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Berry Notes

Prepared by the University of Massachusetts Fruit Team

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IN THIS ISSUE:

CROP CONDITIONS

ENVIRONMENTAL DATA

STRAWBERRY

- ❖ Late Season Strawberry Care – Including Foliar Disease Management
- ❖ Pest Management for Day-Neutral Strawberries
- ❖ White Grubs: Pests of Strawberry Roots and Foliage

RASPBERRIES/BLACKBERRIES

- ❖ Late Leaf Rust of Raspberry

BLUEBERRIES

- ❖ Survey: Pollination Services of Blueberries in the Mid-Atlantic Region
- ❖ Putnam Scale in Blueberries
- ❖ Powdery Mildew on Blueberries – Not Symptoms You'd Expect

GRAPES

- ❖ Rupestris Speckle on Grape
- ❖ Keeping your Grape Mildews Straight!

GENERAL INFO

- ❖ Use A Disease Management Approach When Thinking About An SWD Management Plan
- ❖ Insecticides for Organic Berry Production

UPCOMING MEETINGS

Crop Conditions:

Strawberries: June-bearing fields are quiet at this time of year during regrowth from renovation. Day neutral varieties are fruiting. Maintain a good pest management program in day neutrals with particular attention to tarnished plant bug and spotted wing drosophila (more on this below). Late summer and early fall is a good time to fertilize both new and established June-bearing strawberry fields. Typically strawberries will need 20–50 pounds of nitrogen at this time of year. Amounts depend on how much was applied at renovation and the organic matter content of the soil. Evaluate established fields for the foliar diseases or other problems that could carry over to next year. Also scout fields for weed problems that can be addressed in the fall. **Brambles:** Summer raspberry harvest is largely complete and spent floricanes should be removed to allow for good light penetration to primocanes. This can increase flower bud formation along the length of the canes. Continue tipping the new primocanes of black raspberry and blackberry to encourage lateral branching. Monitor for two-spotted spider mite and control if necessary. Blackberries and fall raspberries are in full production and SWD management is the most important activity at this time. SWD populations are increasing rapidly now. Harvest frequently and thoroughly and get harvested fruit into refrigeration as soon as possible. Be sure to rotate spray materials and make sure to adhere to label restrictions when only a limited number of applications are allowed. Botrytis fruit rot infections are a concern where there is a lot of carryover inoculum as days shorten and evening dew periods lengthen or if wet weather returns. See [New England Small Fruit Guide](#) for recommended materials and rates. Be sure to provide irrigation (drip preferred) so the canes can size up the fruit. Also check for mites and leafhopper damage. **Blueberries:** harvest is winding down. Survey fields before fall dormancy for weak bushes and determine whether or not Blueberry Stunt or Scorch virus may be the cause. Contact the [UMass Extension Plant Diagnostic Lab](#) for help with virus testing. Only non-nitrogen fertilizer applications should be made this late in the season if leaf tissue tests indicate deficiency. Scout fields for weeds to prepare for late season management strategies. **Grapes:** are approaching veraison and early table grapes will be ready by the end of the month. Scouting for disease (mildews and fruit rots) and insect (Grape Berry Moth) levels and taking corrective action are still important activities now.

SWD: See reprint of an article from last year on the need to approach SWD management with a *Disease Management* mentality.

ENVIRONMENTAL DATA

The following data was collected on or about July 25, 2018. Total accumulated growing degree days (GDD) represent the heating units above a 50° F baseline temperature collected via our instruments for the 2018 calendar year. This information is intended for use as a guide for monitoring the developmental stages of pests in your location and planning management strategies accordingly.

Region/Location	GDD		Soil Temp (°F at 4" depth)		Precipitation (in inches)
	2-week gain	2018 Total	Sun	Shade	(2-Week Gain)
Cape Cod	265	1,248	78	71	0.20"
Southeast	n/a	1,362.5	77	71	0.10"
North Shore	285.5	1,378	75	68	2.22"
East	314.5	1,539.5	77	72	2.91"
Metro West	326.5	1,406	72	69	2.69"
Central	260	1,275	70	67	2.97"
Pioneer Valley	323	1,530	78	72	4.52"
Berkshires	218	1,335	75	69	2.80"
AVERAGE	285	1,384	75	70	2.30"

n/a = information not available

Drought conditions update: Viewing the map via the link below, dated July 26, shows Massachusetts is experiencing level D0 - 'Abnormally Dry' - in all areas of the following counties: Berkshire, Franklin, Hampden, Middlesex, Essex and Norfolk. The western halves of Franklin, Hampshire and Hampden Counties are categorized as D0. The northern halves of Bristol and Plymouth Counties are also 'Abnormally Dry'. There are no longer any areas suffering 'Moderate Drought'.

<http://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?MA> (link is external)

(Source: UMass Landscape Message #16, July 27, 2018)

STRAWBERRY

Late Season Strawberry Care – Including Foliar Disease Management

Kathy Demchack, Penn State Univ.

This is the time of year when your strawberry plants are initiating flower buds for next year's crop. So, anything you can do take care of your plants now will help to increase next year's yields. Failure to take care of them now could set the stage for poor yields next year. So, what do we need to do? 1) Make sure the plants have adequate water (1-2" per week). 2) Make sure the plants have sufficient nitrogen (20 to 30 pounds applied during the mid-August to mid- September time frame, or slightly more on sandy soils). If you've experienced a lot of rain since renovation, you may want to apply the nitrogen a bit earlier than usual, especially if plants are light green and are not growing as fast as usual. Nitrogen you applied at renovation may have been washed through the soil, especially if it was in a nitrate form. 3) Keep an eye out for foliar diseases (as you've probably noticed, there are a lot of them out there this year), and apply an effective fungicide for any fungal diseases. Injured leaves = less photosynthesis = less food for flower buds and healthy root growth, and a lot of inoculum overwintering can damage your plants, including fruit, next year. The trick is

correctly identifying which leaf disease(s) you have, and knowing whether any the symptoms you are seeing are caused by fungus or a bacteria. Fungicides only work on diseases caused by fungi. So... here's a description of leaf diseases I'm seeing most frequently this year, in order from most common to least common, at least for 2009.

Leaf scorch: Spots on leaves start out circular and dark red to purple. Eventually the center may turn brown, spots may coalesce, and entire leaves and become affected and die, given the whole plant a scorched appearance. Some common fungicides are effective against this disease, which can be easily confused which angular leaf spot, on which fungicides will have no effect.

Angular leaf spot: At first, light green "windowpanes" between the veins show up on the leaf when it is held up to the light. From the top, these areas may have a blackened appearance at first. Later on, as affected areas enlarge and coalesce, the leaves may develop a reddish tinge, with leaf tissue eventually dying and turning brown. This disease (along with gray mold) was responsible for a

lot of caps on the fruit turning brown or black this past spring. Fungicides don't affect this disease, but copper can help (see cautions below). Since leaf scorch and angular leaf spot are easily confused, here are some photos to help tell the difference. These photos are of the same two leaves, held differently so sunlight either shines down on them, or through them. The primary disease affecting the leaf on the left is leaf scorch, and the one on the right, angular leaf spot. In the first one, where sunlight is shining down on the leaves, the leaves appear very similar. In the second photo, where leaves are held up so that sunlight shines through the leaf, you can see that light



Leaf scorch (left) and angular leaf spot (right) when viewed with light shining down on the leaves.



Leaf scorch (left) and angular leaf spot (right) when held up to the light. The same two leaves appear in each photo.

does not shine through the leaves with leaf scorch on the left, but the “windowpane” effect of angular leaf spot can be clearly seen in the leaf on the right. Note that in these two leaves, there is some of each disease present on each leaf, but the disease causing most of the spots is different.

Powdery mildew: Usually the first symptom noticed is leaf curling, where leaves fold inward along their length. There may be a purple tinge to the leaves. White powdery growth on the upper leaf surface may or may not be seen, but if you look at the leaves under magnification, as with a 16x hand lens, you may be able to see the growth of fungal mycelia on either leaf surface. On the leaf undersides, be careful not to confuse strawberry leaf hairs (they're straighter and thicker) with the mycelia.

Phomopsis leaf blight: As lesions grow, they form a Vshape, with the wide portion of the “V” at the leaf's edge.

Common leaf spot: I'm seeing less of this all the time - most of today's common strawberry varieties have resistance. Spots are small (1/8 to 1/4 inch across), and develop white to gray centers, which may fall out.

Once you've figured out which disease(s) you have, how do you treat them? First, any cultural controls that improve air circulation will help greatly. Keep rows narrowed, and keep plantings weeded. As a general rule of thumb, Nova and Pristine work well on any of the above diseases except for angular leaf spot – just be sure to tank-mix or alternate chemistries, such as with Captan, as both are susceptible to resistance development. Captan or Captevate work quite well on leaf scorch, common leaf spot, and phomopsis leaf blight, but not powdery mildew or angular leaf spot. Copper helps with angular leaf spot, but phytotoxicity is a concern, so follow precautions on the package and discontinue use if phytotoxicity appears. For more info on these diseases and their biology, efficacy ratings, and management options, see the most recent version of the Mid-Atlantic Berry Guide [or 2017 New England Small Fruit Pest Management Guide]. (*Source: Pennsylvania Fruit Times Vol. 28, No. 7*)

Pest Management for Day-Neutral Strawberries

David Handley, University of Maine Extension

Most of the important pests that damage June-bearing varieties can be as much or more of a problem on day-neutral types. Because day-neutral strawberries will have buds, flowers and fruit all occurring at the same time, it is critical to pay close attention to the required number of days to harvest after a pesticide application, to be sure you can safely harvest ripe fruit while still protecting buds and blossoms. Some of the more important pests are listed below, along with currently recommended pesticides and days to harvest as stated on current labels.



Male (left) and Female (right) Spotted Wing Drosophila, photo by Griffin Dill. Actual size: 2-3 mm.

Spotted wing drosophila (*Drosophila suzukii*) is a new pest, which is a concern for day-neutral strawberries, fall raspberries and blueberries. This is a small fruit fly, similar to those that hover around the bananas in your kitchen. However, this species will lay its eggs on fruit before it ripens, resulting in fruit that is contaminated with small white maggots just as it is ready to pick. Infested fruit quickly rots and has no shelf life. This insect can complete a generation in under two weeks, with each adult female laying hundreds of eggs. Therefore, millions of flies can be present soon after the introduction of just a few into a field. Frequently repeated insecticide sprays (1 to 2 per week) may be needed to prevent infestations once the insect is present in a field. Spotted winged drosophila can successfully overwinter here, although it may not build up to damaging levels until late in the summer. We have set out monitoring traps for spotted winged drosophila in fruit plantings around the state, and have found that they are already active this season. However, these traps may not provide adequate early warning, i.e. when we find them in a trap they are probably already established in the field. Products that provide good control of drosophila on strawberries include Radiant®, Brigade®, Danitol®, malathion and Assail®. Keeping fields clean of over-ripe and rotten fruit will also help reduce the incidence of this insect. For more information on identifying spotted wing drosophila and updates on populations around the state, visit our [Spotted Wing Drosophila blog](#).

Tarnished plant bug: This is one of the most prevalent and persistent pests of day-neutral strawberries, because summer flowering coincides with peak populations of this insect. Adult and nymph stages feed on the flowers and developing fruit, causing them to have seedy ends and other malformations. Regular insecticide applications are often required to keep the damage in check. Scout the flower clusters for adults and nymphs often to determine if controls are necessary. Insecticide products for tarnished plant bug include:



Tarnished Plant Bug, photo by Charles Armstrong

Tarnished Plant Bug	
<u>Product</u>	<u>Days to Harvest</u>
Brigade®	0
Pyganic®	0
Assail®	1
Dibrom®	1
Rimon®	1
malathion	3

Two-spotted spider mites: Mites can become a problem during the summer when the growing conditions are warm and dry. In addition to infesting the leaves, mites can move onto the fruit, reducing marketability. Plants that are drought-stressed, over fertilized with nitrogen, or prone to dust covering, e.g. growing beside a dirt road, are especially prone to mite infestation. Predatory mites can be an effective means to control spider mites and keep them in check over the season. Releases should only be made when spider mites are present in the field to provide the predators with a source of food. Most of the products labeled for controlling spider mites will also kill predatory mites; so, do not use these products after predators have been released. Scout for mites often during the season by examining the undersides of the leaves. Control is warranted if more the 25% of leaves examined have mites.



Two-spotted Spider Mites, photo by David Handley

Two-Spotted Spider Mites	
<u>Product</u>	<u>Days to Harvest</u>
Brigade®	0
Zeal®	1
Vendex®	1
Acramite®	1
Danitol®	2
Agri-Mek®	2
Oberon®	3

Savey®	3
Kelthane®	3

Potato leafhoppers, sap beetles, thrips and spittlebugs may also become problems on day-neutral strawberries, but are less frequently observed than tarnished plant bug and spider mites. Recommendations for these insects can be found in the current edition of the *New England Small Fruit Management Guide*.

Foliar and fruit diseases also need to be managed on day-neutral strawberries, and should be controlled in much the same way as they are for June-bearing varieties. Most of the fungicide products labeled to control **gray mold, powdery mildew, leaf spot** and **leaf scorch** have either zero or one day to harvest, so protecting blossoms at the same time as fruit is near harvest should not be a problem; but be sure to check labels carefully and schedule your sprays and harvests accordingly.

Anthracnose fruit rot can be especially troublesome for day-neutral strawberries, because it grows well under warm conditions and spreads by splashing water, which is encouraged on plastic mulch. Fungicides registered for control of anthracnose include Cabrio®, Abound®, Pristine® and Switch®, all of which have zero days to harvest restriction. (*Source: Maine Strawberry IPM Newsletter No. 6. – July 11, 2017*)

White Grubs: Pests of Strawberry Roots and Foliage

Janet van Zoeren and Christelle Guédot, University of Wisconsin Extension

White grub refers to the larvae of scarab beetles, including the Japanese beetle (*Popillia japonica*), European chafer (*Amphimallon majalis*), and May and June beetles (*Phyllophaga* spp. and *Cotinis* spp.). They all have similar appearance and damage symptoms, which can include feeding on strawberry roots, causing wilting of the plant. Typically, white grubs cause significant damage in strawberries following planting in a field that had previously been planted in grasses, which is a preferred food-source. Many species of white grub adults also feed on the leaves of strawberry plants, although typically not extensively enough to cause economically significant damage.

Description and Damage: White grub larvae are thick and fleshy. Their color ranges from grey to white, with a brown head capsule. Although the size depends on species and age, mature larvae tend to be around ¾” to 1½” long. The larvae of all white grub species form a distinctive, curled-up c-shape in the soil. Unlike strawberry root weevil, which also feeds on strawberry roots causing wilting and plant die-back, white grub larvae have obvious legs.

White grub larvae feed on strawberry roots. Typically damage symptoms of white grub feeding include sudden plant wilting and die-back. Often, this will take place in the year following strawberry planting, and will begin with a single plant and then spread to surrounding areas. Roots are typically fed on and then shorn off about an inch or two below the soil surface. In addition to leading directly to reduced plant vigor, white grub feeding can also provide an opening for pathogens.

Adult white grubs are beetles, ranging from ½” to 1½” long. Their coloration varies by species. Japanese beetle adults are a distinctive shiny green/bronze color, and can cause significant damage to the foliage of strawberries and other fruit crops (see article in the previous issue of this newsletter). Rose chafer adults are a sandy tan color with long legs (see WFN Volume 2, Issue 6, page 7). May and June beetles are typically dark brown, with thick-set bodies.

Life Cycle: Many white grub species, including May and June beetles, have a three-year life cycle, in which larvae feed for nearly three years before emerging as adults. Adults will fly for several months in May and June. In

those species, larval feeding damage may occur any time during the summer, as there will always be some individuals in the larval stage in any year. Other species, such as Japanese beetle, complete their development in a single year, with larvae present from late summer to the following spring, and adults flying in the summer from approximately July through August. All white grub species overwinter as larvae.

Monitoring and control: Monitoring for white grubs is recommended if there are wilting symptoms, or if you are planting strawberries where grass used to grow. Check for white grubs by digging near the wilting plants' roots and looking for the large, easy-to-spot grubs.

Additionally, if a plant suddenly dies in the field, pull it up gently to check for roots – if there is a full set of roots

it is likely to be a disease issue, but if the roots end after approximately 1", it is likely caused by white grubs.

The most effective way to minimize root feeding by white grubs is to avoid planting strawberries for two years following any grasses, including livestock pastures, grass sod, or forage crops. Additionally, you can reduce both root and foliar feeding by these beetles by leaving a buffer between grassy fields and strawberry plantings. Chemical control is only recommended when three or more white grub larvae are found on average near wilting plants. Check the 2018 Midwest Fruit Pest Management Guide for chemical control recommendations. (*Source: Wisconsin Fruit News, Vol. 3, Issue 7, July 13, 2018*)

RASPBERRIES/BLACKBERRIES

Late Leaf Rust of Raspberry

James Travis, Penn State Univ.



Late Leaf Rust on underside of raspberry leaf. Photo credit: Cornell Berry Diagnostic Tool.

Late leaf rust can be a problem on fall-bearing raspberries. The disease infects red and purple raspberries but not black raspberries or blackberries.

This rust, unlike orange rust, is not systemic.

their closeness to a planting may increase the likelihood of occurrence. Spores are produced on infected spruce needles in early summer and can infect raspberries. High humidity is necessary for infection to take place. The raspberries will show symptoms shortly afterward. However, spruce are thought not to be necessary for the rust to survive in a planting once infected since this disease has occurred in successive years in plantings with no spruce in the vicinity. Spores are disseminated by wind but may also be physically moved from infected to uninfected plantings by people or machinery.

Disease Management: Clean nursery stock is important since planting stock can be the initial source of inoculum. Control is aided by cultural practices that increase air circulation within the planting such as thinning canes, keeping rows narrow, and practicing good weed control. Prune fall bearers to the ground; do not keep canes around for a summer crop and rake and dispose of all old leaves. Removing floricanes and infected primocanes in winter will reduce the amount of inoculum. This disease has been especially problematic on summer-bearing Festival and fall-bearing Heritage and Jaclyn. Fall-bearing Josephine and spring-bearing Nova and Esta red raspberries tend to be resistant. Because this fungus is not systemic, eliminating the disease from plants is possible. Refer to [Table 7.5](#) [or the 2015 New England Small Fruit Management Guide] for pesticide recommendations. (*Source: Penn State Small Scale Fruit Production Guide*)

Symptoms: Yellow masses of spores are noticed primarily on fall fruit of primocane-bearing varieties, making the fruit unmarketable. Because symptoms on the fruit do not usually develop until late in the season, infections in plantings of summer-bearing varieties may go unnoticed. Powdery yellow spores also form on the undersides of leaves, causing badly infected leaves to drop prematurely, but this symptom is generally not noticed until infected fruit is seen.

Disease Cycle: There are several species of late leaf rust fungi worldwide. In our region, *Pucciniastrum americanum* is believed to be the causal agent. White spruce and Engelmann spruce serve as alternate hosts, and



Late Leaf Rust on raspberry fruit. Photo credit: Cornell Berry Diagnostic Tool.

BLUEBERRIES

Survey: Pollination Services of Blueberries in the Mid-Atlantic Region

Do you grow blueberries on your farm? If so, you've seen the hard work of pollinators firsthand. Unfortunately, bees are now encountering a number of environmental dangers. But don't worry, you can help! Please spend two or three minutes on our [brief survey](#) that will aid in investigating the effect beekeeping practices and agriculture have on the stability and health of honey bee and native bee populations. Let's work together now to understand the problem so we can someday find the solution. The bees will appreciate it!

Putnam Scale in Blueberries

Cesar Rodrigues-Saona, Rutgers University

Crawlers are now present on trap tapes that were placed on infested bushes. This is the start of Putnam scale emergence. If using Esteem, then treatments can be applied now. If using Diazinon, then wait until next week. Not matter what the insecticide is, use enough volume.

Life history: Scales feed on plant sap, decreasing plant vigor and fruit yield. Adult scales are protected from insecticide sprays by a waxy covering. These insects are common in older canes when not removed, and located mostly under loose bark. In New Jersey, the Putnam scale has two generations a year. It overwinters as second-instar nymphs under loose bark. Spring activity begins in early February. Eggs from the first generation are laid in late

April, and immature "crawlers" begin to appear in mid-May. Peak crawler emergences occur in late May and early June. Peak crawler emergences for the second generation occur in early to mid-August (this time of year).



Monitoring and Management: Growers that have a scale problem need to treat post harvest for the 2nd generation of crawlers (use Diazinon or Esteem). Crawlers can be monitored by wrapping black electricians' tape covered by double sided sticky tape around canes. Use a hand lens to see crawlers on the sticky tape. Sprays should coincide with crawler emergence. (*Source: Rutgers Plant & Pest Advisory, Volume 30, No. 15, August 18, 2014*)

Rutgers Plant & Pest Advisory, Volume 30, No. 15, August 18, 2014

Powdery Mildew on Blueberries – Not Symptoms You'd Expect

Kathy Demchak and Cassandra Swett, Penn State Univ.

Powdery mildew, a warm-weather high-humidity disease, is present in some blueberry plantings. Lowbush, highbush, and rabbiteye blueberries are all affected.

Symptoms on blueberries are different from those on most other plants, and could be mistaken for a virus or bacterial disease. The powdery mildew organism, *Microsphaera vacinii*, at first causes a yellow mottling on the upper leaf surfaces (Photo 1), but eventually the mottled areas develop into red spots with a lighter margin; both of these symptoms could be mistaken for a virus. Symptoms on the lower leaf surfaces consist of water-soaked areas (Photo 2) that turn reddish; these symptoms might make one think that the plants have a bacterial disease. The



Photo 1: Early powdery mildew symptoms on upper surface of blueberry leaf. Credit: Tracey Olson, PA Dept. of Agriculture



Photo 2: Powdery mildew symptoms on lower surface of blueberry leaf. Credit: Tracey Olson, PA Dept. of Agriculture

typical "powdery" patches as seen on other crops may be present, but often are not.

Since disease development is favored by warm, dry weather, symptoms start to appear in mid-summer. The fungus overwinters in dormant buds, so inoculum can build up over time if not managed. In most cases, this disease has minor impacts on growth and fruit production, primarily causing infected leaves fall off prematurely. In rare cases impacts on growth can be severe.

Generally powdery mildew incidence on blueberries is not sufficiently severe to warrant a fungicide spray. However, if leaves are severely affected, fungicides such as Orbit, Tilt or Quash (all in activity group 3), or

Pristine (activity groups 7 and 11) may be used. Be sure to follow label directions to avoid development of resistant fungal strains. Cultivars vary in resistance, but information on this subject is limited.

Thanks to Tracey Olson at the [PA Dept. of Agriculture](#) for bringing the presence of this disease to our attention and for providing photos for this article. (*Source: PA Fruit Times, August 28, 2015*)

GRAPE

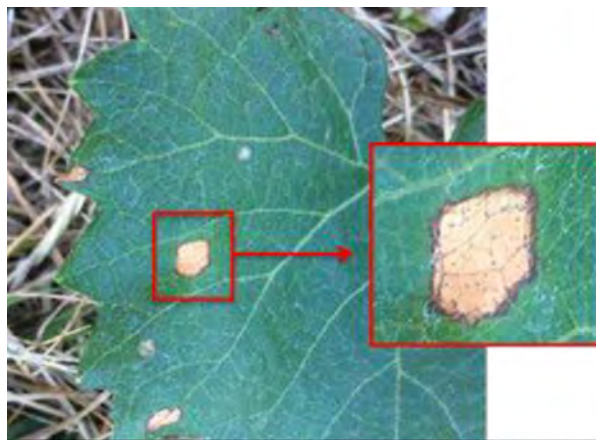
Rupestris Speckle on Grape

Patty McManus, University of Wisconsin

Rupestris speckle, also sometimes call “Muscat Spot” is a physiological disorder that causes brown speckles and spots scattered across a leaf surface or concentrated between veins (see photos). The name is given because the disorder occurs on varieties that have *Vitis rupestris* in their background. In the UW-Madison research plots, we notice most on Frontenac and Frontenac gris. Although some leaves can become severely speckled, we have never seen it affect a canopy so badly that fruit ripening or winter hardiness was impaired. This is consistent with reports from other regions. The rusty, brown speckles and spots are sometimes confused with black rot spots, but with a little effort you can discern the two. Black rot leaf spots are usually larger than the speckles of Rupestris speckle, and black rot spots develop tiny black fungal fruiting bodies (see photos).



Rupestris speckle on Frontenac. Spots may appear isolated from one another (left) or coalesce (right) in more severe cases. These spots differ from black rot (see photo below) in that they lack the tiny black “pimples,” or pycnidia inside. Photos by D.S. Jones.



Black rot, with close-up on right of pycnidia (black “pimples”), which help differentiate black rot from rupestris speckle. Photos by D.S. Jones.

Unless it’s completely out of control, black rot distribution in a canopy is often spotty, being severe in one area and absent on nearby leaves. By contrast, Rupestris speckle usually occurs fairly evenly across a canopy. Finally, Rupestris speckle does not affect fruit, whereas black rot that was not controlled around the time of bloom rots fruit.

(Source: Wisconsin Fruit News, Vol 3, Issue 8, July 27, 2018)

Keeping your Grape Mildews Straight!

Patty McManus, University of Wisconsin

At a recent vineyard walk, there was some discussion of the unfortunate naming of two very different grape diseases with similar names: downy mildew and powdery mildew. While both diseases can cause significant losses to both leaves and fruit, there are important differences to help you identify and manage them. We have found that for downy mildew especially, symptoms on some of the cold-climate varieties look different from photos you find

online that are mostly taken on *Vitis vinifera*. For more information, see our photo guide to diseases of cold-climate grapes at <https://fruit.wisc.edu/wp-content/uploads/sites/36/2017/04/Photo-guide-diseases-cold-climate-grape.pdf>

Here’s a cheat sheet to help keep these diseases straight.

	Downy mildew	Powdery mildew
Cause	Water mold	Fungus
Overwintering site	In leaves on ground and in soil.	On the vine in bark and bud scales.
Early symptoms (May-July)	Pale yellow “oil” spot on upper leaf surface with white, fluffy growth on the underside. Fluffy, white growth on young berries and other green tissues.	Inconspicuous white powdery areas on undersides of leaves near cordon; very difficult to see.
Later symptoms (August and later)	Lesions dry up and turn brown; sometimes develop mosaic of brown, yellow, red discoloration.	Patchy white to gray growth mostly on upper surfaces of leaves. Berries can have whitish growth and cracking, or a gray net-like pattern.
Environment that favors disease	Cool, damp, rainy weather.	Can develop under a range of conditions from cool to hot; does not require rain;
Effective fungicides*	Abound, captan, copper, Forum, Luna Experience, mancozeb, phosphorous acid, Pristine, Quadris Top, Ranman, Revus, Revus Top, Ridomil, Sovran, Tanos, Zampro	Abound, Aprovia, Endura, Flint, Fracture, Inspire Super, JMS Stylet oil, Luna Experience, Mettle, Pristine, Procure, Quadris Top, Quintec, Rally, Reason, Revus Top, Sovran, sulfur, Topsin-M, Torino, Vintage, Vivando
Fungicides for organic production	Copper	Sulfur or oil is best; several other “soft” fungicides have some activity (e.g., potassium bicarb, Serenade, Oxidate).

**There are many fungicide options for both diseases. Among commonly used broad-spectrum fungicides, captan and mancozeb are effective on downy mildew but NOT powdery mildew.*

Downy mildew can take on various appearances, but the white sporulation is always on the **UNDERSIDES** of leaves:



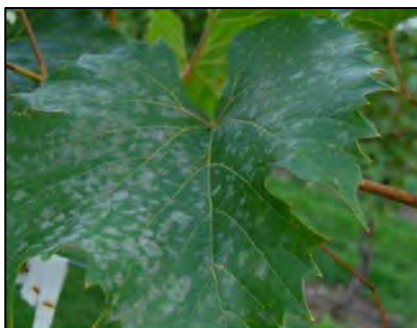
Downy mildew: White sporulation on leaf underside that corresponds to yellowish spots on the upper surface.



Downy mildew: Diffuse sporulation on the leaf underside.



Downy mildew: On fruit there is white growth, but usually not cracking.



Powdery mildew: Patches of white, powdery fungal growth appear on either the lower or upper leaf surface. Photos by D.S. Jones.



Powdery mildew: Fungal growth can cover entire leaves and take on a grey rather than white hue, especially later in the season.



Powdery mildew: On fruit there is often white growth accompanied by cracking.

(Source: *Wisconsin Fruit News*, Vol 3, Issue 8, July 27, 2018)

GENERAL INFO

Use A Disease Management Approach When Thinking About An SWD Management Plan

Dave Jones, Michigan State University Extension



Yellow tart cherry fruit. Tart cherry growers need to get in the mindset of beginning their seven-day programs immediately when fruits reach this developmental stage. Photo by Dave Jones, MSU Extension.

I have had numerous discussions on [spotted wing Drosophila](#) (SWD) with growers in the past few weeks. The analogy that has worked best for them in understanding the new reality of SWD management in west central Michigan has been an [apple scab](#) analogy.

Every year in apples, we set up our spore rods to monitor apple scab ascospores. We observe spore numbers after each rain to determine the start and end of primary risk period for this disease. Nevertheless, as soon as green tissue is exposed on apple trees, we spray. Why? Because we always catch primary apple scab spores ahead of green tip. This is a basic assumption in the apple business.

As a result, we know that our crop is in danger and we take appropriate action. We spray ahead of rain events and we spray regardless of the number of spores caught on the monitoring rods until primary scab is over. We know that spore rod counts are not a tool to gamble on with apple scab sprays. Whether we catch one or 100 ascospores, we know we are at risk until primary scab has ended. Spore catch means only one thing at the beginning of every year: The trees have exposed leaves. We're at risk. We spray. Period.

Let's apply this same train of thought to SWD.

Every year in cherries, we set out traps to monitor SWD. We begin to catch a few flies and monitor the building population. We observe SWD numbers each week to determine the official start of the risk period. Nevertheless, as soon as we have yellow fruit on trees, we need to spray. Why? Because we always catch SWD ahead of yellow cherry fruit. This has to be a basic assumption in the cherry business. We need to realize our crop is in danger from the moment it turns yellow and we need to take appropriate action. We need to spray every seven days and we need to spray regardless of the number of flies caught in the traps until harvest is over.

We need to realize that trap catch numbers are not a tool to base our sprays on. Whether we catch one or 100 SWD, our cherries are at risk until harvest has ended. Catching SWD means only one thing if the cherries are yellow or later. We're at risk. We spray. Period.

Growers ask about weekly trap numbers because they assume the block with the most SWD in a trap is most likely to have SWD larvae in the fruit. Unfortunately, this is not necessarily true. This highlights the risk of treating trap counts as spray guides. In the three conventionally managed tart cherry blocks where we detected larvae in fruit this season, none had the highest SWD counts in traps the weeks that larvae were found in the fruit. One site was actually the lowest the week larvae were detected. The other two sites were in the middle of the pack.

Cherry growers should think of spotted wing Drosophila (SWD) as a disease rather than an insect pest as this will help in controlling this pest.

Watching the SWD population increase each season still gives us valuable insight on where the pest is and what it is doing, but it does not help us determine relative risk in the orchard. The sad reality is that SWD is so-well established in Michigan at this time that **all** blocks are at risk once yellow fruit is present, regardless of population counts.

This July, SWD numbers are higher than anything previously recorded at this point in the growing season. There is a good chance this may be the new "normal" as this pest becomes established in the region. Battling our way through this high-pressure year has taught us several important lessons as an industry in west central Michigan.

Programs that use products rated "excellent" for SWD at seven-day intervals are generally getting very good management. Challenging as it is for growers to meet the high demands of this aggressive spray schedule, those who have risen to the challenge are generally seeing very good control and high grades at the processing plant.

¹⁰It is evident you should either be using this level of

aggression towards SWD or not bother to spray at all. Anything less than an outstanding management program will result in contaminated fruit.

Products rated “good” for SWD that get pushed past four to five days consistently result in larval contamination of fruit. Every report of sweet cherry contamination and the majority of tart cherry contamination reports we received at the [Michigan State University Extension](#) office this season all had one thing in common: Every spray schedule included a product that was **not** rated “excellent,” and these applications were used as four to five day stopgaps in the program. We cannot emphasize enough at this time that this simply will not work in a management program targeting this pest. Even with an “excellent” product, seven days is pushing the limit.

Trap counts in a block are not an indication of the relative risk for fruit contamination. We still do not know if “high” versus “low” pressure means anything regarding risk to the crop. The risk to an orchard is not necessarily proportional to the number of SWD adults caught in a trap. I have seen SWD larvae in fruit from blocks where as few as three adult SWD were caught in five traps in a week and I have seen clean fruit in blocks with over 200. Trap counts are nice. They tell us when the insect starts flying in the spring and allow us to watch populations ebb and flow, but we do not know if there is a difference between 50 and 500 SWD adults in terms of relative risk. For all intents and purposes, we cannot assume there is a marked difference at this time in terms of management considerations.

Growers using only a single cup trap in a block to determine if they need to spray for SWD risk being burned with bad information. SWD catches are highly inconsistent between traps in a single block. Furthermore, scouts who are only looking for males are not going to be able to give an accurate read on SWD populations. To demonstrate this, look at this example of the male and female counts from one week at a site in west central Michigan.

Trap/Fly gender	Males	Females
Trap 1	0	2
Trap 2	0	8
Trap 3	0	0
Trap 4	0	0
Trap 5	0	8

There are two points here.

Insecticides for Organic Berry Production

Janet van Zoeren and Christelle Guïdot, University of Wisconsin

Organic berry production has unique challenges, one of them being managing insect pests with limited insecticide

options, while continuing to rotate chemical classes to prevent insecticide resistance. In this article, we focus on the insecticide options available for organic production. There were two traps that caught no flies out of the five traps. This means there was a 40 percent chance of catching no flies in a trap. This type of result is common, particularly early in the season when fruit first begin to change color. It is not hard to imagine that a single trap in an orchard might catch no flies in a week, particularly early in the season before populations build. In this example, a grower using trap 3 or 4 would assume no flies were present in their block, and would not feel the need to spray.

Additionally, no males were caught in any of the traps. A scout looking for “spotted winged” males in the trap with their naked eye would assume the count is zero. The count is actually 18 flies. This is common, particularly early in the season, and demonstrates **all** flies, both male and female, need to be counted.

Rotating insecticides is critical to maintaining our ability to manage this pest when we look at the “long game” of SWD management. We are getting excellent control of this pest right now because the cheaper pyrethroid insecticides such as Mustang Max are working extremely well for us. We know from experience with other insect pests such as [oriental fruit moth](#) that pyrethroids can quickly become ineffective if they are over-applied. The scary thing from a resistance management standpoint is that oriental fruit moth’s reproduction rate is miniscule compared to SWD.

We need to be extremely conscious of rotating our insecticides each season, mixing multiple modes of action into a program to ensure adequate management. Diamides (Exirel, Harvanta), pyrethroids (Mustang Max, Warrior) and organophosphates (Imidan) should all be used in rotation going forward to help preserve the efficacy of our best products.

Take the time to read the [MSU Extension](#) article, “[Plan to change when dealing with spotted wing Drosophila](#)” by [Mark Longstroth](#). This season has been a big wakeup call for all of us in west central Michigan and it demands adjustments from all of us. This is a manageable problem, but we need to be highly methodical in how we proceed if we want to maintain our industry as we know it. (*Source: Michigan State University Fruit & Nut News, July 25, 2017*)

1]However, organic insecticides will provide adequate

control of insect pests if they are backed up by a solid IPM program. For a reminder of other IPM techniques to complement an organic spray program, please see our series published in 2017 in this newsletter (WFN, Volume 2, issues 3-9) on IPM topics including: monitoring, cultural control, host plant resistance, mating disruption, and biological control.

The table below lists some insecticides which are approved for organic production in Wisconsin, along with their IRAC (Insecticide Resistance Action Committee) chemical class code, re-entry interval (REI), pre-harvest interval (PHI), and efficacy ratings against some of the

main insect pests of berry crops, including spotted wing drosophila, Japanese beetle, and tarnished plant bug. We do not provide efficacy for other insects, but these insecticides have efficacy against other insects as well. All of the following insecticides are registered for use on caneberrries (raspberries and blackberries), strawberries, and blueberries in Wisconsin. Please refer to the 2018 Midwest Fruit Pest Management Guide for information about other insecticides and other fruit crops, and always read the label prior to use. This is not an exhaustive list and we do not endorse any products.

Class (IRAC code)	Trade name	Active ingredient(s)	REI (hrs)	PHI (days)	Efficacy against spotted wing drosophila (SWD), Japanese beetle (JB), and tarnished plant bug (TPB)
	Surround (not registered in strawberry)	Kaolin clay	4	0	SWD: n/a JB: Good TPB: n/a
	DES-X	Insecticidal soap	12	0	SWD: n/a JB: n/a TPB: Good
Spinosyns (5)	Entrust SC	Spinosad	4	1	SWD: Excellent JB: Poor TPB: n/a Thrips: Good
Pyrethroids (3A)	Pyganic EC 1.4	Pyrethrin	12	when dry	SWD: Fair JB: Good TPB: n/a
Azadirachtins (unknown) + Pyrethroids (3A)	Azera	Azadirachtin + pyrethrins	12	0	SWD: Fair JB: Poor TPB: Good
Azadirachtins (unknown)	AzaGuard	Azadirachtin	4	0	SWD: Poor JB: Fair TPB: Good
Biologicals/ Biopesticides	Grandevo	<i>Chromobacterium subtsugae</i>	4	0	SWD: Fair JB: n/a TPB: n/a
	Venerate XC	<i>Burkholderia</i> spp.	4	0	SWD: Fair JB: n/a TPB: n/a
	PFR-97 (not registered in raspberry or blueberry)	<i>Isaria fumosorosea</i>	4	0	SWD: n/a JB: Good TPB: Fair
		<i>Bacillus popilliae</i> spores	varies	varies	SWD: n/a JB: Good TPB: n/a

In general, organic insecticides fall into four IRAC classes: spinosyns, pyrethroids, Neem oils (Azadirachtins), and biologicals.

Spinosyns and Pyrethroids affect the nervous system of many species of insects. Both have low mammalian toxicity, except interestingly pyrethroids can be toxic to

cats. However, they both do have non-target effects on beneficial insects and bees, and so should be used with caution and not be sprayed during bloom.

Azadirachtins are found naturally in the oil of the Neem tree (native to India and surrounding countries). As an insecticide, it works by interfering with the insects' ability

to molt (shed their skin), therefore preventing normal development. These insecticides also serve as repellents. . They are considered to be safe to humans and other mammals, and to have minimal non-target effects on beneficial insects.

Biologicals are usually targeted to affect only the pest and its related species, and so are considered to be relatively environmentally safe. In many cases, biologicals can effectively help manage pests while maintaining healthy beneficial insect populations. However, they require careful timing to target the correct pest species at the life stage when it is most vulnerable to the insecticide, and are not effective against all pest species.

More information about organic berry production is available in Cornell University's series on Organic Production and IPM Guides for raspberries and blackberries, strawberries, and blueberries, which are available on the Cornell webpage as well as on our Wisconsin Fruit berry pages (<http://fruit.wisc.edu>). Also, we have a new publication in collaboration with other universities on "Management recommendations for spotted wing drosophila in organic berry crops".

(*Source: Wisconsin Fruit News, Vol 3, Issue 8, July 27, 2018*)

UPCOMING MEETINGS:

August 14, 2018 – *UMass Extension Vegetable Program Research Tour and Round Table*. 4:00. UMass Crop and Animal Research Farm, 89 River Rd., South Deerfield MA 01373. For more info and to register, go to: <http://ag.umass.edu/vegetable/events/umass-extension-vegetable-program-research-tour-round-table>.

August 14-15, 2018 – *North American Strawberry Growers Assoc. Summer Tour*. Watsonville & Monterey, CA. For general information and registration, go to: <https://nasga.org/n-american-strawberry-growers-summer-tour.htm#>.

August 28, 2018 – *UMass Extension Vegetable Program Twilight Meeting on Reduced Tillage and Transplanters for Vegetable Farmers*. 4:00-7:00pm. Ward's Berry Farm, 614 S Main St., Sharon, MA 02067. For more information or to register, go to: <https://www.surveymonkey.com/r/XF8JQYD>.

August 28, 2018 – *UNH Grape Grower's Twilight Meeting*, 5:30-7:30pm. Sweet Baby Vineyard, 260 Stage Rd., Hampstead, NH. For more information go to: <https://extension.unh.edu/events>.

November 7-9, 2018 – *Great Lakes Fruit Workers Annual Meeting*. The Hotel Ithaca, 222 South Cayuga St. Ithaca, NY. For more information visit <https://greatlakesfruitworkers.weebly.com/>.

February 27-28, 2019 – *Harvest New England Marketing Conference and Trade Show*. Sturbridge Host Hotel, Sturbridge MA. More information coming soon.

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