Pruning Grapevines After Winter Injury

Hedge pruning shows advantages in Ohio trial conducted with Pinot Gris

By Imed E. Dami

Extreme low temperatures in winter can cause significant economic losses to grape production by substantially decreasing yield and fruit quality and increasing the cost of production. It can cost an estimated $155 to retrain or replace a dead grafted *Vitis vinifera* vine. Because extreme freezing events do not occur on a frequent basis, little research has been conducted on the best pruning strategies for optimum grapevine recovery. While reports from Washington state describe how to deal with winter-injured, own-rooted *vinifera* vines, there is no such published research on grafted *vinifera* grown in the eastern United States.

Growers typically respond to extensive winter injury by bypassing pruning altogether. Growers assume there will be major crop losses as a result of winter injury and thus reduce production costs by minimizing cultural practices such as pruning.

Wine East HIGHLIGHTS:

- Sub-freezing temperatures in January 2009 prompted a study of how pruning affects vines damaged by winter injury.
- Methods tested included no pruning, spur pruning, two-node hedging and five-node hedging.
- While pruning strategies did not physiologically affect vine recovery following 90% bud injury, hedge pruning resulted in a moderate crop that ensured future vine balance.

Following winter injury, the primary goal of a grower is to conduct cultural practices that bring the vineyard back to full production with minimum cost and without sacrificing vine health and fruit quality. Among the early and most critical cultural practices is pruning adjustment. The appropriate pruning strategy will depend on the extent of primary bud injury. Therefore, an assessment of primary bud injury prior to pruning is an important step.

The beginning

In January 2009, extreme sub-freezing temperatures occurred east of the Rockies throughout grapegrowing regions in Illinois, Indiana, Iowa, Minnesota and Missouri. In Ohio, temperature lows ranged between -8°F and -24°F, which were

Pinot Gris vines were inspected after pruning in May 2009. Control vines *(left)* weren't pruned. Also pictured: five-bud *(center)* and two-bud hedging.

considered critical to *vinifera* productivity and survival.

This study was initiated to take advantage of that natural freezing event and address the lack of information about the above issue. The specific objective was to evaluate various pruning strategies of one *vinifera* variety that sustained extensive winter injury, Pinot Gris, and eventually to identify the best method of pruning to recommend to commercial growers.

Pinot Gris vines trained to a bilateral cordon system and typically spur pruned were exposed to vineyard temperatures of -15°F on Jan. 15, 2009, at the OARDC Research vineyard in Wooster, Ohio. Four pruning treatments were applied in March:

1. Spur pruning (standard): consisted of retaining six nodes per foot of cordon;
2. Two-node hedging: consisted of hedging canes to two-node spurs and retaining all spurs;
3. Five-node hedging: consisted of hedging canes to five-node spurs and retaining all spurs;
4. No pruning.

Cane pruning was not included because it already is known that vines perform poorly when cane pruned following winter injury. Winter injury also was monitored in August 2009 by further assessing the vascular tissue injury in cordons and trunks. At harvest, yield components data were collected. To determine carryover effects of the 2009 winter injury, the study continued in 2010 to assess vine recovery after returning to normal pruning practices.

Since no significant bud injury occurred during the second year, all vines from all treatments were pruned similarly and back to the standard spur pruning (six nodes per foot of cordon.) Pruning duration and weight of 1- and 2-year-old wood were determined. Pruning weights of 1-year-old wood (i.e., canes) were used to determine the Ravaz index (RI) as the ratio of crop-to-cane pruning weight. The numbers of count buds and clusters per vine were recorded in 2010 to assess whether pruning treatments affected bud fruitfulness (ratio of clusters to count buds.)

The results

In May 2009, the no-pruning treatment resulted in the earliest and most vigorous growth, whereas spur pruning had the latest and weakest; hedge pruned were intermediate *(see photos above)*, resembling early canopy development observed in minimally pruned vines. In July and August 2009, we also observed the so called "mid-summer vine collapse," which took place pre-veraison through post-veraison and consisted of leaf wilting and shoot collapse in a portion of the cordon (partial collapse) or whole vine (total collapse.) *(See photos on page 64.)* It is an indicator of vascular damage including phloem, xylem and even cambium tissues. The assessment of cordon, trunk and whole vine injuries confirmed vascular damage and that cordons, trunks

Control vines *(left)* showed sporadic distribution of clusters in the canopy. The five-node hedging treatment is pictured at right.

and whole vines sustained winter injury, but there were no differences among the pruning treatments (even though there was a trend with non-pruned vines sustaining the most injury.)

As expected, at harvest non-pruned vines had the highest number of clusters and yield (4.8 tons per acre), and spur-pruned and two-node hedge-pruned vines had the lowest (0.6-0.7 tons per acre); cluster number and yield in five-node hedging were intermediate (2.3 tons per acre.) In other words, the higher the pruning severity, the lower the yield; thus the yield response was attributed to pruning severity rather than to freezing injury. However, vine size (expressed as pruning weight of 1-year-old wood) was the smallest in non-pruned vines and the largest in the remaining treatments. All pruned vines were within the optimal range; non-pruned vines were below the optimal range and thus considered out of balance.

Further, non-pruned vines had the highest RI and were over-cropped; spur and two-node hedged vines had the lowest RI and were under-cropped; the five-node hedged vines were balanced since RI value was within the ideal range. As predicted, it took the least time to prune and remove wood from the trellis with

The appearance of the canopy and clusters involved in the two-node hedging treatment *(left)* differed from the spur-pruned treatment at right.

spur pruning treatment, and the most time with non-pruned and five-node hedged vines.

The second year

In year two, the goal was to re-establish spurs in the vicinity of the cordons. Therefore, pruning involved removal of 1-year old canes as well as misplaced 2-year old wood. It was not always possible to have two-node spurs spaced evenly on the cordons since some were dead. By focusing on bringing spurs as close to the cordon as possible, some treatments ended up with uneven number of spurs and thus an uneven number of buds per vine. As a result, count buds were the lowest in non-pruned vines and highest in the two-node hedged vines.

Total shoots per vine followed the same trend as count buds and was directly influenced by count shoots. Total cluster count per vine also was influenced by the total shoots per vine and was lowest in non-pruned vines and highest in spur and two-node hedged vines. However, bud fruitfulness in 2010 was not affected by pruning treatments applied in 2009. Therefore, it is suggested that there is no carry-over effect of pruning type after winter injury that might negatively affect fruitfulness in the following season.

Pinot Gris collapsed mid-summer 2009 due to winter injury. Some vines experienced partial vine collapse *(left)* and others *(right)* total vine collapse.

In conclusion, the various pruning strategies did not physiologically affect the recovery of Pinot Gris following approximately 90% bud injury. Our findings concur with previous reports from Washington state that show no effect of pruning on vine survival in cold-injured Merlot vines.

Practically, though, when vines sustain extensive primary bud injury, hedge pruning is advantageous over non-pruning or standard spur pruning because a moderate crop can be harvested in the same year following winter injury that ensures the maintenance of vine balance and rapid retraining and reestablishment of renewal spurs during year two. The practice of hedge pruning to five-node spurs is, therefore, recommended on cultivars that sustain extensive winter bud injury. WE

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