Cold Snap in Early January and its Impact on Grapes:

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Between January 1st and 7th, official minimum temperatures ranged between -2 °F and -14 °F across the state (Table 1). Some growers reported temperatures as low as -15 °F in their vineyards. Even though grapevines are at the maximum cold hardiness state in January, the minimum air temperatures may have been lower than the critical temperatures for bud survival in some areas which would lead to injury. In Ohio, *Vitis vinifera* are the most tender grapevines and varieties within this species have different cold hardiness level (LT50). Typically, vinifera sustain some level of bud injury after exposure to air temperatures at or below -5 °F.

To check the status of cold hardiness and possible bud injury, canes were collected on 9 January 2018 from OSU research vineyards in Wooster and Kingsville. Five canes (with 10 buds/cane, node positions 3 to 12) per variety were brought indoors to thaw at room temperature for 24 hrs. The lowest temperature for more than 1 hour was -4 °F (or -20 °C on January 5th) at the research vineyard in Wooster and -7 °F (~ -22 °C on January 7th) in Kingsville. Injuries of primary and secondary buds are summarized in Tables 2 and 3 and the following conclusions are drawn. We would to thank Hongrui Wang, Bailey Miller, Patrick Pierquet, Andy Kirk and Yvonne Woodworth for their assistance with cane collection (in frigid weather!) and bud assessment.

- In Wooster, the overall average of *primary* bud injury ranged between 0% (Frontenac) and 44% (Sauvignon blanc). In Kingsville, it was between 5% (Pinot noir) and 72% (Durif, also called Petite Syrah).
- The *overall average*, which is the average of bud injury across all node positions, does not tell the full story. In fact, when assessed by node position, bud injury % is generally different than the overall average. Typically, bud injury is lower on basal node positions and higher on apical (tip) positions. For example, Chardonnay, grown in Kingsville, had an overall primary bud injury average of 11%. Basal buds (node 3 to 5) had no injury at all; whereas apical buds (node 10-12) sustained 20% injury.
- You may ask the question: “How is that important”? The answer is it matters when pruning adjustment is required and based on type of pruning (spur vs cane). For example, if Chardonnay is spur-pruned, there is 0% bud injury in basal buds, then there is no adjustment of pruning. However, if Chardonnay is cane-pruned, there is 12% injury in middle and 20% in apical positions, then pruning has to be adjusted accordingly.
- Secondary buds, as expected, had minimum injury (0 to 17% among all varieties). Even though, they are not as fruitful as primary buds, they become important to assess and count if primary buds are damaged.
- The status of bud injury reported here is only valid up to January 9th. We still have 6 more weeks of potential damaging cold events. In other words, % bud injury could remain the same as of January 9, or get worse if damaging temperatures occur again. In both situations, it is important to assess bud damage just prior to pruning.

Table 1. Dates and corresponding lowest temperatures recorded in different regions in Ohio.

Region	Weather station location	Date of lowest temp.	Lowest temp. (^{o}F)
Central	Columbus/Bolton FLD	2-Jan	-11
	Rickenbacker ANGB	Jan 1, Jan 2	-7
	Ohio State University	2-Jan	-6
	Akron/Akron-Canton	7-Jan	-3
	Wooster	6 Jan, 7 Jan	-11
	Knox County	1 Jan, 6-7 Jan	-4
	Zanesville Municipal	1 Jan, 3 Jan	-9
	New Philadelphia	1-Jan	-10
	Mansfield	5 Jan, 6 Jan	-5
	Marion Muni ARPT	2-Jan	-6
Northeast	Elyria/Lorain CO	7-Jan	-6
	Cuyahogo CO	6-Jan	-2
	Youngstown	7-Jan	-11
	Ashtabula County AR	6 Jan, 7 Jan	-9
Northwest	Metcalf Field	2 Jan, 6 Jan	-6
	Defiance Memorial	2-Jan	-11
	Toledo Express A	2 Jan, 6-7 Jan	-5
	Findlay Airport	2-Jan	-8
	Lima Allen CO ARPT	2-Jan	-11
Southeast	Athens	3-Jan	-10
	Lancaster	6-Jan	-14
Southwest	Hook FLD MUNI	2-Jan	-13
	Springfield/Beckley	2-Jan	-14
	Wilmington Airborne	2-Jan	-11
	Cincinnati Municipal	2-Jan	-4
	Hamilton	2-Jan	-9
	Wright-Paterson AFB	2-Jan	-12

Table 1. Bud injury of varieties grown at the OSU research vineyard at OARDC in **Wooster**. Lowest temperature that lasted for more than 1 hour was -4 ^{o}F on 5 January 2018. Canes were collected on 9 January

Variety	% Bud damage (all node positions/cane)		% Bud damage by node position					
			Basal (node 3-5)		Middle (node 6-9)		Apical (node 10-12)	
	I*	II*	I	II	I	II	I	II
Aromella	12	0	6	0	12	0	25	0
Cabernet franc	8	0	0	0	0	0	27	0
Chambourcin	2	0	0	0	0	0	8	8
Chardonnay	8	0	7	0	5	0	13	0
Frontenac	0	0	0	0	0	0	0	0
Marquette	2	2	8	8	0	0	0	0
Riesling**	11	0	20	0	5	0	8	0
Sauvignon blanc	44	6	27	0	50	10	54	8
Traminette	26	2	27	0	10	0	47	7

*I: primary bud, II: secondary bud. **Some buds sustained damage from causes other than cold.

Table 3. Bud injury of varieties grown at the OSU research vineyard at AARS in **Kingsville**. Lowest temperature (more than 1 hour) was -7 ^{o}F on 7 January 2018. Canes were collected on 9 January.

Variety	% Bud damage (all node positions/cane)		% Damage by node position					
			Basal (node 3-5)		Middle (node 6-9)		Apical (node 10-12)	
	I*	II*	I	II	I	II	I	II
Cabernet franc	10	6	13	13	10	0	7	7
Chardonnay	11	4	0	0	12	0	20	13
Durif (P. Syrah)	72	15	77	17	70	12	70	17
Pinot noir	5	5	0	7	5	5	11	0
Regent	20	7	8	0	26	11	23	8

*I: primary bud, II: secondary bud.

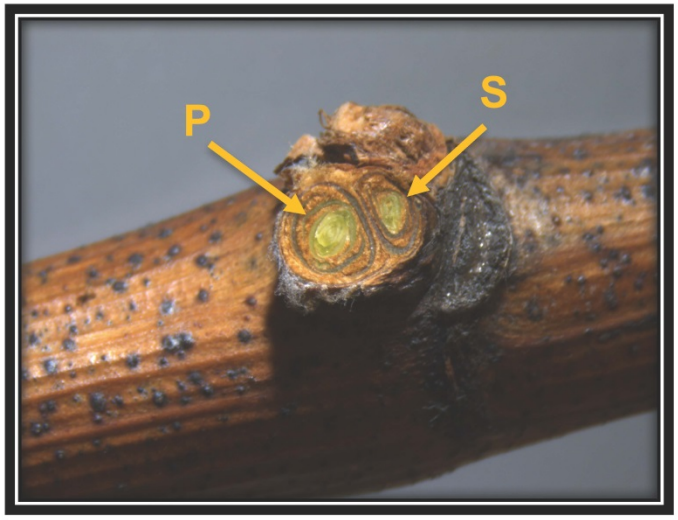
Information on assessing winter damage and pruning adjustment are from previously published articles in OGEN and excerpts are listed below. Most information is from the book titled "Winter Injury to grapevines and Protection Methods" which I strongly recommend (online order: msue.anr.msu.edu/resources/winter_injury_to_grapevines_and_methods_of_protection_e2930).

- Prune cold hardy varieties first and most tender varieties last.
- Collect enough canes to yield 100 "representative" nodes per variety. By representative I mean evaluate nodes that you would otherwise retain as spurs or canes when pruning.
- Place canes indoor to thaw for 48-72 hours.
- Using a sharp razor blade, cut across the bud tip at a third or half of its height.
- Visually assess if the primary bud (largest size) is alive (green color) or dead (brown). You may also evaluate the status of secondary buds if many primary buds are dead.
- We have added photos and links to You-Tube videos to assist with assessing bud winter damage (see below).
- A data sheet could be used to record and compute bud mortality as a percent.
- Conduct bud damage assessment for each variety separately and sometimes for each block of same variety separately (for example one block of chardonnay on top of the hill will likely have different bud damage than a block of same variety at the bottom of the hill).
- If primary bud damage = 0 to 14%, then no adjustment of pruning is needed.
- If primary bud damage = 15 to 34%, then leave about 35% extra buds. For example, if you prune to leave 30 buds/vine, and bud damage = 20% then leave an extra 35% or 40 buds/vine.
- If primary bud damage = 35 to 50%, then double the number of buds retained.
- If primary bud damage >50%, then it is best to minimally prune vines by hedging.
- Generally, basal buds (buds on the basal positions of the cane) are more cold hardy than distal buds. Thus, it is best to increase the number of spurs per vine than buds per spur when adjusting bud number per vine.
- Note that hybrids with fuitful secondary and base buds will produce a normal crop even with relatively high % primary bud injury. Examples include, DeChaunac, Seyval, and Vidal.

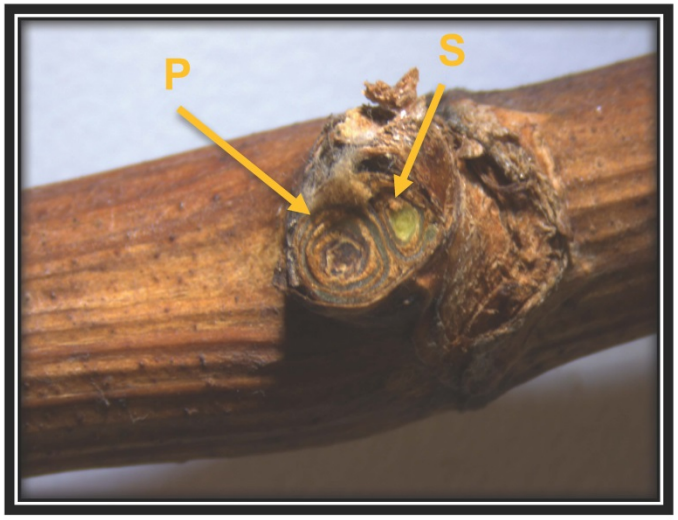
Video links for assessing bud injury:

- Part 1 (cane collection): www.youtube.com/watch?v=_RHJ5mY3fAs
- Part 2 (bud assessment): www.youtube.com/watch?v=eWtr0jzI2Dk
- Assessing bud damage: www.youtube.com/watch?v=rMav5zmGagg
- Assessing bud damage: www.youtube.com/watch?v=vv5axzMkYuY

Grape Bud Winter Injury Assessment



Bud cross section: Live (green) primary (P) and secondary (S) buds (Photo by Imed Dami).



Bud cross section: Dead (brown) primary (P) and live (green) secondary (S) buds (Photo by Imed Dami).