

Winter Hardiness : Evidence of Cold Damage

Trees were examined during dormancy, and again during the growing season for signs of cold damage during the previous winter (2014). Records from previous years was also used as reference. Shoot damage and dieback, along with occurrence of bark damage was used to compile a numerical score. (See table 16)

Since the pool of selections was largely compiled of varieties suggested in literature to be cold hardy, most escaped any heavy damage. Many showed signs of cold damage, generally at the tips of new shoots. Damage was more severe with varieties that had late season growth. Some cold stressed trees began growth later in the spring, and showed poorer growth and leaf expansion (for example many of the European cider varieties). Damage to older tissues occurred occasionally but was not widespread. The winter of 2013/14 did do a fair amount of damage to fruit spurs in the less hardy varieties.

A separate list of varieties that have died in the orchard are listed in table 18, and note is made of those which died as a result, directly or indirectly, of winter injury.

Cold injury is often precipitated by poor choices in management in addition to the genetics of the cultivar in question. Any cultural practice that enhances late season growth is detrimental to the tree's hardening off process. This is often in the form of late summer fertilization, irrigation or summer pruning. Excess crop-load can also lead to winter damage by stressing the tree and depleting nutritional resources. Any stress to the tree can decrease hardiness. Late season cropping can also lead to injury since it keeps the tree in an active state while using resources. Early cropping trees can be a wise choice in the coldest areas because of this latter consideration. Timely thinning and harvesting can also be helpful.

The above factors are taken into consideration in our growing practices, which we believe is why many of the cultivars are doing reasonably well here as regards cold hardiness. Fertilization is never done after July 1, for instance. The orchard in general is back-fed through decaying natural materials and composts as opposed to granular and high nitrogen fertilizers. Due to the general cold conditions, however, growth across the board is slower and smaller than in warmer climates. This also may decidedly be more advantageous in cold resistance, as well as thwarting some pathogens, such as fireblight, through less succulent and rampant growth.

All cultivars in the study have experienced minimum temperatures of -33F, and at least half -41F. It should be noted that the weakest area of the tree as regards winter injury is the area between the root flare the lower trunk. Since the test area is often buffered mid-winter with ample snowcover, damage is avoided. Most of the coldest areas in the nation also have good snowcover, but this should never be taken for granted. Our recommendation is to always have the most cold hardy rootstock in place in the colder climes, and to graft cultivars higher than this sensitive area. Where size reduction is being experimented with, interstem grafting should be explored.

Results of study and its usefulness:

In terms of assessing candidates for the colder regions, growers will find it useful to explore two of the included spreadsheets. Table 13 gives a breakdown of the extent of damage from low to high (0 to 4). Secondly, Table 1 (Tree Physical Characteristics) includes notes, and vigor considerations, some of which are influenced by the climate. Also included is table 18 "Mortality", with notation on those suspected as winterkilled.

Since the focus of the study was to produce a set of data, it should prove helpful to growers who wish to cross-reference these observations with those already published. For instance, when comparing the vigor of some varieties in our climate with those in milder areas. One of the common affectations of a cold stress tree is simply struggle. This failure to thrive syndrome usually expresses itself with meager growth. Akin to stunting of woody species at high elevations, many varieties express slower growth rate. Outright injury also can mean depressed growth as a feature separate from obvious cold injury (spur mortality and shoot-kill on new growth and bark injury. Often injury within the tissue of larger limbs and trunk are evident only through dissection and is expressed in late growth or a general weakened state. Understanding the "normal" vigor and form of each variety will be very helpful in understanding fully how the specimens are faring.

What we have discovered, is that there is a large number of pome varieties that can survive in the challenging environment of zone 3. This is a basic survival pool, here numbering just under 500 distinct commercial varieties. Of these, there is a fair but smaller number we would recommend for investment. (See "Variety Recommendations" tables 14, 15, 17) It remains to be seen which of these will survive many decades of abuse.



