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NUTRIENT MANAGEMENT REGULATIONS PENDING IN MASSACHUSETTS

Landscapers, turf practitioners, and agricultural producers in Massachusetts are advised to stay up to date with changing nutrient management requirements in the state.

In 2012 the Massachusetts Legislature passed Chapter 262 of the Acts of 2012, An Act Relative to the Regulation of Plant Nutrients. This new law directed the Massachusetts Department of Agriculture (MDAR) to develop regulations for fertilizer and nutrient management. **MDAR has completed proposed state-wide regulations which will be subject to public comment in the coming weeks.** Cape Cod, Martha's Vineyard and Nantucket retained the option to develop unique local regulations, and are currently at various stages in the process.

For current, detailed information in regard to the regulations, including information on upcoming public hearings, go to: http://ag.umass.edu/agriculture-resources/nutrient-best-management-practices

UMass Extension has reviewed, revised and expanded our technical information regarding the management of nutrients, fertilizers and soils. This information can accessed at the location listed above.

Strawberry Powdery Mildew: An Update

David Gadoury, Cornell University

The fungal pathogen that causes strawberry powdery mildew (*Podosphaera aphanis*) can survive on senescent green leaves of overwintering plants in perennial production systems, as cryptic infection on nursery stock deployed in annual or perennial production systems, and as small spherical fruiting structures called chasmothecia that normally function as overwintering structures.

Although *P. aphanis* occurs commonly throughout the range of strawberry production, chasmothecia are irregularly reported - particularly from relatively warm climates. Strawberry leaves with mildew colonies representing populations of *P. aphanis* were collected across a climatic temperature gradient of the continental U.S., Europe, and Australia (Fig. 1).

Extracted DNA was then subjected to a PCR-based assay to detect the MAT1-1 and MAT1-2 mating types. Isolates representing each mating type were detected among nearly all samples. In parallel work, temperatures above 60°F strongly suppressed ascocarp initiation when compatible isolates were paired on strawberry leaves. Absence of chasmothecia across the range of strawberry production does not appear to be due to the absence or unequal distribution of mating types of the pathogen, but to suppression of ascocarp initiation by high temperatures in warm climates, in glasshouses, or in high-tunnel production systems. Ascocarps can be expected to form rapidly in such environments if and when temperatures fall below 60°F.

In parallel studies, strawberry plants that had been allowed to enter dormancy, and were then forced to regrow in isolation chambers developed powdery mildew if senescent green leaves were left attached, but not if these leaves were removed before the plants were placed in isolation for regrowth. Thus, *P. aphanis* appears to survive on senescent green leave overwinter, but not within crown tissue.

In the absence of chasmothecia or colonies on senescent leaves, cryptic colonies on nursery plants remain a poorly understood source of infection, but one that could introduce the pathogen to new plantings.

Field plantings started from certified disease-free plants derived from tissue culture remained disease-free for one growing season in New York and Norway, despite the lack of any seasonal use of fungicides to protect the plants, while plants located approximately 100 to 300 m away developed mild to severe disease depending upon the initial level of powdery mildew in the planting (Fig. 2).

Exclusion of the pathogen at planting has a substantial impact on minimizing the risk of disease. The possibility of cryptic colonies of *P. aphanis* entering plantings through the nursery system should be further investigated (Fig. 3). Although the environment of high tunnel and glasshouse production is generally more favorable for development and spread of the pathogen, it may prove to be very unfavorable for production of chasmothecia if temperatures are maintained above the threshold for their initiation.

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Reprinted from: Proceedings 2014 Empire Producers EXPO, Syracuse, NY (***Source**: New York Berry News. Vol. 13, No. 2, March 2014*)

Fig.1. Isolates of *Podosphaera aphanis* were collected from 14 locations in 5 countries representing 3 continents for assessment of the distribution of mating types of the pathogen and potential for the formation of chasmothecia.

Fig. 2. Isolated strawberry plots started from certified mildew-free plants remained free of powdery mildew for one growing season without fungicidal protection.

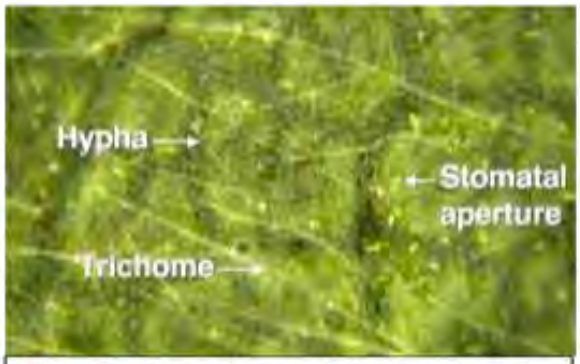


Fig. 3. Microscopic (50X) view of a cryptic non-sporulating colony of *P. aphanis* on the underside of a mature strawberry leaf that appeared otherwise disease-free.

Annual-bed System Strawberries at Kilpatrick Family Farm

Michael Kilpatrick, Kilpatrick Family Farm, Middle Granville, NY

Kilpatrick Family Farm is a mixed vegetable, fruit and poultry farm located in Middle Granville, NY zoned 4b. The majority of our sales are through a 200 member CSA as well as several farmers markets in Saratoga Springs and Glens Falls, NY. We also sell a limited amount if items wholesale through Co-ops, restaurants, and to other CSA's. The farm is approximately 500 acres of owned, rented and leased land. It consists of 40 tillable acres, 100

pasture acres, and the balance, woodlot and scrub. We plant between 12-14 acres of vegetables and fruit every year.

Because of our mixed retail opportunities it is imperative for us to have a wide diversity of crops year-round. Strawberries provide this diversity through our June sales of fresh strawberries and then winter sales of frozen strawberries.

We chose using the annual bed system over matted rows for several reasons:

1. Reduced disease pressure because of the open nature of the plant and relative short lifespan of the crop.

2. Chandler, the variety that we use for this system, has flavorful large berries and an open plant habit, which allows easy identification and harvesting of ripe fruit.

3. Quick turnover of the crop. The fall planting and next spring harvest allows the crop to be in and out of the field relatively quickly, allowing additional cash crops, or cover crops, on that land in the same year.

4. Relatively low labor is required for this system There is none of the runner and flower pruning that is normally associated with matted row system.

5. Because of the short time frame of this crop, perennial weeds are easily controlled mechanically.

The basics of this system are as follows:

First week of August-tips are purchased and propagated in the greenhouse. They are started in 50 cell trays and misted for 30 seconds every 15 minutes for the first week, reducing the frequency every week as they establish in the cells. We also treat them with micronutrients and root shield for increased vigor.

First to second week of September-Ground is prepped, compost and soil amendments are spread, and then raised plastic beds are made. The plants are then set in 3 staggered rows, 12”x12” apart. Beds are mulched between using our Teagle bale chopper.

Middle to end of November-plants are row-covered for the winter. Strawberry plants are highly desirable to deer so we use Typar 518 row-cover, which the deer can’t paw through. At this time we also place bait stations filled with Agrid3 for vole control under the cover.

End of March-as soon as the snow melts we remove row-cover, check plant health and add 5-10 lbs of nitrogen per acre. Row-cover is then reapplied. We will also do leaf analysis and then add any needed amendments based on recommendations.

End of April-We start checking for blossoms; as soon as 10% of the plants are blossoming we will remove row-cover for good, applying again only for nights that could potentially frost. We also start a consistent irrigation schedule at this time, aiming for at least 1” of water per week.

End of May-We typically begin harvesting berries the last week of May. At this time we will apply bird netting over the entire field to keep cedar waxwings and robins out of the field. The netting is only removed during harvest.

End of June-The last week of berry picking we invite our CSA members for a U-Pick event on the farm, cleaning out the field. As soon as this is done, the netting is rolled up, any irrigation pipe is removed and the section is tilled under. Several weeks later, after crop residue is broken down, we plant the next crop.

Our berries are marketed through our Farmer’s markets, CSA and wholesale accounts. We also freeze any extra we may have for winter sales. Our prices are usually $5 a pint, 2 for $9, or $40 for a flat of 12. Wholesale prices usually work out to be around $30-36 a flat.

We have been very happy with our success with the annual bed system. It supplies us a consistent supply of beautiful, flavorful berries starting at least a week before conventionally grown matted row berries start producing. Our yields are usually averaging 12-16,000 lbs per acre or between $50-70 K per acre gross. (***Source**: 2013 NEVFConference proceedings*).

RASPBERRIES/BLACKBERRIES

Growing Brambles in High Tunnels

Marvin Pritts, Cornell Extension

Raspberries and blackberries rank among the high-value crops such as tomatoes, cucumbers and greens that have been successfully grown in high tunnels in northern climates. High tunnels are known to protect plants from cold temperatures, but with very perishable and sensitive berry crops, high tunnels also provide protection against wind, rain and dew. The quality of berries from tunnels far exceeds that from the open field, and yield differences can be dramatic. For example, blackberries have a difficult time surviving winters in the open. In high tunnels, however, survival can be 100% and yields can approach 40,000 lbs per planted acre. With fall raspberries, the season can be extended from 4 weeks to 10 weeks or longer, with yields exceeding those of the open field by several-fold. Economic analyses indicate that all start-up costs can be paid for after 5 years, which is remarkable for an agricultural enterprise.

In our experience, the bramble crops most responsive to high tunnels are summer blackberries, fall red raspberries, and fall blackberries. Benefits accrue to summer red raspberries and black raspberries as well, but the differences between open field and tunnels are smaller. New cultivars of fall-fruiting blackberries adapted to high tunnels in the Northeast are just now being developed, so there are not yet any that are suitable at this time. Therefore, the presentation will only consider summer blackberries and fall raspberries.

The tunnel environment favors high fruit quality, fewer diseases and better plant growth resulting in higher yields. But the main purpose of the tunnel is different for the two types. For blackberries, the tunnel allows the plants to overwinter in our harsh climate where they otherwise would die or be significantly damaged. For this reason, the tunnel has to be "four-seasons" and able to withstand snow loads in winter. This requires more durable construction. For fall raspberries, the main purpose is to extend the harvest season into fall. After the last harvest, the plastic can be removed (it is even desirable to do so). Since the tunnel will not have to withstand a snow load, a less durable tunnel is required. Regardless, the tunnels must accommodate growth that exceeds that which is observed in the field. Therefore, wide (30 ft) and tall (14 ft or higher with 4 ft sidewalls) tunnels are best.

Many detailsare involved with the construction, planting, training, harvest and pest management of tunneled brambles. Readers are encouraged to download our 50-page publication http://fruit.cornell.edu/berry/production/pdfs/hightunnelsrasp2012.pdf entitled "High Tunnel raspberries and Blackberries" for those details. (***Source**: 2013 NEVFConference proceedings*)

BLUEBERRY

Control of Winter Moth Damage in New England Blueberries

Sonia Schloemann and Robert Childs, UMass Extension

Winter Moth (*Operophtera brumata*): This is a new and important pest of blueberries and other deciduous plants, especially in Southeastern New England. They can severely defoliate bushes. Moths emerge from the soil usually in late November and may be active into January. The male moths are light brown to tan in color and all four wings are fringed with small elongate scales that give the hind margins a hairy or fringed appearance. The female is gray, almost wingless (brachypterous) and, therefore, cannot fly. Females are usually found at the base of trees or scurrying up tree trunks. Winter moth caterpillars are pale green caterpillars with a white longitudinal stripe running down both sides of the body. They are "loopers" or "inchworms" and have just 2 pairs of prolegs. At maturity, the caterpillars will be approximately one inch long, whereupon they drop to the soil for pupation. Pupation occurs from late May into early June. Winter moth caterpillars are often found in association with both the fall and spring cankerworms, which look and have similar feeding patterns to the winter moth caterpillar.

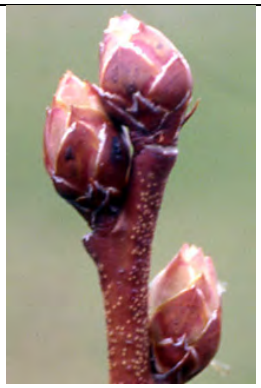
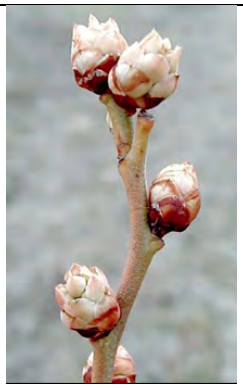
Life Cycle: After mating, the female deposits eggs loosely in bark crevices, under bark scales, under lichen, or elsewhere. The adult moths then die and the eggs over-winter. Eggs are dark-colored at first but turn orange within 3-4 weeks. In March, just prior to hatching, they turn red and eventually a deep, shiny blue just prior to hatching. Eggs hatch when temperatures average around 55°F. It is believed that egg hatch in Massachusetts occurs when 20 Growing Degree Days (base 50) have accumulated, which is historically during the second week in April but earlier if temperatures are atypically warmer, depending. This means that egg hatch occurs just at or right before bud break of most of the host plants. After hatching, the larvae wriggle between bud scales of newly swelling buds of such hosts as: maples, oaks, ash, apples, crabapples, blueberry, cherries, etc. and begin feeding.

Damage: Caterpillars feed within both flower and foliar buds. Once a bud has been devoured from within, the caterpillar will migrate to other buds and repeat the process. Destruction of the flower buds leads to greatly diminished harvest on fruit crops. Older larvae feed in

expanding leaf clusters and are capable of defoliating trees and other plants, when abundant.

Management: A dormant oil spray to the trunks and branches of bushes may be helpful to kill the overwintering eggs before they hatch. However, some eggs are under bark flaps and loose lichen and may be protected from oil sprays. Caterpillars may also invade host plants by ballooning onto them after treatment has been applied. Several insecticides are labeled for use against either Winter Moth or Spanworm or both and are outlined in the table below.

Additional information can also be found at: http://extension.umass.edu/landscape/fact-sheets/winter-moth-overview

Blueberry Bud Stage ***Image and Description Source***: *Michigan State University Blueberry Facts website*.		
		
Dormant **Description:** No visible swelling of the fruit buds. Bud scales tightly closed. No visible signs of growth.	**Bud Swell** **Description:** First sign of growth as plant growth begins in the spring. Visible swelling of the flower buds; outer bud scales begin to separate at the tip revealing paler interior bud scales. This bud stage can usually tolerate cold temperatures of 10 - 15°F.	**Budbreak** **Description:** Flower buds open and the individual flowers can be seen between the bud scales. Can tolerate cold temperatures of about 20°F.
Recommendation for Controlling Winter Moth or Spanworm		
Dormant oil, 2-2.5% **plus** Esteem 35WP, 5 oz/A **or** Confirm 2F, 16 oz /A **or** Asana XL, 4.8-9.6 oz/A	Dormant oil, 2-2.5% **plus** Confirm 2F, 16 oz/A **or** Delegate 3-7 oz/A **or** Assail 70WP, 1.9-2.3 oz/A **or** Asana XL, 4.8-9.6 oz/A **or** Esteem 35WP, 5 oz/A	NO OIL AFTER BUDSWELL Confirm 2F, 16 oz **or** Delegate 3-7 oz/A **or** Asana XL, 4.8-9.6 oz **or** Esteem 35WP, 5 oz

Where brand names for chemicals are used, it is for the reader's information. No endorsement is implied, nor is discrimination intended against products with similar ingredients. Please consult pesticide product labels for rates, application instructions and safety precautions. Users of these products assume all associated risks.

Review Some Of The Newer Materials And Label Changes In Blueberries Found In The 2014 Michigan Fruit Management Guide.

Eric Hanson, and Bernie Zandstra, Michigan State University Extension

Several new herbicides have been labeled on blueberries in the last few years. This is great news because more choices are available, but it also takes time to learn about new products and understand how they are best used. Changes are updated each year in the Michigan State University Extension Bulletin E-154 "Fruit Management Guide," so consult this publication for details. Below is a review of some of the newer materials and label changes for 2014.

New for 2014

Zeus XC (sulfentrazone) is labeled for blueberries that have been in the field for three years or longer. Zeus is a preemergent herbicide that should be applied before weeds emerge in the spring or tank-mixed with a post-emergent herbicide such as Gramoxone or Aim. Apply 8-12 fluid ounces per acre and no more than 12 ounces per acre during any 12 month period. Do not apply after petal fall unless a shielded sprayer is used.

Zeus controls selected broadleaf weeds and grasses as well as sedges. Some common blueberry weeds that are controlled by Zeus include most annual grasses, several pigweeds, smartweeds, black nightshade and yellow nutsedge. Weed control may be reduced in soils with very low pH or high contents of organic matter and clay. Best control is achieved if 0.5 inches of rain or irrigation is received after application. Pre-harvest interval (PHI) is three days.

Surflan XL 2G is a new formulation of the old herbicide oryzalin that is labeled for use on **non-bearing** blueberries. It will likely have limited value in blueberries because few growers have appropriate equipment to accurately spread granular products. Surflan XL is not degraded by sunlight as quickly as older oryzalin formulations, so it is not as critical to incorporate the product with irrigation soon after application. However, rain or irrigation is still needed to activate the product. Oryzalin only controls weeds as they germinate and has no effect on emerged weeds or established perennials. It controls most annual grasses and a few annual broadleaves.

Trellis (isoxaben) is labeled for **non-bearing** blueberries only and replaces the older isoxaben product, Gallery. Trellis will be most useful in new plantings for control of annual broadleaf weeds such as common lambsquarters, ragweed, black nightshade and smartweed. It does not control grasses.

Apply Trellis at 0.7 to 1.3 pounds per acre before weeds emerge. Trellis does not control established perennials or any emerged weeds. If applied after planting, wait until the soil is settled by rain or irrigation. Maximum annual rate is 1.3 pounds. Wait 60 days between applications.

Labeled in the last few years

Chateau has been labeled on blueberries for a few years and the PHI was shortened to **seven days** last year. Chateau controls many broadleaf and grass weeds, including chickweeds, dandelion, common groundsel, lambsquarters, eastern black nightshade, several pigweeds, ragweed and most annual grasses. Chateau also provides some burndown of small weeds if combined with surfactant or crop oil concentrate (COC). Apply 6 to 12 ounces of product per acre to bushes that have been in the field for two years or more.

Sandea provides preemergent and post-emergent control of many broadleaf weeds such as pigweed, ragweed, smartweed and even yellow nutsedge. Treat nutsedge when three to five leaves are present. Two applications with non-ionic surfactant are most effective. The second application may need to be after harvest. Rates are 0.5 to 1 ounce per acre and no more than 2 ounces per year. Do not use on 'Elliott' bushes less than three years in the field. PHI is 14 days.

Dual Magnum is another effective herbicide on nutsedge, but has a 28-day PHI. Use only on bushes established at least one year. Use 0.67 pints on young bushes on sandy soils and 1.33 pints on large bushes on heavier soils. Only one application is allowed per season.

Stinger is a preemergent and post-emergent herbicide that is strong on weeds in the composite and legume families, such as thistle, asters, dandelion, goldenrod, ragweed, clovers and wild bean or groundnut. It also controls nightshades, smartweeds, wild buckwheat and plantain. Stinger has some odd timing restrictions (see chart). Stinger is a growth regulator type herbicide and is most effective when weeds are up and growing. Rates are 2.6 to 5.3 fluid ounces per acre and not more than 10.6 ounces per season.

Matrix controls a broad spectrum of annual grasses and broadleaf weeds. Do not use Matrix on sandy soils or on bushes less than a year in the field. Apply 4 ounces per acre once per year with non-ionic surfactant. Avoid contact with growing shoots and leaves. This product has the same mode of action as Sandea, so don't use these products together or sequentially. PHI is 21 days.

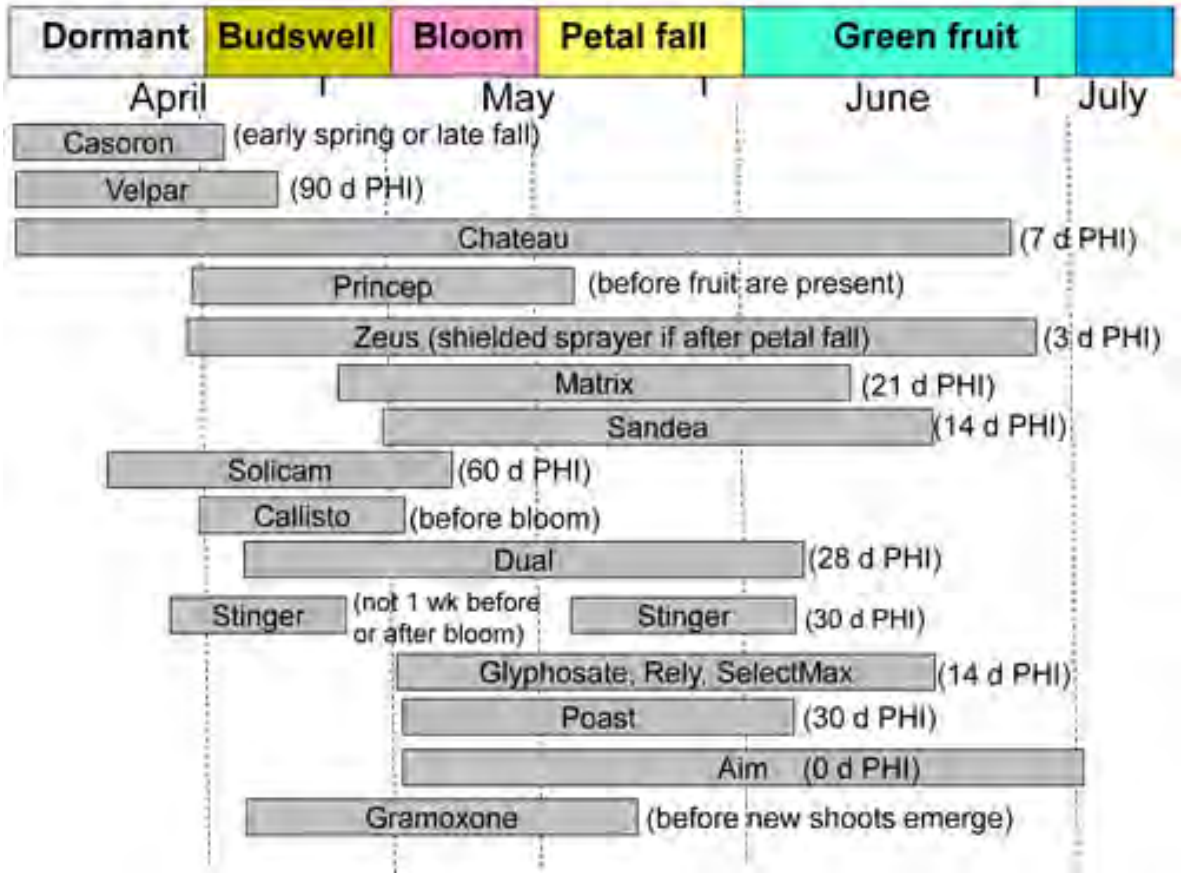
Devrinol XT is a new formulation that protects the chemical from photo-breakdown, so it provides longer control than the older product. Devrinol is safe on new plants and provides good control of annual grasses and some broadleaves if applied to a clean soil surface before

weeds germinate. Apply 2 gallons per acre. Do not repeat in the same growing season.

Application timing

Most herbicide labels include specific application times. Some are less specific. Best timings for weed control and PHI vary and are not always specified. The following table was developed to help describe when herbicides should be applied.

Herbicides kill weeds by disrupting specific plant processes and they are classified based on these modes of action. If herbicides with the same mode of action are used repeatedly, resistant weed populations may develop. The table below groups the common blueberry herbicides by their modes of action. To avoid resistance, rotate between or use combinations with different modes.



Modes of action of blueberry herbicides.

Herbicide	Mode of action
Karmex, Princep, Sinbar, Velpar	Inhibit photosystem II
Casoron, Trellis	Inhibit cellulose synthesis
Sandea, Matrix	ALS inhibitor
Solicam	Disrupt carotenoid synthesis
Stinger	Synthetic Auxin growth regulator
Surflan	Inhibit microtubules (cell division)
Devrinol, Dual Magnum, Kerb	Inhibit VLCFAs (cell division)
Callisto	HPPD inhibitor (pigments)
Aim, Chateau, Zeus	PPO inhibitor (disrupts membranes)
Poast, SelectMax	Lipid synthesis inhibitors
Gramoxone	Photosystem I electron diverters

(***Source***: *Michigan Fruit Crop Team Alert, March 18, 2014*)

Managing Black Rot

Tim Weigle, Cornell University

Black rot (*Guignardia bidwellii (Ellis)*) is a potentially devastating fungal disease that can infect the leaves, shoots, berries and cluster stems of grapes. Susceptibility to black rot varies greatly by variety, but it can be a concern whether the grape is an American, French Hybrid or *vinifera* variety. Black rot is considered to be the bane of organic grape growers due to the limited materials that are available for its control as well as the devastating crop losses that can occur due to berry infections. Complete crop loss can occur in warm, humid climates like those of the eastern United States, but black rot is rarely found in arid growing regions.

Figure 1. Various stages of black rot infection on berries. Photo by Tim Weigle.

Impact on clusters. Grape growers often find black rot to be an insidious disease: the grape clusters will appear to be developing normally until suddenly —as late as mid-summer — the fruit will start to turn brown, then black, with numerous round, black spheres called *pycnidia* on the surface. The grape berry will eventually shrivel up into a hard, raisin-like mass called a mummy. The pycnidia on the mummy's surface contain inoculum, or spores, that will overwinter and be available to infect the grape crop the following year.

Figure 2. Black rot Leaf lesion with black spore-containing pycnidia, Photo by Tim Weigle.

Overwintering inoculum and weather and the disease cycle. The amount of overwintering inoculum and the current season's weather conditions are the key factors affecting the level of black rot found in a vineyard. Black rot inoculum can overwinter within cane lesions and the mummified fruit. In the spring, when the combination of temperature, precipitation and leaf wetness are favorable, the pycnidia on the mummies explosively propel their spores into the air, where they can land on susceptible grape tissue. No infection by black rot occurs when temperatures are below 45°F. At 50°F it takes 24 hours of leaf wetness to provide the conditions necessary for a black rot spore to germinate and infect the green tissue of grapes.

Leaf lesions. The earliest, most recognizable indicator of black rot infections are the leaf lesions. These appear as circular, tan lesions that have a darker margin. Within these lesions are small black spheres, or *pycnidia*, which are containers for spores that can continue to infect the current year's crop. While there can be many causes of tan lesions on grape leaves, only black rot lesions will have the black pycnidia within the tan field.

Timing and environmental conditions for infections. The ideal conditions for black rot infection are temperatures between 70°F to 80°F, when it takes only six to seven hours of leaf wetness for infection to occur. The availability of primary inoculum peaks around bloom and drops off dramatically post bloom. It is at this time that spores from the present season's leaf infections become important because they can mature and produce secondary infections. Over the growing season berries become resistant to black rot infections. Concord is one of the first to become resistant at about four to five weeks after bloom. *V. vinifera* varieties are the latest to obtain resistance, about five to six weeks after bloom.

Sanitation. While there are a number of fungicides available for management of black rot, the importance of sanitation cannot be overemphasized. Sanitation plays a huge part in limiting the amount of black rot inoculum found in a vineyard. Removal of infected canes through pruning during the dormant season will reduce the level of overwintering inoculum. However, the largest reservoir of inoculum is typically found in the mummies. Mummies can be found either on the vineyard floor or retained in the canopy attached to old cluster stems. Removal of mummies from the canopy is critical: research has shown that these mummies provide inoculum much later into the season than those that have fallen to the vineyard floor. If

mummies cannot be removed from the vineyard, the next best option is to make sure that all mummies are dropped to the vineyard floor to reduce the length of time spores will be available in the coming year. In a small planting, removal of infected fruit as it is discovered during the growing season is an excellent way to limit the amount of inoculum. Any mummies not removed from the vineyard during the dormant season should be, at a minimum, dropped to the ground where they can be covered with a dirt berm or cultivation, which effectively buries many of the mummies and limits the number of spores available for infection.

Spray timing. Even the best sanitation practices will leave low levels of inoculum in the vineyard, and this is all it takes for black rot to get a foothold. Using fungicides that are effective in managing black rot is critical, as is the correct timing of the applications. The most effective spray programs will target the overwintered inoculum to limit the number of primary infections in the beginning of the year. If primary infections occur, they can produce and release spores about two weeks after the initial infection, resulting in the continued spread of black rot through secondary infections. As spore production peaks just prior to the bloom period, it has been shown that the period just before bloom through two weeks after bloom is the most important time period to protect against black rot. However, the threat will change yearly depending on the level of black rot in the vineyard the previous year and the current season's weather conditions, as these factors can result in the need to add an earlier season spray or an additional fungicide application after bloom. The Spots chart, a model for determining the weather conditions necessary for black rot infection periods to occur, can be found on the Network for Environment and Weather Applications (NEWA) website at http://newa.cornell.edu by using the grape forecast models in the Pest Forecasts drop down menu.

For more information on black rot, see Integrated Pest Management Disease Identification Sheet #102 : Black Rot , by Cornell's grape pathologist Wayne Wilcox. (***Source**: Appelation Cornell, Issue 17, March 2014*)

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

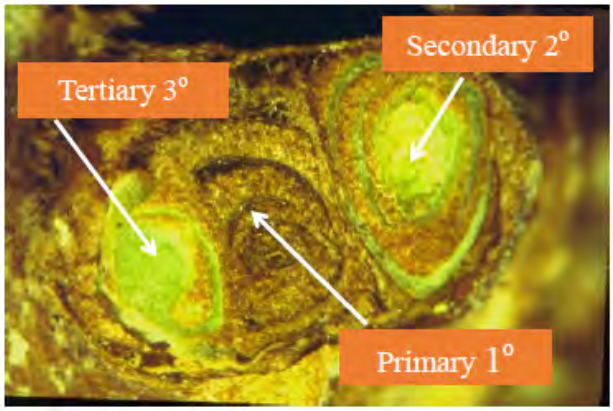


Figure 2. Primary, Secondary and Tertiary buds (Primary = dead; Secondary, Tertiary = alive)

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.

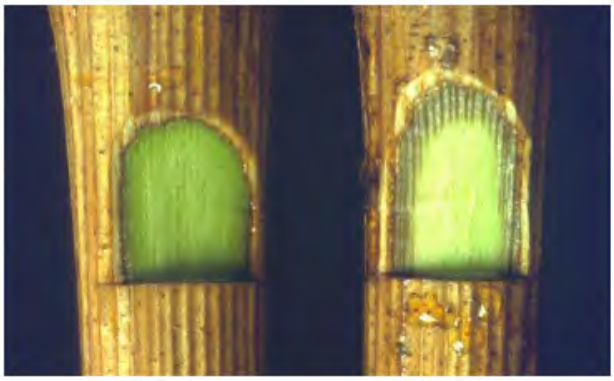


Figure 3. Damage to tissue inside cane

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*)

SPECIALTY CROPS

Currant Production in The Northeasten US: Is this the Beginning of the End?

Kerik Cox, Cornell University

History of White Pine Blister Rust in NY

White pine blister rust (WPBR), caused by the fungus *Cronartium ribicola*, is a disease of white pine that greatly impacted the white pine industry in the United States. Like other macrocyclic rust diseases (cedar apple rust, wheat stem rust), WPBR needs two hosts in order to complete its life cycle. The hosts in the life cycle of WPBR are pine and members of the Ribes genus (currants, gooseberries, etc.). The most common strategy for eliminating this type of rust disease is to eradicate one of the two hosts.

In the case of WPBR, it was decided that the Pine industry was more valuable than Ribes production, and as early as April 1917, Ribes quarantine and eradication legislation was beginning to be put into effect. From 1961 to 1967, there was a more extensive Ribes eradication effort in the US (2, 6). This effort was quite successful in the eastern United States to the point where it was believed that wild Ribes posed little danger to the pine industry (2).

Eventually, the federal ban on currant production was removed due to the development of rust resistant pines (1, 3). However, individual states still impose severe regulations or bans on currant production. Despite the availability of new scientific data and management practices to mitigate dangers to the pine industry, no revisions to state restrictions on were made for some time (2). In New York, planting restrictions on currant production were first discussed in 1998 (7, 8) and restrictions were slightly revised recently in 2003. Rust resistant and immune Ribes varieties do exist, but are often less horticulturally desirable than highly susceptible black currant varieties such as Ben Alder (1). Because of these varietal concerns, the New York State Department of Environmental Conservation has established both currant fruiting and currant quarantine districts (www.dec.state.ny.us/website/regs/part192.html) to allow some currant production in New York.

Currants produce extremely high levels of antioxidants and vitamin C (4, 5), and are becoming increasingly popular according to a report from the New York Farm Viability Institute (10) (http://www.nyfarmviability.org/press-07-26-06.htm). Previously, the crop profile for currants in New York State in 2000 (www.ipmcenters.org/cropprofiles/docs/nycurrants.html) listed total bearing acreage for currants as approximately 9 acres (9).

Currently, growers such as Greg Quinn of the Currant Company LLC (http://www.thecurrantcompany.com/) and Curt Rhodes of R.H. Rhodes and Sons Inc. are reported to have more than 20 Acres each planted to black currants (9, 10), and are continually expanding.

Breakdown of White Pine Blister Rust Immunity in Ribes in New England

Despite the fact that only white pine blister rust (WPBR) resistant cultivars can be legally planted in NY and the fruit pathology extension program has been promoting integrated pest management (IPM) programs developed based on research at the New York Agricultural Experiment Station NYSAES. Since source of WPBR resistance it's monogenic, it's only a matter of time before a virulent strain is selected that overcomes the resistance. I was alerted to the problem to a breakdown of WPBR immunity as early as 2010 in Preston CT at a farm that produced Christmas trees and currants in neighboring fields. My program subsequently conducted a series of molecular characterization and pathogenicity studies using the field and greenhouse facilities of the NYSAES to prove the pathogenicity of the CT strain on certified immune breeding stock in controlled conditions (11).

Not unlike the NY small fruit stakeholders, New England stakeholders were also interested in capitalizing on Ribes the specialty small fruit niche market. However, the white pine industry is incredibly important in the New England states and concerns over our research findings in CT have generated a lot of caution regarding planting restrictions of Ribes on the part of regulatory agencies at the Federal and State level.

Soon after publication of the occurrence in RI, we were contacted in 2012 by the US forest service to examine some samples from Ribes operations in NH. We made some initial confirmation of WPBR on immune currant

varieties, and members of the Canadian Forest Service performed pathogenicity tests in controlled conditions. We subsequently joined with members of the US forest service, the NH Division of Forests and Lands, and the Canadian Forest Service to form a regional/international taskforce to assess the breakdown of WPBR immunity in Ribes and assess the threat to the white pine industry. We applied and received federal funding to investigate the phenomena in NH in 2103. Our combined research efforts have resulted in the realization that the immunity has broken down in several commercially-popular resistant Ribes cultivars throughout the state of NH. In 2013, we surveyed 42 Ribes production operations, and using molecular markers confirmed WBPR infection on immune and resistant Ribesvarieties at 30 of the locations. Cultivars affected included: 'Titania' 'Jonkheer Van Tets', 'Clark' gooseberry, 'Blanca', 'Jahn's Prairie' gooseberry, 'Consort', Jostaberry, 'Randall Red', and 'Coronet'.

To date, the major NY Ribes producers, which I visit regularly during my extension travel, don't seem to have the virulent strain of WPBR that breaks resistance. I have never seen any WPBR on commercial Ribes plantings in NY, but the strain could be or could have been present at one time. Most of the Ribes growers in NY implement a robust integrated pest management program for diseases that includes site-specific fungicides. By implementing management programs as part of their standard production practices, NY growers appear to have eliminated emerging virulent strains able to overcome the immunity in commercial Ribes cultivars.

Practical Epidemiology of White Pine Blister Rust

Understanding the life cycle and the epidemiology of WPBR and the two hosts needed for its survival is important to develop effective management practices for controlling the disease. Several important considerations for the protection of the two hosts and management of the disease are listed below:

•Temperatures over 85ºF in the summer months can suppress infection of Ribes leaves preventing the further spread and development of the disease. Along these lines, WPBR infections require cool temperatures in the range of 60-70 ºF, which is why many of the secondary infection are not present until the late summer months when the plants are beginning to undergo senescence. Continuous moisture for 14 days is need for the development of telial horns, which produce the basidiospores that establish infections of pine.

•Pines are typically planted in planting zones 1 and 4. The conditions that favor the infection of young pines in the fall are most likely to occur in zone 4. Therefore it is fairly safe to establish Ribes plantings in zone 1, even if there are pines in the region.

•The basidiospores produced from infected Ribes leaves in the fall are typically deposited within 1000 ft of the Ribes host. Hence it's important to have a minimum border of 1000 ft. between Ribes planting and pines. Such borders may not be possible in the New England states where pines are fairly pervasive.

•The majority of infections (>95%) on pines take place small branches produced on the lower 10 feet of the trunk. Infections that occur more than 1ft from the trunk will usually not progress to the trunk and kill the tree.

White Pine Blister Rust Management Trials in Geneva

Now that currants are a mainstay of the NY small fruit industry and WPBR has overcome immune varieties in New England states, we should continue a proactive management plan to preserve the longevity of both hosts. For over seven years, the Geneva experiment station has conducted WPBR management trials on currants and gooseberries across a range of cultivar susceptibility to WPBR. Early work focused on conventional pesticide programs and timing while more recent work focused on the management potential of organic and biopesticide programs. A bulleted results summary of our trials follows:

Highly rust susceptible currant varieties:

• Can be successfully managed using 4-5 applications of DMI or QoI fungicides. Rally 40WSP (DMI) is one of the few fungicides that is labeled for WPBR, and it's one of the best. The fungicides Pristine and Cabrio EG are also exceptionally effective against WPBR, but are no longer labeled for the disease in NY.

• Can be managed to low level of infection using a 4-5 application program biopesticides and organic fungicides including materials such as JMS Organic Stylet oil (check current labels).

Rust resistant to less susceptible currant and gooseberry varieties:

• Can be rust free using a 4-application program of DMI or QoI fungicides (Rally 40WSP - see above).

• Can be rust free using a 4-5 application program biopesticides and organic fungicides including materials such as JMS Organic Stylet oil (check current labels).

Several other site-specific, biopesticides, and organic fungicides work really well, and are labeled on the crop, but are not labeled for WPBR.

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(***Source**: New York Berry News. Vol. 13, No. 2, March 2014*)

GENERAL INFORMATION

EPA Proposes New Safety Measures to Protect Farm Workers from Pesticide Exposure

EPA Press Release

Today, the U.S. Environmental Protection Agency (EPA) announced proposed revisions to the Worker Protection Standard in order to protect the nation's two millionfarm workers and their families from pesticide exposure.

"Today marks an important milestone for the farm workers who plant, tend, and harvest the food that we put on our tables each day," said Gina McCarthy, EPA Administrator. "EPA's revised Worker Protection

Standard will afford farm workers similar health protections to those already enjoyed by workers in other jobs. Protecting our nation's farm workers from pesticide exposure is at the core of EPA's work to ensure environmental justice."

EPA is proposing significant improvements to worker training regarding the safe usage of pesticides, including how to prevent and effectively treat pesticide exposure. Increased training and signage will inform farm workers about the protections they are afforded underthe law and will help them protect themselves and their families from pesticide exposure.

Workers and others near treated fields will now be protected from pesticide overspray and fumes. In addition, EPA has proposed that children under 16 be legally barred from handling all pesticides, with an exemption for family farms. These revisions protect workers while ensuring agricultural productivity and preserving the traditions of family farms.

This proposal represents more than a decade of extensive stakeholder input by federal and state partners and from across the agricultural community including farm workers, farmers, and industry on the current EPA Worker Protection Standard (WPS) for Agricultural Pesticides first established in 1992. For more information on the EPA's Proposed Worker Protection Standard: http://www.epa.gov/oppfead1/safety/workers/proposed/index.html . (***Source**: New York Berry News. Vol. 13, No. 3. March 2014*)

New Food Safety Decision Tool for Growers

Nicole Sanchez, NC Cooperative Extension

Identifying and controlling food safety risks is a complicated undertaking. There are a lot of tools out there that outline the risks, but few help growers prioritize the risks in terms of what to address first, and how to do so. In addition, a written food safety plan is becoming a "must" for produce growers, regardless their desire for GAPS or other certification. More and more buyers, such as restaurants and small grocers, are requiring written food safety plans. Because of the uniqueness of each farm and its combination of geography and crops, there is no "one size fits all "food safety plan that can be used widely by a wide range of growers.

Given these challenges, partners at University of TN, Cornell University, and NCSU have been working to develop a decision-making tool to help growers 1) understand the risks; 2) prioritize which risks are the

most important to address; and 3) begin to develop a written farm food safety plan. The new tool, now in beta testing, has several components.

First is a checklist of potential food safety risks, divided into categories such as worker health and hygiene, agricultural water for production, soil amendments, land use, and so on. As a grower moves through the checklist, answers in shaded boxes represent items that need attention or action.

A set of "decision trees," similar to flowcharts, corresponds to each of the categories in the checklist. Growers can use these decision trees to figure out where potential problems are and what to do about them. The recommended actions correspond to regulations in the Food Safety Modernization Act as it is currently written (some sections of this law are currently being reviewed and rewritten).

The tool also includes overviews of each of the sections, samples of standard operating procedures (SOP's), recordkeeping logs, and template language for written food safety plans. All are designed to aid the grower in developing a written plan with language and content that will correspond to the new regulations, while remaining unique to that farm.

If you are interested in using this new tool to help you assess your food safety risks on your farm or to aid you in writing a food safety plan you can access information at the following links:

http://www.gaps.cornell.edu/documents/decision_trees/Decision%20Tree%20Checklist.pdf

www.gaps.cornell.edu/tree.html

(***Source**: The North Carolina Strawberry Grower, Vol 21, No. 2, March 2014*)

Tim and Nate Nourse of Nourse Farms Receive NARBA's 2014 Distinguished Service Award

At its annual meeting on January 27, 2014, the North American Raspberry & Blackberry Association (NARBA) presented Nate and Tim Nourse of Nourse Farms, Inc., with its 2014 Distinguished Service Award. Nourse Farms, based Massachusetts, is a leading nursery supplier of berry plants to the industry.

The award especially honors their leadership in developing the Association's North American Bramble Growers Research Foundation's Nursery Contribution program and their strong support of this program, which since its inception in 2007 has more than doubled the funds available to the Foundation for making grants to research. Nate Nourse, who was there to receive the award, served as NARBA president in 2010 and 2011; both Nate and his father, Tim Nourse, have held many positions of leadership within the berry industry.

Making the award was grower Nathan Milburn of Milburn Orchards, Elkton, Maryland, and 2012-2013 president of NARBA. Said Milburn, "Most of us know Nourse Farms as a leading supplier of plants to the berry industry, but we recognize here the father and son Tim and Nate Nourse, for their contributions specifically to the North American Raspberry & Blackberry Association and the raspberry and blackberry industry....Their commitment to our industry and support of our organization are unrivaled." NARBA is a membership organization of blackberry/raspberry growers, researchers, and others with members in more than 35 states, 8 Canadian provinces, and 5 countries. NARBA's 2014 annual meeting and conference were held in Hershey, Pennsylvania, in association with the Mid-Atlantic Fruit and Vegetable Convention.

For more information about NARBA, visit www.raspberryblackberry.com. A list of previous winners of this Distinguished Service award may be found at www.raspberryblackberry.com/local.cfm?doc=webdocs/NARBAAwards.htm .

Award Presentation

"Most of us know Nourse Farms as a leading supplier of plants to the berry industry, but we recognize here the father and son Tim and Nate Nourse, for their contributions specifically to the North American Raspberry & Blackberry Association and the raspberry and blackberry industry.

Nate Nourse was Region 2 Representative on the NARBA Executive Council, our board of directors, from 2006 through 2010. He served as Vice President in 2009 and as President in 2010 and 2011. He is also a Trustee of our associated North American Bramble

Growers Research Foundation. He serves as Production Committee chair for National Berry Crops Initiative (representing the New England Berry Growers Association). As a grower, and in this leadership role, he has become very active in seeking to find short-term and long-term solutions to SWD for growers, by urging research and regulatory relief to increase the control options available to growers. (***Source**: New York Berry News, Vol. 12 No. 11. February 2014*).

UPCOMING MEETINGS:

March 22, 2014 – *SEMAP Ag and Food Conference.* GNB Voc Tech Hich School, 1121 Ashley Blvd., New Bedford MA. For more information and to register, go to: http://events.r20.constantcontact.com/register/event?oeidk=a07e8nej2rff911f897&llr=jp7zj6bab

March 22, 2014 – *MOFGA Spring Growth Conference.* Unity Maine. Every year at Spring Growth we focus on one topic and dive deeply into it with a day-long program of speakers and workshops. This year the topic is **weed control** – a perennial favorite. We will have a keynote speaker, as well as workshops and discussions on how best to control weeds throughout the season.For more information or to register go to: http://www.mofga.org/Events/SpringGrowthConference/tabid/190/Default.aspx.

March 31, 2014 – *Massachusetts Farm Winery and Growers Association/UMass Twilight Meeting.* 5:00 – 7:30. Willow Spring Vineyard, 840 West Lowell Ave, Haverhill, MA. This meeting will feature a presentation by Jeanette Smith of VineSmith on Planning a Custom Spray Program for Your Vineyard". One pesticide recertification credit is available for attending this meeting. For more information or to register, go to: http://events.r20.constantcontact.com/register/event?oeidk=a07e91j839h2d7faf0a&llr=vu9nrziab&showPage=true.

April 1, 2014 – *Last Chance GAP (2014).* CT Middlesex County Extension Center, 1066 Saybrook Road Haddam, CT, Haddam, CT. 9am – 4pm. For more information contact Diane Hirsch at 203-407-3163 or diane.hirsch@uconn or Candace Bartholomew at 860-570-9067 or candace.bartholomew@uconn.edu.

April 4, 2014 – *Spring Compost Workshop* Dudley Grange. 8:30am – 4:30pm. **T**he Massachusetts Department of Agricultural Resources and NESFI are hosting a Spring workshop for farmers who are considering or are currently composting. Compost expert Bob Rynk of the State University NY Cobleskill will lead the workshop. Space is limited so registration by April 1 required. For more information and to register go to: https://www.eventbrite.com/e/agricultural-compost-workshop-2014-tickets-10941021891?ref=elink.

April 10, 2014 – *UNH Spotted Wing Drosophila Workshop*. 10:30 – 3:30. Community Center - Claremont, NH - 152 South St, Claremont NH 03743. $25. For more information and to pre-register (required) go to: http://extension.unh.edu/events/index.cfm?e=app.event&event_id=36862.

April 29 - *Sprayer Calibration Workshop for Fruit***,** at 1 PM at Lyman Orchards in Middlefield, CT. For more information call 860-570-9067 or candace.bartholomew@uconn.edu or 860-486 -6449 or email mary.concklin@uconn.edu

June 18-25, 2015 – *11th International Rubus & Ribes Symposium* , in Asheville, NC, June 21-25, with preconference tour to farms and research sites June 18-20. More info to come. If you are interested in being a sponsor of this event, contact gina_fernandez@ncsu.edu.

WEBINARS OF INTEREST:

National Sustainable Agriculture Information Service (ATTRA) webinars and videos can be found at: https://attra.ncat.org/video/.

Northern Grapes Project recorded webinars can be found at: http://northerngrapesproject.org/?page_id=257

Northeast Sustainable Ag Research & Education (NE-SARE) Video Vault can be found at: http://www.nesare.org/Dig-Deeper/Pictures-Stories-and-Video/Video-vault