htm

Integrated Pest Management Strategy for Cold Climate Winegrape Growers. Lorraine Berkett
http://www.uvm.edu/~fruit/grapes/gr_ipm/AnInitialIPMStrategy.pdf

Upcoming Events

April 5, 2017 : Capital Region Potluck Dinner

April 17, 2017 : Hudson Valley Potluck

Grape Grower Potluck Dinners - April 2017

Please join us for the last in our series of educational pot luck dinners. Jim O'Connell and Anna Wallis are reaching out to growers, trying to get to know them in a less formal setting. Jim and Anna are regional fruit educators with Cornell Cooperative Extension's (CCE) Eastern NY Commercial Horticulture Program (ENYCHP).

ENYCH Program Educators:

Fruit
James O'Connell
Phone: 845-691-7117
Email: jmo98@cornell.edu
Berries & Grapes

Anna Wallis
Phone: 443-421-7970
Email: aew232@cornell.edu
Tree Fruit & Grapes

Dan Donahue
Phone: 845-691-7117
Email: djd13@cornell.edu
Tree Fruit

Laura McDermott
Cell: 518-791-5038
Email: lgm4@cornell.edu
Berries

Vegetables
Chuck Bornt
Cell: 518-859-6213
Email: cdb13@cornell.edu

Amy Ivy
Phone: 518-561-7450
Email: adi2@cornell.edu

Teresa Rusinek
Phone: 845-340-3990 x315
Email: tr28@cornell.edu

Erik Schellenberg
Phone:845-344-1234
Email:js3234@cornell.edu

Crystal Stewart
Cell: 518-775-0018
Email: cls263@cornell.edu

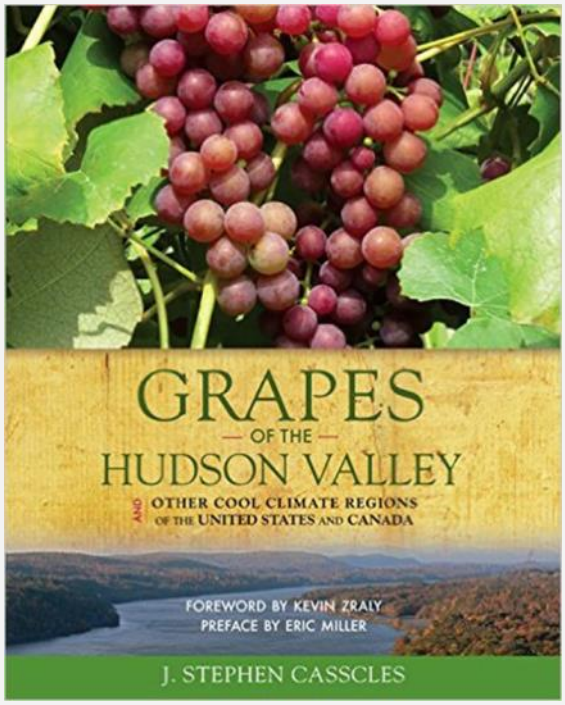
Maire Ullrich
Phone: 845-344-1234
Email: mru2@cornell.edu

Business and Economics

Jesse Strzok
Phone: 518.429.1464
Email: js3234@cornell.edu

Content Editor: Anna Wallis

Layout: Abby Henderson



Stephen Casscles, wine maker at Hudson Chatham Winery in Ghent, NY and grape grower since 1976 recently published a book. Titled, "Grapes of the Hudson Valley and other Cool Climate areas," and is available for $30.00 from Flint Mine Press.

From Stephen Casscles, "It is really a text book that covers 172 grape varieties. It is good for growers who want to know how to grow it, winemakers that want to make wine from it, wine consumers, and grape breeders. It is organized differently than other grape books. It is done by hybridizer and has their bios, and the goal of the hybridizer. so there are chapters on Baco, Seibel, Cornell varieties, Minnesota hybrids, and those developed in the Hudson Valley (a real lot of them). It is a field guide that is 230 pages."

James O'Connell
Phone: 845-691-7117
Email: jmo98@cornell.edu
Berries & Grapes

Anna Wallis
Phone: 518-410-6823
Email: aew232@cornell.edu
Grapes & Tree Fruit

Quick Links

Cornell Grapes Website
http://www.fruit.cornell.edu/grape/

ENYCHP
http://enych.cce.cornell.edu/

Northern Grapes Project
http://northerngrapesproject.org/

NEWA Weather and Pest Forecasting
http://newa.cornell.edu/

Viticulture and Enology Cornell
https://grapesandwine.cals.cornell.edu/

Veraison to Harvest
http://grapesandwine.cals.cornell.edu/newsletters/veraison-harvest

Appellation Cornell
http://grapesandwine.cals.cornell.edu/newsletters/appellation-cornell

NYS IPM Fact Sheets
http://www.nysipm.cornell.edu/factsheets/grapes/