

UMass
Extension
CENTER FOR AGRICULTURE

Berry Notes

Prepared by the University of Massachusetts Fruit Team

March 2018 - Vol. 30, No. 3

Support the UMass Fruit Program

<http://ag.umass.edu/fruit/publications/berry-notes>

Berry Notes is edited by Sonia Schloemann with articles written by other contributors with attribution; sources are cited. Publication is funded in part by the UMass Extension Agriculture & Landscape Program, subscription fees and generous underwriting. Questions can be directed to Sonia Schloemann at sgs@umext.umass.edu. Please cite this source if reprinting information that originates here.

IN THIS ISSUE:

Shorts

STRAWBERRY

- ❖ Winter Mulch Removal in Strawberries

RASPBERRIES/BLACKBERRIES

- ❖ Assessing Cold Damage in Blackberry and Raspberry Buds and Wood at Annual NC Grower Meeting
- ❖ Organic Raspberry Production in Three-Season High Tunnels

BLUEBERRIES

- ❖ Winter Moth 2018

GRAPES

- ❖ Understanding Grapevine Bud Damage

GENERAL INFO

- ❖ Chilling Requirement and Dormancy in Fruit Explained

UPCOMING MEETINGS

SHORTS:

Renew your subscriptions for 2018 – For anyone who hasn't done so yet, now is the time to renew your subscriptions for UMass Extension Fruit publications. These include Berry Notes, Healthy Fruit, Fruit Notes and Grape Notes. For more information about renewing subscriptions, go to <https://ag.umass.edu/fruit/subscribe-to-fruit-publications>. From here you can access online subscription using credit cards or subscription via by check through the mail.

NRCS EQUIP SIGN UP DEADLINE - The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) is accepting applications for the [Environmental Quality Incentives Program \(EQIP\)](#), which helps farmers and forest land owners improve water quality, conserve water and energy, reduce soil erosion and sedimentation, and improve soil health, wildlife habitat, plant and animal communities. Farmers and forest land owners may apply for financial and technical assistance through EQIP at any time throughout the year by visiting their local NRCS field office. USDA Service Center locations are listed on-line at <http://offices.usda.gov>.

2017 Census of Agriculture Needs Your Response - There is still time to fill out your 2017 Census of Agriculture survey. As of today, the return rate on the 3 million agriculture questionnaires mailed last fall, is just over 40 percent. USDA's National Agricultural Statistics Service (NASS) is making progress every day, but they need to hear from the rest of the producers. Help NASS spread the word that farmers and ranchers still have time to be counted in the [2017 Census of Agriculture](#).

STRAWBERRY

Winter Mulch Removal in Strawberries

Sonia Schloemann, UMass Extension

Winter mulch is applied to overwintered strawberry fields or beds to protect plants from severe winter cold temperatures and also to prevent soil heaving from freeze thaw cycles in the Spring. This heaving can damage roots that are held in a frozen layer when the crown is heave up by thawing of the top layer of soil. This causes the roots to snap and leave a wound where soil pathogens can infect injured tissue.

Mulch covering strawberries should be removed in the Spring when plants beneath the mulch begin to show new green tissue. Select several random spots in various sections of the field and check the plants for growth. This growth may be very light green or even yellowish. The mulch should then be raked off the rows to allow sunlight to reach the new foliage. Delaying removal will delay plant growth and flowering. This can be useful in to help protect flowers from early frost where other methods (e.g., frost irrigation) is not possible but delaying removal may also reduce yield in some cases. Be sure that frost

protection equipment is ready for use once mulch is removed.



Mulch can be raked off by hand with ordinary yard rakes in smaller plantings. In larger plantings, various mechanical tools are available ranging from modified hay rakes and tedders to equipment specifically designed for the purpose. Tractor traffic on wet Spring soil can be damaging so this operation is best done early in the morning when soil is still somewhat frozen or after a period of dry weather when soils are not as saturated.

Early fruiting varieties can be covered with synthetic row covers at this time to accelerate growth and advance the fruiting season. If this is done, frost protection becomes even more important and should be put in place once the row covers are applied to the field. Be sure to secure all the edges of row covers to prevent wind from dislodging it and exposing plants prematurely. Remove row covers as soon as significant bloom appears on covered plants in order to allow for proper pollination to occur.

RASPBERRIES/BLACKBERRIES

Assessing Cold Damage in Blackberry and Raspberry Buds and Wood at Annual NC Grower Meeting

Adapted from Gina Fernancez and Brandon Hopper, North Carolina State University

In early January [2014], at the SE Vegetable and Fruit Expo in Savannah, GA, we set up a microscope and a magnifying glass (the kind you get in a craft store) to look at bud damage in blackberries. Most of the buds that I sampled looked good. <http://teamrubus.blogspot.com/2014/01/buds-look-good.html>

If you want to prepare samples for evaluation at home, here is the protocol (courtesy of Michelle Warmund, University of Missouri):

- cut 3-4 8" cane sections from a low, mid parts of a main cane and some laterals from the fruiting area
- place each group of canes in in a zippable plastic gallon size bag
- label each bag with name of cultivar and where the cane was taken from the plant (low, mid, laterals)
- store at room temperature for 4-5 days.

After waiting a few days cut canes as illustrated below and check for injury symptoms. Dead cane sections and buds will have oxidized and turned brown after storage for 4-5 days in the "zippable" plastic bags. For examples of injury see images below.

(*Source: NC State Extension Blackberry & Raspberry Information Blog @*

<https://rubus.ces.ncsu.edu/2014/01/assessing-cold-damage-in-blackberry-and-raspberry-buds-and-wood-at-annual-nc-grower-meeting/>)



Figure 1. “Bark” scrapped off, showing oxidation of cambial/vascular tissues. Photo: Fumi Takeda



Figure 2. Primary bud is damaged as indicated by necrosis of partially differentiated inflorescence axis. Secondary bud is still undifferentiated, no sign of damage. Photo: Fumi Takeda.

Organic Raspberry Production in Three-Season High Tunnels

Eric Hanson, Vicki Morrone, Rufus Isaacs¹, Michigan State University Extension, ¹MSU Department of Horticulture, ²MSU Department of Community Sustainability, ³MSU Department of Entomology

High tunnels offer several potential advantages for production of raspberries in humid regions such as the Midwest, including:

- Improved plant vigor and yields.
- Extended harvest and marketing season.
- Improved berry quality.
- Reduced damage from several pests and diseases.

For organic producers, these benefits may be particularly valuable since pesticide options are limited. This bulletin integrates knowledge on conventional culture of high tunnel raspberries (see Cornell publication in references) with information collected from a Michigan State University organic high tunnel research project. Initiated in 2009, the project tested cultural methods for organic production of fruits under high tunnels.

The high tunnel research included nine, 26-by-200-foot, multi-bay tunnels from Haygrove Tunnels, Ltd., constructed on a sandy loam soil on the Michigan State University campus in East Lansing, Michigan. Three bays were planted with three different systems: raspberries, sweet cherries mixed with raspberries, and sweet cherries. This publication provides guidance for growers interested in high tunnel production of organic raspberries, though the information is of value to non-organic growers as well. Here are some suggestions based on this and other’s work.

Site selection – Sandy loam or loamy sand soils are best because they provide good drainage. Poor drainage promotes root rot in brambles.





With loam and clay loam soils, modify drainage by using raised beds and installing drain tiles under sidewalls. Flooding and erosion can also occur since during rain storms, large volumes of water run off the tunnel sides. If soil does not drain adequately, subsurface drain tile should be installed along each side of the tunnel to help direct rain water away from the plants. Tiling is especially important if the soil has a high percentage of clay or if the slope is negative from surrounding areas.

The year before planting, be sure to test the soil and adjust the pH to 6.0 to 6.5 with lime or sulphur additions. Soil preparation should also include planting cover crops for a year prior to planting brambles to reduce weeds and improve soil quality. Short-lived cover crops such as buckwheat and oats work well as they can be grown and incorporated twice in one season to add organic matter and suppress weeds. Sorghum-sudangrass is another good option for smothering weeds and producing large quantities of organic matter. Sites may also benefit from applications of 1 to 2 tons of manure per acre the year prior to planting canes.

Tunnel and plastic types – Raspberries grow well in multi-bay tunnels and stand-alone tunnels. Multiple bay tunnels consist of interconnected bays and are relatively inexpensive per area covered, but they can be damaged by snow and need to be uncovered during the winter in snow-prone areas. Plastic needs to be installed and removed annually, which can tear the plastic and is a high labor cost. *Plastic should be installed after the threat of snow in the spring and removed before the first autumn snowfall.*



Single-bay high tunnels may take less space, but are more costly per square foot since they require more structural support.

Stand-alone high tunnels vary in size and design, but are generally smaller and more costly per square foot. Many can withstand snow, stay covered all year and be tightly enclosed so that harvest times can be manipulated more than with multiple-bay tunnels. Stand-alone tunnels can also protect raspberry canes from winter injury.



One acre range of multiple bay tunnels in southwest Michigan.

Plastic coverings vary in light transmittance. We used Luminence THB plastic, which reduces tunnel temperatures by screening infrared light and also diffuses (scatters) light. This or similar films will work well for raspberries since optimum summer temperatures are likely below 80 degrees Fahrenheit (26 degrees Celsius). Standard greenhouse films that do not remove infrared light allow more direct light and thus increase temperatures. With any plastic film, tunnels need to be vented during warm weather. Peak temperatures can also be reduced by several degrees by placing 30 percent shade materials over the plastic film.

Tunnel orientation – Choice of orientation is site-specific. North-south orientated tunnels provide the most uniform light distribution. However, multiple-bay tunnels are subject to wind damage. Since wind direction during summer storms in Michigan is usually from the west, orienting tunnels east-west may reduce risks since wind can blow through the tunnels. If the

site is protected by hills or trees, wind hazard is less important. Tunnels oriented up a gentle slope will help dissipate heat, directing it upward, similar to a chimney.

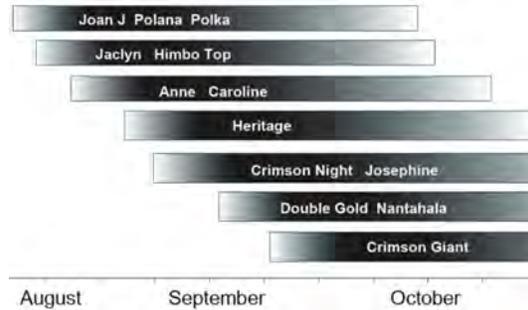
Varieties – Preferred varieties have high yields and fruit quality, some resistance to pests and diseases, and ripen at the desired marketing time. Primocane-fruiting varieties produce fruit on one-year-old canes in the late summer and fall. Floricane-fruiting varieties only fruit on two-year-old canes in June and July. In previous high tunnel studies, we observed that the relative qualities of raspberry varieties in the open field tend to be similar in high tunnels. We tested three newer primocane-fruiting varieties in this study: Joan J, Himbo Top and Polka. Yields from these varieties were similar, ranging from 6,500 to 11,500 pounds per acre.

‘Himbo Top’ is vigorous and produces large, lighter red berries that are somewhat soft. ‘Joan J’ produces firmer berries with an excellent flavor, but they are a darker red that some customers perceive as over-ripe. ‘Polka’ berries also are very tasty and firm with a shiny, bright skin, but ‘Polka’ is very susceptible to potato leafhopper damage. Cultivars Joan J and Polka are early season primocane-fruiting types. Other varieties (e.g., Caroline, Josephine) have potential as well and new types are regularly being introduced.



Organic raspberry production under multiple bay tunnels in East Lansing, Michigan. Bay on the left is covered with shade fabric to reduce summer temperatures.

High tunnels retain heat and can greatly extend harvest periods so berries can be marketed when field-grown plants are not fruiting. As a rule of thumb, harvest in multiple bay tunnels will begin one to two weeks earlier and continue one to two weeks later than open field harvest. Stand-alone or single bay tunnels usually retain more heat so harvest periods may be extended even longer. Early primocane-fruiting varieties in multiple-bay tunnels in central Michigan begin bearing the first week of August. Consider including later varieties to extend the picking season later into fall (see figure below).



Relative harvest season for various primocane fruiting raspberry varieties in tunnels in southern Michigan. Harvest volume increases with bar darkness.



Appearance of the raspberry varieties (L to R) Himbo Top, Joan J and Polka from organic tunnels.

Planting, irrigating, trellising – In the spring, set plants 18-24 inches apart in rows spaced 7-8 feet apart, depending on tunnel dimensions. Install trickle irrigation immediately. Plants must be irrigated once or twice every day during the summer. A tunnel of raspberries will need about 1 inch of water (27,000 gallons per acre) per week in the summer. Initially we installed a single irrigation drip-tube per row with 0.6 gallons per hour emitters spaced at 24 inches. A single tube may be adequate on heavier soils, but on our loamy sand soil, the area between emitters stayed too dry since the water did not easily wick in the soil. We later added a second tube to reach more of the root zone. To provide 1 inch of water per week with this dual tube set-up required running the system for about one hour per day. Adjust the timing and application rate depending on soil type, temperature and the amount of rainfall infiltrating from tunnel run-off. Using soil moisture sensors such as tensiometers may help to avoid over or under-irrigating.



Pairs of conduit inserted into the ground 1 foot apart provide a suitable support for primocane-fruiting raspberries. Plastic wire is secured to the conduit with zip-ties.

Plants grow tall, 5-8 feet, and need a trellis for support. Sturdy end posts of wood or metal are needed. A simple system consists of pairs of metal poles, such as conduit poles, placed 18 inches apart every 20 feet down the row. Run twine or plastic wire the length of the row and secure it to the conduit at desired heights to support the canes. Another option, a V-shaped trellis, is desirable for floricanes-fruiting plants. The fruiting floricanes can be tied to the outside wires to make berries more accessible and allow room in the middle for new primocanes to grow. Trellis posts must be untreated wood or unpainted metal in organic systems. Rot-resistant wood is preferred, such as cedar or black locust.

Weed and groundcover management – Start by eliminating perennial weeds such as thistle and quackgrass before planting. This is best achieved by repeated cultivation and use of cover crops. To suppress weeds using cover crops, it is usually best to use a drill for uniform spacing and sow at relatively high rates for a full canopy. For high carbon (biomass) cover crops like sorghum sudangrass, cut and incorporate or incorporate directly in the fall. Wait a minimum of 10 days after cutting and incorporating the cover crop to avoid nutrient tie-up. Once raspberries are planted, weeds emerging within the plant rows will need to be removed by hand-weeding and tilling two to three times per year. On sandier soils, the surface between the rows tends to dry out during the summer, so few weeds emerge late in the season.

Growing cover crops between raspberry rows for weed and nutrient management is challenging in high tunnel systems due to limited moisture, harvest traffic and shade from the raspberry canopy. Perennial cover crop species like ryegrass and fescues that are sometimes used in non-tunnel systems have limited growth in tunnels unless irrigation is used. Legumes such as Dutch white clover are also problematic since they have high water requirements and may host potential pests including root-lesion nematodes. Weed barrier cloth can also be used between the rows if care is taken to avoid entanglement during tillage operations.

Pest management

Spotted winged Drosophila (SWD) is the most important pest of tunnel and field raspberries. This small vinegar fly infests and contaminates berries. In mid-Michigan, populations are generally low until early August when their activity increases sharply and remains high late into the fall. This outbreak coincides with harvest of primocane-fruiting (fall-fruiting) raspberries. Organic pesticide choices are very limited for SWD, so effective control requires investment in cultural controls combined with approved pesticides. For a current list of registered pesticides for use on raspberries, see the Michigan Fruit Management Guide from MSU Extension. Sanitation and timely harvest are critical; harvest all ripe berries every one to three days. Collect soft or damaged berries in separate containers and destroy them. Keep plant rows narrow so berries are easy to see and remove. Harvested fruit should be cooled to 34-38 F immediately to stop deterioration. Recent research shows exclusion netting can also be used to minimize access of SWD to tunnel plants.



Inside of raspberry showing larvae of spotted wing Drosophila. Hannah Burrack, North Carolina State University, Bugwood.org

Two-spotted spider mites can also be a serious pest of tunnel raspberries because they thrive in hot, dry tunnel conditions. Outbreaks may be severe during hot summers and absent during cooler years. The primary management approach is to adequately vent the tunnel to lower temperatures when they reach 80 F. Predatory mite species are also available for purchase and may help suppress populations if they are introduced before

the spider mite populations have become a problem. Mite problems are increased by applying pesticides to control SWD since the pesticides also kill beneficial insects, including predatory mites that feed on two-spotted mites.



Two-spotted spider mite (inset) and its damage.
Rufus Isaacs, MSU

Less serious raspberry pests encountered during this project include raspberry sawflies (*Monophadnoides geniculatus*), potato leafhoppers (*Empoasca fabae*) and Japanese beetles (*Popillia japonica*). Raspberries are preferred by Japanese beetles. When populations are high, beetles can be picked from small plantings by hand and disposed of in buckets of soapy water. Potato leafhoppers feed on raspberry leaves and cause deformed growth and stunted canes. In our research, damage was severe on the variety Polka, but only minor on the other two cultivars. Sawflies cause some damage to leaves early in the summer, but likely not enough to cause economic losses.

Pollination – Bees are needed to pollinate raspberries. Honey bees do an adequate job of pollinating in smaller tunnel operations. Although they do not prefer working under plastic, raspberry flowers are very attractive to them. Bumble bees are adapted to working in tunnels, but it is unclear whether the cost of hives is justified for small tunnel raspberry plantings where native bees also help. However, if tunnels are being netted for SWD exclusion, it will be essential to have bumble bee colonies for pollination. Place hives of bumble bees (*Bombus impatiens*) in tunnels before bloom begins.

Bumble bees will cost approximately \$0.15 per square foot (\$75 per hive covering a minimum of 5,000 square feet).



Bumble bee hives placed in tunnels for pollination.

Nutrient management – Raspberries have a high demand for nitrogen (N) and potassium (K). Meeting those needs is complicated in tunnels because rain is excluded, making it difficult for the nutrients to move into the root profile. Solid fertilizers and compost placed on the soil surface tend to dry out except under irrigation lines, so the nutrients in these materials are not available later in the season. Nutrients for annual crops can be incorporated into the soil before planting, but not in perennial crops such as raspberries. Conventional growers have numerous high concentration soluble fertilizers that can be injected through the irrigation system to supply plant needs throughout the year. Injectable organic nutrient sources, such as fish or kelp products, are more expensive, yet effective if applied weekly through the drip irrigation system.

A combination of solid nutrients (organic fertilizer, compost) and liquid products appears to work well for organic tunnel raspberries on sandier soils. Apply the solid materials over the top of the plant rows several weeks before the plastic is installed in the spring. Some of these nutrients are released and moved into the soil by rain. From June through early September, supplement with injections of liquid nutrient sources such as fish emulsion. Solid materials in the spring may be adequate for plantings on heavier loam soils that retain more nutrients.

Economics – Costs and potential returns have been compiled in a spread sheet. Email Eric Hanson at hansone@msu.edu to request a copy. Capital investments to establish one acre of raspberries under tunnels were paid off in the second year and annual net profit after the first year was estimated to be about \$12,000 in the organic study at MSU. The primary drawback to organic raspberry production under tunnels

at this point is the challenge to manage spotted wing *Drosophila* with organic-approved practices. Controlling this insect is a major challenge that will require detailed preparation and attention throughout the fruit-ripening period.

References and resources

This bulletin integrates MSU organic research experience with existing knowledge on high tunnel raspberry culture as described in Cornell University's High Tunnel Raspberries and Blackberries publication: www.fruit.cornell.edu/berry/production/pdfs/hightunnel_srasp2012.pdf

- Recommendations for conventional raspberry culture in tunnels are available at Cornell University's Fruit website: <http://www.fruit.cornell.edu/berry/production/brambleprouction.html>
- Michigan Fruit Management Guide from MSU Extension is updated annually and includes organic pesticide recommendations. Bulletin E0154. Order at shop.msu.edu
- MSU Spotted Wing *Drosophila* website. Resources for the North Central U.S. at bit.ly/swdmsu

(Source: [Tunnel Berries Project](#))

BLUEBERRIES

Winter Moth 2018

Heather Faubert, URI Extension

Over the last decade, winter moth eggs started hatching anywhere from mid-March to mid-April, depending on temperature and other factors. I don't expect eggs to hatch

until after red maples start blooming and when McIntosh apple buds crack open and expose a little bit of green tissue.



Winter moth eggs tend to hatch at McIntosh apple 'green tip' and red maple tree bloom.

Tree wraps were set up in November to monitor eggs at 10 locations in RI, one in CT and two in Massachusetts. In November and December, as female winter moths climbed trees and encountered tree wraps, female moths deposited eggs below the wraps, aggregating the eggs and making it easier to monitor now. Tree wraps have been removed at most locations, and though we have a few

hundred eggs to monitor, there are many fewer eggs than past years! At two locations, no winter moth eggs were found below the tree wraps.

Winter moth eggs are orange now, but turn blue a couple of days before hatching. This trait makes it very handy for monitoring egg hatch!



*Tree wrap and close up of small, orange winter moth eggs found below tree wrap.
Eggs are nearly impossible to find without setting up tree wrap in the fall.*

Winter moth populations are declining in our area. Whether or not winter moth caterpillars will need managing this spring probably depends on your situation. I don't think landscape trees will need protecting this year - and perhaps no landscape trees needed protection from winter moth caterpillars last year. I didn't see any trees defoliated by winter moth last year. If landscape trees do need protecting, probably the best time to spray will be late April or early May after trees leaf-out, while caterpillars are still small, and before excessive feeding damage has occurred.

For fruit (apple, pear, and blueberry) it's hard to know what to do. For years I've been saying fruit growers need to spray right when eggs hatch to protect flower buds

from getting infested with winter moth caterpillars. With a smaller population of winter moth caterpillars, it may not be necessary to spray when the eggs start hatching. Winter moth caterpillars will still get inside flower buds, but there are fewer caterpillars so less damage. I expect most fruit growers will still need to protect fruit from winter moth, but perhaps spraying can be delayed until apple and pear flower buds are at tight cluster or buds are starting to separate, but before flower buds open. The advantage to waiting to spray is it is difficult to time and control caterpillars when they are hatching. It is easier to get adequate control with one spray when caterpillars are larger and moving around from bud to bud.



Apple tight cluster



Apple bud separation



Blueberry tight cluster

Or, perhaps there are too many caterpillars and fruit crops will still need protecting when eggs first hatch.

Once eggs hatch, winter moth caterpillars wriggle into swollen buds and begin feeding. For apple & pear trees and blueberry bushes, swollen buds are primarily flower

buds. Once inside buds caterpillars are protected from insecticide sprays. After a couple of weeks, as caterpillars grow and buds open, they begin to walk outside of buds and are then susceptible to insecticides again.

Dormant oil can be applied before eggs hatch, but this may not be very effective if unsprayed trees are nearby or if you cannot get complete coverage with an oil spray. Winter moth eggs are often located in bark nooks and crannies, so complete oil coverage is very difficult. When applying oil, temperature must be above freezing and remain above freezing for 24 hours after application or plant damage can occur.

Winter moth caterpillars are pretty easy to kill, provided they are not inside closed buds. Insecticide choices for caterpillars at egg hatch for fruit growers include, but are not limited to, spinosad, Imidan, Sevin, and Malathion. Spinosad product names are Delegate and Conserve (for

commercial growers), Entrust (for organic, commercial growers), and Captain Jack's Deadbug Brew (for backyard growers). Adding a dormant oil may be useful for the first spray of any of the listed insecticides.

Once buds open, B.t. kurstaki products (*Bacillus thuringiensis* kurstaki) such as DiPel, Thuricide (for backyard growers), and Biobit work well controlling winter moth on fruit crops and landscape trees. To protect pollinators and other beneficial insects the best choice is a B.t. product since B.t. kills only caterpillars. Spinosad will kill bees for up to 3 hours after being applied and other insecticides even longer. Do not spray spinosad or other non-B.t. products on plants in bloom. B.t. products break down in sunlight after 3-5 days so may need to be reapplied.

(Source: URI Caterpillar Update, March 13, 2018)

GRAPE

Understanding Grapevine Bud Damage

Joe Fiola, Univ. of Maryland

Damage from low winter temperatures is arguably the greatest risk to sustainable profitable winegrape production in the eastern US. The majority of Maryland vineyards have not experienced a significant amount of low temperature damage over the past decade or so, however some vineyards have experienced damage this winter (2013/2014). The following "Timely Vit" 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 next "Timely Vit" 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:
 - Dehydration - movement of water to intercellular spaces
 - 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 oF are experienced. The damage may vary based on:
 - Variety/type; the following are in decreasing order of hardiness: (damaging temps.)

- American cvs. (< -15 oF) > French Hybrids (< -10 oF) > vinifera (< -5 oF)
- 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 higher)
- Extreme temperature fluctuations from warm (50 oF+) and then quickly to very cold (0 oF) 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. from Zabadal et al., 2007.)
 - Low temperature tolerance increases as the vine hardens through the fall;
 - Maximum hardiness is typically reached in mid-winter;
 - Low temperature tolerance decreases after rest is satisfied and vines deacclimate

(become less cold tolerant) as they approach the end of winter.

- The actual temperatures are critical - Wind chill does not affect grapevines.



Figure 1. Vine Acclimation from Fall thru Spring

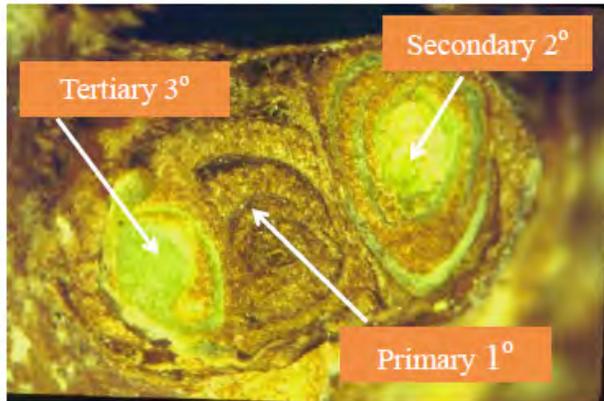


Figure 2. Primary, Secondary and Tertiary buds (Primary = dead; Secondary, Tertiary = alive)

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 3. Damage to tissue inside cane

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 “Timely Vit” on “Assessing Grapevine Bud Damage.”

The following resources were utilized for the information in this “Timely Vit.” 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” <http://grapesandwine.cals.cornell.edu/appellati-on-cornell/issue-5/grapes-101.cfm>

“Winter injury to Grapevines and Methods of Protection.” Zabadal, T., et.al. 2007 MSUE Bull.# E 2930; 105 pp List Price :

\$15.00 <http://www.emdc.msue.msu.edu/product/winter-injury-to-grapevines-and-methods-of-protection-685.cfm>

(Source: Maryland Timely Viticulture Factsheet Series found at <http://extension.umd.edu/learn/understanding-grapevine-bud-damage>)

GENERAL INFO

Chilling Requirement and Dormancy in Fruit Explained

Terrence Bradshaw, Univ. of Vermont

Temperate fruit crops undergo several phases of cold hardiness development. In fall, trees reduce shoot growth and export water from cells into intercellular spaces in response to shorter day length and cooling temperatures. During this period, known as acclimation, the cold

hardiness of plant tissues increases until maximum dormancy is reached, usually sometime in mid-December. This state is called endodormancy, and requires a period of cold below 45° and above 32°F for the tree to 'reset' and initiate hormonal processes that will allow it to bud

out in spring. Without this process, plants would bud out easily during winter warm spells, and subsequent cold could kill deacclimated buds and other tissues. The chill hour requirement ranges from a high of about 1200 for apples to as low as 200 for some grapes. As of today, Shoreham, VT has accumulated 1173 hours since November 11, and East Dorset 926. So, warmer regions may have accumulated chill hours for apples or are near doing so, while cooler upland orchards still have a little ways to go. We should assume that all orchards will have met this requirement in the next few weeks. After chill hour needs have been met, the plants are in a state known as ecodormancy, where environmental conditions are the only thing preventing them from resuming growth. However, that doesn't mean that buds will immediately start popping. Trees will then need to undergo deacclimation which is driven by accumulated heat units.

Unfortunately, we do not have a good handle on how much accumulated heat is needed to push apple (or cold-hardy grape) buds. I looked at the last seven years' 'McIntosh' budbreak date from the UVM Hort Farm and calculated accumulated growing degree days (GDD), base 39°F (or about 4°C) since January 1 for each of those years from NEWA. This is far from comprehensive, as a true analysis would need to consider bud health going into the winter, acclimation conditions, date when chill hours were reached, soil moisture, and soil temperature conditions. But this is what I pulled together quickly on a Sunday night anyway. Bud break occurred after an average of 134.7 accumulated GDD base 39°F (range 132-174) from January 1 in South Burlington, VT. Today, we are calculating 54.1 GDD at this same site. In order to accumulate any GDD at this base, we need to see high temperatures in the high 40s and above. In the near-term outlook, I only see a couple of days (2/28 and 3/1) that might accumulate a few GDD in the Champlain Valley, and in cooler upland regions I don't know if those days will accumulate GDD as far as apple phenology is

concerned. Plus, it is likely that upland orchards still need some chill hours to accumulate before dormancy is broken, so they are even better off. In my opinion, apples are fine as far as cold hardiness to the temperatures expected in the near future and early (pre-April) bud break are concerned.

As for grapes, the news is a little worse, and yet better. There is no question that grapes have met their chill hour requirements in all of Vermont, although we really don't know what those requirements are for the cultivars we grow. However, grapes need a bit more heat accumulation after entering ecodormancy to break bud than apples (although exposed tissue is more vulnerable to cold once it has emerged). Again, I don't have a good handle on how much heat it will take to make grapes push bud, nor at what deacclimation stage they are in. However, the few (and not entirely reliable) long-range forecasts available are not suggesting more extreme (-0° or +50°F) weather after Wednesday. That means that even if buds have lost some hardiness (and some preliminary analysis by Tim Martinson at Cornell suggests we have), we are not likely to see the deep cold needed to cause damage, while we are not likely to accumulate the heat required to push budbreak until well into March. We'll keep an eye on things, but I do not see, at this time, no cause for worry.

Here's a good rundown on how things are developing in the southern U.S.: <https://www.usanpn.org/data/spring> [updated link]. It's good to remember that the chilling hour requirement and generally cooler temperatures overall help keep Vermont and other northern country growers a bit more protected than those who are living in areas with warmer winters. It's why we had fruit in 2010 and 2012 (albeit a smaller crop) when Tennessee and Michigan did not.

(Source: University of Vermont Fruit Blog, February 2017)

UPCOMING MEETINGS:

March 13, 2018 – *Maine Vegetable & Fruit School* 8:30am – 4:30pm, Seasons Event & Conference Center, Portland ME. \$45 registration fee. See: <https://extension.umaine.edu/highmoor/blog/2018/01/09/maine-vegetable-and-fruit-school-2018/> for more information.

March 14, 2018 – *Maine Vegetable & Fruit School* 8:30am – 4:30pm, Seasons Event & Conference Center. \$45 registration fee. See: <https://extension.umaine.edu/highmoor/blog/2018/01/09/maine-vegetable-and-fruit-school-2018/>

March 14, 2018 – *Lake Erie Regional Grape Program Growers' Conference*. 8:00 – 3:45. William's Center- SUNY Fredonia Campus. For program and registration information, go to: https://lergp.cce.cornell.edu/event_preregistration.php?event=335

March 20, 2018 – *UMass Produce Safety Alliance Grower Training* - 9:00am to 5:00pm, UMass Cranberry Station Library, 1 State Bog Road, Wareham, MA 02538 For more information and to register, go to: <https://www.regonline.com/builder/site/?eventid=2148029>

March 27, 2018 – *UMass Produce Safety Alliance Grower Training* - 9:00am to 5:00pm, Lenox Town Hall Auditorium, 6 Walker Street, Lenox, MA 01240. For more information and to register, go to: <https://www.regonline.com/builder/site/?eventid=2152815>

April 10, 2018 – UMass Fruit Team Twilight Meeting, 5:30 – 7:30. Location TBD

April 11, 2018 – UMass Fruit Team Twilight Meeting, 5:30 – 7:30. Location TBD

April 12, 2018 – UMass Fruit Team Twilight Meeting, 5:30 – 7:30. Location TBD

Thank you to our Sponsors:



Massachusetts Berry Notes is a publication of the UMass Extension Fruit Program, which provides research based information on integrated management of soils, crops, pests and marketing on Massachusetts Farms. No product endorsements of products mentioned in this newsletter over like products are intended or implied. UMass Extension is an equal opportunity provider and employer, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations or the UMass Extension Director if you have complaints related to discrimination, 413-545-4800