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CENTER FOR AGRICULTURE
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Massachusetts Berry Notes Underwriters:

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IN THIS ISSUE:

Crop Conditions:

Strawberries: Harvest will soon be underway in June-bearing varieties across the state with good yield expected in most locations. Overwintered Day Neurtal varieties and row-covered June-bearing varieties are already being harvested. Tarnished Plant Bug pressure has been low. Weather conditions have favored a lot of Gray Mold infection. Watch for potato leafhopper, two-spotted spider mite and root weevil through harvest. Anthracnose fruit rot, leather rot, leaf spots and powdery mildew can also develop during this period. New plantings are in and keeping ahead of weeds is important as the beds become established. **Brambles**: Summer fruiting varieties in bloom and showing good fruit-set potential. Tarnished plant bug, cane borers, two-spotted spider mite, and potato leafhopper will be active this month. Cane and spur blights can begin to show symptoms this month. Also orange rust has been found in several locations. See more about orange rust in this issue. An open canopy with conditions for good air circulation and spray penetration is a good practice for managing disease. Primocane varieties are showing about 24 inches of new growth. Now is a good time to fertilize all brambles. **Blueberries**: Fruit set is looking exceptional in many locations. Some locations have suffered damage from Gypsy Moth, however. Cranberry fruitworm and blueberry maggot are likely to be showing up soon. Traps can help identify if and when these pests are present. Putnam scale has been reported in some plantings. See more on scale in this issue. Watch for symptoms of mummy berry, Botrytis blight, anthracnose, and powdery mildew this month. Bird netting and/or bird scare devices should be in place before fruit ripening begins. Also, now is a good time for fertilizer applications. **Grapes**: Varieties of wine and table grapes range from pre-bloom to post bloom and early fruit set. This is a critical time for controlling phomopsis, powdery and downy mildew, black rot, grape berry moth. Shoot thinning should be done now and some varieties my also need shoot positioning and cluster thinning. As with brambles and blueberries, now is a good time to apply fertilizer to grapes.

Excellent new publication: *Beneficial Insects in New Hampshire Farms & Gardens*. Don't miss this great new publication by Dr. Alan Eaton.

Download by going to https://extension.unh.edu/resources/files/Resource000499_Rep521.pdf.

ENVIRONMENTAL DATA

The following data was collected on or about May 31. Total accumulated growing degree days (GDD) represent the heating units above a 50° F baseline temperature collected via our instruments for the 2017 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)
	1-Week Gain	*2017 Total*	*Sun*	*Shade*	*1-Week Gain*
Cape Cod	30.5	264	62	56	0.94”
Southeast	26	278	63	59	1.50”
North Shore	31	317	56	52	0.76”
East	39	369.5	63	59	1.46”
Metro West	46.5	342.5	55	52	1.33”
Central	33	367	56	55	2.27”
Pioneer Valley	66	370	61	56	2.41”
Berkshires	53	298	57	53	1.26”
AVERAGE	41	326	59	55	1.49”
n/a = information not available					

(***Source**: UMass Landscape Message #11, June 2, 2017*)

STRAWBERRY

Strawberry IPM – Gray Mold

Angela Madeiras and Sonia Schloemann, UMass Extension

Gray mold, caused by the fungus *Botrytis cinerea*, is a disease of many crop species. It can be a serious problem for the strawberry grower, especially in the Northeast where cool, damp spring weather is ideal for disease development. Disease can strike at any time during the growing season when weather conditions are right. Gray mold can cause significant crop loss both pre- and post-harvest.

ID/Disease Cycle

The fungus overwinters in plant debris. In spring, it produces spores that are dispersed by wind and rain splash. These spores germinate and can infect blossoms and leaves. The optimum temperature for infection is 60-77°F, and spores can infect in as little as 6 hours when leaves are wet . New leaves and blossoms are especially vulnerable, but the pathogen can infect any part of the plant. After infection, the fungus remains quiescent in plant tissues until they begin to die due to things such as frost, mechanical damage, or natural senescence. Infected plant parts then become covered with fuzzy white or gray mycelium and abundant gray spores. Blighted blossoms lose their petals and turn brown. Fruit that develops from infected flowers will harbor latent infections that become active when fruit ripens. Secondary infections can occur any time during the growing season when the weather is cool and moist. Infected fruit will shrivel and mummify, but often remain attached to the plant.

Management

Monitoring:

A forecasting tool for *Botrytis* can be found at the Strawberry Advisory System (SAS) website (http://agroclimate.org/tools/strawberry)

Cultural Control:

- Plant in full sun.
- Proper plant spacing and good weed control increase air circulation, which decreases humidity and facilitates drying of plant surfaces.
- Plant in raised beds and use drip irrigation if possible in order to avoid wetting leaves and blossoms.
- Organic mulch such as straw can protect fruit from soil contact and diminish splashing of inoculum from the soil onto plants.
- Till in dead plant material at renovation to avoid long term buildup of inoculum in the field.
- Minimize nitrogen fertilization in spring to avoid overgrowth of foliage which creates a dense, shaded and moist canopy and higher levels of infection. Apply needed fertilizer after harvest during the renovation period and then again in late summer to support flower bud formation for the following year.
- A few cultivars are considered less susceptible to gray mold. These include Allstar, Earliglow, and Jewel.
- Harvest in dry weather, handle fruit gently, and refrigerate immediately.

Conventional Chemical Control:

- A treatment should be applied at early bloom (10%), then again 7-10 days later at full bloom.
- If possible, spray 24 to 48 hours before rain is predicted to fall.
- As a general rule, do not make more than 2 consecutive applications of the same product. Rotation of active ingredients is imperative for the prevention of resistance development.
- See the New England Small Fruit Management Guide for current recommendations on products labeled for gray mold on strawberry.

Organic Chemical Control:

Several OMRI-approved control products are available, but evidence of their effectiveness is lacking. Growers concerned with fungicide input on their properties should consider growing less susceptible varieties.

- Sulfur and copper compounds are not very effective for gray mold control; in addition, these compounds can cause phytotoxic damage to leaves and fruit.
- Actinovate-AG (*Streptomyces lydicus* WYEC 108s) may provide some level of control and has best efficacy when applied with a spreader/sticker prior to an anticipated infection period.
- *Trichoderma harzianum* products are used as a biocontrol agent in Europe and Israel.
- A good source for current recommendations for organic production is the Cornell Organic Strawberry Production Guide, which can be found at http://www.nysipm.cornell.edu/organic_guide/strawberry.pdf.

Flower Thrips in Strawberries

Hannah Burrack and Aurora Teonnisson, NC State University

Biology

Flower thrips (*Frankliniella* spp.) are tiny insects that feed on strawberry leaves, flowers, pollen and fruit. In addition to strawberries, they feed on a variety of other cultivated plants and weeds. Some flower thrips feed on two-spotted spider mite eggs so low levels of flower thrips can be beneficial. To the naked eye, flower thrips look like elongated yellow or brown specks, about a millimeter long, that run rapidly when disturbed. Examination with a hand lens or microscope reveals the adult flower thrips to have two pairs of feathery wings.

Adult female thrips lay their eggs into the leaf of a host plant. The tiny (< 1mm) yellow or white larvae hatch 2-14 days later. Availability of pollen and warm temperatures greatly facilitate larval development which can be completed in as little as 3-5 days. Once mature, larvae spend a pre-pupal and pupal stage in the soil before returning to the plant to feed and reproduce as adults.

Western flower thrips (Frankliniella occidentalis), one of the species that may be found in strawberries.
P.M.J. Ramakers, Applied Plant Research, Bugwood.org

Damage in strawberry

Flower thrips' tiny mouthparts pierce and suck plant juices from the outer layer of plant tissue. This feeding does not

seriously damage strawberry leaves, but thrips feeding can cause misshapen blossoms and bronzing of the fruit near the leaf cap. Such feeding damage is rare in North Carolina, and when it does occur, usually happens late in the season.

Bronzing and cracking of fruit surface from Thrips feeding. (photo courtesy of Nate Norse, Nourse Farms)

Thrips feeding has not been shown to impact fruit set, and thrips feeding does not cause deformed fruit.

Sampling and thresholds

Strawberry blossoms can be held over a piece of white paper and beat against it so that thrips fall onto the paper. Note that even adult thrips are very small, so a handlens may be useful for distinguishing them from other arthropods. Treatment thresholds for North Carolina have not been established, but work in California indicates the insecticide treatment should be considered only after populations exceed 10 thrips per blossom.

Management options

Conventional

Conventional foliar insecticides are available for control of flower thrips. Refer to the *North Carolina Agricultural Chemicals Manual* for materials recommended for use in North Carolina and the Southern Region Small Fruit Consortium *Strawberry IPM Guide* for regional recommendations.

Organic

OMRI approved foliar materials are available for control of flower thrips. Refer to the *North Carolina Agricultural Chemicals Manual* for materials recommended in North Carolina and the Southern Region Small Fruit Consortium *Strawberry IPM Guide* for regional recommendations.

Biological

Minute pirate bugs, such as the insidious flower bug (*Orius insidiosus*), feed readily on flower thrips. These insects occur naturally in North Carolina, and purchasing additional bugs for release is unlikely to be cost effective. Some predatory mites are available for release against thrips (*Amblyseius swirskii*), but these mites have not been widely tested in strawberries.

More Information

Western Flower Thrips - UC IPM Online

Flower Thrips in Ornamentals - NCSU Dept. of Entomology Insect Notes

North Carolina Agricultural Chemicals Manual

Strawberry IPM Guide - Southern Region Small Fruit Consortium

(***Source**: NC State Strawberry Factsheet Series, May 2014*)

Slug Damage to Strawberries

Emily Hoover, University of Minnesota

Identification

Slugs have fleshy slimy legless bodies that are predominantly different shades of gray. Slugs are basically snails with a reduced shell located internally. Their head contains two pairs of feelers; a larger pair above carries the eyes and a lower pair below is used for smelling. Most slugs in strawberries range in length from 1/4" to 1 1/2".

Typical slug.
Photo: Jeff Hahn, University of Minnesota

Important biology

Slugs have a layer of slime to protect their skin from desiccation. As they move, they leave a slime trail which can be used to identify their presence. They prefer moist habitats and locations where they can escape the sun. They feed at night or on dark, overcast days. Slugs lay their translucent eggs under plant debris or in the soil, where the moist conditions provide for optimum development of eggs and young. Continuous straw mulch in a strawberry patch provides such an ideal habitat. Slugs seek out straw mulch and other types of mulch to lay their eggs in the fall and these eggs will hatch in the following spring with the slugs feeding on strawberries in the spring and early summer.

Evidence of slug activity comes in two forms, slug movement and slug feeding. Slugs continually produce slime on which they move and it is a dried slime trail that indicates their travel the previous night.

Slugs have an anatomical structure called the radula which contains small teeth made of chitin. The radula is a rasping organ which scrapes or cuts food before being ingested, and it is the structure that damages the strawberry fruit.

Damage

Slug damage on strawberry.
Photo: Ontario Strawberry IPM, OMAFRA

Slugs create varying size holes in the strawberry fruit. The damage can vary from minor practically unnoticeable scraping on the surface of the fruit to significant cavities equal to half of the fruit. When present in large numbers significant damage can be done to the fruit.

Management

Monitoring

Slugs hiding under board.
Photo: Jack Kelly Clark, University of California

Slugs should be monitored during and after bloom. In the day look for slime trails in the patch or place wooden boards in the straw underneath which slugs will congregate. Pick up the boards to see monitor slug populations. Keep especially vigilant for slugs during extended periods of overcast and rainy weather. In the evening use a flashlight to check for slugs.

Cultural

Remove potential hiding places for slugs such as weeds vegetation and debris.

Water plants early in the morning to permit all day drying, which avoids creating a moist habitat ideal for slugs.

Place drip irrigation tape close to the plants and avoid creating wet mulch situations which are ideal habitats for slugs.

If you plant in rows keep the width of the rows narrow (12 to 18 in.) to allow quicker drying

Place traps, such as wooden boards and rolled-up newspapers in the patch. Check traps first thing in the morning every day and dispose of the slugs.

Create a slug trap by pouring beer into a shallow pan buried so that the edge is at ground level. Slugs are highly attracted to smells emitted from fermentation processes, and will fall into the pan and drown. Check and renew the trap every couple of days.

Pesticides

Baits need to be considered as a part of a cultural program and employed in conjunction with other methods. Baits alone will not effectively control slugs.

Baits need to be applied prior to the ripening of the berries because the slugs prefer ripe berries to slug bait.

The patch should be irrigated prior to placing the baits to create a situation that will encourage the slugs to be more active. Apply the bait in the late afternoon or evening

close to the time when the slugs will begin activity. Sprinkle some bait in protected area where you think the slugs might be hiding such as areas close to walls or fences and in areas which you think the slugs might have to traverse to get to the patch.

Iron phosphate

Baits that contain iron phosphate don't kill as many slugs as those with metaldehyde, but seem to protect the crop well enough. Iron phosphate baits are cleared for organic production and are safe around children and pets. Baits break down after rains or irrigation. Iron phosphate kills more slowly than metaldehyde and the slugs will seek a hiding place and die there. You may not see slug casualties when you use iron sulfate.

(***Source**: adapted from Univ. of MN Pest Mgt for the Home Strawberry Patch*)

RASPBERRIES/BLACKBERRIES

Orange Rust on Brambles – an ongoing saga

Cassandra Swett, University of Maryland

We all get a little rusty as we get older, but one thing that we don't want to see getting rusty is our brambles. There are several rust diseases that affect brambles. I'm just going to focus on orange rust, which is the most important rust disease in the northeast. We are definitely seeing a bit of orange rust this year, with the cool wet springs. You'll see this disease on blackberries, black raspberries and purple raspberries. Orange rust does not affect red raspberries.

Orange rust stunting black raspberry plant. Note the "spindly" elongated shoots. Photo credit: Mike Ellis

This is an unusual fungus—it grows systemically throughout the whole plant. So once a plant is infected, it will stay infected the rest of its life, and be a persistent source of inoculum for other plants. Over time, orange rust stunts and weakens plants so they will not bear fruit, but plants do not typically die. All in all, not a disease you want in your bramble field.

Orange rust is caused by two species:

1. *Arthuriomyces peckianus*, which is more common in the northeastern US.
2. *Gymnoconia nitens*, which is more common in southern states and primarily effects blackberry.

When To Control Orange Rust:

Life Cycle

Infection by orange rust occurs when:

- it's persistently wet (for more than 12 hrs in a day)
- and between 43° F and 72° F.

The fungus cannot infect if it's hot for most of the day or if it's very dry. Above 85°F the fungus cannot infect at all.

The life cycle of orange rust is much more complex than your typical fungal pathogen, so I'm just going to boil it down to the simple take homes:

- **First:** In a new field, orange rust can come in on infected plants, or can spread from nearby brambles—either other fields or wild brambles.
- **Second:** Rust overwinters on infected leaves on the soil surface and on old canes, so if rust gets established your field, it will likely persist at low levels through the life of the planting.
- **Third:** There are two periods of infection that are important to control:
  - about 3-4 weeks in the spring, around the time of shoot emergence, after the last frost.
  - about 3-6 weeks in the fall, from the time when primocane growth slows until first frost.

Understand that these are estimates—what really determines infection is the weather—again, persistently wet and between 43°F and 72°F.

- **Fourth:** It is important to protect both leaves and emerging shoots / buds. The time of year and

history of the field can inform you about whether you need to protect leaves, buds or both.

In the spring
Protect against leaf infections if you are detecting rust for the first time; if you have a history of rust in your field, also protect against emerging shoot / bud infections.

In the fall
Protect only against emerging shoot / bud infections. This has to do with the type(s) of spore present in your field:

- If you **Have Not** had rust in your field in recent years, you should not have the overwintering spores, which infect buds. You should only have spring spores, which only infect leaves.
- If you **Have** had rust in your field in recent years, then you probably **Do Have** overwintering spores, which infect buds.

Control Methods
Scout and remove infected plants in the spring

Once a plant is infected, it must be removed. Otherwise it will continue to provide inoculum, allowing spread to other plants. It does not do much good to keep it, because after a couple of years the plant will stop yielding.

Spring is a critical time to scout for and remove orange rust-infected plants in the field, because this is the only time you will see the bright orange spores. Scout early, as soon as new shoots start are emerging, after the last frost. Be particularly diligent when it's a wet spring—this year is a great example. The disease is easily identified as orange pustules on the underside of young leaves. You will not be able to detect orange rust after sporulation ends (early to June, onwards).

Scout for orange pustules on the underside of young leaves, early in the spring. Photo credit: Mark Bolda

Chemical control
Chemical control is an important compliment to removal. Once you remove all infected plants, you will want to spray to prevent the spores from infecting new plants.

When to spray
Weather can be a good indication that you need to spray—it has to be wet and between 43°F and 73°F to get infection. It is typically too cold between November and March and too hot between June and mid-August. In our region, the critical control periods for chemical protection are:

- About 3-4 weeks in the spring, around the time of shoot emergence, after the last frost.
- About 3-6 weeks in the fall, from the time when primocane growth slows until first frost.

Spring protection
Apply fungicides upon first discovery of the blisters, preferably before they burst open and release spores.

If the field has a history of the disease, sprays should be initiated before blisters appear.

Direct this application to the foliage, since you are preventing leaf infections.

If you have had rust in previous years, **Also** do a spray directed to the base of the cane, to protect the developing buds from getting infected by overwintering spores.

Fall protection
Apply fungicides if you detected rust in the field in the spring. Direct towards the base of the cane, to protect the developing buds (both floricane and primocane); for floricane varieties—also spray the primocane shoots, to protect the buds on next year's floricane.

What to spray
- Rally (formerly called Nova) (myclobutanil)
- Pristine 38 WG (pyraclostrobin + boscalid)
- Cabrio 20EG (pyraclostrobin).

Fungicide recommendations for orange rust control, from the **2016 Midwest Fruit Pest Management Guide, developed by the Midwest Fruit Workers Group.** The page numbers refer to the Management Guide—a link to the guide is provided here and in Resources below, if you would like to get more information.

See Raspberry Leaf Spot and Septoria Leaf Spot of Blackberry and Raspberry—page 115.

Material	Rate/Acre	Comments
Rally 40WSP (Rally was formerly called Nova)	2.5 oz.	For late leaf rust and powdery mildew, begin applications when disease first appears and repeat on a 10 to 14 day schedule. See Cabrio, Pristine, and Rally for Control of Orange Rust, page 114.
Cabrio 20EG	14 oz.	See notes on Abound, Cabrio, and Pristine, pages 114 - 115.
Abound	6.2 - 15.4	

Material	Rate/Acre	Comments
	fl.oz.	
Pristine 38WG	18.5 - 23 oz.	See Pristine 38WG (page 115) about Pristing mixing instructions.
Quilt Xcel	14 - 21 fl.oz.	30 day PHI
Tilt	6 fl.oz.	

When to spray
Apply on a 10-14 day schedule--use the shorter interval in wet weather. Alternate Rally with Pristine and Cabrio to prevent fungicide resistance. Do not apply more than two sprays without alternating. An example of a 14 day-interval program for northern MD, would be:

In the spring—Starting after the last frost, at shoot emergence:

- April 10: Rally 40WSP (Nova)
- April 24: Cabrio 20EG
- May 8: Rally 40WSP

In the fall—When primocane growth slows, until the first frost:

- September 20: Rally 40WSP
- October 4: Pristine 38WG
- October 18: Rally 40WSP
- November 1: Cabrio 20EG

Note that with high disease pressure, you would want to spray on a 10 day interval over these same time periods.

Some notes on these fungicides

- Rally may have a bit better curative activity than the others because of its greater systemicity, which would make it the material of choice during or after a rainy period with inoculum already present. Do not apply more than 1.5 lbs (24 oz.) of Rally per year (label restriction)
- Since Pristine has two active ingredients, it has the broadest spectrum of activity.
- Avoid applying strobilurins (Cabrio or Pristine) more than three times each season, to prevent resistance development.
- While Abound (azoxystrobin) is labeled for use on brambles, it does not have orange rust (or any other rust for that matter) on the label.

Resistant cultivars
Red raspberries are all resistant. If you have persistent orange rust problems, this may be a good option.

Blackberry varieties reported to be resistant include: Choctaw, Commanche, Cherokee, Cheyenne

Susceptible blackberry cultivars include: Navaho, Ouachita, Chickasaw, Chester, Triple Crown. All black and purple raspberries are susceptible

Note: Triple crown is reported as resistant in Kentucky trials, but it appears to be susceptible in our region.

Site selection
Avoid planting near woodlots or riparian corridors that have wild brambles.

Clean planting material
Getting plant material from a clean source is critical to preventing establishment of orange rust in your field.

Resources
For additional information on orange rust and other bramble diseases:

- *Orange Rust on Brambles*, by Mike Ellis. Ohioline.
- *Midwest Fruit Pest Management Guide 2016* Produced by the Midwest Fruit Workers Group, out of Purdue University. Fungicide recommendations for bramble disease control.
- *Midwest Small Fruit Pest Management Handbook* Produced by Richard C. Funt, Michael A. Ellis, Celeste Welty, out of The Ohio State University. Comprehensive information on orange rust biology and cultural control.
- *Mid-Atlantic Berry Guide* Produced out of Penn State.
- Swett Lab: Berry Pathology

(***Source***: *Penn State Fruit Times, July 1, 2016*)

Potato Leafhopper in Brambles

Sonia Schloemann, UMass Extension

ID/Life Cycle: Leafhoppers are small, green, bullet-shaped insects which take flight quickly if disturbed. The nymphs are lighter colored and do not fly. They are easily identified by their habit of moving sideways when disturbed. Potato leafhoppers don't overwinter in New England but are blown up every year from the south on storm fronts. There are multiple generations every year.

Damage: The potato leafhopper feeds on the underside of leaves leaving small chlorotic areas and causing a downward cupping of the leaves. Most feeding is the upper, more succulent leaves on primocanes and often causes a stunting of those canes.

Management:

Monitoring: Scouting is especially important in new raspberry/blackberry plantings and on primocane fruiting varieties. Scout by brushing the leaves with the hand and looking for small adult leafhoppers flying off. Examine the underside of injured leaves to see if nymphs are present. There are no thresholds established for potato leafhoppers. Consider control if there are one or two nymphs per leaf and leaf curl is evident.

Control strategies:

See New England Small Fruit Management Guide **for more information on recommended materials and rates**

Cultural/Biological: Follow recommended practices in table below.

Chemical:

- Apply recommended insecticides when large populations of nymphs are noted on the leaves or symptoms become apparent.
- If repeat applications are needed, rotate insecticides from different IRAC groups to reduce the chance of resistance development in the pest.

Conventional(PHI)	Organic OMRI listed (PHI)	Cultural Practices
Assail 30SG (1) Actara 25WDG (3) Admire Pro (3) Malathion 57EC (1) Malathion 8F (1) Sevin XLR Plus (7)	Aza-Direct (0) AzaGuard (0) Neemix (0) Safer Brand #567 (0)	Avoid proximity to alfalfa plantings, which provide a major source of potato leafhopper population build-up.

-- Read labels thoroughly for application rates and restrictions

Blossom Blight in Blueberries

***Annemiek Schilder**, Michigan State University Extension,*

[Editor's note: This article is from the archives of the MSU *Crop Advisory Team Alerts*. Check the label of any pesticide referenced to ensure your use is included.]

Blighted flower clusters were seen at low levels in several blueberry fields. In most cases, the blighted clusters looked like they were caused by Phomopsis, which is characterized by a dark brown discoloration of the twig that bears the flower cluster (photos 1, 2). Initially, the brown lesion is ¼-½ inch long, but can expand to several inches in length in a couple of weeks and can kill additional flower clusters on that same twig. Eventually, the lesion will stop growing and the blighted blossoms will fall off. The causal fungus, *Phomopsis vaccinii*, overwinters in dead twigs and canes, and in the spring infects the flower clusters, aided by long wetness periods and possibly by frost injury. In some cases, it also appears that the fungus infects flower buds in the summer or early fall and overwinters in live buds. In the spring, the fungus will become active again and kill the bud followed by invasion of the twig. These types of infections are characterized by a dead flower bud surrounded by a brown lesion, while nearby buds would have developed normally.

(Left) ***Photo 1***. *Brown, spreading lesion on stem. Photo credit: Phillip Wharton, MSU. (Right)* ***Photo 2***. *Blueberry flower cluster killed by Phomopsis twig blight. Note brown discoloration of subtending twig.*

In Michigan, at least four different pathogens can cause blossom blight: *Phomopsis vaccinii* (Phomopsis twig blight), *Monilinia vaccinii-corymbosi* (mummy berry flower strikes), *Botrytis cinerea* (Botrytis blossom blight), and *Colletotrichum acutatum* (anthracnose). Just by looking at a blighted blossom, it may be difficult to identify the causal agent unless fungal growth is present, so it is a good idea to inspect the cluster with a hand lens or magnifying glass. In the case of mummy berry flower strikes, a layer of gray powdery spores is present, but restricted to the flower stem or cluster stem (photo 3). In general, flower strikes are much less common than shoot strikes, so it is unlikely to have flower strikes without shoot strikes. Spores produced on flower strikes behave similarly to those produced on shoot strikes and infect the stigmas of recently opened flowers.

Photo 3. *Flower cluster killed by the mummy berry fungus (Monilinia vaccinii-corymbosi) with characteristic layer of gray powdery spores on cluster stem and flower stem. Photo credit: Peter Oudemans, Rutgers University.* ***Photo 4***. *Flower cluster killed by Botrytis cinerea showing layer of grayish brown powdery spores all over flower cluster. Photo credit: Bill Cline, NC State University.*

Botrytis blossom blight, caused by **Botrytis cinerea**, may occur during or after very wet and cool weather and is characterized by fluffy grayish brown spores that are present all over the blossoms (photo 4). Often, leaves and twigs are also showing blight symptoms. Considering the relatively warm and dry weather conditions we've had so far, Botrytis is not a likely cause of the blossom blight currently observed in blueberry fields in Michigan. Anthracnose blossom blight looks a lot like Phomopsis twig blight and does not have very diagnostic features to distinguish it from Phomopsis. Incubation in the laboratory is necessary to identify the causal agent.

To scout for blossom blight, walk several rows in a blueberry field and scan the bushes for symptoms. When you find any, inspect the flower clusters for twig lesions and fungal sporulation and possible presence of insects or insect frass. To quantify disease severity and changes over time, pick five random bushes and record the number of blighted blossoms per bush every one to two weeks. Record numbers of blighted blossoms, type of sporulation, and average lesion length of twig lesions.

For control of further blossom blight or twig blight infections, a fungicide spray may be needed if rainy weather is in the forecast. A spray of Topsin M + Captan (or Ziram), Indar + Captan (or Ziram), or Pristine would work well against most causes of blossom blight at this time. (***Source**: Michigan Fruit Crop Advisory, May 2007*)

Checking Blueberry Fields for Scale Infestation

Rufus Isaacs, Michigan State University

A few isolated cases of scale infestation have been reported in the past few weeks in west Michigan, and this would be a good time to be checking blueberry fields during regular scouting to see whether scale is present in your farm. These are small insects that survive on older woody canes through winter, grow in spring usually under protective covers, and then start egglaying in spring and summer followed by those eggs hatching into a crawler stage that spread throughout the plant looking for new places to settle and feed.

These scale insects are covered with a white covering that is evident on this mature blueberry cane.

Scales have piercing mouthparts they use to suck sap from the plant, and the honeydew they produce can be tended by ants, so looking for ants crawling up and down the canes is another approach for detecting these scales. Blueberries are most often susceptible to Putnam scale, Lecanium scale or Terrapin scale, but the current specimens seem to be Azalea bark scale based on our preliminary identifications.

Isolated detections of scale in blueberry fields have been reported in west Michigan. Now is a good time to check fields during scouting for scale.

If scales are detected, the best option for control is to identify the timing of the crawlers emerging from under the protected waxy covering. This can be done using double-sided tape checked each week, and this can identify when an in-season scale control product could be used.

Other strategies that are important for preventing outbreaks of scale in the first place include regular pruning of old canes, a dormant oil application in the early spring and protecting scale-parasitizing wasps through careful selection of insecticides.

Please send reports of scale to your local [State University Extension fruit educator], and if you have specimens that need identification, remove an infested piece of stem and send to [UMass Diagnostic Services].

A close-up image shows multiple scales clustered in a depression on a blueberry cane. Removal of the white covering from two scales in the bottom left of the image reveals the dark purple female scale and the numerous pink eggs.

(***Source**: Michigan Fruit Crop Advisory June 7, 2016*)

GRAPE

Important Pre-bloom Sprays for Grapes

Bruce Bordelon, Purdue University

Grapes in the southern half of the state will soon be reaching the critical pre-bloom stage, which is a key time to control important diseases such as black rot, downy mildew, and powdery mildew. The three or four sprays made from immediate pre-bloom to 4 weeks post bloom are critical for controlling fruit infections. Growers should pay extra attention to coverage, especially in the fruit zone, and use the best fungicides available.

The Midwest Fruit Pest Management Guide lists recommended products. [Editor's Note: the *New England Small Fruit Management Guide* also provides this information.] A protectant (FRAC M) such as mancozeb or captan plus one of the sterol inhibitors (FRAC 3) such as Bayleton, Mettle, Procure, Rally or Tebuzol is the recommended fungicide treatment. Rotating with a different mode of action, such the strobilurins (FRAC 11) Abound, Sovran, or Flint is a good option as well. The combination products such as Pristine, Inspire Super, Revus Top, Quadris Top and Adamant are also effective for broad-spectrum disease control. Be sure to read the warnings about phytotoxicity with fungicides containing difenoconazole. These next few sprays are critical to producing sound, clean fruit. Pay attention to detail now to assure excellent fruit quality at harvest. This is the most important time of the year for disease control. Once we

get 4 to 5 weeks past fruit set, disease pressure drops significantly.

Grape cluster at immediate pre-bloom stage.

Grape cluster at early bloom.

(***Source**: Facts for Fancy Fruit, Issue 17, No. 5, May 26, 2017*)

In the Vineyard

Andy Muza, Lake Eerie Regional Grape Program

Diseases

Phomopsis – scouting Concord and Niagara vineyards this week indicated that shoots appear to look a lot better than last week. The extensive discoloration (blackening, dark spotting) seems to have greatly diminished. However, appearances can be deceiving. Shoots have expanded rapidly since last week, due to warmer temperatures, therefore more green, uninfected tissue is visible. But closer examination reveals that nodes 1 and 2 on many shoots are heavily scarred due to earlier phomopsis infections. Symptoms on leaves (i.e., small, black lesions surrounded by yellow margins) are also more evident and easier to see than last week.

Phomopsis lesions on Niagara shoot and leaf

Phomopsis shoot and rachis lesions can weaken tissue leading to breakage. In addition, pedicel (berry stem) infections can result in fruit infections later in the season when berries ripen. Therefore, fungicide protection on rachises, pedicals and berries is important until berries have reached about pea size.

Broken Niagara shoot due to Phomopsis shoot infection

Downy Mildew – no downy mildew was observed in any of the Concord or Niagara vineyards checked this week. Primary infections can occur about 2-3 weeks before bloom (around 10" shoot length, 5-6 leaves present). Average shoot length throughout the belt is at or past this stage so growers should now be looking out for this disease. A mancozeb spray for phomopsis at this time will also provide protection against downy mildew infections.

Insects

Grape cane gallmaker – red galls were observed on Concord shoots at a few sites. This injury is caused a small, brownish, snout beetle which hollows out shoot tissue in which an egg is laid. The injury is mostly cosmetic and rarely requires an insecticide treatment.

Red gall on Concord shoot caused by grape cane gallmaker

Plume moth – injury to terminal leaves caused by plume moth larvae was observed at one site. Larvae web together leaves to form a shelter and feed on the young leaf tissue. Population levels are usually low and the amount of injury caused is minor. Insecticide treatments are rarely required.

Plume moth larva inside webbed Concord leaves

(***Source**: Lake Eerie Regional Grape Program Crop Update, May 25, 2017*)

Nitrogen Fertilization in the Vineyard

Joseph Fiola, Univ. of Maryland

The annual goal in the established vineyard is to have the vines fill their allotted trellis space, top out just above the top wire at verasion, and produce a crop that is in balance with the vegetative vigor.

- For many grapevines (especially vinifera varieties), excessive nitrogen may lead to excessive vigor and unbalanced vines. This ultimately leads to poor fruit quality due to shaded fruit and delayed ripening.
- Overall, excess vigor is a problem with grapevines, so a conservative approach is typically taken with N fertilization.
- On heavy soils adding too much N during the growing season may result in the vine actively growing late into the fall with poorly hardened wood that has increased sensitivity to winter damage.
- Nitrogen is a very dynamic element in the soil and plant. Many of the N compounds are very soluble and are easily taken up by the plant and leached from the soil.
- Nitrogen is a major component in proteins and growth regulators (cytokinin and auxins) in plants, and therefore is utilized in large quantities. Nitrogen requirements are best determined by growth and performance. The grower needs to determine rates of N for each variety for each block of the vineyard.
- Soil tests for nitrogen have not proven useful in determining plant needs, so leaf analysis is the best tool for determining fertilizer needs in bearing vineyards.
- When planning a nutrient management program, leaf analysis, soil series, and vineyard vigor observations including shoot growth rates, leaf color, productivity, and pruning weights should all be taken into account.
- For vinifera, N needs and applications should be based on tissue testing in conjunction with observation on vigor and productivity.
  - Typically grafted vinifera vines are very vigorous and do not require annual N applications, except maybe on high sand content soils.
- Premium and Grafted Hybrids will typically respond similarly to vinifera varieties and may require little or no fertilizer.
  - Vinifera and premium hybrids are managed for moderate yield and maximum fruit and wine quality. Thus N supply is in the lower end of spectrum.
- Self-rooted Hybrids and American varieties require regular annual applications to maintain vigor and balance productivity.
- Nitrogen is supplied naturally in the soil primarily through the breakdown of organic matter. Every 1% of organic content in the soil supplies 5 to 20 lbs. of N/acre/year, depending on soil series, temperature, etc.
- As a guideline, the annual N requirement for vinifera and premium hybrids ranges between 0- 30 lbs./acre.

- For premium hybrids, annual N requirement ranges between 0- 50 lbs./acre.
- Self rooted hybrids and Americans my require 20-60 lbs./acres annually.

N content of fertilizers:

- Ammonium nitrate (32% N): acidic soil reaction (1 lbs. N = 1.8 lbs CaCO3 ; It takes 1.8 lbs of lime to neutralize the acidic reaction of 1 lbs. of ammonium nitrate fertilizer). May be difficult to obtain due to explosive nature
- Urea (46% N): economical N source, acidic soil reaction (1 lbs. N = 1.8 lbs CaCO3); subject to ammonia volatilization if not incorporated
- Calcium Nitrate (15% N): more expensive, basic soil reaction; excellent source for fruit.

The early spring growth of the vine is primarily fueled by reserve N stored in the trunks and other permanent wood and this typically runs out around bloom.

Most N (75%) is stored in the roots of dormant vines.

- Most N uptake by the vine occurs at 2 periods: 2-3 weeks prior to bloom and 2- 6 weeks after bloom. Vines take up only 10% of N applied at bud break, but double the rate of N uptake near bloom. Thus, it is not recommended to apply N at bud break.
- It is therefore recommended to make the first N application around full bloom, in late may or early June.
- A second application, if necessary can be made no later that mid-July if the growth of the vines has slowed on stopped by that point or the leaves look light or chlorotic.
- Vineyards on sandy soils typically require more N during the growing season, and depending on the soil organic matter content, it is best to split the application.
- Fertigation, if possible, is the desired and most efficient mode of application as it concentrates the N in the root zone.
- Dry fertilizer is typically banded under the row to feed the grapevines and not the turf middles.

Resources:

Dr. Terry Bates Cornell University; Dr. Tony Wolf, Virginia tech; Dr. Tim Martinson, Cornell University; Dr. Imed Dami, OARDC

Visit http://extension.umd.edu/smallfruit/grapes for more information on viticulture and small fruit.

(***Source**: Maryland Timely Viticulture, posted May 19, 2017*)

UPCOMING MEETINGS:

June 15, 2017 - *UMass Extension Fruit Program Berry Twilight Meeting*, 5:00-&:30, Nourse Farms, 41 River Rd., Whately MA. Strawberry & Raspberry Variety Showcase, Blackberry Swing Arm Trellis Demo, High Tunnel Berry Production Update, Spotted Wing Drosophila Management Research and Management Update. 1 Pesticide Credit requested. Cost $20 payable at the meeting. Light fare and refreshments included. **Pre-registration is encouraged** by emailing umassfruit@umass.edu in order to provide enough seating and food. For more info go to http://ag.umass.edu/fruit/upcoming-events.

June 17, 2017 - *Massachusetts Cultivated Blueberry Growers' Association Summer Meeting*, 11:30 - 3:00. Co-sponsored by UMass Extension Fruit Program. Vandervalk Farm & Winery, 25 Lovell St. Mendon, MA . Weed Management and Weed Control in Blueberry Plantings with Dr. Hilary Sandler, UMass Extension. BYO lunch and lawn chairs. Pre-registration requested by emailing Elisabeth Patt at eap1226@verizon.net. 1 Pesticide Credit requested. Cost: $15 non-members, free for MCBGA members. For more information go to: http://www.mcbga.com.

June 28, 2017 - *UMass Water Management Twilight Meeting*, 4:00 - 6:00pm. Tangerini's Spring St. Farm, 139 Spring St., Millis MA. FSMA and drought got you down? Come to this Twilight Meeting at Tangerini Farm in Millis, MA. Tour the newly installed irrigation system for orchard and vegetable crops built with funding support from NRCS with the designer, Trevor Hardy of Brookdale Farm, Irrigation and Row Crop Supply. Find out water sampling protocols and lab requirements for FSMA from the UMass Food Safety Specialist Lisa McKeag and about grant opportunities for irrigation and food safety improvements. Other industry representatives will be available for consultation and dinner will be provided following the tour. For more information go to: http://ag.umass.edu/vegetable/events/water-management-twilight-meeting.

July 11, 2017 - *Massachusetts Fruit Growers' Association Summer Meeting*, all day. Cider Hill Farm, 45 Fern Ave., Amesbury, MA. Save this date. More information on the program will be available soon. When available the program will be posted at: http://ag.umass.edu/fruit/upcoming-events.**May 26, 2017 –** *Early Season Blueberry Planning*. 3-5pm. Haynes Homestead, 172 Harvey Swell Rd., Colebrook NH, 03576. For more information see: https://extension.unh.edu/events/files/41FC38F1-5056-A432-4FDE26C7DAEDAFC2.pdf