

Eastern Viticulture and Enology Forum

A webinar series from Penn State and Cornell for Eastern Growers and Winemakers.

Brief responses to your questions:

Jason Londo – (in blue)

Jim Willwerth – (in red)

From Jim Quarella to Everyone: 03:05 PM

Does mechanical prepruning effect cold hardiness and if it does when should it be done?
I'll have to mostly punt to Jim on this, but I wouldn't expect cold hardiness to be impacted, unless the mechanical process damaged the buds themselves.

We did some studies with this because the industry was interested to know if pre-pruning impacted hardiness. We did not see any impacts with respect to hardiness compared to un-pruned vines. We pre-pruned in December with no impacts during max hardiness or deacclimation periods.

From Annasamy Chandrakala to Everyone: 03:08 PM

Does the training systems affect or modify cold hardiness and any particular training system protect cold hardiness of grapevines and influence plant health and biochemical factors? Thanks
Especially in Northeastern US*

Viticulture punt again here. I've never tested this myself, the experiment is doable, but would require other things held constant, like vineyard topography and soil fertility.

Hardiness can be optimized for a given cultivar through good decision making in the vineyard. This includes everything from quality of vines to cultivar selection to cultural practices. Proper training selection is important for vigor management, crop load and fruit quality. Poor choice of training system can lead to excessive vigor (or not enough growth) that can lead to bull wood, shading and lack of lignification. In these instances, and the vine is out of balance, hardiness can be compromised. Training system can also impact winter survival as well. Some training systems have been shown to be more susceptible to cold injury in some regions. We typically don't use large elaborate training systems for V. vinifera with a lot of perennial wood because after many long, cold winters these vines will collapse due to repeated freeze injury in trunks and cordons. Helen Fisher and Justine Vanden Heuvel did some work with different training systems and demonstrated that some had more winter injury than others.

From Isabelle Patenaude to Everyone: 03:18 PM

What is the impact of a long, warm fall on cold hardiness? I am in Prince Edward County, Ontario, where we bury or use geotextiles. This year, for example, we fretted about whether we were getting our textiles on too early given the mildness of the fall.

A long warm fall would be expected to possibly slow acclimation, though in my slides I showed that even an average of 45F with oscillation will get you to a decent cold hardiness. Once you see periderm pass a bud, its basically tracking temperatures and gaining cold hardiness. Even when I test buds collected in California and shipped overnight, I still get cold hardiness to around -17C. My concern with the textiles is potentially muting the temperature oscillations they would get while exposed.

A warm fall is probably more in your best interest except for the fact the soil may wash off the vines because of rain and lack of frozen soil. This can also lead to more bud rot. For geotextiles, it is important to monitor temperatures and if you can, place a temperature data logger below the textiles to compare temp differences under and outside of the material. When there are huge fluctuations in temp there is more cause for concern. Warm temperatures later in winter and when the temps start getting above 10C is when you need to more concerned due to greenhouse effects and premature vine deacclimation. I found warm periods in March are worse than warm falls.

From Harlene Hatterman-Valenti to All Panelists: 03:20 PM

Does the programmed decrease in temperature actually depict winter temperatures?

No, we don't try and model outside patterns of cooling, though 4C/hour isn't a crazy drop in temperature either. The phenotype we are measuring is supercooling and without getting too technical, supercooling should not be impacted by rate of cooling.

From Hans Walter-Peterson to Everyone: 03:33 PM

Do you find that LT10 numbers from the lab relate fairly well to actual field results?

Punt to Jim, I mostly avoid the LT10 measurements because we often see at least one weak bud in a collection of 10. The variation on the canes can occur due to lots of issues, including user error when we set up the freezer run. A slip of the razor and the bud will not supercool like its undamaged neighbors.

It does relate but not as well as LT50. We use LT10 mainly for risk management and when we can expect to see damage to buds. If we use LT50 to set wind machines we would get considerable damage before the LT50 temps and we don't want to lose ANY buds. The data can be useful though explaining some treatments that we have done and showing how bud hardiness along a cane may become less variable.

From Lucian Dressel to Everyone: 03:34 PM

Are there any efforts to measure damage to cells in the trunks and cordons? Can we assume they are more hardy and if so by how much of a factor?

Measuring damage to the phloem, xylem, and cambium is possible. These tissues will also supercool, but the data that is obtained is far more difficult to accurately measure. These tissues freeze over a longer period of time, making the data look messy. In every study I have read, phloem and xylem are more hardy than the buds. Also, we didn't detail in the talk, but primary buds (fruitful) are the weakest buds, and the ones we typically report on. The secondary and tertiary buds will also supercool and are more hardy than the primary. This is due to water content in the tissues, and likely the advanced development of the inflorescence in primary buds.

Nothing much else to add.

From Esmaeil Nasrollahiazar (he, him, his) to All Panelists: 03:35 PM

How we can expedite and facilitate grapevine acclimation?

We are working this. There is some evidence that spraying with the plant hormone ABA can stimulate early dormancy and early acclimation. Similarly, northern wild grapes and some hybrids will respond to shortening daylength in the fall and shut down before vinifera. Theoretically, if we could trigger this (imagine specific light wavelength treatments, a vineyard disco) we could advance acclimation.

Healthy, clean vines, good viticulture and reduce severe stress. Anything you do to maximize fruit quality and advance fruit maturity will likely advance vine maturity. We have been studying plant growth regulators as described by Jason but a lot can be done with good viticulture. In a year, look at lignification of your canes...that will give you a sense if what you are doing is right for good acclimation.

From Mark Hart to Everyone: 03:35 PM

Growers are always asking about appropriate timing for pruning. Conventional wisdom, based on older studies from warmer climates/varieties, suggest advantage to spring pruning. It would be nice to have a decent study like this from the NE region with modern cultivars that compares bud/cane mortality based on pruning time (and method) Anything like that to guide NE growers exist? More specifically, something that looks at this in hardier hybrids. I am sure waiting is probably really important in growing things that are very tender varieties.

I haven't done any pruning studies, but late pruning gives you the largest pool of buds to use if we do get a polar vortex kill. There is also the potential to delay budbreak through late pruning. If you let the vines start to push buds, the apex buds will suppress basal bud outgrowth. So if you wait and prune late, and we get a frost, those early apex buds may protect your lower buds.

General rule of thumb is to prune hardiest cultivars first and most tender or early breaking ones last. It is always good to leave spare parts (more canes, longer spurs etc) so that if damage occurs after you prune that you have extra that you could use. You can always cut off the extra canes when you tie for example.

From Linda McKeegan to Everyone: 03:38 PM

Is spur pruning safer than cane pruning?

I don't think it matters, but punt to Jim.

Not necessarily, there are advantages and disadvantages to both.

From Peter Rigan to Everyone: 03:42 PM

Have you experimented with applying Abscisic Acid to increase cold tolerance?

I currently have an experiment looking at Protone (ABA) and Ethephon treatments in Concord, Riesling, Valvin Muscat, Vidal, Chancellor, La Crescent, St. Croix, Noiret, and Aromella. We tried a few concentrations and tested 1 week post veraison in Riesling and Concord, and 3 weeks post veraison in everything. Right now, it doesn't look to be working to enhance cold hardiness, except maybe in Valvin

Muscat, and only by maybe 1 °C. We will follow up with bigger experiments to test timing, concentration, and cultivar in the future though.

We've done trials with both ABA and ABA analogs. Our results are much better using ABA analogs particularly with respect to maintaining dormancy and delaying deacclimation. I have yet to see plant growth regular improve maximum cold hardiness though.

From Jennifer Phillips Russo to All Panelists: 03:42 PM

If two vines have a crop load of 12, one is pre-pruned the other is not, does the mechanical pre-pruning effect cold hardiness? Has this been tested?

Punt to Jim on this. I work mostly on the direct biology and not so much on the viticulture angle.

We have not seen any differences with mechanical prepruning. The higher crop load will have more of an impact on cold acclimation than anything. But usually, the maximum hardiness is not impacted unless it is very over cropped or it is a variety like Pinot noir.

From Eric Hahn to Everyone: 03:44 PM

I have lost a few varieties to early frost. When I prune, how should I get those vines propagated? I've seen some people put cuttings in a bucket of dirt and some put them in the fridge with some wet paper towels. What would you suggest? Thanks!

I've had the most success propagating from dormant cuttings by collecting late in winter or by putting cuttings in the fridge for 2-3 months to satisfy chilling. I trim to 2 nodes, dip the bottom node in rooting hormone and then bury them in soil. I put the soil in a dark place with a heating mat on the bottom if possible.

From Annie E Klodd to Everyone: 03:45 PM

What is the data showing so far regarding the effectiveness of geotextiles so far? What are the potential issues? Do you ever see the issue of it getting too warm inside the fabric tent?

Punt to Jim. I would be most concerned that making the local microclimate warmer will impact acclimation ability in early winter, and promote earlier deacclimation through both increasing chilling hours (raising freezing temps to the chill window) and through direct heating.

See my answer above. Later in the winter and early spring when the soils warm up and temperatures are >10C with warmer nights you need to start being careful. But just opening the tent up can help and you can put it down if the weather gets cold and there is freeze risk. It can be advantageous to help get an earlier start in the growing season in regions with low # of GDD and short season.

We have seen increased yields compared to buried vines and they do work but need to install them correctly. Anyone interested can email me.

From Annie E Klodd to All Panelists: 04:03 PM

Is he saying that if the winter is colder, it's going to de-acclimate faster in spring?

I'm having a hard time understanding how much this might translate to Minnesota winters, because our winters are so much colder.

When the temperature drops below freezing, the chilling clock stops, so in MN, depending on your winter, your critical chill could occur very late in winter. Delaying the chill accumulation until late winter would mean the vines deacclimation rate wouldn't maximize until the warming of spring starts to occur. An easy way to demonstrate this is to compare chilling accumulation rates between MN and NY. If you have a weather station with hourly data, I can show you how to figure it out. My data suggests the critical chilling amount is the same no matter where you grow grapes, so you could figure out when they enter the danger zone.

From wegs1975 to Everyone: 04:05 PM

How does bud break of each variety correlate to loss of acclimation in late winter/early spring? I would think late bud break (e.g. Petite Pearl) would maintain cold acclimation longer than Marquette, an early budder.

My studies in the lab show that there is a very tight correlation between cold hardiness (starting point), deacclimation rate (speed of the runner), and budbreak (finish line). Correlating it in the field is harder to do, because the temperature is changing so frequently. In the lab I can look directly at constant heat units. What you have to remember though, is that two cultivars with the same cold hardiness but different deacclimation rates, will have different budbreak (Same starting line, two different sprinters). Similarly, two cultivars with different cold hardiness but the same deacclimation rates (Different starting lines, same speed of sprinter) will also have different budbreak. The lines can cross. Expect to see a paper describing the correlation in the new year, I'm working on it.

From Dave L to Everyone: 04:10 PM

Hi all - amazing stuff. How might vineyard topography (meaning air draining) alter this data? Thanks for the info.

Any aspect of topography that impacts temperature or light exposure is going to have an impact on these processes. The impact might be small, but it would be there. Anything that makes the vineyard colder will increase acclimation and slow deacclimation. It might also kill at midwinter. Anything that makes the vineyard warmer, will tend to decrease acclimation, increase chill accumulation, and increase deacclimation. We've also used micro probes to measure the heating impact of sunlight. Sun exposed buds in NY can be up to 7°C warmer than the air.

From Hans Walter-Peterson to Everyone: 04:14 PM

Vidal blanc is one of the last cultivars to break bud in NY. You have it listed as a cultivar with a pretty fast deacclimation. Does this mean that it has a very high chilling requirement?

We would have to look at the actual rate, as I only showed relative rates. What I'm finding is that the idea of different chilling requirements is incorrect. All cultivars have the same chilling requirement. However, they have different max speeds after that critical switch in endo-eco dormancy. If Vidal blanc is a late breaker, it is either slow at deacclimating, or it has deep cold hardiness. The deeper the cold hardiness, the farther the buds need to travel (deacclimate) before you can physiologically break bud.

From Harlene Hatterman-Valenti to All Panelists: 04:20 PM

Climate change suggests warming on average the past five years, but we've seen that fluctuations and ultimate lows seem to be as severe as 20+ years ago. So does your model compensate for this?

We haven't had the dataset with enough time depth to really test this question as most long term DTA studies haven't been going that long. One thing about using our empirical data to estimate the model, we are directly measuring temperature impact on changing physiology. We are not constrained by the changing temperatures outside in figuring out these impulses. So our model should be robust against climate change. The one caveat I would add is that our empirical studies are limited by technology. We use growth rooms, so we can't test full field plants, only cuttings. Also, Cold rooms that allow temperature oscillation are super expensive and break down all the time. So we are limited on how far we can test all temps and fluctuations. We have tested deacclimation at many temperatures, and have a solid understanding of that process. We can try running our model in reverse though, and see what past winters might have looked like.

From Dean Schuler, Owner to Everyone: 04:20 PM

does it hurt to trim too early

Punt to Jim, but my point of view would be pruning early reduces your backup node number if you get a freeze.

See answers above.

From David Christianson to All Panelists: 04:21 PM

What about root hardiness –

Michele Moyer at WSU has a paper looking at root hardiness. In general, the roots are not very cold hardy. Only to around -6°. But they also don't really need to be hardy due to the insulation of the snow and soil. While air temp might plunge to -40°C during a polar vortex, only the top few inches of soil would become damaging.

See answer above. It depends where you are and if you should be concerned about it. We typically don't see root injury where we are, but I do know some rootstock studies in the Pacific northwest under their conditions where they saw vine death due to root injury. If you use an appropriate rootstock I wouldn't be too concerned at least on the east coast with our soils and moisture levels.

From Fabien Gagné to All Panelists: 04:21 PM

Jim, if I remember correctly, at the very beginning of the program CCOVI also measured xylem LTE.

Jim says: Fabien: We have measured phloem/xylem LTE periodically like WSU but we've never posted that data on VineAlert.

From Shawna Mull to All Panelists: 04:21 PM

can cold prompt truck disease like crown gal?

Typically we see an association of cold weather with crown gal increase. I believe this is primarily due to freeze cracking in the trunks. Cornell research has shown that Crown gal is basically in every tissue in the plant, just sort of waiting for the right moment. When you have freeze cracking in the trucks, you create a wound that is flooded with nutrients in the spring. Crown gal is just ready for all that buffet and jumps in. Freeze cracking usually occurs when the temperature is very low, but the sun is out and bright. The sun side of the truck heats up and thaws while the shade side doesn't. The expansion loosens up everything and when night falls, all that thawed water freezes again, splitting the wood.

No question cold injury in trunks leads to crown gall as stated above. I've seen it even in canes after a cold winter. If perennial parts of the vines are damaged pathogens can move in.

From mstutler to Everyone: 04:22 PM

Do you see any difference in cold hardiness and vine nutrition? Any known advantage to late season fertilizer application specifically potash?

I've never looked at this link though I believe the running idea is anything that promotes late season growth is potentially problematic. While the vines shut down due to shortening days and cooler temperatures, if you force them to keep growing vegetatively, you can delay the acclimation process and result in weaker vines over winter.

There have been studies showing excess fertilization can reduce hardiness as stated above.