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Berry Notes
Prepared by the University of Massachusetts Fruit Team

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Massachusetts Berry Notes Underwriters:

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IN THIS ISSUE:

SHORTS:

Northeast SARE Video Vault - Here are some interesting short videos from Northeast SARE:
Backpack sprayers - A Professional Development award developed this series of videos about using and calibrating backpack sprayers on small-scale farms.
Enhancing native pollinator floral resources - Cover crops are generally selected for their ability to build soil organic matter, prevent erosion, suppress weeds, and scavenge nitrogen, but these crops can also support improved bee habitat by using phacelia, buckwheat, and a bee forage mix.

EPA Worker Protection Standard Train-the-Trainer Course for Organic and Non-Certified Pesticide Users - All farmworkers must be trained under the EPA Worker Protection Standard (WPS) if your farm uses any pesticides, including , those approved for organic production and other general use pesticides. The agricultural worker employer is responsible for complying with all components of WPS including the training of farmworkers. This training can only be provided by an individual who has a pesticide certification license or has attended an approved EPA WPS Train-the-Trainer workshop. With the support of the UMass Extension Risk Management Crop Insurance Education Program, we are offering three workshops in April in Taunton, Hadley and Chelmsford. The registration fee is $60.00 per person. If you would like to register for these workshops via the mail using a check or money click here.

Rutgers Offers Information on Ultra-Niche Crops - Rutgers New Jersey Agricultural Experiment Station's Ultra-Niche Crops for the Progressive New Farmer project is providing information on high-value crops that can be grown on 10 acres or less. The project goal is to teach new and beginning farmers about the cultivation, marketing, and business management of 10 ultra-niche crops. To date, resources are available for cut flowers, winter high-tunnel lettuce, and strawberries. A module on High Tunnel Raspberries is coming soon. See https://njaes.rutgers.edu/ultra-niche-crops/ for more information.

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

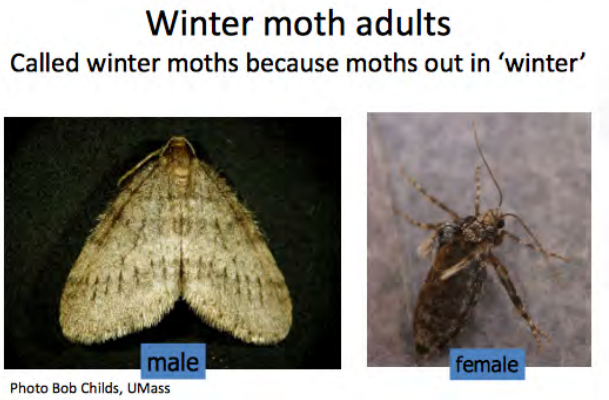
Figure 2. Primary bud is damaged as indicated by necrosis of partially differentiated inflorescence axis. Secondary bud is still undifferentiated, no sign of damage. Photo: Fumi Takeda.

BLUEBERRY

Winter Moth: Detection & Management

Heather Faubert University of Rhode Island

Winter moth is an invasive insect originally from Europe. It was found in Nova Scotia in the 1930s and Cape Cod, MA in the 1990s. Since the 1990s it has spread throughout coastal areas of New England - north into Maine and south through Rhode Island into Connecticut and Long Island, NY. Female winter moths have reduced wings and cannot fly, limiting how quickly winter moths spread. It's unknown at this time whether or not winter moths will stay confined to coastal areas or spread inland throughout New England and New York. During 2015 growing season, winter moths could be found as far west as Worcester, MA and western RI.



Adult winter moths emerge from the ground between Thanksgiving and Christmas. In areas of high winter moth populations hundreds of male moths are attracted at night to porch lights and lighted windows. Small, gray, female moths can be found climbing up tree trunks and buildings. After mating female moths climb trees and deposit eggs singly in crevices of trunks and branches, depositing 150-350 eggs per female. Eggs hatch in early spring and tiny, olive-green caterpillars 'wriggle' into swollen or recently opened buds, such as blueberry flower buds. Inside blueberry buds, caterpillars feed on flower parts, destroying blueberry flowers and inhibiting future pollination. After a couple of weeks, caterpillars can be found feeding on blueberry leaves. Full size caterpillars are bright-green inchworms with pale longitudinal stripes.

Winter moth caterpillars feed on a variety of hosts including oak, maple, apple, birch, elm, ash, crabapple, cherry, and blueberry. Large winter moth populations can defoliate hardwood forests and landscape trees. Generally, the year before winter moths destroy a blueberry crop, leaves of nearby deciduous trees have lacy holes from winter moth caterpillar feeding. An excellent monitoring technique is to scout nearby maple and oak leaves for the characteristic lacy caterpillar feeding damage. Once winter moth damage is found on surrounding trees, control in blueberry bushes is probably needed the following spring. Before winter moths have infested an area no control is needed.

Timing is critical to protect blueberry flowers from winter moth caterpillars. An insecticide must be sprayed in the spring when winter moth eggs begin hatching. Once eggs hatch, tiny larvae move into blueberry buds where they will be protected from insecticides. Experience (not spray trials) has shown that Imidan applied when eggs begin to hatch gives excellent control. For organic production, Entrust is the best insecticide choice. If additional insecticide is needed later, Bacillus thuringiensis (Bt) products can be used. Bt is not effective for the first spray because winter moth caterpillars do not feed as they enter buds and Bt must be ingested to be effective.

Dormant oil applied before eggs hatch may be helpful. Dormant oil can also be mixed with the first insecticide application. For dormant oil to be effective thorough coverage is essential therefore bushes must be well pruned. Dormant oil will not help control winter moth caterpillars that 'balloon' into blueberry bushes from surrounding trees. Ballooning occurs when caterpillars spin a silken thread and are carried by the wind. Oak tree buds are still dormant when winter moth eggs hatch so caterpillars hatching on oak trees are especially prone to ballooning onto nearby blueberries. Through April and May caterpillars can crawl or balloon onto blueberry plants from nearby deciduous trees. Scouting blueberries for winter moth is needed until caterpillars finish feeding late May - early June. At this time winter moth caterpillars drop to the ground on silken threads, enter the soil to form a cocoon and pupate. Pupae remain in the soil until late November when adult moths emerge again.

Early November set up tree bands

BUGBARRIER® TREE BAND

Shelter Tree
North Attleboro, MA

To help time sprays for egg hatch in early spring, tree bands can be set up in November. When a climbing female moth encounters a tree band it tends to deposit many eggs below the tree band. These eggs can be monitored in the spring for hatching. Winter moth eggs are first green and then become orange within 2-3 weeks. In the spring, a couple of days before hatching, orange eggs turn light blue. This color change can be monitored using a handlens and allows growers to pinpoint when hatching will take place.

Monitor egg hatch

Remove bands in March before egg hatch

A parasitic fly, *Cyzenis albicans*, has been released at 40 locations in New England since 2005. These flies have been recovered at 17 of the release sites and are believed to be controlling winter moths at one release site so far.

The future looks bright for winter moth biological control, but winter moths will not disappear and will need to be monitored and probably controlled in commercial blueberry fields for the foreseeable future.

To be added to my winter moth egg hatching email list please send me an email at hhf@uri.edu.

(***Source**: 2015 New England Vegetable & Fruit Conference Proceedings. http://www.newenglandvfc.org/2015_conference/pps/NEFVC%20BB1/1Faubert.pdf*)

"In-Row" Control of Annual Weeds in Established Blueberries with Residual Herbicides

Thierry Besancon, Rutgers University

The program for the control of annual weeds in blueberries should consider the weed free strip under the row and the row-middles, sodded or tilled, separately. The "Weed Control Season" in blueberries starts in late fall. The program implemented in the spring depends on what herbicides were applied the previous fall. If herbicides were applied in late fall, applications may be able to be delayed until later in the spring. Residual herbicides should be applied before bud break in late winter or early spring after the soil is no longer frozen if no late fall treatment was applied.

Winter annual weeds germinate in the fall or late winter, flower in the spring or early summer, then die. Summer annuals germinate in the spring and early summer, flower, and die in late summer or fall. Perennial weeds are weed species that live for more than two years. Control of these weeds must be considered separately.

Emerged annual weeds under the row are controlled with a postemergence herbicide. Annual weeds that germinate throughout the remainder of the season are controlled with residual herbicides. Two applications of postemergence herbicide plus residual herbicides are recommended annually in the weed free strip under the row.

1. The first application should be applied in late fall, after the blueberries are dormant, but before the soil freezes, or in late winter before the buds break in the spring. This application targets the control of winter annuals and provides early season control of summer annual weeds. The fall can be a less busy time to apply herbicides to the fields, usually after Thanksgiving in New Jersey. In March, growers find themselves scrambling to apply insecticides and fungicides, and prune. Pruned branches must be removed or chopped before weed spraying can be accomplished after pruning.
2. The second application of residual herbicides should be applied before bloom or later spring, depending on the herbicides to be applied. A postemergence herbicide may not be needed to control annual weeds in the spring if residual herbicides were applied in late fall. However, a postemergence herbicide may be included to control certain perennial weeds such as yellow nutsedge, Canada thistle, goldenrod species, or aster species.

Most residual herbicides primarily control annual grasses or annual broadleaf weeds (BLWs). A combination of an annual grass herbicide and an annual BLW herbicide is usually recommended. Rate ranges are recommended for most residual herbicides and will depend on soil type and organic matter content (see Table 3 in the 2017 Blueberry Weed Control Recommendations for New Jersey). Use the lower rates in fields with coarse textured (sandy) soil low in organic matter, and the higher rate when soils are fine textured (silt and clay) and have higher organic matter. For efficient weed control, **residual herbicides require a clean soil** (no weeds, organic mulch or pruning residues) before spraying and **need to be activated** with a minimum of ½" of rain or irrigation in the week following application.

Casoron (dichlobenil), applied in late fall, followed by a spring application of a residual annual grass herbicide is the most effective residual weed control program recommended. More different species of weeds are controlled than any other residual herbicide combination available. Apply 4.0 lb active ingredient Casoron CS (2.7 gallons per acre) or 4.0 to 6.0 lb active ingredient Casoron 4G (100 to 150 lb per acre) in late fall when soil and air temperatures will remain below 50 degrees Fahrenheit until rainfall moves the herbicide into the soil. The active ingredient in the granular formulation can be lost to volatilization in warm weather. The Casoron CS formulation is encapsulated, which prevents loss due to volatilization. Casoron provides annual broadleaf weed control until fall and annual grass control until early summer the next year. Certain herbaceous perennials, including goldenrod species, aster species, and yellow nutsedge will also be controlled or suppressed by Casoron applied in late fall. Late winter applications provide less consistent winter annual and perennial weed control. Apply an additional residual annual grass herbicide in early or late spring to provide late summer annual grass control following the late fall application of Casoron.

If Casoron has not been applied in late fall, choose your residual annual grass herbicide for the coming season

before the late fall or late winter herbicide application. Options include **Devrinol** (napropamide), **Surflan** (oryzalin), or **Solicam** (norflurazon). All three residual annual grass herbicides can be used at the rate of 4.0 lb active ingredient per acre per year. Apply half the yearly labeled rate, 2.0 lb active ingredient per acre, in the late fall, and the second half, an additional 2.0 lb active ingredient per acre, in the spring, or the full rate in early spring, in no late fall application was applied.

Your residual BLW herbicides should be chosen considering crop safety, effectiveness, and price. For many years **Princep** (simazine) was recommended at 1.0 to 2.0 lb active ingredient per acre in the late fall, and **Karmex** (diuron) was recommended at 1.0 to 2.0 lb active ingredient per acre in the spring. Both herbicides have been safe, reliable, and cost effective choices for many years, and continue to good options where their use provides good weed control. Both Princep and Karmex share the same mode of action, inhibition of the light reaction of in photosynthesis. Unfortunately, triazine resistant weeds (horseweed, common lambsquarters) with cross resistance to urea herbicides are present at some sites.

Where a triazine resistant weed has become established, switch to a BLW herbicide(s) with a different mode of action. Use **Chateau** (flumioxazin) at 0.19 to 0.38 lb of active ingredient per acre or **Callisto** (mesotrione) at 0.094 to 0.19 lb of active ingredient per acre in late fall or late winter. Chateau and Callisto must be applied before bud break in early spring to avoid crop injury. Chateau can cause speckling and crinkling the crop's foliage if spray drift occurs. The activity of Chateau occurs at the soil surface as sensitive BLW seedlings emerge. Do not disk, till or otherwise mechanically mix Chateau into the soil after application, or the effectiveness of the herbicide will be reduced or eliminated. Callisto bleaches foliage white. Horseweed, also called marestail or stickweed, and common lambsquarters are very sensitive to Callisto both pre and postemergence. Chateau and Callisto can be used in combination, or either herbicide can be tank-mixed with Princep (simazine) and Karmex (diuron) to improve BLW control.

Sandea (halosulfuron) controls BLWs and yellow nutsedge in blueberries, and has postemergence and residual activity. Sandea is an ALS inhibitor. Herbicides with this mode of action rely on a single site of action in susceptible weeds, putting herbicides with this mode of action at high risk for weed resistance development. Weed resistance to ALS inhibitor herbicides is already present in the New Jersey and the surrounding mid-Atlantic region. Due to resistance management concerns, **Sandea is recommended ONLY for emerged yellow nutsedge control** later in spring, but not for residual annual weed control.

Stinger (clopyralid) is a growth regulator herbicide with postemergence and residual activity labeled in New Jersey for use in blueberries to control annual and perennial weeds in the legume and composite plant families. Legume weeds found in blueberries include vetch and clover species. Composite weeds targeted include horseweed, dandelion, aster species, goldenrod species, Canada thistle, and mugwort (also called wild chrysanthemum). Stinger rates and application timing depend on the weed targeted.

When annual weeds have emerged before residual herbicides are applied, a postemergence herbicide should be included in the tank. Potential options include the following herbicides:

- **Gramoxone** or other labeled generic paraquat formulations applied at 0.6 to 1.0 lb active ingredient per acre plus nonionic surfactant to be 0.25% of the spray solution will control most of broadleaf and grass seedlings that are 2 inches tall or less. As a contact herbicide, paraquat will not be translocated and regrowth may occur from the root system of established weeds (taller than 2 inches).
- **Roundup** and other labeled generic glyphosate products can also be used to control emerged weeds as a spot treatment, and can be especially useful where susceptible perennial weeds are a problem. Take great care when spot treating with Roundup or other glyphosate formulations to never contact the blueberry bush, or serious crop injury could occur. The rate depends on the perennial weed targeted and the glyphosate product used.
- **Rely 280** (glufosinate) is an alternative to glyphosate that is registered for use in blueberries. It is not as fast as Gramoxone, but tends to provide more complete and faster control than glyphosate without the concern for systemic movement in the blueberry bush. Similarly, to glyphosate, do not allow spray to contact desirable foliage or green bark as this would result in serious injury. Consult the label for preemergence herbicides that can be tank mixed to broaden the spectrum of weed control.

Consult the Commercial Production Recommendations for rates and additional information. (***Source**: Rutgers Plant & Pest Advisory, March 6, 2017*)

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

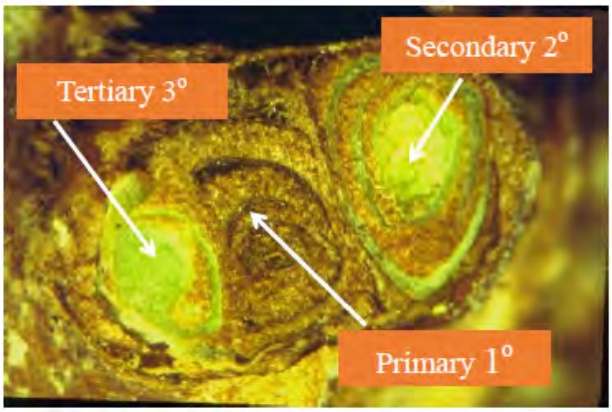


Figure 2. Primary, Secondary and Tertiary buds (Primary = dead; Secondary, Tertiary = alive)

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.

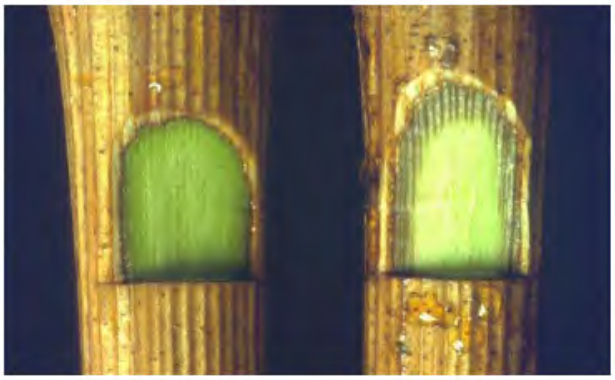


Figure 3. Damage to tissue inside cane

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/appellation-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.usgs.gov/news/just-how-early-spring-arriving-your-neighborhood-find-out-0 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.

Temperature Affects Stink Bugs More Than Any Other Factors

Peter Jentsch, Cornell University

Here is an excellent synoptic piece on the environmental constraints on stink bug populations written by Richard Levine, featured in Entomology Today and available at PLOS one in the research article titled "Contrasting Role of Temperature in Structuring Regional Patterns of Invasive and Native Pestilential Stink Bugs".

ADULT BMSB ON LATE SEASON PEACH.

Adult BMSB on late season peach.Many things can affect the size and range of insect populations, including the climate, the availability of food sources, and the absence or presence of predators. But when it comes to certain stink bugs, researchers have found that temperature is the most important factor affecting regional distribution and abundance.

By using complex spatial and statistical analyses, entomologists from Maryland, Virginia, and Delaware determined that temperature is the primary driver of stink bug patterns, and they identified differences in thermal tolerances among native and invasive stink bugs.

The researchers conducted a survey of three stink bug pests — the invasive brown marmorated stink bug (BMSB) and two native insects, the green stink bug and the brown stink bug — in soybean fields in Maryland, Virginia, West Virginia, and Delaware. They found that the abundance of BMSB became lower as temperatures increased in June. In fact, no BMSBs were found in fields with average June temperatures that were higher than 23.5º C (74º F).

However, in contrast to the invasive BMSB, the abundance of the native stink bugs increased as temperatures rose.

This study highlights the importance of temperature on the pattern of distribution and abundance of stink bugs.

The early developmental stages are particularly vulnerable to high summer temperatures. Photo by Dilip Venugopal.

"This is important for understanding the establishment and growth of BMSB populations that are spreading to other parts of the United States and in Europe," said Dr. Dilip Venugopal, a current AAAS science and technology policy fellow hosted by the U.S. EPA, and one of the co-authors. "These results can help us predict the pest potential of BMSB and the vulnerability of agricultural systems in various regions, and accordingly target control efforts. For example, the north-central and central regions of the U.S. contain very high soybean acreage, but temperatures from March to June are too low for optimal growth and development of BMSB eggs and early nymphal stages."

However, people in these colder areas shouldn't expect to be completely free of the BMSB because some warmer areas will still support them.

"Urbanized areas in these regions could support high abundance of BMSB by acting as 'heat islands' because cities tend to be warmer than rural areas," Dr. Venugopal said. "Similarly, in the southeastern U.S. where warmer temperatures do not support large stink bug populations, BMSB might occur in higher abundance in the western mountains and Piedmont region, where it is cooler than the eastern coastal plains."

This study is the first comprehensive large-scale survey that quantifies the interactive roles of the environment, resource availability, and distance from the source population on the pattern of distribution and abundance of stink bugs. Previous studies on BMSB examined these factors mostly in isolation.

Additionally, this study clearly identifies the spatial scale at which each of these factors operate, and it is the first to distinguish the roles of environmental and landscape factors on invasive versus native stink bugs.

"This study shows that despite the similarity among BMSB and native stink bugs in terms of their broad host-plant choice and stages of crops they prefer, their environmental and landscape associations are entirely different," Dr. Venugopal said. "The native stink bugs have a tolerance for higher summer temperatures than BMSB, and that probably explains their broad distribution range in the U.S. However, BMSB is not able to tolerate very high summer temperatures. In pest management programs, similar group of pest species tend to get grouped together for similar strategies for management. Our results show that regional management strategies for stink bugs should incorporate these biological differences." (Source: Jentsch Lab Blog, 3/3/17)

Changes to the Worker Protection Standard

What are the Major Changes for Farmers and Farmworkers?

The revisions to the Worker Protection Standard cover many different areas. The major revisions include:

- Annual mandatory training to inform farmworkers on the required protections afforded to them. Currently, training is only once every 5 years.
- Expanded training includes instructions to reduce take-home exposure from pesticides on work clothing and other safety topics.
- First-time ever minimum age requirement: Children under 18 are prohibited from handling pesticides.
- Expanded mandatory posting of no-entry signs for the most hazardous pesticides. The signs prohibit entry into pesticide-treated fields until residues decline to a safe level.
- New no-entry application-exclusion zones up to 100 feet surrounding pesticide application equipment will protect workers and others from exposure to pesticide overspray.
- Requirement to provide more than one way for farmworkers and their representatives to gain access to pesticide application information and safety data sheets – centrally-posted, or by requesting records.
- Mandatory record-keeping to improve states' ability to follow up on pesticide violations and enforce compliance. Records of application-specific pesticide information, as well as farmworker training, must be kept for two years.
- Anti-retaliation provisions are comparable to Department of Labor's (DOL).
- Changes in personal protective equipment will be consistent with DOL's standards for ensuring respirators are effective, including fit test, medical evaluation and training.
- Specific amounts of water to be used for routine washing, emergency eye flushing and other decontamination, including eye wash systems for handlers at pesticide mixing/loading sites.
- Continue the exemption for farm owners and their immediate families with an expanded definition of immediate family.

For more detailed information visit: https://www.epa.gov/pesticide-worker-safety/revisions-worker-protection-standard

(***Source**: NY Berry News, Vol. 16, No. 1, Winter 2017*)

UPCOMING MEETINGS:

March 6, 2017 – *Organic Strawberry Grower School*. 8:00am - 4:00pm, Lake Morey Resort, 1 Clubhouse Road, Fairlee, VT 05045. For more information, go to: http://www.uvm.edu/vtvegandberry/meetings/OrganicStrawberryGrowersSchool2017.pdf.

March 7-9, 2017 – *Harvest New England Agricultural Marketing Conference & Trade Show*. Sturbridge Host Hotel, Sturbridge MA. For more information go to: http://www.harvestnewengland.org/events/.

March 9, 2017 – *2017 Northeastern NY and VT Grape School*. 8:30-5:00 Holiday Inn Lake George, 2223 Canada St. , Lake George, NY. AM: Viticulture Presentations, PM: Wine Faults Workshop. Registration information forthcoming.

March 9, 2017 – *Creating and Improving Pollinator Habitat on Your Farm*. Jones Auditorium, Connecticut Ag. Experiment Station, 123 Huntington St., New Haven, CT 06511. $40 includes lunch. Contact Tracy Zarrillo: Tracy.Zarrillo@ct.gov or 203-974-8473. Cash or check, please (can't take credit cards). Pesticide recertification credit requested.

March 9, 2017 – *9TH Annual Berry Production & Marketing Conference*. 8:00 – 3:30. Gateway Dining Hall, Virginia State University, Petersburg, VA. $20. For program and registration information, visit www.ext.vsu.edu or click here.

March 9, 2017 – *Fruit Workshop I: Pest & Diseases of Small Fruit*. 8:30-12:30. Windham Co. Extension Center, Brooklyn, CT. $10-$20. For more information go to: http://plant.lab.uconn.edu/workshops/.

March 18, 2017 – *Mass Aggie Pruning Blueberries Hands-on Workshop*. 10-12. Nicewicz Farm, 116 Saywer Rd., Bolton, MA. Registration Required. Cost: $35. For more information or to register, go to: http://ag.umass.edu/fruit/news-events/mass-aggie-seminars/mass-aggie-seminars-2017.

March 23, 2017 – *Produce Safety Alliance Grower Training*. 8:00am – 5:30pm. Brigham Hill Community Farm, 37 Wheeler Rd. N. Grafton, MA 01536. The course will provide a foundation of Good Agricultural Practices (GAPs) and co-management information, FSMA Produce Safety Rule requirements, and details on how to develop a farm food safety plan. Cost: $35. For more information or to register, go to: http://ag.umass.edu/food-safety/events/produce-safety-alliance-grower-training-0.

March 24, 2017 - *Produce Safety Alliance Grower Training*. 8:00am – 5:30pm. Bristol County Agricultural High School, Kieth Hall, 84 Center St. Dighton, MA 02715. The course will provide a foundation of Good Agricultural Practices (GAPs) and co-management information, FSMA Produce Safety Rule requirements, and details on how to develop a farm food safety plan. Cost: $35. For more information or to register, go to: http://ag.umass.edu/food-safety/events/produce-safety-alliance-grower-training.

March 25, 2017 – *Mass Aggie Pruning Raspberries and Blackberries Hands-on Workshop*. 10-12. Wards Berry Farm, 614 South Main St., Sharon, MA. Registration Required. Cost: $35. For more information or to register, go to: http://ag.umass.edu/fruit/news-events/mass-aggie-seminars/mass-aggie-seminars-2017.

April 19, 2017 – *EPA WPS and Train-the-Trainer Workshop*. 10-12 WPS Update, 1pm – 4pm Train-the-Trainer Workshop. Holiday Inn, 700 Myles Standish Blvd, Taunton MA 02780. 2 PAT credits for each section. Total Cost: $60. You must take both parts if you wish to become EPA WPS approved Trainer. For more information or to register, go to: http://www.umass.edu/pested/training_workshops/2017_EPA_WPS_Workshops.htm.

April 26, 2017 – *EPA WPS and Train-the-Trainer Workshop*. 10-12 WPS Update, 1pm – 4pm Train-the-Trainer Workshop. Hadley Farms Meeting House. 41 Russell St. Hadley, MA 01036. 2 PAT credits for each section. Total Cost: $60. You must take both parts if you wish to become EPA WPS approved Trainer. For more information or to register, go to: http://www.umass.edu/pested/training_workshops/2017_EPA_WPS_Workshops.htm.

April 27, 2017 – *EPA WPS and Train-the-Trainer Workshop*. 10-12 WPS Update, 1pm – 4pm Train-the-Trainer Workshop. Radisson Hotel and Suites Chelmsford, MA, 10 Independence Drive, Chelmsford, MA 01824. 2 PAT credits for each section. Total Cost: $60. You must take both parts if you wish to become EPA WPS approved Trainer. For more information or to register, go to: http://www.umass.edu/pested/training_workshops/2017_EPA_WPS_Workshops.htm.

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