

Bud cold hardiness monitoring in Québec. Summary of the 2020-2021 winter season

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Winter temperatures are particularly challenging for the Quebec wine industry. At the Centre de recherche agroalimentaire de Mirabel (CRAM), we have implemented a cold hardiness monitoring system in collaboration with Brock University's Cool Climate Oenology and Viticulture Institute (CCOVI). The goal is to better understand how the grapevines respond to the harsh climate. The system allows us to

identify potentially lethal temperatures and assess the percentage of buds at risk during extreme cold weather events. The 2020–2021 winter gave us the opportunity to measure the hardiness of Quebec vines for a second consecutive year. We sampled again the buds of hybrid grape varieties such as Frontenac, Marquette, St-Pepin, Frontenac Blanc and Petite Perle from vineyards in the Montérégie, Laurentians, Lanaudière and Eastern Townships. In the fall and spring, we also evaluated the hardiness of a few cultivars protected by geotextiles such as the *Vitis vinifera* Chardonnay and Pinot noir.

Overall, the vines underwent the expected hardiness phases, from fall acclimation to a period of maximum hardiness in the middle of winter followed by spring deacclimation.. In the fall, the gradual drop in temperatures allowed the vines to acclimate and gain up to 10 °C in hardiness between October and December. Acclimation followed the trends reported by other monitoring programs such as CCOVI's Vine-Alert in Ontario. Acclimation was completed by mid-December with hardiness stabilizing around -25 °C and -30 °C for cultivars such as Marquette, Frontenac and St-Pepin. The vines had therefore developed enough resistance when by the time the first days below -15 °C arrived, between December 15 and 19, 2020. The “maximum hardiness” period, when one would expect hardiness to stabilize during the coldest months of the year, was marked by significant temperature fluctuations that impacted the vines. A warm spell at the end of December caused partial deacclimation at some sites such as our experimental vineyard in Oka. The vines reacclimated when temperatures returned to normal and reached a particularly high level of hardiness between late January and mid-February following the coldest temperatures of the season. The LT50, the temperature lethal to 50% of the buds, reached -31 °C, going as low as -35 °C for some site and cultivar combinations. Following this cold period, hardiness stabilized around -30 °C despite a gradual rise in temperatures. Deacclimation started in mid to late March, depending on the site and cultivar. It proceeded more rapidly than acclimation, following the rise in temperature in March and April. Between March 20 and April 10, some cultivars lost more than 11 °C of hardiness, but a lot of variation was observed between sites. After the geotextiles were removed, the hardiness was often lower for covered than uncovered vines. For example, on April 7, 2021, previously covered *Vitis vinifera* and uncovered hybrids from neighbouring Montérégie vineyards had more than 5 °C hardiness difference. Our monitoring ended in April with the pruning season, but we observed an early bud break. Although the winter temperatures of the 2020–2021 season were not cold enough to cause significant damage, a major three-night frost event affected most areas in late May 2021. So, despite a good winter for bud survival, many vineyards had to deal with frost damage and yield reduction. For a second consecutive year, grapevine cold hardiness greatly varied from one site to the next. The large variations between vineyards and the unpredictable differences between grape varieties demonstrate that the monitoring program is needed to better understand hardiness in Quebec.

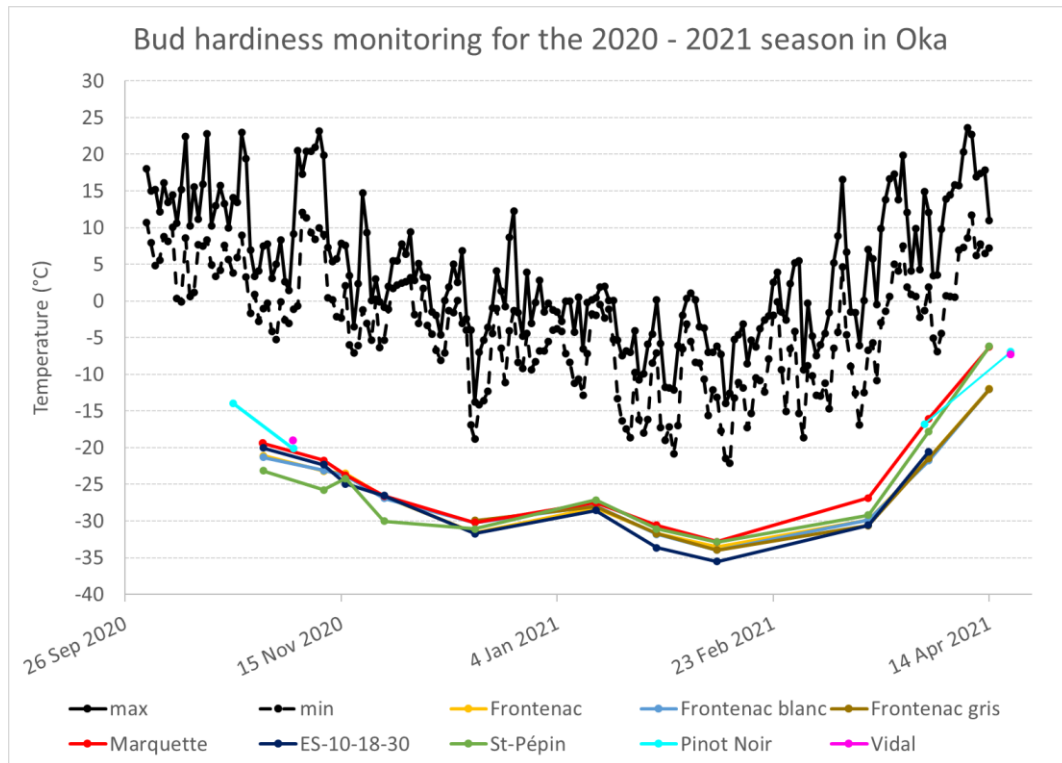


Figure 1. Monitoring of bud cold hardiness (LT 50) for some of the cultivars at the CRAM's experimental vineyard located in Oka, Quebec.

Table I : Lethal temperatures for 10, 50, and 90% of grapevine buds (LT10, LT50, and LT90) for many Québec regions for the 2020-2021 season.

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