Assessing and Managing Grapevines in Response to Winter Injury

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There will be winter injury to grapevines in vineyards grown in cool climates. A grower can neither despair over nor ignore this aspect of vine management in a cool climate. Therefore, each year the strategy for coping with winter injury begins with delaying pruning as long as possible during the dormant period, assessing the extent of any winter injury before the start of pruning and then adjusting pruning and other cultural practices in response to that assessment. During the winter dormant period prune hardiest varieties first and the most cold tender varieties last.

Two types of tissues need assessment prior to the start of pruning practices. The first of these are the fruiting buds. Each fruiting bud (technically a node) is a complex of three buds. The primary bud is a central cylinder of tissue in the middle of the bud. On either side of the primary, the secondary bud is located located towards the base of the cane (basipetal) while the much smaller, relatively unfruitful tertiary bud is towards the tip of the cane (acropetal). The primary bud is responsible for about two-thirds of the fruiting potential of the whole bud complex. Flower clusters on this primary bud are situated at the tip of the primary which is located at about one-third to one-half the overall height of the bud. Therefore, making cross-sectional cuts through the bud at that depth will reveal whether that cylinder and the flower clusters are still a healthy, green or a brownish-black color, thus indicating their mortality. The skill to make this assessment with a new, sharp razor blade is easily and quickly learned. Too often there is a hesitation or lack of self-confidence to perform this assessment and an alternate method of soaking canes in water for a period of one or two weeks to observe the actual growth of shoots from buds is used instead. It is my opinion that not only is this a more time consuming method, but it is also less accurate than a razor blade assessment. Often, a quick, random selection of a dozen buds in the vineyard will reveal little or no injury and pruning can proceed. If some injury is found, then a more detailed evaluation of 100 buds from a population of canes, which represent those that would be saved for fruiting, can result in an assessment with a 10 to 15 percent error. When such an assessment is made, adjustments to pruning severity would be made accordingly (Table 1).

Table 1. Vine management strategies in response to varying amounts of primary bud mortality from winter injury.

Primary bud mortality (%)	Adjustment
0 - 15	none
20 - 30	add 20 - 30% more nodes
40 - 50	double node number
60 +	no dormant pruning

The recommended approach (Table 1) ignores the traditional weighting of two-thirds of vine fruitfulness to primary buds and a one-third of vine fruitfulness to secondary buds. Assessments that factor in those percentages often result in a false accuracy. Nevertheless, some assessment of secondary buds should be made when primary bud mortality exceeds 50%. Secondary bud mortality often closely parallels that of the primary. However, occasionally there can be high

primary bud mortality with relatively low levels of secondary bud mortality. In these instances pruning severity should be adjusted to add about one-third additional buds over those that would have been left under normal conditions. Whenever primary bud mortality exceeds 60 percent, there should be no dormant pruning of the vines. When bud mortality is that severe, it is a matter of not only maintaining fruiting potential but also the survival and balance of growth of the vines. Leaving vines with high percentages of bud mortality unpruned will greatly increase the opportunity for the development of base buds at pruning cuts and at the base of canes. This can be a highly desirable strategy to increase the number of shoots and leaf area of the vine to nurture the mature, large root system of a vine and restrict the growth of individual shoots so that they do not become excessively vigorous, which would make them susceptible to repeated winter injury.

The second type of tissue to be assessed for winter injury is the cambium tissue of canes, arms and trunks. These tissues will be a bright green color when they are healthy. Injured cambium tissues range from a light-brown to almost-black in color. Although it is possible to readily identify injury to these tissues, it is often not possible to determine whether or not that portion of the vine can continue to function. When cambium injury is found, efforts should be made immediately to restructure the vine. This may mean bringing up trunk renewal canes if they are available. However, it should be emphasized that there should not be such an urgency to replace these injured tissues so that the vine is severely pruned and becomes unbalanced. For example, on a large, mature vine, one should not prune out its one or two mature trunks, which exhibit cambium injury, and leave only a single trunk renewal cane. This would unbalance the growth of shoots on the trunk renewal cane and possibly lead to yet another cycle of winter injury. Prune out injured trunks as there is opportunity to replace them while keeping a balance of growth on the vine. Winter injury to trunks and occasionally to other parts of the vine can lead to the expression of the Crown Gall disease. This occurs because bacteria present in the vine alter the genetic makeup of winter-injured cells of the vine. Here too prune out such diseased portions of the vine whenever there is opportunity to replace them with healthy tissues. Current research holds the prospect of reducing or eliminating the occurrence of Crown Gall in newly-planted winter-injured grapevines.

The management of a moderately winter-injured grapevine may simply be a matter of a slight adjustment in pruning severity (Table 1) followed by an assessment for any need for shoot and/or crop adjustment early in the growing season. For severely winter injured grapevines, i.e., bud mortalities in the 60 to 100 percent range, one should take a Await and see@ approach. When such grapevines have been left unpruned, base buds may push at various locations in the vine and this can start to occur as late as late May or even early June. At that time in-season pruning adjustments should be limited to those that eliminate growth that sticks out too far in the vineyard row. Tie up canes that have been lying along the ground and have live shoots on them. A frequent vine response to severe winter injury is a proliferation of sucker growth at the base of the vine. At times this will be almost the exclusive source of leaf area on the vine. In those instances resist the temptation to thin those shoots. Rather, tie 4 to 6 of those in a loose bundle so that they can climb the trellis and be the source of trunk renewal canes in the succeeding year. Allow the rest of the sucker shoots to sprawl on the ground as an additional source of leaf area to maintain the health of the entire vine including the root system. There are strategies for vineyards, which are vulnerable to repeated occurrences of winter injury. They include: (1) the use of multiple trunks and frequent trunk renewal to maintain young, healthy trunks, (2) the encouragement through spur pruning of adequate suckering at the base of the vines especially near graft unions, and (3) delay in pruning until the principal winter-injury period has passed. More intensive vine management strategies for avoiding winter injury to grapevines are presented in a separate manuscript in these proceedings.