



2011 Missouri Grapevine Bud Mortality Survey Report

Institute for Continental Climate Viticulture and Enology

Andy Allen, Jackie Harris, Keith Striegler, and Eli Bergmeier

Severe low temperatures were recorded for many parts of the state in early February. Consequently, we conducted a survey to determine the extent of winter bud injury in grapevines. Cane samples were collected from different grape growing regions of the state. Twenty to twenty-five canes consisting of 5-6 buds per cane or fifty-five 2-bud spurs were collected from each plot to assess bud mortality. The canes were wrapped in moist paper towels and placed in polythene bags and transported to the laboratory. Canes were examined for bud mortality within seven days after sampling. Canes were stored under refrigeration prior to analysis. The procedure used for bud dissection was per the procedures described at (<http://www.nysaes.cornell.edu/hort/faculty/pool/budcoldinjury/Assessingbudcoldinjury.html>).

The buds were cut to appropriate depths using a sharp razor blade and examined under a stereo binocular microscope or hand magnification lens. Buds that displayed complete brown / black color were considered dead and buds found to be completely green were considered live. Primary bud mortality was determined for all samples and in some instances secondary and tertiary bud mortality was also assessed.

Low temperature data recorded during January and February 2011 were collected for all locations. Temperature data were collected from on-site weather stations or the nearest network weather station. Very low temperatures were recorded for Platte County at -12°F followed by Lafayette County at -11.7°F which additionally had nighttime temperatures that dropped below 0°F for three consecutive nights. The coldest temperature overall was in Madison County, Arkansas which reached -18°F. All selected locations experienced low temperatures below 0°F with the exception of Saint Charles County, Missouri. Observed bud mortality for selected cultivars at different locations and their respective low temperatures are presented below, along with information on adjusting pruning severity to compensate for bud injury.

Lawrence County, MO

Primary bud injury for Chambourcin was 45%. Samples were collected from a single site with the temperature data from a nearby weather station.

Bud mortality of selected cultivars in Lawrence County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Chambourcin	45	12	10

Low temperatures recorded during January and February

2011 in Lawrence County, MO

Date	Low Temperature (°F)
1/13/11	0
2/2/11	-2
2/3/11	-9
2/9/11	-4
2/10/11	-10

Barry County, MO

Primary bud damage was greater than 25% for all varieties surveyed except for Norton at 7%. Highest primary bud injury was on Cabernet Franc (55%), followed by Chardonel (34%), Vignoles (33%), and Chambourcin (27%). Samples represent one vineyard operation with temperature data reported from an on-site weather station.

Bud mortality of selected cultivars in Barry County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Chardonel	34	20	18
Chambourcin	27	9	8
Norton	7	0	0
Vignoles	33	7	4
Cabernet Franc	55	28	19

Low temperatures recorded during February 2011 in Barry County, MO

Date	Low Temperature (°F)
2/2/11	0.9
2/3/11	-5.7
2/8/11	0.1
2/9/11	2.2
2/10/11	-2.9

Ste. Genevieve County, MO

Maximum primary bud injury of 28% and 25% was recorded on Chardonel and Vignoles respectively. Primary bud injury for the cultivars Chambourcin and Valvin Muscat was 13%. Traminette showed minimal primary bud damage at 5% and Norton had the least primary bud mortality with only 1%. Samples were collected from one vineyard operation. Temperature data were sourced from a weather station within the region.

Bud mortality of selected cultivars grown in Ste. Genevieve County, MO.

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Vignoles	25	1	0
Chambourcin	13	2	0
Chardonel	28	16	7
Traminette	5	na	na
Norton	1	0	0
Valvin Muscat	13	na	na

Low temperatures recorded during January and February 2011 in Ste. Genevieve County, MO

Date	Low Temperature (°F)
1/13/11	4
1/21/11	-1
2/3/11	4
2/4/11	8
2/10/11	7

Phelps County, MO

Lowest primary bud damage was seen in Norton (5%), followed by Chardonel (7%). Vignoles had primary bud damage at 15% and Concord at 25%. Greatest primary bud mortality was observed on Traminette at 30%. Samples represent one vineyard operation with temperature data sourced from an on-site weather station.

Bud mortality of selected cultivars in Phelps County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Chardonel	7	5	3
Traminette	30	na	na
Norton	5	na	na
Vignoles	15	13	5
Concord	25	20	8

Low temperatures recorded during winter of 2010-11 in Phelps County, MO

Date	Low Temperature (°F)
12/13/10	-0.3
1/12/11	3.4
1/13/11	2.2
2/3/11	-2.9
2/10/11	-1.6

Gasconade County, MO

Norton, Vidal blanc, Chardonel, Corcord, Traminette, and Chambourcin had primary bud injury of 20% or less. Primary bud injury was highest for Vignoles with 55% bud mortality. Samples were collected from two vineyard operations and temperature data were sourced from a nearby weather station.

Bud mortality of selected cultivars grown in Gasconade County, MO.

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Vidal blanc 1	2	na	na
Vidal blanc 2	1	na	na
Vignoles	55	na	na
Norton	0	na	na
Chambourcin	20	na	na
Chardonel	10	na	na
Traminiette	16	na	na
Concord	12	na	na

Low temperatures recorded during January and February 2011 in Gasconade County, MO

Date	Low Temperature (°F)
1/13/11	-4
1/21/11	-1
2/3/11	-6
2/9/11	2
2/10/11	-9

St. Charles County, MO

Primary bud injury was 37% for Vignoles while only 3% mortality was seen for Norton. Samples represent one vineyard operation with temperature data sourced from a nearby weather station.

Bud mortality of selected cultivars in St. Charles County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Vignoles	37	9	3
Norton	3	0	0

Low temperatures recorded during January and February 2011 in St. Charles County, MO

Date	Low Temperature (°F)
1/13/11	7
1/21/11	0
2/3/11	4
2/8/11	9
2/10/11	8

Boone County, MO

The cultivar Vidal blanc had the highest level of primary bud mortality at 42% followed by Chardonel (35%), Chambourcin (30%), and Vignoles (25%). The least amount of bud injury

was observed on Norton at 1%. Samples represent two vineyard operations. Temperature data were sourced from a nearby weather station.

Bud mortality of selected cultivars in Boone County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Vignoles	25	3	2
Chardonel	35	15	9
Vidal Blanc	42	16	14
Norton	1	1	0
Chambourcin	30	10	5

Low temperatures recorded during January and February 2011 in Boone County, MO

Date	Low Temperature (°F)
1/13/11	-3
2/2/11	-1
2/3/11	-10
2/4/11	-3
2/10/10	-10

Lafayette County, MO

Temperatures in this region were among the coldest observed in MO. Cabernet Franc buds were hardest hit with 100% primary and secondary bud mortality and 96% for tertiary buds. Chambourcin at the same site suffered 52% primary damage while Chambourcin from a second site only suffered 38% primary bud damage. Weather data were collected at the second site which may have experienced slightly warmer temperatures than the first site.

Bud mortality of selected cultivars in Lafayette County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Cabernet Franc	100	100	96
Chambourcin 1	52	18	9
Chambourcin 2	38	8	1

Low temperature recorded during January and February 2011 in Lafayette County, MO

Date	Low Temperature (°F)
1/13/11	-8.6
2/3/11	-11.7
2/8/11	-2.9
2/9/11	-1.6
2/10/10	-8.6

Platte County, MO

Vignoles had the highest amount of primary bud mortality at 46%. Minor bud injury was observed for both Traminette (6%) and Norton (7%). Samples represent one vineyard operation. Weather data were collected from a nearby weather station.

Bud mortality of selected cultivars in Platte County, MO

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Vignoles	46	na	na
Traminette	6	na	na
Norton	7	na	na

Low temperature recorded during January and February 2011 in Platte County, MO

Date	Low Temperature (°F)
1/13/11	-6
2/2/11	-2
2/3/11	-12
2/8/11	0
2/10/11	-6

Madison County, AR

Primary bud injury was highest on Chambourcin with 57% mortality. Lower bud injury was seen in Catawba and Concord (33-34%). Samples represent one vineyard operation. Temperature data were collected from a nearby weather station.

Bud mortality of selected cultivars in Madison County, AR

Cultivar	Percent bud mortality		
	Primary	Secondary	Tertiary
Catawba 1	33	18	13
Catawba 2	33	14	11
Concord	34	11	5
Chambourcin	57	23	20

Low temperature recorded during February 2011 in Madison County, AR

Date	Low Temperature (°F)
2/2/11	-2
2/3/11	-5
2/9/11	-3
2/10/11	-18
2/11/11	-5

Discussion

As can be seen, observed temperatures and bud mortality varied across the region. Differences in observed low temperatures likely explain a significant portion of the variation, but it is critical to remember bud mortality is also broadly influenced by numerous other factors including general vine health, crop load, and cultural practices. This highlights the importance of site, cultivar, and even block specific data in making informed pruning decisions in response to bud injury. We urge growers to carefully examine bud mortality in their vineyards prior to determining final retained node numbers whenever possible. In addition, in regions where extreme low temperatures occurred it is important to evaluate trunks and cordons for phloem damage.

Adjusting Pruning Practices to Compensate for Bud Mortality

Zabadal et al. (2007) recently published revised pruning recommendations to compensate for varying levels of primary bud mortality. Their recommendations include the following:

- If primary bud mortality is 0% to 14%, prune normally. A small percentage of dead primary buds is normal, and the vine will often compensate for these losses completely with increased berry set in the remaining clusters.
- If primary bud mortality is 15% to 34%, retain 35% additional nodes.
- If primary bud mortality is 35% to 50%, double the normal retained node number.
- If primary bud mortality exceeds 50%, restrict pruning to removal of tissues that cannot be managed on the training systems. A light mechanical hedging can accomplish this task efficiently. This level of bud injury may indicate that injury has occurred in the perennial structure of the vines (trunks and cordons).

This approach is conservative from the standpoint of retaining adequate yield potential, and may actually retain sufficiently large amounts of additional (excess) crop to necessitate fruit thinning during the growing season. While securing the potential for a full crop is desirable, growers must be prepared to adjust crop load appropriately during the growing season should an excessively large crop be set through these adjustments in pruning severity. This is particularly true for hybrid winegrape cultivars that offer significant crop potential from secondary and non-count shoots (Zabadal et al., Allen, 2007). The current authors suggest that growers rely upon their experiences and available data to make prudent adjustments in retained node numbers for cultivars that exhibit these traits.

Literature Cited

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