



Timely Viticulture

- Dormant
 - Pre-Bloom
 - Bloom
 - Post Bloom
 - Mid Season
 - Pre-Harvest
 - Harvest
 - Post Harvest
 - Dormant

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"TimelyVit" is designed to give those in the Maryland grape industry a timely reminder on procedures or topics they should be considering in the vineyard.

Understanding Grapevine Bud Damage

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Damage from low winter temperatures is arguably the greatest risk to sustainable profitable winegrape production in the eastern US. The majority of Maryland vineyards had not experienced a significant amount of low temperature damage over the past decade or so, however vineyards throughout Maryland have experienced damage over the past three winters. The following "TimelyVit" will give an overview of how vines attempt to prevent damage, the conditions which influence the level of damage, and types of damage. Please see the complement "TimelyVit" in the series on "Assessing Grapevine Bud Damage," which discusses how to assess the damage and how to modify your pruning based on the assessment.

Preventing Damage

- Buds acclimate and tolerate sub-freezing temperatures by two mechanisms:
 1. Dehydration - movement of water to intercellular spaces
 2. Accumulation of sugars and protein complexes that bind water that serve as cryoprotectants. These cryoprotectants lower the freezing point of water and allow cell contents to "supercool" without forming damaging ice crystals.

Conditions that influence damage

- In general, damage typically begins to occur when minimum temperature extremes of -5° F are experienced in mid-winter. The damage may vary based on:
 - Variety/type; the following are in *decreasing* order of hardiness: (damaging temps.)
 - American cvs. (< -15°F) > French Hybrids (< -10°F) > *vinifera* (< -5°F)
 - Previous season's cropping level: Higher crop = lower hardiness
 - Previous season's fall acclimation and hardening of canes
 - Slow acclimation and hardening of canes = grater hardiness
 - Seasonal water table: If the roots of the vine are in water, the hardiness will decrease.
 - Trellis system: High cordon will tend to have less damage than VSP (buds are physically higher)
 - Extreme temperature fluctuations from warm (50°F+) and then quickly to very cold (0°F) may cause vines to slightly deacclimate and therefore less hardy which may make them slightly more sensitive to low temperatures.
 - Recently pruned vines may be more susceptible to damage than unpruned vines.
 - When the low temperature occurs in relation to the stage of acclimation of the vines (See Figure 1 on page 2 from Zabadal et al., 2007.)
 - Low temperature tolerance increases as the vine hardens through the fall;
 - Maximum hardiness is typically reached in mid-winter;

(Continued on page 2)

- Low temperature tolerance decreases after rest is satisfied and vines *deacclimate* (become less cold tolerant) as they approach the end of winter. When the buds are swelling, damage can take place with temperature in the mid 20sF.
- The *actual* temperatures are critical - Wind chill *does not* affect grapevines.

Types of Damage

- There can be damage to buds, including primary secondary, and tertiary (see figure 2)
 - In this figure, the primary bud (middle) is dead (brown)
 - The secondary (right) and tertiary buds (left) are alive (green)
 - Secondary buds may give some percent of production depending on variety.
 - Tertiary buds are purely vegetative (survival – no crop)
- There also can be damage to canes/wood (see figure 3)

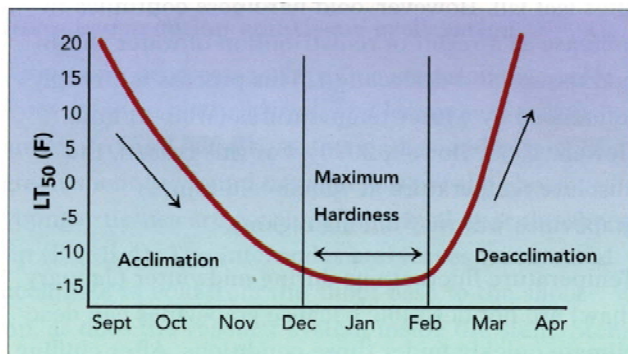


Figure 1. Vine Acclimation from Fall thru Spring

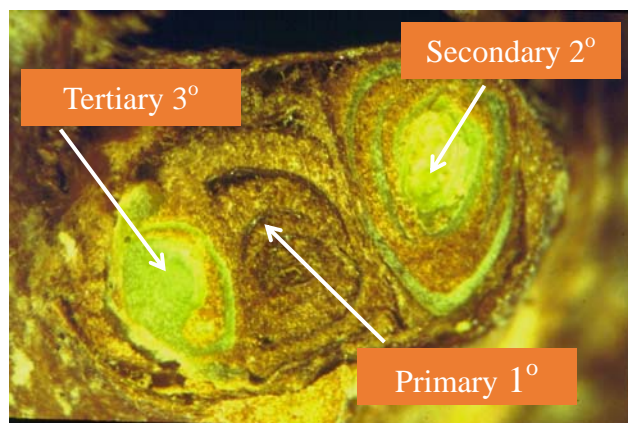


Figure 2. Primary, Secondary and Tertiary buds (Primary = dead; Secondary, Tertiary = alive)

When temperatures below 0 °F take place, it is prudent for growers to collect canes and assess bud damage prior to pruning. Please see the next “TimelyVit” on **“Assessing Grapevine Bud Damage.”**

The following resources were utilized in this “TimelyVit.” For more information on assessing bud injury:

“Anatomy of Grapevine Winter Injury and Recovery”

http://www.hort.cornell.edu/goffinet/Anatomy_of_Winter_Injury_hi_res.pdf

“How Grapevine Buds Gain and Lose Cold-Hardiness”

<https://grapesandwine.cals.cornell.edu/newsletters/appellation-cornell/2011-newsletters/issue-5/how-grapevine-buds-gain-and-lose-cold>

“Winter injury to Grapevines and Methods of Protection.

” Zabadal, T., et.al. 2007

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Figure 3. Damage to tissue inside cane

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