

Final Plain Language Research Summary - AgriScience Grape & Wine Cluster 2018-2023

Activity: *Factors affecting grapevine winter hardiness*

Principal Investigator(s): Carl Bogdanoff, Ben-Min Chang (AAFC Summerland)

After Carl Bogdanoff retired in 2021, Dr. Ben-Min Chang resumed the activities under the supervision of Dr. Kevin Usher.

Objective 1: Evaluation & modification of vineyard management practices

In this objective there are four multi-year field experiments.

- Expt 1 (planted in 2017) – The aim of this study is to investigate whether rootstocks affect vine cold hardiness. Merlot were grafted on eight rootstocks (101-14, 110R, 3309C, 5C, Ramsey, Riparia gloire, Schwarzmann, and SO4) in 2017. The experimental block was drip irrigated three times a week. The rootstock treatments did not affect yield, juice Brix, juice pH, juice TA, and cold hardiness under frequent irrigation. The potential small rootzones that are created by frequent irrigation might reduce the effects of rootstock treatments.
- Expt 2 (initiated in 2019) – Early season deficit irrigation enhanced vine hardiness but reduced yield in 2019 trial. However, the 2020 trial was then canceled due to COVID restriction. Despite the fact that the experiment was terminated, the results suggested that early season management can affect cold hardiness later in the dormant season. The cool and wet early season in 2022 might explain why vines became less hardy during the 2022/2023 winter (The lethal temperature was about 2°C higher than 2021/2022 winter).
- Expt 3 (initiated in 2021) - Effects of irrigation/fertigation treatments on vine senescence and hardiness. This experiment, with irrigation/fertigation treatments ranging from 50% to 150% of conventional irrigation rate, were repeated in 2022–2023 season. Bud break rate, photosynthesis measurements, leaf senescence, berry composition, yield, pruning weights and bud hardiness measurements have been and will continue to be collected till May 2023. Bud damages were widely spread in the Okanagan valley due to December 21-22, 2022, cold snap. The budbreak rate will be assessed in early May 2023. The results in 2021 trial showed the irrigation treatments did not affect budbreak rate. The budbreak rate could be interpreted as survival rate after a significant cold snap event. However, the minimum air temperature during the cold snap did not reach the lethal temperature in December 2021. Thus, the effects of irrigation treatment might be masked by buds without any winter damage. The budbreak rate of 2022 season will be analyzed. On the other hand, the yield, berry weight, juice pH, and juice TA were associated with amount of irrigated water.
- Expt 4 (initiated in 2021) - Effects of post-harvest defoliation on bud hardiness. The aim of this experiment is to simulate an early hard frost event and explore its effect on bud hardiness. The second-year trial in 2022 was compromised by the early November frost event.

Objective 2: Regular posting of varietal bud hardiness measurements and development of predictive bud hardiness models

Due to low staffing in the 2022 season, we collected samples from only south Okanagan valley. Varietal bud hardiness measurements from 36 Okanagan Valley vineyard sites have been made every two weeks from late October to early April. This data is posted to the BCWGC, the BCGA and to local growers, and is used to verify and improve the predictive bud hardiness models that have been developed for eight widely grown cultivars. However, the cold snap on December 21-22, 2022, caused severe bud death. We obtained aberrant Low Temperature Exotherm measurements after the cold snap. The data was not used in constructing the model. Dr. Wolkovich of UBC had developed an online dashboard based on the model. The assessment of cold hardiness will be continued to the next Sustainable CAP project by Dr. Ben-Min Chang (pending cluster and activity approval). The report of cold hardiness forecast will be resumed in 2023 winter.

Objective 3: The investigation of grapevine phloem hardiness

As this objective had been completed, no further action was taken.

Objective 4: The investigation of grapevine root hardiness

Much of the proposed goals for this objective have also been completed.

Objective 5: The examination of grapevine diseases and novel vineyard management practices on winter hardiness

Bud hardiness was measured from late fall to early spring for all field experiments in Activities 2, 6, 11, 21, & 22.

Objective 6: Surveying local vineyards to develop new varietal winter hardy clones

New assessment will be conducted. Six vineyards in Kelowna and Lake Country areas had been surveyed for surviving vines after the cold snap in December 2021. The surviving vines could be isolated as a winter damage resistant new clone. Unfortunately, no obvious survivors stood out in the surveyed vineyards while the environmental variations can make significant differences. For example, some vines with stunted growth could be observed in the survey. Initially, these vines were considered as cold damaged vines. The rest of healthier vines were identified as potential winter survivors. In fact, the stunted growth might be related to Pinot curl leaf symptom due to cool weather in the spring of 2022. To select winter damage resistant clones or mutants efficiently, we can utilize new technologies (e.g. gene sequencing) for screening before entering field comparison trial.