COLD INJURY IN A WARM WINTER

Timothy E. Martinson and Bob Pool

Despite a mild winter, in which winter lows were in the +1 to +6 range across the Finger Lakes, we are seeing some winter injury in the Finger Lakes. This injury appears to be most pronounced on late-harvested vinifera, such as riesling, cabernet sauvignon and cabernet franc, but also is widespread (but varying in severity) on aurore, and cayuga white. Given the moderate temperatures, why are we seeing any winter injury this season?

I should point out up front that, although I could find injury throughout the Finger Lakes, most blocks made it through the winter in good shape. Colleagues in Canada, Virginia, and Pennsylvania have seen similar injury.

A typical scenario is that when pruning, wood appeared to be in good condition, and those who examined buds of cold-sensitive cultivars in February before pruning found 90% live buds. Yet entire canes and buds did not develop, and upon examination both primary and secondary buds appeared to be dead. In some blocks, 50% of the vines appeared to have been affected. Although temperature records from Geneva (Figure 1) showed a few large temperature swings in December and February, there was no ‘smoking gun’ cold event to point to that would explain the observed injury.

Possible causes. It’s easy to concoct explanations after the fact for ‘why’, but hard to verify them. The most likely general explanation is that poor weather conditions during the 2000 growing season resulted in poor cold acclimation (2000 was the 15th coldest growing season in the last 100 years at Geneva).

Specifics (crown gall, cropping level, pattern of injured vines) vary from vineyard to vineyard. The first indicator that there might be some bud injury came in early March from Bob Pool’s lab at Geneva, where they were doing controlled bud cooling to determine bud hardness. This is done by placing buds in a freezer, gradually lowering the temperature, and attaching sensitive temperature sensors to the buds to detect the small release of heat that occurs as the buds freeze. In early February, readings from merlot and cabernet sauvignon became erratic – indicating that many of the buds being tested were probably already dead. Apart from this, LT50’s (Lethal temperature below which 50% of the buds freeze) during January were 5-8 degrees higher than in previous years (See Figure 2). Although winter low temperatures in the Finger Lakes were several degrees above these LT50’s, buds were nevertheless less hardy than they usually are in January. Heavy, late crops probably...
contributed to poor acclimation. Martin Goffinet’s dissections of Concord buds revealed poor bud differentiation – in other words, cluster embryos within dormant buds were less developed than they normally are in other years, and buds from vines with heavy crops were less developed than buds from vines with lighter crops. Less developed buds tend to be less hardy than more developed buds.

**Figure 2.** Long term average LT50’s and data from the 2000-2001 winter. Note that both Concord and Cabernet Sauvignon lowest median freezing temperatures were about 6 degrees higher than those shown in the top figure from previous years.

It seems likely, then that in some vineyards buds were right on the ‘edge’. When this happens, variations in bud hardiness within vines become more noticeable. In one riesling vineyard where the training system was being converted from a high renewal to VSP, differences in bud survival were very apparent. In a portion of this vineyard, vines were converted in ’99, and sun-exposed canes were retained. Nearly all the buds survived. In adjacent rows where vines were converted this winter, shaded canes were retained, and bud survival was poor – indicating that the shaded canes had less hardy buds than the exposed canes.

With buds less hardy in January (but alive as indicated by cut buds in midwinter), its tempting to speculate that bud death occurred late in the winter as buds were deacclimating. Its also tempting to speculate that some of the vines affected had pre-existing trunk injury, many with active crown gall infections.

**Consequences.** Injury varies from a few dead buds per cane to entire dead arms, to entire vines with no buds emerging. In some vineyards, buds are emerging, but development is delayed. As of last week, Aurore vineyards with dead canes in the Branchport/Pulteney area showing injury had vigorous suckers and shoots in the head area of trunks. A cayuga white vineyard (top wire cordon/spur trained) appeared to be shooting out secondary buds at many spur positions. Some grafted *vinifera* had vigorous scion suckers, while others had vigorous rootstock suckers and no scion suckers.

As buds swell after budburst, growth hormones produced in shoot tips stimulate growth of the vascular cambium (cell layer that produces new xylem and phloem layers each year), and reactivates the phloem layer. This reactivation moves from shoot tips down the trunk, and ‘reconnects’ growing shoots with roots that take up nutrients. These connections are often not fully established until bloom. Two consequences are: 1) if there are no growing shoot tips the cambium will not become active, and the trunk is dead; 2) If the trunk is partially injured, shoot growth will eventually stop and shoots will collapse.

**Trunk Replacement:** (Note: The following is based on a section of Bob Pool’s Grape Pages; for more complete information and pictures of trunk injury, please go to: www.nysaes.cornell.edu/hort/faculty/pool/GrapePagesIndex.html -TEM)

On injured vines, trunks will need to be evaluated to decide when and how to replace damaged them. If a trunk is partially injured, retaining it temporarily is almost always the best idea. Doing so prevents the excessive growth and vigor of suckers emerging from a mature root system. Even if growth collapses in mid season, having the injured trunk in place will help counter excessive sucker growth. Bloom is an ideal time to evaluate trunk injury.

**Evaluating Trunk Injury:** You can evaluate trunk injury by going through the vineyard and making a small shallow cut into the trunk at the effective snow line. You will find one of three conditions:

1. **No discoloration and the bark slips or peals off smoothly.** Trunk is uninjured or has minor injury and can be retained.
2. **Discolored phloem (brownish instead of light colored), and bark slips.** This means the phloem was injured, but the cambium layer has reformed. Trunk should be flagged and removed in winter. Train one or more replacement trunks.

3. **Discoloration and bark does not slip.** This means there was extensive injury, and the cambium layer was not regenerated. The vine may collapse during the growing season. Train up two or more shoots as replacements. Flag and remove the injured trunk in the winter.

**Additional Points:**

- Large pruning cuts serve as entry points for *Eutypa* dieback fungus. The only reliable treatment to prevent *Eutypa* infection has been to apply Benlate (benomyl) fungicide to pruning cuts. This is not practical for normal winter pruning, but may be applicable in this situation. Dupont is phasing out production and registration of Benlate, but it still should be available this year.

- This injury serves as an important reminder that growers of cold sensitive varieties should always be prepared to train up renewal trunks. If you aren’t doing so already, leave a 2-bud trunk renewal spur at the base of the vine each year. You may also want to reconsider the need for hilling up over the graft union in winter. It is particularly important during the first 4 years of a vineyard, but recent mild winters have prompted growers to do so less often. Hilling up is time consuming and can also result in vine injury. As an alternative, some growers have had success with placing piles of sawdust around the graft union instead of hilling up. If you have a nearby source of free sawdust, this may be an option for winter protection.

**THE EFFECT OF SPRAY APPLICATION VOLUME IN VINEYARDS**

*Andrew Landers, Cornell University  
Wayne Wilcox, NYSAES*

Poor spray coverage is a major factor contributing to poor disease control in grapes. Better coverage leads to better control, and a thorough application of an effective material is required. Uneven coverage increases the amount of fungicide that must be applied in order to provide adequate control on poorly covered areas and the number of sprays required if it allows a disease to become established.

Whilst canopy size and shape will affect application volume, there are dangers in not applying enough spray and in applying too much spray. There is an optimum quantity required for a thorough coverage of the target. The old adage that you should spray until the leaves drip is misplaced; likewise lowering spray rates to below the minimum which offers control is also misguided advice.

A number of growers have reduced application volumes to extremely low levels and are observing poor disease control due to inadequate coverage. Interestingly, research around the world confirms similar results and also indicates that there is an optimum volume to provide thorough coverage and disease control.

**Background**

Physics is a wonderful subject!

A droplet with twice the diameter of another has four times the area and eight times the volume. Eight smaller droplets having the same total volume as the larger droplet will provide twice the coverage of the larger droplet.

Conversely, for the same volume of liquid, when you halve the diameter of a droplet you increase the number of droplets eight-fold. For instance, when a single 200 micron droplet is halved to 100 microns, you disperse its liquid into eight of these smaller droplets. Halve them again to 50 microns and you now get 64 droplets etc.

Similarly the area covered increases as the size of droplets decreases, assuming the volume stays the same. As shown above, a 200 micron droplet has 64 times the volume of a 50 micron droplet. Assuming the target area covered by a droplet is equal to its cross sectional area, 64 droplets of 50 microns will cover four times the area of a single 200 micron droplet, even though both scenarios involve the same amount of spray.

This shows why Controlled Droplet Application (CDA) sprayers with their large number of small droplets can be so successful (provided their droplets hit the intended target rather than drift!) since the small droplets adhere to the leaves and provide good surface coverage.
A combination of the optimum volume and droplets that adhere to the leaves will provide good disease control. It must be stressed that too fine a droplet will result in off-target drift and equally important, especially in hot weather, lead to evaporation of droplets.

**Literature review**

A review of global literature proves this reasoning. Unfortunately not all authors state canopy size and variety.

Pergher and Gubiani (1995) conducted experiments in hedgerow vineyards in Italy during June (at the end of blossom) and July (full canopy) to assess the influence of spray application volumes from an axial fan sprayer. Increasing spray application volume led to higher losses to the ground and lower deposition on foliage. However differences were only significantly different in the July experiment. Losses to the soil ranged from 34.5 to 36.8% for the lower spray volume of 31 – 39gpa and from 41.3 to 48.9% for the medium spray volume of 65-78gpa.

Three airblast sprayers were compared by Pergher et al (1997) in an Italian hedgerow vineyard in July whilst in full canopy. They used high volume (135gpa) (conventional airblast) and low volume (25gpa) (similar to an AgTech or Kinkelder). They found no substantial differences in total pesticide loss between the sprayers tested. Both sprayers were capable of applying more than 64% of the sprayed material onto the leaves and grapes.

Riley et al (1995) reported on the development and testing of sprayers in medium-heavy canopies in Australian vineyards. The airblast sprayers were used at 10, 30 and 50 gpa. At 10 gpa there were 404 drops/cm², at 30gpa 805 drops/cm², and at 50gpa there were 493 drops/cm² on the front of the leaves. On the back of the leaves the number of drops/cm² was 224, 426 and 410 respectively. These results clearly show how an optimum volume, in this case 30gpa, provides the most leaf coverage whereas an extremely low and a higher application volume results in a smaller number of drops/cm². The results also indicate the variation found between front and back coverage and the importance of good air movement to prevent leaf shingling and ensure canopy penetration.

Landers et al (2001) conducted a trial in a Niagara vineyard using a Proptec CDA sprayer. When used at 25gpa, the Proptec provided disease control statistically equivalent to that provided by the airblast at 50 gpa. However, control was noticeably inferior when the Proptec spray volume was increased to 50gpa. This compared favorably with trials carried out in 1999 which showed that spray deposition with the Proptec was greater at 30gpa than at 50gpa, (Landers et al 2000).

This raises a number of interesting questions, in particular, why should the same rate of active ingredient in a lower quantity of carrier (water) give better results? A possible (even probable) answer is that when lower water rates are applied via smaller droplets in a good, directed airflow, these droplets attach themselves more readily to the canopy than do the larger droplets in higher water rates, which are more prone to run-off. Additionally, it is likely that the greater surface coverage provided by the smaller droplets (see above) provides a more uniform coverage of the fungicide on leaves and fruit, which should improve the activity of materials that do their work directly on the surface (e.g. mancozeb) and optimize the uptake of those that are absorbed into the waxy cuticle (strobilurins) or into the body of these tissues (sterol inhibitors).

A good comparison is the application of pesticides on many crops via aircraft at extremely low rates of carrier providing the same levels of control at the same a.i. rates provided by ground machines using considerably higher water volumes. But experience shows that if they reduce volumes too much they lose efficacy.

The aim of good pesticide application is to provide many small droplets which will stick to the surface of the leaf. If the volume applied is too great, leaf surface run-off occurs, removing fungicide from the leaves. If the volume is reduced too much, then there aren’t enough droplets to cover the leaves, thus not providing a thorough coverage for disease control.

**References**


Report of 2000 proposals received and awards made and final reports to grant year 1999. Viticultural consortium- East. 117-123, NYSAES, Geneva


**DUPONT TO PHASE OUT SALE OF BENLATE**

WILMINGTON, Del, April 19, 2001 – Today DuPont informed its customers around the world that it will discontinue the manufacture of its fungicide benomyl and will phase out sales of Benlate® in all its forms from the global market. No sales will occur after December 31, 2001, and we expect all product will clear the channels of trade by the end of 2002.

DuPont advised customers that this is not a product recall, but a voluntary business decision based on a review of global market conditions and other factors.

**NEW LONG ISLAND APPELLATION APPROVED**

Jim Trezise
New York Wine & Grape Foundation

“LONG ISLAND” is now an official American Viticultural Area (AVA) which encompasses the two longstanding AVA’s (North Fork of Long Island, and The Hamptons). On May 15, the Bureau of Alcohol, Tobacco and Firearms approved the petition filed by Richard Olsen-Harbich, winemaker at Raphael, and Karen Meredith, co-owner of Southold’s newest vineyard called Broadfield. Rich, a member of the Foundation Board of Directors, was also instrumental in securing the other AVA’s years ago, which will remain in effect. As long as at least 85% of the grapes come from the designated AVA, Long Island vintners now have three options for labeling their wines. Other New York AVA’s include Hudson River Region, Finger Lakes, Cayuga Lake, and Lake Erie (encompassing parts of New York, Pennsylvania, and Ohio along the south shore of Lake Erie). The Long Island industry was also the focus of a great article by Howard Goldberg in last Sunday’s New York Times. With a revived Long Island Wine Council and a new Long Island Vineyard Technical Group, the future is certainly bright on the East End.

**ARE YOU A DIRECT MARKETER? MAKE SURE YOUR FARM IS COUNTED**

William Blackson
New York Agricultural Statistics Service
www.nass.usda.gov/ny

The New York Agricultural Statistics Service has been conducting the 2000 Direct Marketing Survey and is asking farmers: "WILL YOU BE COUNTED?"

The last Direct Marketing Survey was in 1987. Since then many farmers have come to depend on direct marketing to sustain their farm operations. But we lack current information on the size, scope, and importance of direct marketing of agricultural products in New York State.

This information is vital to supporting Department of Agriculture and Markets programs like the New York State Guide to Farm Fresh Products, the Farmers’ Market Nutrition Program, and the Food and Agricultural Industry Development Grant and Farmers’ Market Grant Programs. It will also be useful to educate state and local government officials, Cornell University staff and Cooperative Extension staff about the importance of direct marketing and help them develop new programs to service the needs of farmers and producers.

The 2000 New York State Direct Marketing Survey will give us this very important information. It will document, among other things:

- The number of New York farmers involved in direct marketing.
- The variety and volume of New York products sold directly to consumers.
- The income direct marketing generates for New York State farmers as a whole.
• The types of recreational, educational, and tourism related services provided by direct marketers, including farm tours, festivals, and food and lodging services.

Please help us to serve you better by completing your survey and mailing it TODAY. If you did not receive a survey and are involved in the direct marketing of agricultural products, please call 1-800-821-1276 and a survey will be sent to you.

UPCOMING EVENTS

July 10-13, Niagara-on-the-Lake, Canada ASEV Eastern Section 2001 Conference. The conference features a 1.5 day symposium “Space Age Winegrowing” July 11 and 12, with an optional pre-conference July 10 tour of leading Ontario vineyards and wineries. The ASEV Eastern Section Annual Meeting will follow on July 12-13. Both events will be held at the White Oaks Conference Centre & Spa, Niagara-on-the-Lake, Ontario, Canada. For conference registration & information visit the ASEV-Eastern Section website at http://www.nysaes.cornell.edu/fs/aev, or contact: Tim Martinson, NYSAES Cornell University, CCE-Yates, 110 Court Street, Penn Yan, NY 14527, ph: 315-536 5134, Email: tem2@cornell.edu, or Ellen Harkness, 1160 Food Science Building, Purdue University, West Lafayette, IN 47907, ph: 765-494 6704, Email: harkness@foodsci.purdue.edu

July 16-17 Red Newt Cellars, Hector, Seneca Lake. Vineyard and Winery Management’s Summer Seminar, a hands-on workshop for industry newcomers. Morning seminars followed by afternoon field demonstrations of equipment, visits to local vineyards and wineries. Exhibits, breakfast and lunch included. For registration, call: 800-535-5670.

July 17, 2001, Valois, NY. 2 PM - 6PM. Spray Technology Demonstration Day. Andrew Landers has contacted 8 spray equipment manufacturers and area growers who will demonstrate spray equipment. Equipment to be demonstrated will include sprayers from CIMA, Hardi, Proptec, Red Trac (tunnel sprayer), Electrostatic Spraying Systems (ESS), Gregoire, Berthoud, Air-O-Tec, and Weedseeker. Wine tasting at Mike Doyle’s new Seneca Lake winery will follow. Pesticide recertification credits have been requested from the DEC.

July 24-26, 2001. Field trip and Tour to southwestern Michigan. Barry Shaffer (Lake Erie Regional Grape Program) is organizing a trip that may be of interest to Finger Lakes growers. The tour will cover several SW Michigan vineyards, and include the annual Field Day at the SW Michigan Research and Extension Center, organized by former Finger Lakes Grape Specialist Tom Zabadal. For more information contact Barry Shaffer at 716-679-3185.

August 7-10, 2001, Kennett Square, Pennslyvania. Second Annual Eastern Pinot Noir Conference. The purpose of this conference is to critically taste Pinot Noir wines from across the region and beyond. Modeled after the incredibly successful Steamboat conference in Oregon, this event asks wine makers and growers to bring their wines to share and to be evaluated by their peers in an informal and casual setting. The goal is to improve our wines through the unrestrained sharing of knowledge and experience, both in the cellar and the vineyard. Entry to this event is limited to commercial producers only in an effort to assure the confidentiality of our conversations. For more information and registration, please contact Mark Chien at 717 394-6851 or mlc12 @psu.edu.