

Northern Michigan FruitNet 2013

Northwest Michigan Horticultural Research Center

Weekly Update

June 25, 2013

GROWING DEGREE DAY ACCUMULATIONS AS OF June 24 AT THE NWMHRC

Year	2013	2012	2011	2010	2009	2008	23yr. Avg.
GDD42	1113	1560	1063	1456	1059	1052	1186.1
GDD50	669	945	598	850	572	582	682.3

Growth Stages at NWMHRC (June 24, 8:30 a.m.)

Apple: Red Delicious – 24 mm

Gala – 20 mm

Yellow Delicious – 19 mm

Pear: Bartlett: 17 mm

Sweet Cherry: Hedelfingen: 12 mm

Napoleon: 12 mm

Gold: 11 mm

Tart Cherry: 11 mm

Balaton: 11 mm

Apricot: 24 mm

Grapes: 30% bloom

NORTHWEST MICHIGAN REGIONAL REPORT

N.L. Rothwell, NWMHRC

Recent heat has increased insect activity slightly, but fruit continues to size at a slow rate

Daytime temperatures have been in the high 70s to low 80s since mid-week last week, and humidity levels have been high but very little rainfall since 16 June. The NWMHRS weather station recorded 0.09" of rain early on Sunday morning, but conditions are dry across the northwest. We have accumulated 1113GDD base 42 and 669GDD base 50 so far this season. Although our degree days are not far off from our 20 year average, fruit is sizing slowly. Tarts, sweets, or Balatons have not gained any size since 10 June, and for the past 14 days, the fruit is still measuring 11-12mm. With the predicted warm conditions this week, we suspect fruit will move along. Some sweet cherry varieties at the NWMHRS are showing some color, birds have moved in to feed on varieties where sugar levels are increasing. Growers have been busy, and ensuring proper timing for sprays has been the primary concern with the high humidity. Insect activity has picked up with the warm temperatures.

Apple. The last **scab** infection was on 16 June, and although we had a wetting event on 23 June, it was not long enough to result in a scab infection. The model says that we are at 100% spore maturity and 95% of our spores have discharged. Although it seems so late, a good rain

would ensure a call to end primary scab. There are scab lesions showing up in some blocks across the region; these growers will need to continue their scab program past primary to ensure scab free fruit at harvest.

Codling moth (CM) numbers remain low at the NWMHRS, but other growers have reported substantial flight with these warm evenings. Codling moths fly at dusk, and they prefer warm temperatures for flight. These last few nights have been excellent conditions for CM flight.

Obliquebanded leafroller numbers made a big jump from last week's zero catches—we caught an average of 19 moths per trap at the NWMHRS. **Rose chafers** have been very problematic in some areas of the northwest, and many growers have sprayed for these pests, especially in young apples.

Cherry. Cherry leaf spot is not hard to find in regional blocks, and with these warm and humid conditions, growers need to continue to be diligent about protecting their leaves. Protecting leaves from this disease is particularly important for those trees that have set a lot of fruit; a good healthy leaf canopy is needed to help ripen trees with a big crop. Additionally, as this season seems to be moving slowly, the harvest season may be a long one, and CLS control is key in a drawn out harvest.

As mentioned in the MSU E News on Friday, 21 June, Dr. Sundin's articles on **European brown rot** (EBR) are worth a second read, particularly for those growers that were hard hit by this somewhat surprise of a disease this season. Although we do not know as much about EBR and fruit infection, data from Australia and Eastern Europe have shown this disease to infect fruit. Orchard with substantial EBR infections should be applying Gem (3.8oz/acre) and captan (1.75-2lb/acre) for their next spray as Gem has been shown to have anti-sporulant properties, which will help minimize the spread of this disease from dead spurs potentially to the fruit.

American brown rot (ABR) is also a concern at this time. We have seen the ABR fungus move onto fruit that had canker from the freezing conditions earlier in the season. As most fruit is still on the green side, controlling ABR now is crucial because this disease is even more problematic when fruits begin to accumulate sugars. We are recommending a Gem application now to minimize the spread of spores and save Indar until we are closer to harvest (please see Rothwell and Sundin article 'Scout now for sporulating American brown rot fungus in sweet cherry').

Obliquebanded leafroller (OBLR) are also flying in cherry, and we caught an average of 25 moths/trap at the NWMHRS. Growers that missed their petal fall insecticide spray targeting overwintering OBLR should pay close attention to the OBLR model to best time a spray to control these summer generation larvae. Larvae that are not controlled can end up as a contaminant pest if larvae are found in tanks at harvest. In past years, we have had more problems with OBLR larvae at harvest if the harvest season is stretched out. **Plum curculio** stings are higher in some blocks than in past years, and the current warm and humid conditions are favorable for PC egg laying. Growers that have been using the P.I.T.S model in tart cherry should be putting on an insecticide to protect the fruit as eggs laid in the fruit at this time will be present at harvest. Plum curculio egg-laying may go on for a longer period this year due to the cool start to the spring.

Lesser peachtree borers have still been caught in high numbers, and it would be a good time to make trunk application against this pest. **American plum borer** numbers remain down, and we caught our first **peachtree borer** moths this week. We have not yet caught a cherry fruit fly, and no spotted wing drosophila have been caught in northwest Michigan in our 60 traps. Two SWD were caught in SW Michigan this week.

Grapes

Bloom has started in many varieties. Shoot growth has been rapid during the past week and the vine canopies are starting to fill in. All this combined puts us into a prime period for **powdery mildew** infections on interior leaves and fruit clusters over the next few weeks. Fortunately, powdery mildew infections have been very minor to this point – we still have not seen any on un-sprayed vines in the research vineyard. If you have a powdery mildew problem in any vineyard site, please contact me so I can help track the progress of this disease in the area.

Rose chafer continues to be the chief insect concern. Reports are coming in from many places, but there are also many areas that hardly have any this year. It is an insect that can appear in large numbers very rapidly, so be sure to keep watch for it. Feeding is usually restricted to tender leaves, but we have seen rose chafer feed heavily on flower clusters a few times in the past.

Potato leafhopper numbers are very low at all the sites I have visited.

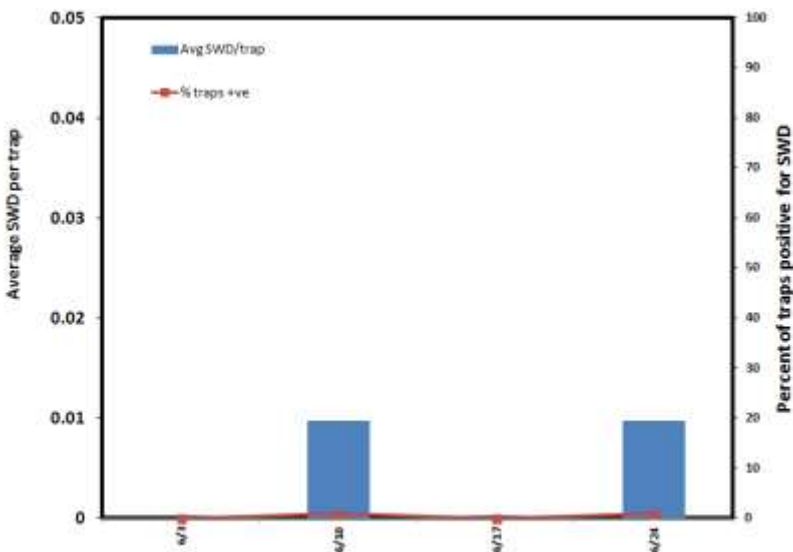
Dr. Rufus Isaacs will be on hand to discuss insect management issues for the next MSUE/Parallel 45 meeting on **Friday, July 12, from 3-5 p.m.** at 2 Lads Vineyard and Winery on Old Mission Peninsula.

Michigan SWD Report for June 25, 2013

TWO MORE SWD WERE CAUGHT IN SW MICHIGAN: ONE IN RASPBERRY HIGH TUNNELS AND A SECOND ADJACENT TO BLUEBERRIES

Nikki Rothwell, Karen Powers, and Statewide SWD Monitoring Team

As mentioned last week, we have started a statewide monitoring team to help growers, crop consultants, scouts, and others know when and where we are detecting SWD across the state. Traps have been deployed at fruit farms across the fruit growing regions of the state, and this report is a compilation of the information from those captures during the previous week. The report includes information on the counties where SWD have been trapped in the last week, the proportion of traps catching SWD, the average number of SWD per trap, and guidance on management approaches. As the season develops, we plan to show the timing of first SWD captures and the trends in fly activity across the state. Again this week, we caught very few SWD in Michigan. A female was caught in the raspberries in the high tunnels at the Southwest Michigan Research and Extension Center located in Berrien County. A second female was caught in Allegan County at the edge of a blueberry field. Likely due to the cool start to our spring, our early captures are a few weeks later than the 2012 first captures. We recommend that as fruit ripens, growers should try and monitor their fields and orchards for SWD. Although we did not find SWD in June-bearing strawberries last year, growers should be using SWD traps to monitor for this pest as we continue harvest in the south and begin harvest in the north.



ROSE CHAFERS ARE PROBLEMATIC IN AREA ORCHARDS

N.L. Rothwell, NWMHRC

Rose chafers have been observed across northwest Michigan, and some areas seem to have higher populations than usual. These insects are related to Japanese beetles, and both insects feed on many crops including, apples, cherries, and winegrapes, among a long list of other plants. Rose chafers are in the family Scarabaeidae, and their larvae resemble the characteristic C-shaped white grub. These larvae overwinter deep in the soil, and in spring, they move up to feed on grass roots just below the soil surface. Adults emerge from the soil in late May and into June, and male beetles are attracted to females and congregate on plants to mate and feed. Rose chafers are often more problematic in vineyards and orchards that are adjacent to grassy areas, particularly those with sandy soils.

Rose chafer adults are tan, long-legged beetles (Figure 1), and this life stage is the most damaging because they feed on tree fruit and grape vine foliage. This feeding can be particularly damaging in young trees and vines. The feeding damage is also the most obvious sign that rose chafers are present in the orchard and/or vineyard. The feeding damage is also similar to that of Japanese beetles where adult beetles feed on the leaf tissue between the large veins, a type of injury known as skeletonizing. However, if populations reach high enough levels, rose chafers can feed on developing fruits. The good news is that mating and egg-laying last only about two weeks, and the average life span of the adult is three weeks.

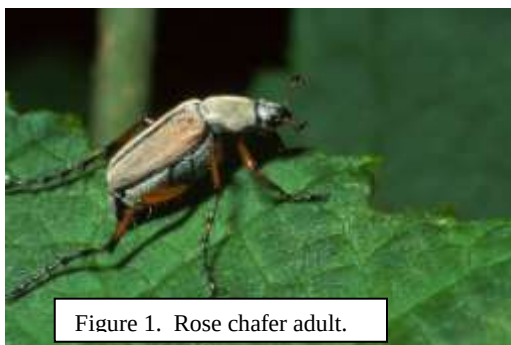


Figure 1. Rose chafer adult.

Rose chafers management can be questionable in orchard or vineyard systems both because the insects are only present for a short time and because they can re-infest an area quickly after an insecticide application. The feeding damage and/or population size of this pest may not warrant an insecticide, particularly on older trees or vines with ample leaves present at this time of the year. Many insecticides will knock down the beetle population effectively, but most

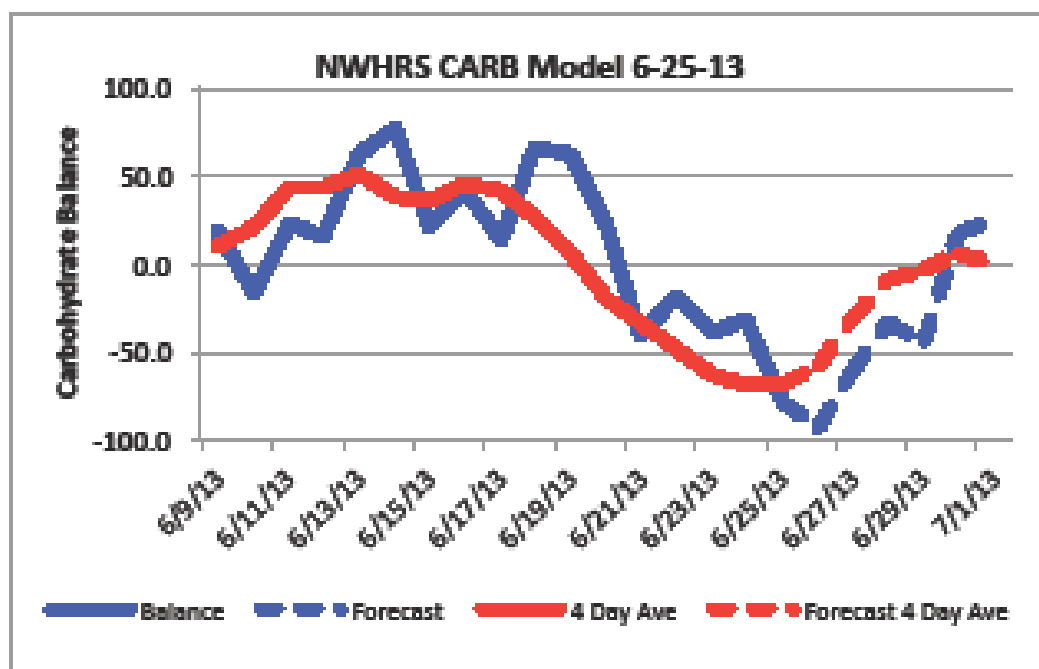
are only rated as fair or good because of the beetles' mobility and potential to re-infest an orchard or vineyard. There are many options for control, but because these insects can reinfest so quickly, these insecticides are only rated fair to good against rose chafers. Guthion, Imidan, and Sevin are all rated good while Lannate and Actara are fair against rose chafer.

APPLE THINNING IN NORTHWEST MICHIGAN

N.L. Rothwell, NWMHRC

The carbohydrate model has indicated that we have been in stress for the past few days, and good thinning would have occurred at this time. However, much of the fruit across the region is out of the optimal thinning window and is too big for thinners to be effective. Here at the NWMHRS, Macs are at 29mm, Galas at 20mm, Red Delicious are at 24mm, and Golden's are at 19mm.

I also want to take a moment to thank Phil Schwallier, District Educator on the Ridge, for all of his work in putting together the carbohydrate models for our region each week. We are appreciative for all of his efforts, and this carbohydrate model is another tool to help with the magic of thinning.



NWHRS	Solar Rad	Min	Max	Carb Balance	4 Day Ave	Recommendation
6/10/13	12.1	58	74	-17.1	20.3	Increase 30%
6/11/13	22.0	56	77	22.6	43.5	Increase 30%
6/12/13	19.0	55	81	14.2	43.1	Increase 30%
6/13/13	24.7	53	65	61.4	49.9	Increase 30%
6/14/13	29.9	47	71	75.9	33.0	Increase 30%
6/15/13	13.6	49	73	20.9	30.8	Increase 30%
6/16/13	24.9	56	78	41.5	39.0	Increase 30%

6/17/13	13.0	53	71	13.4	34.9	Increase 30%
6/18/13	25.0	48	72	64.9	26.6	Increase 30%
6/19/13	25.0	48	73	62.0	5.8	Increase 30%
6/20/13	21.0	54	82	21.0	-19.7	Use Standard Rate
6/21/13	9.0	56	84	-41.6	-33.0	Reduce 15%
6/22/13	13.0	60	77	-18.3	-42.0	Reduce 30%
6/23/13	13.0	59	87	-40.1	-60.7	Reduce 50%
6/24/13	15.0	62	83	-32.0	-66.0	Reduce 50%
6/25/13	9.0	68	82	-77.8	-66.5	Reduce 50%
6/26/13	5.0	63	81	-92.9	-58.3	Reduce 30%
6/27/13	9.0	63	78	-61.3	-30.9	Reduce 15%
6/28/13	13.0	59	79	-33.9	-9.5	Use Standard Rate
6/29/13	9.0	56	77	-44.9	-3.2	Use Standard Rate
6/30/13	21.0	57	73	16.6	6.0	Increase 30%
7/1/13	21.0	51	76	24.0	0.6	Increase 30%

2013 MICHIGAN PEACH HARVEST DATE PREDICTION

The harvest of Michigan peaches in 2013 is expected to be approximately in line with the long-term average.

Posted on **June 18, 2013**, MSUE News, by **Bill Shane**, Michigan State University Extension



Here is [Michigan State University Extension](#)'s 2013 prediction of Redhaven harvest onset for Michigan peach growing regions. The goal is to help growers, shippers, marketers, buyers and visitors to the state plan their season. For Michigan, the start of significant peach volume is with the Redhaven season, providing a handy benchmark time point.

The estimate is based on records collected on commercial Redhaven harvests in Berrien County since 1995. The Redhaven harvest onset model is based on weather data at the [Southwest Michigan Research and Extension Center \(SWMREC\) Enviro-weather station](#) approximately four miles southwest of Benton Harbor, Mich.

Regression analysis was used to determine a relationship between growing degree days and onset of harvest. The resulting predictive equation is $D = -0.0386x + 234.9$, $r^2 = 0.752$, where x is the cumulative growing degree days (GDD) base 50 degrees Fahrenheit from Jan. 1 through June 3 and D = the estimated harvest day of year (i.e., Jan. 1 = 1 and Dec. 31 = 365 in a non-leap year). The estimation is for the onset of the main season Redhaven harvest, not including fruit with split pits that ripen several days earlier than peaches without split pits.

For 2013, the estimated onset of Redhaven for Berrien County is predicted to be Aug. 2, comparable to the long-term average of Aug. 3 and 10 days behind last year. Over the years, the estimated harvest dates are generally within a few days of the actual observed harvest.

The model was used to estimate Redhaven harvest (non-split pit fruit) for four locations in addition to Berrien County. **The spread of harvest dates are predicted to be from Aug. 2 in the southwest corner of Michigan to Aug. 8 at the [Northwest Michigan Horticultural Research Station](#) (NWMHRS), northwest of Traverse City, Mich., a difference of six days.** The predicted spread between north and south have ranged from four days (2010) to nine days (2009) in recent years.

Remember that other factors such as soil type, proximity to Lake Michigan, crop loads and weather shortly before harvest can affect peach ripening. Due to frost problems in some orchards, crop loads are potentially low in some blocks, but high in many others. A heavier crop delays the harvest date in an individual orchard. There is also evidence from work in California that cooler temperatures following bloom are correlated with larger fruit size.

Table 1. Estimated Redhaven harvest onset in 2013 and 2012 for five locations based on the MSU peach maturity prediction model.

Enviro-weather station	Estimated harvest date for 2013	Estimated harvest date for 2012
Bainbridge/ Watervliet (Berrien County)	Aug. 2	July 23
Sparta	Aug. 5	July 27
Romeo	Aug. 5	July 27
Hart	Aug. 8	July 29
NWMHRS	Aug. 8	July 31

The estimated Redhaven harvest day can also be used to approximate the harvest dates for other varieties by adding or subtracting harvest dates relative to this reference variety (Table 2). As two examples, a rough guess is that PF-1, one of the earliest varieties grown in Michigan, will ripen 30 days before Redhaven, or approximately July 2, and Loring, generally ripening 12 days after Redhaven, will harvest approximately Aug. 14 in Berrien County in 2013.

Table 2. Typical yellow melting flesh peach variety harvest windows for the Michigan climate.

Older peach varieties	Newer varieties with significant production	Newest peach varieties
Harbinger = -33*	PF-1 = -30	
Harrow Diamond = -25	PF-5B = -25	Desiree = -26 ^^ PF-5D Big = -22 ^^ Earlstar = -18 ^ PF Early 8 Ball = -17 ^^

Garnet Beauty = -10 Early Red Haven = -10	Glenglo = -13 PF-7 = -10 Summer Serenade = -10 PF 8 Ball = -10 Rising Star = -8 GaLa = -8	Brightstar = -12 ^ PF-7A Freestone = -10 ^^ PF Late 8 Ball = -5 ^^
Redhaven = 0 Reliance = 0 Vivid = +2 Bellaire = +3 PF-12A = +3 John Boy = +3	PF 9A-007 = -2 Blazing Star = +2 Starfire = +3 Redstar = +3 PF 14 New Jersey = +4	PF 11 Peach = -2 ^^ PF Lucky = 13 +6 ^
Glohaven = +8 Canadian Harmony = +10 Loring = +12 Suncrest = +12	PF 15A = +6 Blaze Prince = +8 Bounty = +10 PF 17 = +12	PF Super Duper = +8^^ John Boy II = +8 ^ Gloria = +13 ^^ LA SweetStar = +14 ^
	Allstar = +16 Coralstar = +18 Contender = +18	PF 19-007 = +16 ^^ Messina = +17 ^^ Beaumont = +18 ^
Cresthaven = +24 Redskin = +26	PF 23 = +20 PF 24-007 = +22 Glowingstar = +24 PF 25 = +26	PF 22-007 = +20 ^^ July Prince = +24 ^^ PF 24C Cold Hardy = +24^^ PF Paramount = +24^^
Madison = +28 Harcrest = +28 Fayette = +28 Encore = +31	PF 27A = +30 PF 28-007 = +32 Lauroi = +41	Autumn Star = +37 ^ Flame Prince = +38 ^^ PF 35-007 Fat Lady = +40 ^^ PF Legendary = +41^^ Victoria = +47 ^^ PF Big George = +50^^ PF Fashionably Late = +54^^

** = estimated harvest days before (-) or after Redhaven. Harvest order can change depending on the warm/cool characteristics of a season. A cooler year will delay harvest dates, a warmer season will compress the harvest dates closer together.*

^ = little experience with this variety to date, ^^ = very little experience to date. LA = low acid type. Harvest order numbers are more tentative with newer selections.

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BANNING BLACK ROT AND PHOMOPSIS FROM YOUNG GRAPE CLUSTERS

Young grape clusters are highly susceptible to black rot and Phomopsis. With warm, wet weather approaching, plan to protect clusters with effective fungicides.

Posted on **June 19, 2013, MSUE News**, by **Annemiek Schilder**, Michigan State University Extension, Department of Plant, Soil and Microbial Sciences

Young fruit clusters are highly susceptible to all major diseases such as black rot, Phomopsis and anthracnose. If prolonged cool, wet weather prevails during bloom, Botrytis can also gain a foothold in clusters of susceptible varieties by promoting fungal growth on senescent flower parts. The fungi that cause black rot, Phomopsis and anthracnose infections on the berries first make themselves known by infecting leaves earlier in the season. Numerous lesions on leaves also indicate a high risk of fruit infection, and in the case of black rot and anthracnose, contribute additional inoculum for fruit infections. Therefore, [Michigan State University Extension](#) advises careful scouting on a weekly basis and growers are advised to protect flower and fruit clusters from infection using effective fungicides. The risk of infection is especially high if we experience multiple rain events and moderate to high temperatures (70 to 85 degrees Fahrenheit).

In general, aim to protect the clusters of juice grapes from immediate pre-bloom until four to five weeks after bloom. As the berries develop, they become naturally resistant to black rot and anthracnose, so the need for protection diminishes after the susceptible period ends. Concord grapes become resistant to black rot at four to five weeks after bloom, but some wine grape varieties may remain susceptible to black rot for up to eight weeks after bloom. While berries remain susceptible throughout their development to Phomopsis, the risk of infection diminishes after bunch closure because spore supplies become exhausted, especially in rainy years.

Black rot

Frequent rains and temperatures in the high 70s and low 80s are perfect for black rot infection. Black rot is a tricky disease because infections can remain latent (invisible) for weeks, so you won't know the berries are infected until it is too late to do anything about it. However, one can scout for leaf spots, which will also contribute conidia for fruit infections. Old fruit cluster remnants left hanging in the trellis are risky due to their proximity to current-year fruit. Fruit infections can take place anytime from bloom onwards, but only become apparent between bunch closure and veraison.

Black rot is relatively easy to control in the period from immediate pre-bloom through early fruit development, focusing primarily on protecting the clusters from infection. EBDC sprays applied earlier in the season for Phomopsis will also control black rot leaf infections, and therefore no sprays are recommended specifically for black rot early in the season. One immediate pre-bloom and two post-bloom fungicide sprays should be sufficient. Sterol-inhibitor fungicides (e.g., Rally, Elite) continue to provide outstanding control and have several days of post-infection activity.

There are various "generic" tebuconazole products on the market, e.g., Orius and Tebuzol, that may be more cost-effective. The difenoconazole ingredient in Revus Top and Inspire Super is similar to Rally and Elite when it comes to black rot control. When using SI fungicides after a recent infection period, use the highest labeled rate because post-infection activity is strongly rate-dependent, particularly when extended "kickback" activity is required. The strobilurin fungicides (Abound, Flint, Sovran, Pristine) are also excellent against black rot, but have limited

post-infection activity and are better applied in a preventative mode. Luna Experience and Quadris Top are pre-mix fungicides with very good black rot activity.

Serenade (+Nu-Film P) is currently the best option for organic control of black rot, although bicarbonates also have moderate efficacy.

Phomopsis

Each rainfall event will lead to additional spore dispersal from old, overwintered canes and spurs and can lead to successful infection on the rachis and berries. The optimum temperature for infection is 59-68 F, at which time about six to 10 hours of wetness are needed for infection. The longer the tissue stays wet, the more severe the symptoms will be.

The best fungicides for control of Phomopsis during and after bloom are Abound and Pristine – do not use Pristine on Concord grapes. Phosphorous acid fungicides such as ProPhyt and Phostrol are also (cost) effective alternatives. These are systemic and will likely provide some kick-back activity. In trials done in Michigan, ProPhyt provided very good control of Phomopsis when sprayed on a 14-day schedule. Tighten the schedule and increase the rate if disease pressure is high.

Sterol inhibitors are **not** very effective against Phomopsis, although fungicides containing difenoconazole (Revus Top, Quadris Top, Inspire Super) tend to be a bit more effective. Ziram is a moderately good protectant against Phomopsis and can be a tank-mix partner with a phosphorous acid fungicide. EBDC fungicides and Captan are good protectants, but cannot be applied after bloom has started in juice grapes grown for the National Grape Cooperative. In addition, EBDC's have a 66-day pre-harvest interval.

Serenade (+Nu-Film P) is the best organic option for control of Phomopsis, other than dormant applications of lime sulfur or copper.

See also

[“Protecting young grape clusters from powdery and downy mildew”](#)

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PROTECTING YOUNG GRAPE CLUSTERS FROM POWDERY AND DOWNY MILDEW

When it comes to battling powdery mildew and downy mildew on grapes, the following adage applies: “The early grower catches the fungus!”

Posted on **June 19, 2013** by **Annemiek Schilder**, Michigan State University Extension, Department of Plant, Soil and Microbial Sciences

Early fruit set heralds a time of extra vigilance when it comes to disease control, as young fruit clusters are highly susceptible to all major diseases, including downy mildew and powdery mildew. Recent rains are likely to favor primary inoculum release for both powdery and downy mildew pathogens and it is possible that we will see substantial powdery mildew pressure on the young fruit this year. As a reminder, it is possible to have powdery mildew fruit infection prior to observing any foliar infections, so protect the fruit of susceptible cultivars even if no powdery

mildew has been seen on the leaves. This year, downy mildew appears to have arrived “right on schedule” as the first infected clusters were spotted on unsprayed Chancellor vines in southwest Michigan on June 12, 2013. Therefore, careful scouting is advised on a weekly basis.

[Michigan State University Extension](#) strongly advises growers to protect flower and fruit clusters from infection using effective fungicides. The risk of infection is especially high if we experience multiple rain events and moderate to high temperatures (70 to 85 degrees Fahrenheit). As the berries develop, they become naturally resistant to downy mildew and powdery mildew and the need for protection diminishes after the susceptible period ends. This happens quite rapidly for downy mildew – two to three weeks after bloom – whereas for powdery mildew berries build up resistance about four to five weeks after bloom.

Powdery mildew

Fungicides such as sterol inhibitors (e.g., Elite, Rally) and strobilurins (e.g., Sovran, Flint, Abound, Pristine) fungicides have the ability to cure early infections, but will not eliminate colonies that are already established. Since strobilurin-resistant powdery mildew isolates have been found in Michigan – mostly in MSU experimental vineyards and wine grape vineyards with a significant history of strobilurin use – and we have circumstantial evidence for sterol inhibitor resistance, we recommend adding a protectant fungicide like Sulfur or Ziram to the tank-mix when using either type of fungicide. Sulfur is the most cost-effective option for non-sulfur-sensitive grape cultivars. Also, alternate fungicides with different modes of action, such as Vivando, Torino, Quintec, Endura, Serenade and Regalia.

Revus Top, Inspire Super and Quadris Top are newer pre-mix fungicides for control of powdery mildew and other diseases in grapes. Difenoconazole, the active ingredient in these products, is one of the more active sterol inhibitor fungicides, but also happens to be phytotoxic on Concord and Noiret grapes under some circumstances. Luna Experience is a new pre-mix fungicide for control of powdery mildew, black rot, Phomopsis and anthracnose.

Serenade and Regalia are options for disease control in organic grapes – their efficacy is based on microbial antagonism and induced resistance, respectively. Add a spreader-sticker (e.g., Nu-Film P) to increase efficacy and longevity of these products. Mineral oils (e.g., JMS Stylet Oil, Purespray Oil) and potassium bicarbonate salts (Kaligreen, Armicarb, MilStop) can be used to eradicate visible powdery mildew colonies. Oxidate (hydrogen peroxide) also has some eradicant activity, but dissipates quickly. If you use eradicants, make sure that spray coverage is thorough (use sufficient spray volume), as only those colonies contacted by the fungicide will be killed.

Downy mildew

For most varieties, foliar infections are the main phase to be concerned about. However, cv. Chancellor is like the proverbial “canary in the coal mine” for cluster infections. Both flower and young fruit clusters can be destroyed. As soon as active infections are found, use fungicides with post-infection activity at the highest labeled rate. For downy mildew, Ridomil Gold (MZ or Copper) are the strongest fungicides, followed by phosphorous acid fungicides such as Phostrol and ProPhyt. When using phosphorous acids, applying a “booster spray” five days after the first spray will enhance the curative effect. Strobilurin fungicides have limited post-infection activity and should be used in a preventative mode.

Newer fungicides for downy mildew control are: Zampro, Presidio, Revus/Revus Top (don't apply Revus Top to Concord or Noiret vines due to risk of phytotoxicity), Gavel (contains

mancozeb), Forum, Reason, Ranman and Tanos. While some of these newer fungicides have post-infection (curative) activity, they are best applied on a preventative basis. Forum is one of the least expensive of this group. They are good for integration into a fungicide resistance management program as many of them represent new and different chemistries.

Serenade, Sonata and copper products are organic options for downy mildew control. Among copper fungicides, Cueva and Magna-Bon might be interesting to growers due to their much lower copper content than traditional copper products.

See also

[“Banning black rot and Phomopsis from young grape clusters”](#)

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MICHIGAN HOP UPDATE – June 21, 2013

Downy mildew continues to expand in Michigan hopyards and with rain in the forecast, growers should apply protectant sprays to minimize infections.

Posted on **June 21, 2013**, MSUE News, by **Erin Lizotte**, Michigan State University Extension

So far this season, the [Benton Harbor Enviro-weather station](#) has accumulated 793 GDD50 with 0.35 inches of rain over the past week; the [Clarksville Enviro-weather station](#) has recorded 695 GDD50 with 0.74 inches of rain this past week; and the [Northwest Michigan Horticultural Research Center](#) accumulated 572 GDD50 with 0.97 inches of rain over the last week. Bine training has wrapped up for the most part and growth really took off this last week with bines as high as 12 feet in northwest Michigan.



Hop development in northwest Michigan on June 20, 2013.

Photo credit: Erin Lizotte, MSU Extension

Downy mildew is the major concern for Michigan growers right now, with early initial infections fueling significant outbreaks in some hopyards. Downy mildew is caused by *Pseudoperonospora humuli* and can cause significant yield and quality losses, depending on

variety and when infection becomes established. In extreme cases, cones can become infected and the crown may die.

Typically, downy mildew appears early in the season on the emerging basal spikes. Spikes then appear stunted, brittle and distorted. Asexual spore masses appear fuzzy and black on the underside of infected leaves. As vines continue to expand new tissue becomes infected and vines fail to climb the string. Growers can retrain new shoots, but often incur yield loss as a result.

This season, symptoms have appeared more readily on expanded leaves as small, angular lesions that are yellow and chlorotic in appearance. These small lesions expand over time and eventually sporulate on the underside of leaves when warm and moist conditions occur. According to "[A Field Guide for Integrated Pest Management in Hops](#)," infection is favored by mild to warm temperatures (60 to 70 degrees Fahrenheit) when free moisture is present for at least 1.5 hours, although leaf infection can occur at temperatures as low as 41 F when wetness persists for 24 hours or longer. At this point in the season we are also beginning to see stunting and wilt of terminal portions of the bine.



Small, angular lesions in the early stages of downy mildew infection on the back of a hop leaf. The front of the hop leaf appears to have chlorotic, yellow halos where lesions are located. Photo credit: Erin Lizotte, MSU Extension

It takes a multipronged approach to manage for downy mildew. Growers should utilize a protectant fungicide management strategy to mitigate the risks of early and severe infections. Keep in mind that varieties vary widely in their susceptibility to downy mildew and growers should select the more tolerant varieties when possible. Clean planting materials should be selected when establishing new hopyards since this disease is readily spread via nursery stock. It is also recommended that growers pull all basal foliage during spring pruning. Pruning should be performed as late as possible and all green materials should be removed from the hopyard and covered up or burned.



The variety Centennial with advanced downy mildew infections sporulating on the underside of leaves and causing stunting and collapse of the bine. Photo credit: Erin Lizotte, MSU Extension

Cultural practices alone are not enough to manage downy mildew. Protectant fungicide strategies are particularly important during the year of planting to minimize crown infection and limit disease levels in the future. Well-timed fungicide applications just after the first spikes emerge and before pruning has been shown to significantly improve infection levels season long. Subsequent fungicide applications should be made in response to environmental conditions that favor disease (temperatures above 41 F and wetting events). Fungicides containing copper, boscalid, pyraclostrobin, phosphorous acids and a number of biopesticides have varying activity against downy mildew.

For organic growers, [OMRI](#)-approved copper formulations are the most effective. Sulfur products applied for **powdery mildew** protection will not protect against downy mildew. Michigan growers have yet to report significant powdery mildew damage, but given the experiences of hop growers around the United States, growers should keep an eye out for this potentially significant pathogen.

If you already have downy mildew established in your hopyard, cultural practices will be very important in regaining ground. According to [David Gent](#), a hop specialist at [Oregon State University](#), diseased shoots on the string should be removed by hand and healthy shoots retrained in their place. Remove superfluous basal foliage and lower leaves to promote air movement in the canopy and to reduce the duration of wetting periods. If there is a cover crop, it should be mowed close to the ground. If yards have no cover crop, cultivation can help dry the soil and minimize humidity. Keep nitrogen applications moderate.

Growers should also carefully monitor their [hops](#) for **potato leafhopper** populations as this insect has arrived throughout Michigan. Potato leafhoppers move in all directions when disturbed, unlike some leafhoppers that have a distinct pattern of movement. Potato leafhoppers can't survive Michigan's winter and survive in the Gulf States until adults migrate north in the spring on storm systems. Although hop plants are susceptible to potato leafhoppers, they can tolerate some level of feeding and growers should be conservative in the application of insecticides. At this time there is no set economic threshold for potato leafhoppers in hops and despite having caught potato leafhoppers two weeks ago, no damage has been reported or observed yet this season.



*Potato leafhopper nymphs that have begun appearing around the state.
Photo credit: Mario Mandujano, MSU*

Potato leafhopper feeding on hops causes what growers have termed “hopper burn,” which causes necrosis of the leaf margin in a v-shaped pattern and may cause a yellowed or stunted appearance as well. The easiest way to observe potato leafhoppers is by flipping the shoots or leaves over and looking for adults and nymphs on the underside of leaves. Growers may also choose to place two-sided yellow sticky traps in the field to catch potato leafhoppers.

Growers continue to scout for **mites** and despite some activity in tree fruit, no activity has been reported or observed in hopyards yet this season, though it likely is occurring at a low level. Two-spotted spider mites are a significant pest of hops in Michigan and can cause complete economic crop loss when high numbers occur by decreasing the photosynthetic ability of the leaves and causing direct mechanical damage to the hop cones. Two-spotted spider mites feed on the liquid in plant cells, eventually causing visible symptoms. Leaves take on a white appearance and will eventually defoliate under high pressure conditions. Intense infestations weaken the plant and reduce yield and quality. Infested cones develop a reddish discoloration, do not hold up to the drying process, and commonly have lower alpha levels and shorter storage potential. Additionally, the mites themselves act as a contaminate issue for brewers.

In the spring, only female two-spotted spider mites are present as they have overwintered in a dormant stage from the previous season and are already mated and ready to lay fertilized eggs. She appears particularly orange in color this time of the year and has overwintered on debris and trellis structures in the hopyard. As temperature warms, the females feed and begin laying eggs. Larvae emerge from the eggs in two to five days, depending on temperatures, and develop into adults in one to three weeks – again, depending on temperature. Two-spotted spider mites like it hot with the pace of development increasing until an upper threshold around 100°F is reached. Conversely, cold and wet weather is not conducive to development, which may explain the low pressure thus far this season.

Two-spotted spider mites are very small, but can be observed on the underside of leaves using a hand lens. The eggs look like tiny, clear spheres and are most commonly found in close proximity to adults and larvae. The larvae themselves are small, translucent versions of the adults that begin the season with a distinctly orange hue that changes over to translucent, yellow or green as they feed. Adults also have two dark spots.



Two-spotted spider mite eggs, larvae and adults (the adult females are the largest followed by the males). Photo credit: David Cappaert, Michigan State University, Bugwood.org

When you are observing the underside of leaves, keep an eye out for beneficial, predatory mites that actually feed on the two-spotted spider mite. Predatory mites are often translucent, larger than two-spotted spider mites, and move at a much faster speed across the leaf surface. Predatory mites play an important role in balancing the two-spotted spider mite population and should be protected when possible.

Growers should be scouting for mites now and remember that only when mites reach an economically significant level should cultural and chemical intervention be considered. Scouts should take leaf samples from 3 to 6 feet up the bine; as the season progresses, samples should be taken from higher on the bine as the mites migrate upward. Use a hand lens to evaluate two leaves from 20 plants per yard. Thresholds developed in the Pacific Northwest have established that more than two adult mites per leaf in June indicate the need to implement a pest management strategy. By mid-July, the threshold increases to five to 10 mites per leaf. Remember that if cones are not infested, hop plants can tolerate a good deal of damage from mites.

There are many factors that can affect the prevalence of mites in a given season, including the presence of beneficials, rainfall and temperatures. Consider selecting insecticides that have a minimal effect on beneficial insect populations and do not apply pesticides for mite control unless absolutely necessary as one application often necessitates continual applications in the absence of beneficial predators. Specifically, pyrethroid applications have been shown to increase in mite populations in the hopyard due to their negative impact on beneficial insects.

Growers should read and follow all pesticide labels carefully and proceed with caution when utilizing new materials.

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WEBSITES OF INTEREST

Insect and disease predictive information is available at:

<http://enviroweather.msu.edu/homeMap.php>

60 Hour Forecast

<http://www.agweather.geo.msu.edu/agwx/forecasts/fcst.asp?fileid=fous46ktvc>

Information on cherries is available at the new cherry website:

<http://www.cherries.msu.edu/>

Fruit CAT Alert Reports have moved to MSU News

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