

## Grape Bud Hardiness - Effect of Exposure Time

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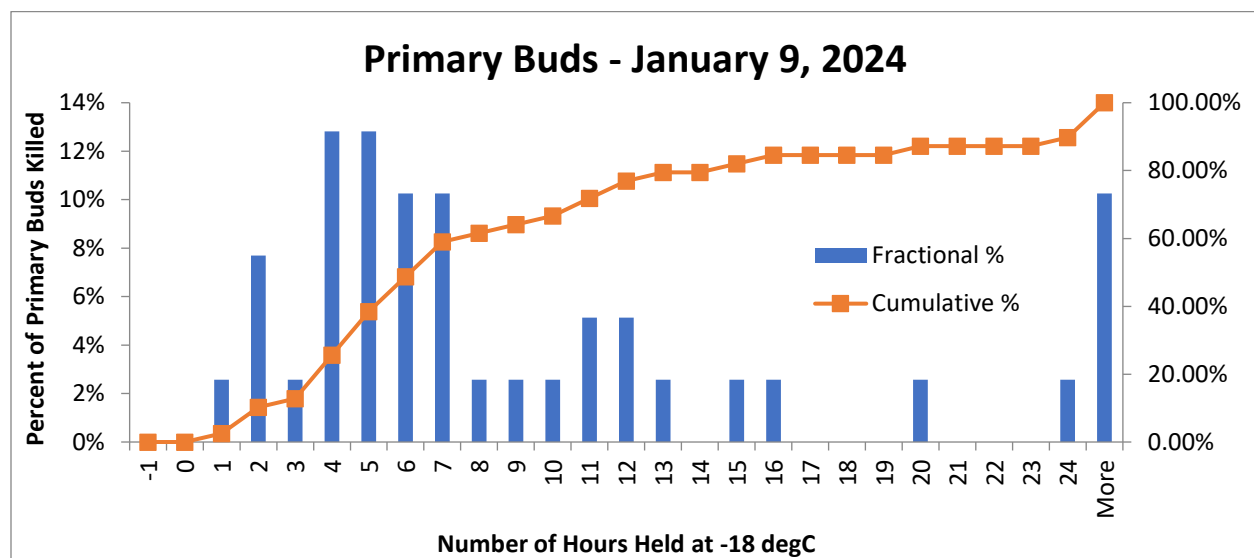
Typically the daily minimum temperatures in the Okanagan and Similkameen that threaten grape buds are relatively short in duration occurring during the night. However the weather events experienced on Dec 26th to 28th, 2021 and Dec 19th to 23rd, 2022 and currently projected Jan 12th to 14, 2024 create threatening levels of low temperatures for many consecutive hours.

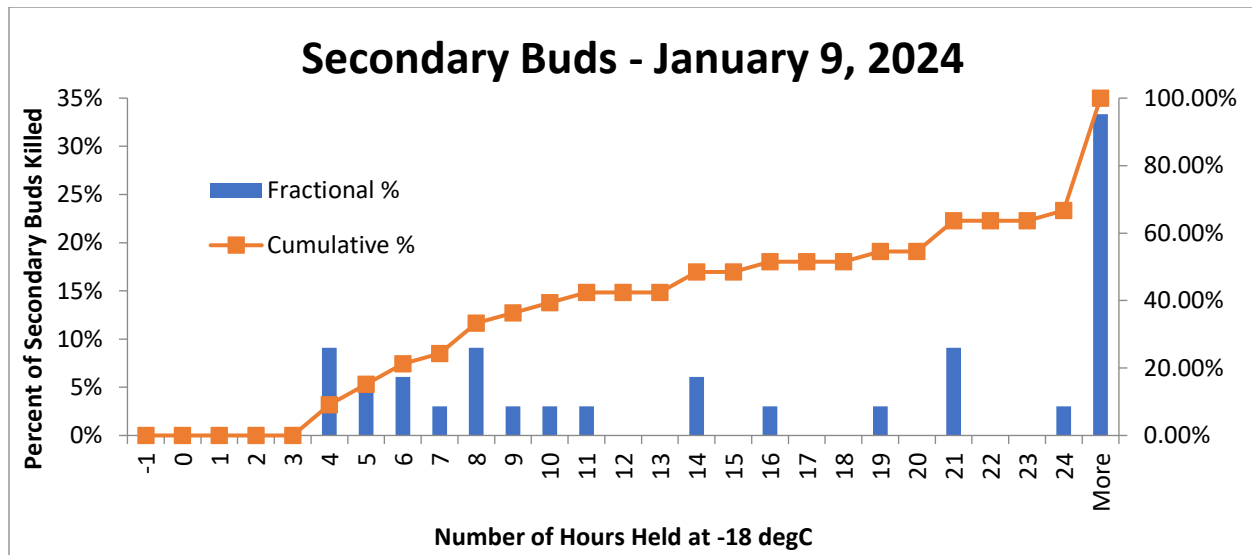
The length of exposure time at a temperature is another important factor in Grape Bud Hardiness. This factor is not a variable in standard bud hardiness testing methodology. The standard bud hardiness testing method used at SuRDC and elsewhere uses a constant cooling ramp rate (-3.6 degC/hour at SuRDC) and at that cooling rate the exposure time to an integer temperature value is only approximately 15 minutes. Experiments at SuRDC have shown that higher temperatures than determined from standard bud hardiness testing can be lethal if the exposure time to these temperatures is increased.

Using a novel system developed at SuRDC that allows for hardiness testing of intact grape vine shoots, and that can differentiate primary and secondary exotherm events, the effect of exposure time on grape bud hardiness has been investigated. Merlot grape vine shoots are cooled at -3 degC/hour to to -18 degC (a temperature where minimal damage to buds is typically expected from standard bud hardiness testing) and held for 24 hours. After 24 hours the samples are cooled at -3degC/hour down to -33 degC to capture any exotherm events from buds that survived the -18 degC holding period.

Below are the plots and results from the sampling run carried out on January 9th, 2024. Primary bud damage starts occurring at a significant amount around 4-5 hours with an average survival time of 7.24 hours and 10% survival greater than 24 hours at -18 degC. Secondary buds showed an average survival time of 10.04 hours and 33% survival greater than 24 hours at -18 degC. Results from January 4<sup>th</sup>, 2024 also included as it shows how rapidly the hardiness has been increasing since the return of cooler weather last week. On January 4<sup>th</sup> 0% of primary or secondary buds survived greater than 24 hours at -18 degC.

Effect of Exposure Time on Grape Bud Lethality





Primary Bud Survival Time (Hours) at -18degC

DATE	n	HoursNeg18 <sub>AVE</sub>	StDev	HoursNeg18 <sub>10</sub>	HoursNeg18 <sub>50</sub>	HoursNeg18 <sub>90</sub>	% Primary Buds Survive -18degC > 24 Hours
1/4/2024	40	2.78	3.39	-0.72	2.05	8.16	0%
1/9/2024	39	7.24	5.20	2.09	5.79	13.61	10%

Secondary Bud Survival Time (Hours) at -18degC

DATE	n	HoursNeg18 <sub>AVE</sub>	StDev	HoursNeg18 <sub>10</sub>	HoursNeg18 <sub>50</sub>	HoursNeg18 <sub>90</sub>	% Secondary Buds Survive -18degC > 24 Hours
1/4/2024	31	3.89	4.23	0.12	3.25	7.59	0%
1/9/2024	33	10.04	5.91	3.86	7.78	20.06	33%

For Samples where both Primary and Secondary Bud LTE Events observed during the 24 hour -18degC holding period

Additional Survival Time (Hours) of Secondary Bud after Primary Bud LTE Event

DATE	n	HoursNeg18 <sub>AVE</sub>	StDev	HoursNeg18 <sub>10</sub>	HoursNeg18 <sub>50</sub>	HoursNeg18 <sub>90</sub>
1/4/2024	31	2.00	2.18	0.33	1.09	4.74
1/9/2024	22	5.31	4.72	0.38	3.89	10.59

AveLTE of Buds that Survived -18degC > 24 Hours

DATE	Primary Buds			Secondary Buds		
	n	AVG_LTE <sub>SurfaceTemp</sub>	Avg_LTE <sub>AirTemp</sub>	n	AVG_LTE <sub>SurfaceTemp</sub>	Avg_LTE <sub>AirTemp</sub>
1/4/2024	0	N/A	N/A	0	N/A	N/A
1/9/2024	4	-23.06	-23.83	11	-24.06	-24.75

\* 10, 50, 90 represent the 10<sup>th</sup> 50<sup>th</sup> and 90<sup>th</sup> percentile of the sample population (eg HoursNeg18<sub>90</sub> indicates the number of hours at which 90% of the sample population has been killed)

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