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VITICULTURE NOTES ..... Vol. 30 supplement, 17 February 2015

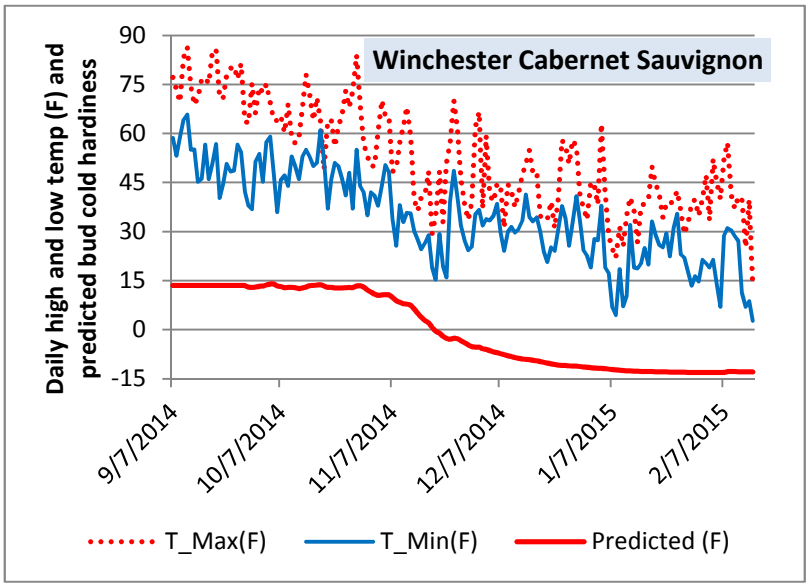
Tony K. Wolf, Viticulture Extension Specialist, AHS Jr. Agricultural Research and Extension Center, Virginia Tech, Winchester, Virginia

vitis@vt.edu http://www.arec.vaes.vt.edu/alson-h-smith/grapes/viticulture/index.html

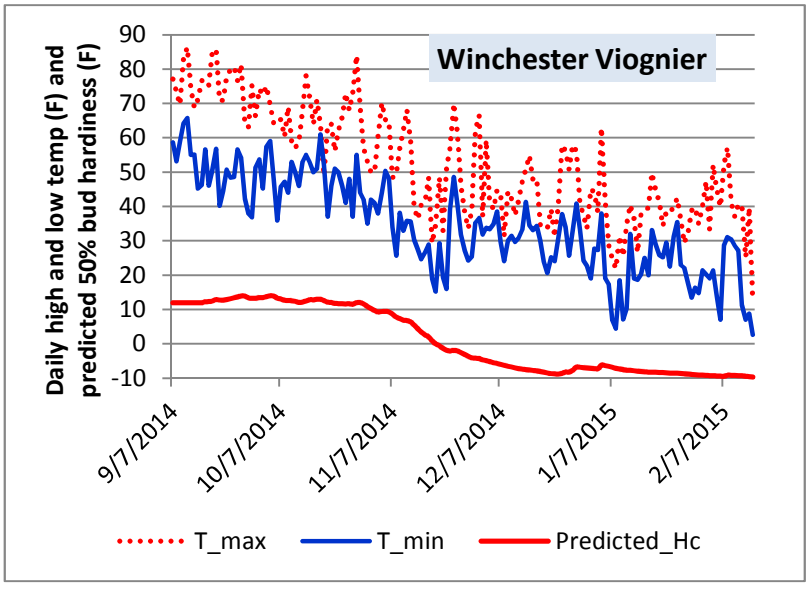
Question from the field:
The NWS has forecast low temperatures of 0 to -5F for much of the state early Thursday morning, 19 February, possibly colder in some areas. Will this damage my grapevines?
I would like to be able to answer this question (negatively) with some assurance, but the best that I can offer are some predictions based on our historical record, from modelling of predicted hardiness, and from some seasonal cold hardiness measures being conducted further north in the Finger Lakes and in Ontario (http://www.ccovi.ca/vine-alert). On the bright side, temperatures over the past week have been much lower than normal, with repeated dips into single-digit temperatures and daytime highs hardly rising above freezing, particularly in northern Virginia. While these temperatures have been much lower than normal for mid-February, they have provided a positive, reinforcing maintenance of the vines' mid-winter cold hardiness levels – we want low, but non-damaging temperatures at this time of year, and daily lows in the 5 to 15F range are ideal for well managed varieties that are reasonably well-adapted to Virginia's winters: the Cabernets, Chardonnay, Petit Verdot and Viognier, for examples. Does wind chill pose a risk to the vines? No, for all intents and purposes, wind speed is not going to be a factor above and beyond the absolute low temperature attained by the vine. That stated, one potential problem with windy conditions during these cold arctic excursions is that higher elevation vineyards may very well sustain lower absolute temperatures than would vineyards situated at lower elevations on a given slope/mountain. The windy conditions disrupt the temperature inversions that often protect the higher elevations under calm, radiational cooling events.

Okay, I understand that, but what is the absolute low temperature that my vines can withstand at this point in the winter? Based on the above three guiding factors, I would anticipate that our common vinifera varieties that went into the 2014/15 winter in reasonably good physiological condition will not sustain appreciable trunk or bud injury late this week (19 Feb) if temperatures remain above 0F towards southern VA and above about -3F in northern VA. Bud and potentially trunk/cordon injury is likely to be noticeable at lower temperatures, with a sharp transition from relatively minor bud kill to substantial bud kill occurring in the -4F to -9F range. Factors that would likely raise these critical temperatures in your vineyard (reflect a reduced degree of mid-winter cold hardiness) would include the inherent maximum cold hardiness of the variety, the tissue "ripening" conditions of this past fall, and the weather conditions immediately prior to the stress, which will vary throughout the state. We know that there are varietal differences in cold hardiness. Among vinifera varieties for example, Petit Verdot is typically more cold-hardy than Chardonnay, which is more cold hardy than Merlot, which is more cold hardy than Tannat. Common hybrid varieties such as Chambourcin and Vidal should see a further 5 degrees superior cold hardiness – avoiding substantial injury at temperatures as low as -10F at this time of year. Even relatively cold-hardy vinifera such as Petit Manseng and Petit Verdot may tolerate temperatures in the -5 to -10F range with minor to moderate (50%) bud injury. Vascular tissues of the trunks, cordons and canes are normally somewhat more cold-hardy (but only by a few degrees) than are buds in mid-winter. As such, I would not expect temperatures down to -5F to seriously challenge otherwise healthy vascular tissue. In many years of comparative testing of bud hardiness, a given variety grown in northern Virginia appeared to be about 5 degrees less hardy than the same variety grown in the Finger Lakes or in Ontario's Niagara Peninsula. Recent cold hardiness assessments of varieties from those 2 northern regions suggest that

further increases in bud cold hardiness have occurred since mid-January, and that varieties such as Chardonnay and Cabernet franc are not sustaining 50% primary bud kill until temperatures dip to about -9F or lower. Again, in our experience, that would put those same varieties at about -4F here in northern Virginia.



The following two plots offer a third means of predicting how hardy vines might be here in the northern Shenandoah Valley. The daily high and low air temperatures were recorded on the AREC farm from early September 2014 through 15 February 2015. Note that we came close to 0F this past week. The red line on the lower part of each plot is essentially the temperature that could be predicted to kill 50% of the buds of Cabernet Sauvignon (upper plot) or 50% of Viognier buds (lower plot) over the same timeframe. The hardiness modeling is done with a model developed at Washington State University (Ferguson et al., 2014). When we've used this model before, and compared the predicted outputs with our own cold hardiness testing, we were impressed with how closely the *predicted* bud hardiness matched our own *actual* bud hardiness data. We don't have the option of testing cold hardiness of plant material here this winter, so I can't make the direct comparison.



Despite the close correspondence that we've seen between predicted and actual bud cold hardiness in the past with the Washington State model, I feel that the -12F predicted bud hardiness for Cabernet Sauvignon is over-stating the Cabernet Sauvignon hardiness – but only by 2 or 3 degrees. We sustained -11F here at the research center on 19 January 1994 (pay attention here – that's 20 years ago). Routine cold hardiness assessments of Cabernet Sauvignon clone #8 showed a mean LTE (roughly, the temperature required to kill 50% of buds) on 18 Jan 1994 of -10F. The LT90 (temp required to kill ~90% of buds) was -12F. When we went back in and assessed actual bud kill after that freeze, we found that we'd lost 90% of primary buds – spot on with what our hardiness testing had predicted (Wolf and Cook, 1994). So what? Well, this does tell me that Cab Sauvignon can tolerate

temperatures down to -9F or so with moderate but tolerable bud loss. Furthermore, the conditions preceding the January 1994 shot of cold air were really only appreciably cold for the 4 days leading up to 19 January… the longer cold soak that we've had over the past 10 days would be expected to lead to slightly greater cold hardiness, all other factors being equal.

The same weather data from Winchester, plugged into the Washington State model produced a predicted bud cold hardiness LT50 value of about -10F for Viognier (lower plot, above). By comparison, the measured bud hardiness of our Viognier back on 17 January 1994 was -11.6F, while the LT90 was -13.9F. Using Charlottesville VA data in the above plots/models, produced very similar predictions of cold hardiness to those generated with the Winchester data (which reinforces what we've seen on any weather report – it's been pretty cold over the entire state).

I will remind the reader that there will likely be appreciable spatial or location variation in low temperatures attained on Thursday morning of this week. I had seen some predictions of some sub -10F temperatures in some forecasts over the past weekend, but those and other predictions have been slowly rising over the last 48 hours, and it appears that there might be some cloud cover in some areas of the state, which would help dampen the cooling.

I reviewed at the recent Winter Technical Conference in Charlottesville the factors that can affect vine cold hardiness, the conditions that likely led to injury last winter (2013/2014), the means of assessing cold injury, and the practical measures that growers can use to retrain cold-damaged vines. The snow cover that much of Virginia received over the past 24 hours is a mixed blessing. On the one hand, it can protect a portion of the scion of grafted vines much as soil would do with hilled-up graft unions. However, the snow cover will also reflect radiant energy, and the lack of soil warming means less soil heat to dissipate at night. Thus, air temperatures can be expected to drop even lower than had the ground been free of snow.

Regardless of how cold your vineyard gets, it's worth your time to examine buds, canes and trunks for evidence of winter injury, especially before you complete your winter pruning. My colleague Hans Walter-Peterson with Cornell Cooperative Extension has a couple of good videos of how to examine buds for cold injury and how to compensate for a variable number of killed buds (cut and paste the following URLs into your web browser:

Testing for Bud Injury Part I - https://www.youtube.com/watch?v=_RHJ5mY3fAs&spfreload=10

Testing for Bud Injury Part II - https://www.youtube.com/watch?v=eWtr0jzI2Dk&spfreload=10

References cited:

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Good luck and stay warm!