

UMass
Extension
CENTER FOR AGRICULTURE

Berry Notes

Prepared by the University of Massachusetts Fruit Team

March 2016 - Vol. 28, No. 3

www.umass.edu/fruitadvisor/berrynotes/index.html

Massachusetts Berry Notes Underwriters:



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
- ❖ Strawberry Viruses: Why Worry?

RASPBERRIES/BLACKBERRIES

- ❖ Trellising Options for Raspberries and Blackberries in Cold Climates

BLUEBERRIES

- ❖ Winter Moth: Detection & Management

GRAPES

- ❖ Understanding Grapevine Bud Damage

GENERAL INFORMATION

- ❖ New(er) Berry Crop Herbicides
- ❖ The Importance of Boron in Fruit Production
- ❖ Understanding The Nutrient Management Regulations

POLLINATOR CORNER

UPCOMING MEETINGS

SHORTS:

Renew your subscriptions for 2016: 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 surface mail with a check.

Massachusetts Honey Bee Hive Survey - This survey was created by the Massachusetts Department of Agricultural Resources (MDAR) to serve as a tool for Massachusetts honey beekeepers to share data on hive losses that occurred during the 2015 season. Participation in this survey is voluntary. Responses will be analyzed by MDAR Apiary Program staff, who will then provide a summary of results to the beekeeping community this winter. Beekeepers willing to submit photos documenting 2015 hive health issues should send them via email to: massapiaryprogram@gmail.com. Photos will be reviewed and responses provided in a timely manner. If you have specific questions that you want addressed, please include that information in the email. Click [here](#) to access survey. Thank you for taking the time to complete the survey and provide feedback on the health of your hives! Happy Beekeeping, -The MDAR Apiary Program.

USDA NRCS Conservation Innovation Grants - USDA NRCS is accepting applications for up to \$20 million in competitive national Conservation Innovation Grants (CIG). Up to \$2 million has been set aside for projects targeted to historically underserved and veteran farmers and ranchers, beginning farmers and ranchers, and those with limited resources. The CIG focus for 2016 is Water Quality and Conservation Finance. **Applications are due by May 10, 2016.** For more information, click [here](#).

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.

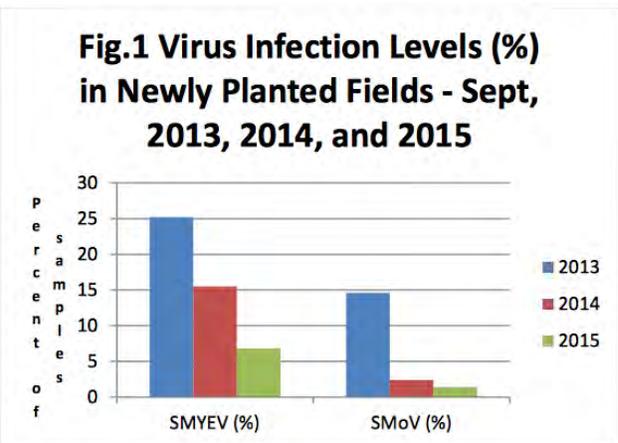
Strawberry Viruses: Why Worry?

John C. Lewis, M.Sc., Perennia Food and Agriculture Inc., Nova Scotia Canada

An outbreak of two aphid vectored viruses in Nova Scotia strawberry fields in 2012-2013 caused significant losses to both nursery and commercial fruiting operations. The overall loss to the sector was nearly 50% of the combined \$19 million crop value. Recovery efforts focused on three strategies: 1) inoculum reduction facilitated by a federal/provincial disaster assistance “replant” program, 2) production of clean nursery stock facilitated by third party virus testing, and 3) optimum vector management facilitated by a province wide aphid monitoring program. More than half of the commercial fruit crop was lost in 2013 and about 25% in 2014 due to the effects of the viruses. However, the 2015 crop was a bumper one and most growers attribute this to declining virus levels (Figure 1).

The two problem viruses, strawberry mild yellow edge virus (SMYEV) and strawberry mottle virus (SMoV), are among the most common viruses to be found in strawberries and are reported around the world. Individually, they do not appear to cause problems for

strawberries but in mixed infections can cause decline symptoms and severe yield reduction. A third previously



unknown virus, named strawberry polerovirus 1 (SPV1), was discovered in symptomatic plants collected in 2013 and may also add to the synergistic effects of the primary viruses identified above.

SMYEV and SMoV are both spread primarily by the strawberry aphid, *Chaetosiphon fragaefolii*, so monitoring and management of this aphid is critical for controlling the spread and impact of the decline phenomena observed in Nova Scotia in 2012/2013. In Nova Scotia, this aphid species overwinters as shiny black, football shaped eggs on the underside of old leaves lying close to the ground. Monitoring should begin immediately after mulch removal in the spring with the assumption that the majority of eggs found are of the strawberry aphid. If significant numbers are found, plans should be made to apply a control shortly after hatch which will be within 2 weeks of mulch removal. Newly hatched strawberry aphid nymphs prefer young succulent leaves so monitoring is facilitated by collecting 60 random immature trifoliolate leaves on a weekly basis from each field block and examining for nymphs on the underside of the leaves. The strawberry aphid nymphs are wingless and easy to identify although growers will require either trained scouting services or magnifying equipment greater than 20x for verification. No thresholds for treatment have been established but our experience in Nova Scotia has shown that even low numbers of nymphs will increase rapidly and a treatment should be applied when monitoring counts exceed 15 nymphs per 60 leaf sample.



Fig.2 “Wingless” strawberry aphid

Left untreated, strawberry aphid colonies will eventually become crowded and adult aphids will quickly grow wings to allow dispersal to new areas. This marks the beginning of the high-risk flight period where winged strawberry aphids can spread viruses from infected plants throughout a field and potentially downwind to a neighbor’s fields. Monitoring for the initiation of the strawberry aphid flight period is critical for minimizing virus spread and we are using yellow

sticky traps for this purpose. Ten traps per field block are deployed at canopy height in mid to late May in Nova Scotia and examined on a weekly basis to establish the beginning of the flight period and upon first catch in a given area growers are informed by a “virus alert” email. Once again, no thresholds for treatment have been established for winged aphid catches but it is important to know that the yellow sticky traps are extremely conservative and even with zero counts in a field, there can be new infections. As such, in the midst of an epidemic such as experienced in Nova Scotia in 2012-2013, it is advisable to guide your spray decisions based on the overall monitoring report (eg. virus alert) rather than your individual field counts. In contrast, a threshold of 1 winged strawberry aphid per 10 trap set is likely a satisfactory threshold to warrant a spray in a low virus pressure situation.



Fig.3 “Winged” strawberry aphid

The strawberry aphid flight period lasts 6-8 weeks in Nova Scotia and upon completion growers may breathe a sigh of relief; however, fields should be monitored by leaf sampling in mid-fall to assess the need for a clean-up spray to minimize egg laying.

Strawberry viruses are a very real threat that caused a serious crop failure in Nova Scotia in 2012-2013. These viruses and others causing decline symptoms in northeastern North America in recent years have been primarily aphid vectored and effective control can be achieved by timely removal of fields, replanting with virus tested stock, and effective monitoring and management of the strawberry aphid. (*Source: 2015 New England Vegetable & Fruit Conference Proceedings. http://www.newenglandvfc.org/2015_conference/18_3_Lewis.pdf*)

Trellising Options for Raspberries and Blackberries in Cold Climates

Marvin Pritts, Cornell University

Several principles involving bramble plant growth and physiology must be understood before one can appreciate the benefits of trellising, and the various ways that brambles can be trellised.

- 1) The top half of a cane has the potential to produce more fruit than the lower half of a cane.
- 2) The amount of light intercepted by a bramble plant is somewhat proportional to its yield
- 3) Brambles can compensate somewhat for the loss of flowers and buds through pruning by increasing bud break and the size of remaining fruit
- 4) Primocanes can interfere with floricanes light interception and harvesting
- 5) Blackberry primocanes bend when they are young and succulent, whereas raspberry primocanes do not bend.
- 6) Erect blackberry canes exposed to a typical winter will experience damage to fruiting canes.

Knowing these principles, we can examine various approaches to trellising.

1. No trellis - This option is obviously less expensive to implement, but unsupported canes often bend over when they have a fruit load and are then difficult to harvest. If canes are topped to prevent bending over, a significant portion of the fruiting potential is lost.
2. I-trellis - This option holds canes erect and prevents loss from topping. But light interception is poor, and yields do not meet their full potential. Primocanes grow towards the light and can interfere with spraying and harvesting of the floricanes.
3. V-trellis - This system opens up the canopy by pulling fruiting canes to the outside of the V, and allows primocanes to grow in the middle of the V. Interference with picking is minimized and light interception and penetration are improved. Yields can be improved 30% by converting from an I to a V-trellis, although the trellis is more elaborate and expensive to install.
4. Modified V for a tunnel - Blackberries in a tunnel grow very vigorously; primocanes of some varieties can grow

20 feet in one season. Standard trellising does not work well in a tunnel as the canopy is too dense and canes are too tall. Vigor can be reduced without a major reduction in yield by horizontally training a limited number of primocanes (2 or 3) to the lower wire of a V-trellis. When the primocane reaches the adjacent plant, it is pinched to promote lateral bud break.

These buds are trained upright to one side of the V. Harvesting a one-sided V is much easier than a regularly trained plant (where densely arranged primocanes are shortened to approximately 6 feet). Primocanes are trained to the opposite side of the V in alternating years. This system does not work for raspberries as canes do not bend even when they are young.

5. Rotatable cross-arm trellis - Primocanes are trained similarly to the previous description of the V-trellis. However, the accommodating trellis has a cross-arm that can rotate into a horizontal position so that canes can be laid against the ground at an appropriate time. The trellis arm with attached canes is laid on the ground prior to winter, and covered with a row cover to minimize winter injury. The trellis arms are raised after winter, and the buds emerge with significantly less injury. We have documented five-fold differences in yield in cv. Chester between canes laid on the ground and those held erect for winter.

Canes bent and trained along the lower wire twist about 90 degrees when the cross arm is laid in a horizontal position. This small amount of twisting does not damage the canes. However, a vertical cane forced into a prostrate position will snap. Therefore, it is important to train the canes horizontally from the time of their emergence in spring so they will twist and not break when laid horizontally.

Applying these principles to a good trellis design will allow growers to maximize their yield potential in raspberries and blackberries. Installing a trellis requires materials and labor, but the fact that nearly all raspberry and blackberry growers use them, attests to their efficacy.

(Source: 2015 New England Vegetable & Fruit Conference Proceedings.
http://www.newenglandvfc.org/2015_conference/7_3_Pritts.pdf)

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.

Winter moth adults

Called winter moths because moths out in 'winter'



Photo Bob Childs, UMass



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 'wiggle' 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.



Early spring, eggs hatch. Caterpillars wriggle into buds



11 days after eggs start hatching

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



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 hand lens 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 hfh@uri.edu.

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

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.

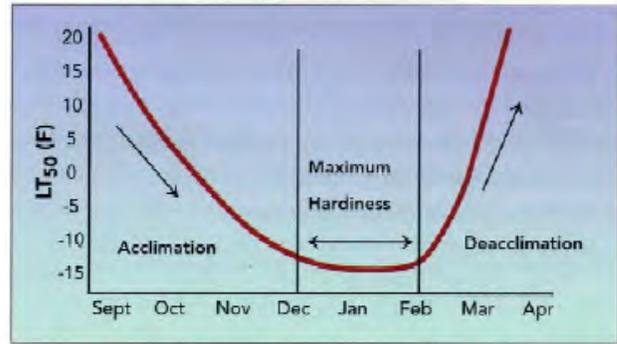


Figure 1. Vine Acclimation from Fall thru Spring

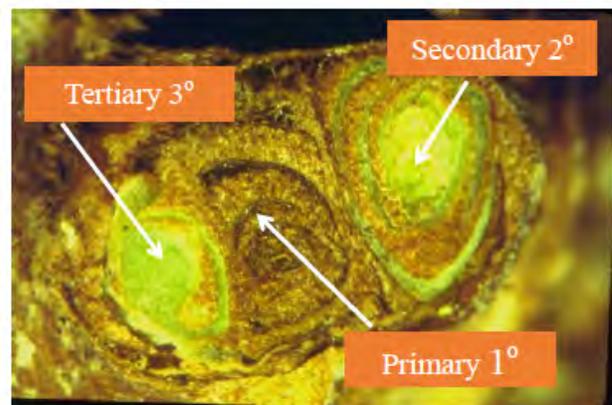


Figure 2. Primary, Secondary and Tertiary buds (Primary = dead; Secondary, Tertiary = alive)

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.

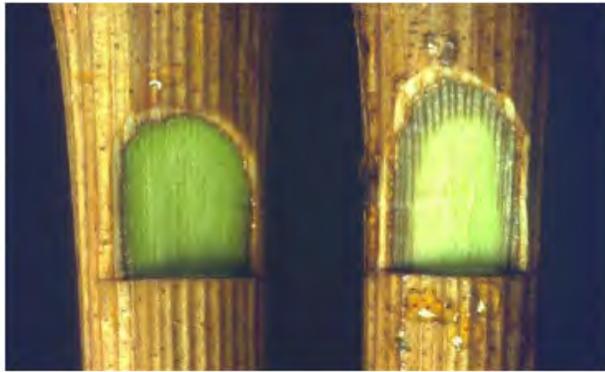


Figure 3. Damage to tissue inside cane

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 INFORMATION

New(er) Berry Crop Herbicides

Kathy Demchak, Penn State University

Some new herbicides, or in some cases, new formulations, have become available for use in berry crops in the last few years. Here is a summary of these additions.



Figure 1. Yellow woodsorrel

Devrinol

Devrinol (napropamide) is a pre-emergent herbicide that has been around for a long time, but one drawback was that it needed to be incorporated quickly after application to prevent it from breaking down in sunlight. It is available in two new formulations, Devrinol 2XT and Devrinol DF-XT. Both contain an additive that makes the active ingredient more resistant to breakdown in sunlight, so the recommended time for incorporation is now given as a range from 24 to 72 hours. It still has the same spectrum of activity, being strongest on annual grasses, but also is effective in preventing some broadleaf weeds

including pigweeds, purslane, and chickweed. It’s labeled for use in strawberries, raspberries, blackberries, and blueberries. It is typically used for spring or fall applications.

Trellis

Trellis (isoxaben) is a pre-emergence material with the same active ingredient as the one in Gallery. Like Gallery, Trellis is effective for prevention of broadleaf weeds including some troublesome ones such as ragweed and nightshade. It can be used only in nonbearing (i.e., at least one year to harvest) plantings of raspberries and blackberries, blueberries, currants, gooseberries and elderberries.

Callisto

Callisto (mesotrione) is labeled for pre-bloom use on raspberries, blackberries, highbush blueberries and red and black currants. It can be used on lowbush blueberries only in non-bearing years. It has pre-emergence activity, and also post-emergence activity as long as the weeds are small (< 5” tall). It is effective against many broadleaf weeds including marehail, black nightshade and pigweeds, but has little activity on grasses.

Casoron CS

Casoron CS (diclobenil) is a liquid formulation of an older product that was challenging to apply as a granular formulation. It can be used in established (more than a year old) raspberry, blackberry, and blueberry fields, preferably during late fall and early spring when conditions are cool and moist. If applied under conditions that are warm (> 70 degrees) and dry, the material

converts to a gaseous form and is not bound to the soil, so control is reduced. It has preemergence activity against a wide range of annual broadleaves and some grasses, and also suppresses some perennials. It has kickback activity on young weeds whose root systems are not already growing below the herbicide layer (i.e., generally weeds that are less than 2" tall).

Zeus XC

Zeus XC (sulfentrazone) is labeled for use on healthy blueberry plants that have been in the ground for at least three years. It is in the same chemical class as Chateau and has a similar spectrum of activity. It is primarily a preemergence material with some postemergence activity on emerging annual grasses and certain broadleaves. It also can help control sedges postemergence.

Zeus Prime XC

Zeus Prime XC is a combination of two active ingredients (carfentrazone-ethyl and sulfentrazone) and has both post-emergence burndown activity and pre-emergence activity. It is labeled for use on bushberries (highbush blueberries, currants, gooseberries, and elderberries) and caneberries (raspberries, blackberries, etc.) and controls a wide range of broadleaf weeds including emerged nutsedge. It should only be applied to established plants that have been in the ground for at least two years.

Matrix SG and Solida

Matrix SG and Solida (both contain rimsulfuron as the active ingredient) are labeled for use on highbush blueberries, raspberries, blackberries, and lowbush blueberries during their vegetative year when managed to have one. These products have both preemergence and

early postemergence activity and control primarily annual grasses and a limited variety of broadleaves. Raspberries must have been in the ground at least one year, and blackberries at least two years before these materials can be used on them. The active ingredient has the same mode of action as Sandea, and so these materials cannot be used in the same year as Sandea.

Sandea

Sandea (halosulfuron-methyl) is labeled for use on highbush blueberries. It has both preemergence and postemergence activity and is useful for control of broadleaf weeds including marehail, and also nutsedge. The label recommends one or two applications to nutsedge in late June; however, with a 14-day PHI, timing of application could be problematic for early and mid-season blueberry varieties.

Prowl H₂O

Prowl H₂O (pendimethalin) is now labeled for use on highbush blueberries, red and black raspberries, blackberries, and aronia, in addition to strawberries for which it has been labeled for some time. It is a preemergence material that is effective mostly on grasses, with control of certain broadleaves (lambsquarters, purslane, pigweeds).

As always, the label is the law—pesticides can only be used in the manner consistent with the product label. Products must be registered for use in the state in which they are applied.

(Source: Penn State Vegetable and Small Fruit Gazette, February 26, 2016)

The Importance of Boron in Fruit Production

Mary Concklin, UConn Visiting Associate Extension Educator

When we think of plant nutrients and fertilizers, the nutrients that most often come to mind first are nitrogen (N), phosphorus (P) and potassium (K). These are macro-nutrients (along with calcium and magnesium) that are needed and utilized by plants in large quantities. There are other nutrients that are needed in smaller amounts that are referred to as micro-nutrients, including boron (B), zinc (Zn), copper (Cu), iron (Fe), and manganese (Mn). Although lower quantities of the micro-nutrients are needed, they are no less important than the macro-nutrients. Nutrients play multiple roles in plant health and production, with many of those roles overlapping. For example, all nutrients are involved in fruit quality either directly or indirectly. This article will focus on the role of one of the micro-nutrients, boron, and its deficiency and toxicity symptoms.



Whether you are growing tree fruit, berries or grapes, boron is one of the important nutrients in root development and root growth (phosphorus being another). When it is in short supply in the soil, roots are

compromised, leading to problems with nutrient uptake, in particular potassium and calcium. When this occurs, the visual symptoms due to the lack of boron may appear as potassium deficiency. Boron is very mobile in the soil making soil applications of boron (Solubor, Borax) effective. It can be applied pre-plant and disked or plowed in, or applied post-plant and in established plantings as a granular soil application or mixed in the herbicide tank. Keep in mind that with all micro-nutrients, there is a fine line between toxicity and deficiency. Applications should be made only when soil and/ or foliar testing indicates a need.



Further up the plant, boron plays an important role in bud development, growth of the pollen tube, fruit set, fruit quality and fruit maturity. When deficient, the result is misshapen fruit (apples, pears, strawberries) and internal corking, a reduction in fruit set, small berries, and zig-zag growth of new grape shoots with small or misshapen leaves. Boron is immobile in the plant, unlike the soil, so foliar deficiency symptoms will first appear in younger leaves, and at the growing tip. To correct boron deficiency in the plant, foliar boron sprays are the most effective with applications beginning prior to bloom in order to have an impact on bud and fruit development. Additional one or two foliar applications are recommended based on the boron level as determined in foliar analysis for tree fruit & berries and petiole analysis for grapes, as well as previous year boron applications.

Boron toxicity is caused by an over-application and first appears as bleached or chlorotic foliage, followed by necrosis. With grapes, toxicity appears as necrotic spots on the foliage. Severe toxicity can result in early defoliation. Following nutrient recommendations derived from soil and foliar/petiole analysis will help maintain adequate levels of all nutrients and avoid deficiency as well as toxicity problems. (*Source: UConn Crop Talk, Feb. 2015*)

Understanding The Nutrient Management Regulations

Katie Campbell Nelson, UMass Extension

On December 5th, 2015 [Plant Nutrient Regulations \(330 CMR 31.00\)](https://ag.umass.edu/agricultureresources/nutrient-management) went into effect in the state of Massachusetts establishing limitations on when and where plant nutrients may be applied to agricultural lands. Cape Cod and the Islands developed their own sets of regulations by municipality, and those may be found here: <https://ag.umass.edu/agricultureresources/nutrient-management>

The purpose of this regulation is to protect our water resources from nutrient pollution while maintaining agricultural productivity. These same goals are echoed by many farmers in their nutrient management practices and the steps required to comply with these regulations will not seem burdensome to those who already have good nutrient management and record keeping practices in place. If you have not kept records of nutrient applications in the past, now is a good opportunity to start since these records will also help you make the most economical nutrient applications by comparing yield response to applications over time.

The Massachusetts Department of Agricultural Resources (MDAR) is responsible for enforcing these regulations and regulators have stated at public meetings that their efforts currently are focused on education, not

enforcement. Also, since Governor Baker instituted an Executive Order for Regulatory Review, all state regulations including this one are open for review therefore some changes may still occur.

A Nutrient Management Plan will need to be prepared for any farm making nutrient applications to 10 acres or more (the acreage does not need to be contiguous). If preparing a plan yourself, use the checklist following this article. Use links to websites from the checklist as options for preparing each portion. The mapping software available online is particularly helpful. Plans are the responsibility of the land manager, though they may be developed by a crop consultant. Farms with an NRCS 590 Conservation Plan are in compliance with this portion of the regulation. Plans are to be kept on-farm in case of an inspection by MDAR.

Setbacks from water resources, limitations on Fall and Winter applications, rules on field stacking of byproducts

(section 31.03 of the regulations), and record keeping are responsibilities of all farms regardless of size. While the Nutrient Management Plan is the responsibility of the

farm manager, records are the responsibility of the applicator.

Many of the requirements in this regulation are that farmers follow UMass Guidelines for Nutrient Management and testing. UMass Guidelines recommend use of the Modified Morgan extraction method for soil testing because this method has over 50 years of calibration and correlation data showing crop response to nutrient applications in the field. Labs with the Modified Morgan extraction method include: [UMass](#), [UMaine](#), [UVM](#), [UConn](#), [Dairy One](#) (Cornell) and [Spectrum Analytic](#). General UMass Guidelines for Nutrient Management in Vegetable Production may be found here: <https://ag.umass.edu/vegetable/resources-services/nutrient-management>.

When UMass does not offer any guidelines because local research is not available or we do not have the expertise, farmers should refer back to the regulations for guidance or contact one of the people below with any questions.

If you have any questions about UMass Guidelines for Nutrient Management, contact Katie Campbell-Nelson, UMass Extension Vegetable Program: 414-545-1051 or <mailto:kcampbel@umass.edu>

If you have any questions about the Plant Nutrient Regulations, contact Hotze Wijnja, MDAR Chemist, Crop & Pest Services: 617-626-1771 mail to: <mailto:Hotze.Wijnja@state.ma.us>

Nutrient Management Plan Checklist:

- Operator name and address
 - Location of all land under Plan (addresses or GPS coordinates)
 - Date the Plan was prepared or updated
 - Period of time the Plan covers (may be up to 3 years unless there is a change in management practice)
 - Name and contact information of the person responsible for the Plan development
 - Map or aerial photograph, which shall include: field boundaries, field names, field acreage, location of surface waters and public supply wells, and setbacks if present.
- Google Maps area calculator allows you to calculate field acreage easily: <https://www.daftlogic.com/projects-google-mapsarea-calculator-tool.htm>.
 - OLIVER: Mass GIS online mapping tool allows you to find and mark public water supplies, and Zone I's

on your land: http://maps.massgis.state.ma.us/map_ol/oliver.php

- Web Soil Survey allows you to map soil types on your land: <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
 - Current and/or planned crop and crop rotation for each field or management unit
 - Determination of nutrient needs for crop production based on test results, nutrient credits from preceding crops, UMass guidelines.
- Most recommendations for vegetable crops are available in the New England Vegetable Management Guide: <https://nevegetable.org/>. [*Editors Note: Fruit recommendations can be found in either [New England Tree Fruit Management Guide](#) or [New England Small Fruit Management Guide](#) or at the [UMassFruit.com](#) website*] It is not necessary to copy crop nutrient needs from this publication into your plan as long as a web link or hard copy of the book is being used.
 - Determination of whether a Nutrient Application Rate should be based on nitrogen or phosphorus as a limiting factor.
- High, above optimum or excessive phosphorus soils: Recommendations for fields with soils containing a high or excessive phosphorus level shall follow UMass Guidelines for high-phosphorus soils. Recommendations for nutrient application rates on high-phosphorus soils may be refined by conducting a risk assessment of phosphorus loss to surface waters, including the use of the Massachusetts NRCS Phosphorus Runoff Index or UMass recommended risk assessment procedures for high-phosphorus soils.
 - Inventory of agricultural byproducts and nutrient sources
 - Timing and amount and method of application for each field

Record Keeping Checklist:

- Soil test results and recommended nutrient application rates
- Quantities, analyses, and sources of plant nutrients applied
- Dates and methods of nutrient application
- Crops planted

(*Source: UMass Veg Notes, Vol. 28, No. 3, March 10, 2016*)

POLLINATOR CORNER

- ⇒ SARE Video on **Winter Hardy Bees** Project at: <http://www.nesare.org/Dig-Deeper/Pictures-Stories-and-Video/Video-vault/Winter-hardy-bees>.
- ⇒ SARE Video on **Enhancing Native Pollinator Floral Resources** Project at: <http://www.nesare.org/Dig-Deeper/Pictures-Stories-and-Video/Video-vault/Enhancing-native-pollinator-floral-resources>.
-

UPCOMING MEETINGS:

- March 1, 2016** - *FDA Food Safety Modernization Act (FSMA) Information Session* - CT, (snow date, March 2nd), 9:30 - 12 noon at the New Haven County Extension Center in North Haven, CT. Pre-registration is required. For more information contact Diane Wright Hirsch at 203-407-3163 or diane.hirsch@uconn.edu.
- March 1-4, 2016** - *North American Raspberry & Blackberry Conference*, Williamsburg, Virginia. All-day tour on March 2, educational sessions and trade show on March 3-4. For more information, visit www.raspberryblackberry.com.
- March 8, 2016** - *UConn Extension GAP (Good Agricultural Practices) School for Fruit & Vegetable Producers*, (snow date March 10th), two-day comprehensive course, second day is March 16th, pre-registration is required. For more information contact Diane Wright Hirsch at 203-407-3163 or diane.hirsch@uconn.edu.
- March 16, 2016** - *UConn Extension GAP (Good Agricultural Practices) School for Fruit & Vegetable Producers*, (snow date March 17th), two-day comprehensive course, pre-registration is required. For more information contact Diane Wright Hirsch at 203-407-3163 or diane.hirsch@uconn.edu.
- March 19, 2016** – *Apple Tree Grafting – a hands-on workshop*. 9am – 3pm. UMass Cold Spring Orchard. Cost \$100. For more information and to register go to: <https://ag.umass.edu/fruit/mass-aggie-seminars-2016>.
- March 19, 2016** – *Western Massachusetts Master Gardeners Upper Valley Symposium*, 8am – 2pm. Frontier Regional Highschool, South Deerfield MA. For more information go to: <http://wmmga.org/events/>.
- March 22, 2016** – *Network for Environmental and Weather Applications (NEWA) Fruit and Vegetable Growers Training*. 10am – noon. Litchfield County Extension Center, 843 University Drive, Torrington, CT 06790. To register, contact me at mary.concklin@uconn.edu or 860-486-6449. Pesticide credits have been requested.
- March 23, 2016** – *Network for Environmental and Weather Applications (NEWA) Fruit and Vegetable Growers Training*. 10am – noon. Middlesex County Extension Center, 1066 Saybrook Road, Haddam, CT 06438. To register, contact me at mary.concklin@uconn.edu or 860-486-6449. Pesticide credits have been requested.
- March 24, 2016** - *Network for Environmental and Weather Applications (NEWA) Fruit and Vegetable Growers Training*. 10am – noon. Tolland County Extension Center, 24 Hyde Avenue, Vernon, CT 06066. To register, contact me at mary.concklin@uconn.edu or 860-486-6449. Pesticide credits have been requested.
- March 29, 2016** - *FDA Food Safety Modernization Act (FSMA) Information Session* - CT, (snow date, March 2nd), 9:30 - 12 noon at the Litchfield County Extension Center in Torrington, CT. Pre-registration is required. For more information contact Diane Wright Hirsch at 203-407-3163 or diane.hirsch@uconn.edu.
- March 30, 2016** – *UConn Boom Sprayer Workshop*. 9:30am – 2:30pm. Scout Hall Youth Center, 28 Abbe Rd., East Windsor CT. \$25/person. For more information contact Candace Bartholomew at Candace.bartholomew@uconn.edu or 860-570-9011.

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.