

Northern Michigan FruitNet 2013

Northwest Michigan Horticultural Research Center

Weekly Update

August 27, 2013

CALENDAR OF EVENTS

2013

- 9/5** **Senator Stabenow Roundtable on Proposed 2013 Farm**
Benzie Central Schools Auditorium
- 9/12** **Apple Field Sorting Machine Demo**
Sparta, MI
- 9/14** **Roadblocks to MAEAP Verification Workshop**
Putney Beef and Fruit
See attached for more details

2014

- 1/14-15** **NW Michigan Orchard & Vineyard Show**
Grand Traverse Resort
- 2/18-19** **IPM Academy**

GROWING DEGREE DAY ACCUMULATIONS AS OF August 26 AT THE NWMHRC

Year	2013	2012	2011	2010	2009	2008	23yr. Avg.
GDD42	2858	3472	2936	3323	2589	2806	2917.3
GDD50	1910	2353	1967	2213	1598	1822	1909.5

Northwest Michigan Regional Report

N.L. Rothwell, NWMHRC

Things are quiet across the north now that cherry harvest has finished; growers waiting to start apples and grapes.

Tart cherry harvest is complete, and we have come in just under the 125 million pound average. Numbers will be recalculated this week for changes, and the totals will be complete for 2013. Growers across the region are taking a small and deserved breather before apple and winegrape harvest begins. Although fall is in the air, current temperatures make it feel like the middle of summer. Daytime temperatures have been in the mid-80s and the nights have cooled down into the mid-60s. We received some rain early this morning, less than 0.2" in most locations, and by mid-morning the skies cleared and the remainder of the day has been sunny. We could have really used the rain as the region is extremely dry. Sweet cherry trees at the NWMHRC have really started to show drought symptoms, and mite populations are exploding in this heat. So far this season, we have accumulated 2858GDD base 42 and 1910GDD base 50. Our 20+ year averages are 2917GDD base 42 and 1909GDD base 50.

Apple. Apple harvest is almost here, and early varieties have started to come off the trees. Color on apples this year is terrific, and growers are mostly pleased with size. Growers have done a nice job controlling **scab** this season, and the dry and cool weather early gave us an extra boost in protecting fruit from this disease. **Codling moth** (CM) numbers are the highest they have been all season here at the NWMHRC. Growers have also reported that numbers have been climbing in the past few weeks, and some farms are reporting trap catches in the 40s and 50s. This second generation took slightly longer to start flying likely due to cool temperatures earlier in the summer, which likely slowed them down. However, the moths that are flying now are mating and laying eggs—fruit needs to continue to be protected. In addition, the night time temperatures are conducive for CM flight. **Obliquebanded leafroller** (OBLR) numbers are also higher this week than they were last week at the NWMHRC. Both OBLR and CM are internally feeding pests, and both are in the family Lepidoptera; we have good insecticides that will control these pests. Growers need to use an insecticide with a different mode of action than they used with first generation OBLR and CM. **Oriental fruit moth** numbers are also at a season high: 8.5 moths/trap.

Cherry. **Mite** populations are increasing in many cherry blocks across the region, likely due to the hot and dry conditions. Some tart cherry orchards are also showing some **firing** at this time. Firing is typically the result of hot and dry weather coupled with **two spotted spider mite** (TSSM) infestations, but firing can happen with no mites. Growers need to assess if they have high mite populations before applying a miticide (please see last week's FruitNet for more information on firing). **Obliquebanded leafroller** (OBLR) numbers have also jumped in cherry—from 8 moths/trap last week up to 24 moths/trap this week. Growers that have these high populations of OBLR will need to be aware of these populations next season. Now that insecticide sprays have stopped in cherry orchards, **spotted wing drosophila** numbers are increasing. We are catching up to 75 flies/trap at this time.

Cherry leaf spot is showing up in the tops of trees in many blocks, but overall growers did a good job of controlling this disease this season. Most growers put on a post harvest spray to keep leaves on through September.

Wine Grapes

Duke Elsner, Grand Traverse County MSUE

A number of cultivars have now reached veraison. A few very early selections at the research center have already softened and developed ripe flavors! We will start reporting brix and pH levels for interesting cultivars next week.

Powdery mildew continues to increase in intensity on susceptible cultivars. The use of eradicant materials at this time can halt the progression of berry infections if good penetration and coverage can be achieved. The Michigan Fruit Management Guide lists JMS Stylet Oil, Armicarb, Kaligreen or MilStop (all potassium bicarbonate salts) and Sulforix and Oxidate as possible products for this purpose. JMS Stylet Oil can cause a temporary delay in brix accumulation and should not be used more than twice after veraison. Oil and sulfur products should not be used within 14 days of each other.

MICHIGAN SPOTTED WING DROSOPHILA REPORT - August 27, 2013

As harvest is winding down in many crops at high risk from SWD, fly numbers are similar to last week total catch

Captures of SWD in our statewide monitoring trap network are consistent with last week's catch. This week, the average number of SWD per trap is 45, which is precisely the average from last week, but the proportion of traps catching this pest increased from 72 to 87%. As many crops have finished for the season, this will be our last formal SWD report for the year. We will continue to trap SWD for research purposes at multiple sites across the state.

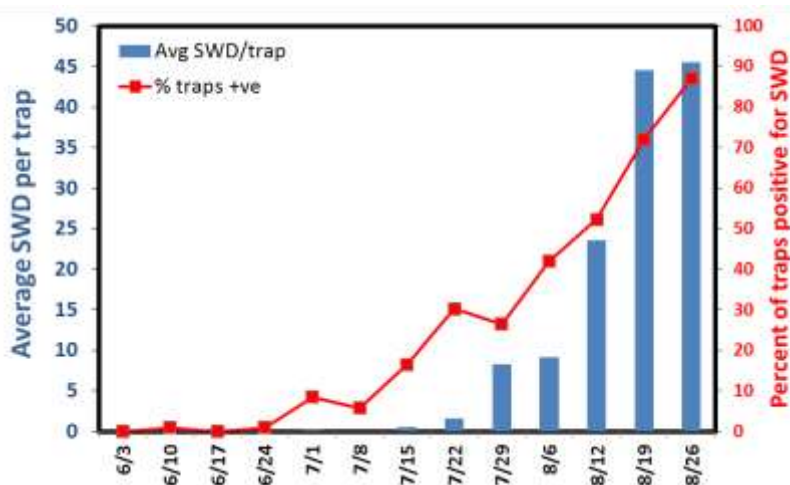
The southwest region of the state continues to catch more SWD than the other fruit growing regions in Michigan. The trap catch this week seems to be more site dependent than in past weeks, which is likely the result of sprayed vs. unsprayed fields. In southwest Michigan, we continue to trap flies in grapes, caneberries, and blueberries in similar numbers to last week. However, reports from Berrien County have shown tremendous increases in SWD catch across many crops. One trap was estimated to have over 2600 flies in it. Other Berrien County traps caught 50+ flies while other trap counts were up in the 1000s. We also continue to find eggs and larvae in our samples of raspberry fields. Although catches are not as consistent in the northwest, some traps are catching over 100 flies/trap. Overall trap catch in the north ranges from a few flies to mid-20s and 30s. West central traps were removed last week, and no counts are available for this report. Overall, farms that are still being harvested and managed for this pest have much lower counts and have not seen such large spikes in the fly captures as in unsprayed blocks or fields.

Sampling of fruit at some of the monitored sites that have not been managed this season continues to detect some drosophila larvae in the salt test samples, with unsprayed raspberry and blueberry samples containing large numbers of larvae. Commercial farms have either no infestation or low levels, and management programs are generally succeeding in keeping the fruit free of infestations. Growers will need to have tight spray intervals and make sure they are achieving excellent coverage to continue controlling SWD in the weeks to come.

For more information on SWD and to read past reports, visit MSU's Spotted Wing Drosophila website http://www.ipm.msu.edu/invasive_species/spotted_wing_drosophila.

For growers of later blueberry varieties, blackberries, or fall red raspberries it is essential that crop protection measures be taken if the fruit is still ripening and will be harvested later in August or September. Given the dense canopies, excellent coverage is essential for good control of SWD. For guidance on which treatments are effective, please refer to the management guides posted online at the SWD website mentioned above.

As this will be our last report for the season, we would like to thank the dedicated scouts, researchers, and growers for their input into this important weekly report. Spotted wing Drosophila will continue to be a challenge in many crops, but the MSU Team is committed to continue to help Michigan growers with this pest into the future. The weekly SWD scouting report has been funded through Project GREEN and Michigan State University Extension. This output is generated through a scouting and reporting network of MSU Extension field staff and campus specialists. We would like to acknowledge the following team members and again thank them for their weekly scouting efforts and input into this report: Rufus Isaacs, Keith Mason, Steve VanTimmeren, Larry Gut, Peter McGhee, Michael Haas, Bob Tritten, Mark Longstroth, Diane Brown, Carlos Garcia, Karen Powers and Nikki Rothwell.



PREDICTED 2013 APPLE HARVEST DATES

**Phillip Schwallier, District Horticulture Educator Amy Irish-Brown, District ICM Educator
Clarksville Horticultural Experimentation Station Bill Shane, Senior Extension Specialist,
SW Michigan Research and Extension Center**

The predicted harvest dates for every MAWN weather station is now available on Enviroweather web site at Michigan State University. This season began with a roller coaster of weather across the state. A late winter extended cool period delayed spring and then followed by alternate periods of warm and cold weather surged tree development forward and backward. Some areas experienced a severe frost. This unusual spring was also characterized by considerable seemingly unending record precipitation in some state locations. At times apple tree development was 2 to 3 weeks behind normal but in the end most of the state bloomed near normal to slightly behind normal dates. SW and SE Michigan bloomed 2 to 3 days behind normal and the rest of the state bloomed near normal to slightly late. In some parts of the state, the severe frost killed some primary bloom (bloom on 2 year wood and older) but the late primary and secondary bloom (bloom on 1 year old wood) was not hurt and a heavy fruit set resulted.

Last year's early bloom (about 30 days early) resulted in record early predicted harvest, about 20 to 30 days ahead of normal. The 2013 predicted harvest dates (Table 1) are between 1 to 7 days behind normal depending on the area. These predicted harvest dates are for the center or peak harvest of these varieties for CA storage. Gala is notorious for ripening early when late summer temperatures are above normal. Heavy crops will mature a few days later. Other varieties are less prone to hot temperatures advancing fall maturity. Still other varieties ripen when triggered by cold temperatures that occur near harvest time. The normal harvest dates for other varieties are listed in Table 3 for the Grand Rapids area. This year's 2013 predicted dates and adjusted predicted dates are a rough estimate based on the McIntosh, Jonathan and Red Delicious predicted dates. Other areas of the state should adjust non-predicted varieties based on their own history. Use a 30 days before harvest 2013 predicted harvest date to time applications of ReTain for stop drop management.

Table 1. 2013 predicted peak harvest dates

Full bloom date				Predicted harvest date			
Station	McIntosh	Jons	Reds	McIntosh	Jons	Reds	Observer
SWMREC	9-May	13-May	14-May	11-Sep	27-Sep	3-Oct	Shane
Deerfield	8-May	9-May	10-May	9-Sep	26-Sep	4-Oct	Tritten
Romeo	15-May	16-May	16-May	15-Sep	2-Oct	8-Oct	Tritten
Peach Ridge	15-May	16-May	17-May	15-Sep	29-Sep	5-Oct	Schwallier
Hart	19-May	20-May	20-May	20-Sep	5-Oct	11-Oct	Schwallier
NWMHRS	21-May	21-May	22-May	23-Sep	8-Oct	16-Oct	Rothwell

SUNSCALD AND HEAT STRESS IN APPLES COULD BE AN ISSUE IN THE NEXT WEEK OR TWO

Apply apple sunscald protective materials right now prior to environmental conditions that lead to fruit damage.

Posted on **August 22, 2013**, **MSUE News**, by **Phil Schwallier**, and Amy Irish-Brown, Michigan State University Extension

Back in mid-July 2013, some very high temperatures and low humidity levels led to some early sunscald, sometimes called sunburn, damage in apples. The forecast for the next 10 to 14 days calls for environmental conditions that again could potentially cause sunscald.

Sunscald can occur in all apple growing regions, but is more pronounced in conditions with high temperatures and clear skies. It is enhanced when soil moisture levels are less than adequate. Fruit in the southwest quadrant of the tree is most likely to be affected. Heavy crops can cause branches to bend over and suddenly expose fruit. Light-skinned apple varieties are most sensitive to sunburn. Sensitivity might be associated with low calcium concentration in the fruit. Symptoms begin as white, tan or yellow patches on the sun-exposed side of the fruit.

Sunscald results from heat stress to the fruit leading to injury of the affected cells. The transpiration of water from the apple fruit helps cool fruit on the tree and water stress conditions can lead to higher levels of sunscald. Most of Michigan's apple growing regions are in a bit of a water-deficit situation and blocks without irrigation could have higher incident of sunscald in the coming two weeks (as of Aug. 22, 2013). The forecast is calling for a significant shift in our weather pattern – much higher temperatures and clear skies. The greatest likelihood of sunscald occurs when fruit are suddenly exposed to high temperatures and intense sunlight such as when the weather rapidly shifts from being cloudy and cool for many days to sunny and warm.

There are products recommended by [Michigan State University Extension](#) you can use to prevent sunscald, but they need to be applied before potential sunburn weather – in other words, right now. These include:

- Raynox
- Surround
- Vapor Gard
- Purshade
- DIFFUSION® Light Management from Wilbur-Ellis
- and others

These products need to be applied before potential sunburn weather and all with 100 gallons of water per acre. Some of these products need reapplication after several days as fruit grow and rain washes the product off. Some suggested rates from are:

- Raynox at 2.5 gallons per acre
- Surround at 20 to 50 pounds per acre

- Vapor Gard at 1 gallon per acre
- Purshade at 2 gallons per acre
- DIFFUSION® at 2 gallons per acre

Again, all with 100 gallons of water per acre.

APPLE FIELD SORTING MACHINE DEMO

Renfu Lu will demonstrate his field sorting machine on **Sept 12** from **10 AM to 12 PM** at Brett Anderson's farm. This machine allows for in the field sorting.

Lu is an agricultural engineer with USDA's Agricultural Research Service and he partners with Michigan State University's Agricultural Engineering Department on various projects related to the apple industry as well as the sugar beet industry.

You will be busy with harvest by September 12, but it's during harvest that we have to do this demo. We hope you can slip away to see what it's all about.

Date: Thursday, **September 12, 2013**

Time: 10 AM to Noon

Place: Brett Anderson's Farm
2909 11 Mile Rd
Sparta, MI 49345

Phil Schwallier and Amy Irish-Brown
MSU Extension Educators - Production Tree Fruit

ETHREL DAMAGE HAS BEEN OBSERVED IN SWEETS AND TARTS

N.L. Rothwell, NWMHRC

There have been many reports of visible phytotoxicity in both sweet and tart cherry, and this damage is likely a result of applying ethephon before or at the time of hot temperatures before harvest. In past years, we have seen high levels of ethephon-induced damage with the hot, dry weather conditions. Ethephon can have excessive activity under a certain set of conditions, which can result in tree injury. We observed substantial ethephon damage back in 2007, especially in sweet cherries and of those varieties, Golds seemed to be the most sensitive. However, we have seen damage in sweets and tarts this season.

The damage is often cumulative when we have a run of hot and dry weather around the ethephon timing, which has been the case in recent years: trees under multiple years of drought stress are prone to phytotoxicity from ethephon applications than trees with adequate water. Therefore, if trees are not under irrigation, they become drought stressed and trees under stress become more susceptible to ethephon damage. Damaged trees exhibit excessive gumming, and leaves turn yellow and eventually drop prematurely. We have also noticed areas within a block may show considerably more ethephon damage than other areas. Most likely the trees that show the most damage were more stressed in some way at the time of application, and soils in a particular area can help showcase this ethephon damage.

There is little growers can do to reverse the phytotoxicity caused by ethephon sprays this season. However, if trees still have the majority of their leaves, a fall foliar nitrogen application is recommended. Fall foliar nitrogen applications have been shown to increase winter hardiness as well as improve tree growth and fruiting in apples and cherries the following season. These fall foliar applications will give trees an extra boost in the spring-- when trees break dormancy, they will have immediate carbohydrate reserves for initial growth (please see fall foliar N application article in this week's FruitNet).

Lastly, trees with ethephon damage are more susceptible to San Jose scale (SJS). This pest is usually considered an apple pest rather than a pest of cherry, but when trees are stressed, SJS can become problematic. Once an orchard becomes infested, San Jose scale is a difficult pest to control, and eradication is unlikely. Therefore, growers want to minimize stress on their trees this fall to avoid SJS infestations. Fall foliar nitrogen applications are the best measure to improve tree health at this time.

FALL FOLIAR NITROGEN APPLICATIONS SHOULD BE APPLIED NOW

Stressed sweet and tart cherry trees would benefit from fall foliar nitrogen applications

Nikki Rothwell, NWMHRC

Greg Lang, Dept. of Horticulture, MSU

Maintaining cherry tree health is important as we head into winter. In southwest Michigan, many tart cherry orchards had outbreaks of cherry leaf spot (CLS), and this disease has caused substantial defoliation throughout the season. Additionally, orchards without irrigation are under severe drought stress at this time, particularly in northwest Michigan, and drought stress results in very little photosynthesis or nutrient uptake. Therefore, as we move into the winter months, if trees still have the majority of their leaves, we are recommending fall foliar nitrogen applications in orchards that have had CLS infections or drought stress. Fall foliar nitrogen applications have been shown to increase winter hardiness as well as improve tree growth and fruiting in apples and cherries the following season.

Nitrogen (**N**) and carbohydrates are stored in tree tissues in fall and are vital for fruit tree growth and development in spring. Fruit trees accumulate carbohydrate and N reserves prior to leaf drop, which are stored through the winter until they are remobilized to growing points (flower buds, new shoots, and expanding spur leaves) the following spring. Reserves provide trees with the necessary energy for new growth when leaves are not yet present for photosynthesis and roots have not yet begun taking up adequate amounts of N from the soil.

Ayala and Lang (2004) investigated carbohydrate reserves in sweet cherry and found that stored carbohydrates are used for the development of fruiting and non-fruiting spur leaves during the first few weeks after budbreak, whereas new shoot leaves develop using carbohydrates from the current season's photosynthetic activities later in the spring and summer. Further work shows that spur leaf size and the total leaf area per spur increased with foliar urea applied the previous fall. Spur leaves play an important role in sizing fruit, since larger leaf area close to the fruiting clusters equates to larger fruit. Spur leaves also play a role in development of Montmorency tart cherries. The Montmorency study also showed that tree winter hardiness actually improved with fall foliar nitrogen applications. Therefore, if trees are heading into winter under substantial stress, fall foliar applications are likely to improve winter hardiness as well as promote strong early season growth in 2013.

The recommended rate for foliar sprays is a total of 40 lb of urea, split into two applications; growers should apply this spray to the leaves (not ground applied) and be sure the product is formulated for foliar applications (i.e., a low biuret urea). In research trials at Clarksville (Ouzounis and Lang, 2011), optimum application timing was early September and followed by a second application 1-2 weeks later. However, good results also were found at Clarksville and at Traverse City for split applications in early October; timing of applications will depend on the numbers of leaves remaining on the tree. For instance, if trees are quickly defoliating at this time, applications should be made as soon as possible. However, if leaves are still green and the majority of the canopy remains, applications can be made at the end of September or the first of October. Whether growers apply the foliar applications sooner or later, the initial applications should be followed with a second spray within two weeks, if adequate leaves are still on the trees. Trees with substantial leaf loss will **not** benefit from these applications because the leaves need to absorb the material and translocate it down to the storage tissues in the buds, bark, and roots.

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LATE SUMMER GRAPE DISEASE UPDATE FOR 2013

During July and early August, grape disease symptoms became more apparent, although well-managed vineyards continue to look fairly clean. Growers should continue regular monitoring.

Posted on **August 21, 2013, MSUE News**, by **Annemiek Schilder**, Michigan State University Extension, Department of Plant, Soil and Microbial Sciences

Downy mildew

Downy mildew has been active since mid- to late June in southwest Michigan and mid-July in northwest Michigan due to abundant rainfall and conducive temperatures, although more recent warm, dry weather in some locations may have slowed it down. Rainfall continues to be quite variable across Michigan, which makes disease occurrence spottier and precludes blanket recommendations for disease control. However, warm humid nights and dew formation are conducive to downy mildew development, as it promotes abundant sporulation in lesions. Dew formation also promotes downy mildew development on Niagara and Concord vines. Their hairy lower leaf surfaces are difficult to wet by rain.

Powdery mildew

Powdery mildew symptoms were first reported in early to mid-July and may get more prevalent during warm, dry weather forecast for the rest of August, especially since the relative humidity is increasing as noted from increasing dew point temperatures. Powdery mildew late in the season goes into “overwintering inoculum production mode” and cleistothecia (small brown to black specks) have already been seen in powdery mildew colonies.

To prevent cleistothecium production on infected plant tissues, you can apply eradicant fungicides, such as oils or bicarbonate salts. If you do, make sure to use sufficient water to achieve thorough coverage as these materials have to contact the powdery mildew hyphae to be effective. Be careful with oils during periods with high temperatures (85 degrees Fahrenheit and above) as leaf burning can occur. Sterol inhibitor fungicides will also prevent cleistothecium production, but are not recommended for full-blown infections as that may enhance fungicide resistance development.

Black rot

Black rot symptoms are common on fruit in unsprayed vineyard blocks, and low levels have also been seen even in some sprayed vineyards due to suboptimal spray timing or fungicide wash-off by rain during the susceptible period (early fruit development). Protectant fungicides, such as mancozeb, were more likely to wash off than systemic fungicides, resulting in lower efficacy during the rainy periods. Systemic products like Rally or Elite are the most effective choices for black rot, especially if post-infection activity is needed.

Black rot is always a bit confusing as symptoms that are showing up now are the result of infections that happened three to four weeks ago. ‘Concord’ grape berries are susceptible to black rot infection for about four to five weeks after bloom while some *V. vinifera* cultivars don’t

become fully resistant until eight weeks after bloom. Sometimes small, circular black spots are seen on the berries; these appear to be late black rot infections that were restricted due to the natural resistance in the berries. In other cases, black spots on berries are caused by paraquat (Gramoxone) injury; in those cases, symptoms are more common on low-hanging clusters.



Left, Early stages of black rot on grapes. Right, close-up of black rot on grapes.

If you have more black rot than you expected this year, [Michigan State University Extension](#) advises to focus on doing a better job of controlling the disease next year: the key to controlling black rot is to prevent infections during early fruit development. In juice grapes, a very high level of control is usually achieved with just two sprays applied at the first and second post-bloom timings. For susceptible wine grape cultivars, three post-bloom sprays should be sufficient to nip black rot in the bud.

Phomopsis

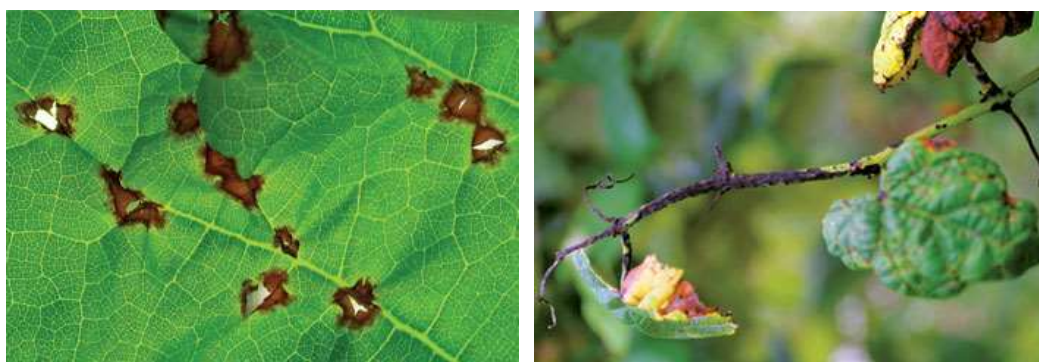
Phomopsis spots have been present on leaves and canes since May, but new growth is obscuring older infections. During rainy springs and early summers, Phomopsis spore availability usually tapers off before bunch closure, so the risk of cluster infections is nil or very low. However, some in early-ripening wine grapes, such as 'Vignoles' and 'Chardonnay' berries are starting to show Phomopsis infection and secondary berry infections are possible once fungal spores are produced on rotting berries.

Anthracnose

Anthracnose symptoms are fairly severe this year in table grapes (e.g., Mars, Marquis) and some wine grapes (e.g., Frontenac, Vidal) due to the rainy weather early in the season. Anthracnose lesions are visible as sunken black lesions on canes, black shot-hole lesions on the leaves and reddish-purple blotches on berries. Anthracnose-infected berries stay firm and may crack open and dry up.



Anthracnose symptoms on grapes.



Left, Shot-hole lesions on leaves. Right, Anthracnose symptoms on leaves.

Botrytis

Botrytis has been seen in clusters here and there, but mostly associated with injury to the berries (grape berry moth infestations or berries being squeezed out in compact clusters).

Continue regular scouting for all grape diseases, including virus diseases and fruit rots now that we are coming into veraison. We have seen symptoms of tobacco and tomato ringspot viruses, which are more visible in relatively cool growing seasons. Grapevine leafroll symptoms, such as leaf reddening in red cultivars or yellowing in white cultivars and rolling under of leaf edges, are also becoming more apparent in wine grapes.



Left, Grapevine leafroll virus on grapes. Right, Tomato ringspot virus on grapes.

Contact me (Annemiek Schilder) at schilder@msu.edu or Jerri Gillett at gillett@msu.edu or 517-355-7539 if you need a free diagnostic lab test done for suspected virus symptoms.

Dr. Schilder's work is funded in part by [MSU's AgBioResearch](#).

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BOTECTOR: A NEW BIOFUNGICIDE FOR CONTROL OF BOTRYTIS BUNCH ROT IN GRAPES

Botector is a new biofungicide labeled for Botrytis bunch rot control of grapes. It is based on competitive exclusion of Botrytis cinera and can be used in organic production.

Posted on **August 21, 2013**, **MSUE News**, by **Annemiek Schilder**, Michigan State University Extension, Department of Plant, Soil and Microbial Sciences

Botector (*Aureobasidium pullulans*) is a new, yeast-based biological control product marketed by [Westbridge Agricultural Products](#) in Vista, Cal., for control of Botrytis bunch rot in grapes. The product is also labeled for control of Botrytis gray mold in strawberries and Botrytis, Monilinia and storage diseases in pome fruit and stone fruit. Botector consists of two strains of *Aureobasidium pullulans*, a yeast that is ubiquitous in the environment and naturally occurs on plant surfaces. Botector works through competitive exclusion in that the yeast competes with other microbes for nutrients and space, thereby inhibiting *Botrytis cinerea* from colonizing infection sites on the berry surface. The product leaves no residue, does not affect fermentation or wine quality, and is harmless to bees and beneficial insects.

Botector performed well in a fungicide efficacy trial in Michigan in 2011 under moderately high disease pressure (see Table 1). [Michigan State University Extension](#) specialists also observed good efficacy against foliar powdery mildew (83 percent control with Botector versus 99 percent control with Pristine fungicide) in that trial, so that would be an added benefit.

Table 1. Efficacy of dormant and seasonal sprays for control of Botrytis bunch rot in ‘Aurore’ grapes in Lawton, Mich., in 2011

Treatment, rate/A	Application timing ^z	Botrytis bunch rot on cluster						
		Incidence (%)		Severity (%)		Overall severity (%)		Control (%) ^x
Untreated		78	a ^y	37.8	a	29.5	a	
Sulforix 1 gal	1	63	b	28.8	b	18.4	a	[37.6]
Botector 5.7 oz	2, 3, 4, 5	52	c	11.8	c	6.0	b	[79.7]
Elevate 1 lb	2, 4,	42	cd	5.9	cd	2.5	c	[91.5]
Regalia 2 qt + CoHere 0.25%	3, 5							
Pristine 38WG 18.5 oz	2, 4,	34	d	3.2	d	1.1	d	[96.3]
Vangard 75WG 10 oz	3, 5							

^z Spray dates: 1 = May 9 (dormant), 2 = June 14 (bloom), 3 = June 29 (pea-sized clusters), 4 = July 18 (bunch closure), 5 = Aug. 8 (veraison), 2011

^y Column means followed by the same letter are not significantly different according to Fisher’s Protected LSD test ($P \leq 0.05$)

^x Bracketed values denote percent control relative to the untreated check

The product has to be applied preventatively to the cluster zone to be effective. The recommended rate according to the 2(ee) label is 5 to 10 ounces per acre; 5 ounces would be sufficient under normal conditions whereas 10 ounces is recommended under high disease pressure. Up to three sprays are recommended between the end of flowering and harvest, in a sufficient spray volume to assure adequate coverage. Since the product contains a live organism, it ideally needs two days to fully colonize the plant surface it is sprayed on, so apply the product ahead of anticipated infection conditions. There is no risk of resistance development, even with frequent applications. The pre-harvest interval is zero days and the restricted entry interval is four hours.

Do not apply this product aerially or through any type of irrigation system. Ensure that the temperature of the tank-mixture is below 86 degrees Fahrenheit (30 degrees Celsius). Agitate the mixture before and during application. Use the spray mixture within eight hours after tank-mixing. Do not mix Botector with other chemicals or fertilizers during application. Avoid freezing of the stored product.

Botector is suitable for use in organic production. The product can be obtained through Hamilton Ag and [Wilbur Ellis](#) and possibly other distributors in the state and the price will probably be between \$30 to \$40 per acre at the 5-ounce rate.

Dr. Schilder's work is funded in part by [MSU's AgBioResearch](#).

This article was published by [Michigan State University Extension](#). For more information, visit <http://www.msue.msu.edu>. To contact an expert in your area, visit <http://expert.msue.msu.edu>, or call 888-MSUE4MI (888-678-3464).

CRUMBLY RASPBERRY DISORDER BEING SEEN ACROSS MICHIGAN

Small, misshapen, crumbly fall red raspberry fruits can have several causes.

Posted on **August 23, 2013**, **MSUE News**, by **Bob Tritten**, Michigan State University Extension, Annemiek Schilder, Department of Plant, Soil and Microbial Sciences, and Eric Hanson, Department of Horticulture

Late last week, inquiries from fall red raspberry growers across Michigan were made asking what was happening to their raspberry crop that is beginning to ramp up in the harvest window. Growers reported seeing berries that are much smaller than usual, misshapen and crumbling when harvested. The canes and leaves appear normal in terms of their growth and color.

Normal raspberry flowers have between 100 to 125 pistils. Each pistil is able to produce a seed and a drupelet. In normal berries, 75 to 85 drupelets usually develop. If appreciably fewer than 75 drupelets develop, the berry does not hold together and crumbles as it's pulled from the plant. Crumbly fruit usually contain fewer drupelets than normal, so they are small. The berries are of such poor quality that they are not marketable for fresh market berries, pick-your-own sales and even for the processing market.

There are many potential causes of crumbly fruit. Many times growers have difficulty sorting them out. The list of causes of crumbly raspberry disorder is long; here are a few of the most common causes suggest by [Michigan State University Extension](#).

Poor pollination

Poor pollination causes crumbly fruit because a full complement of drupelets fails to develop. Raspberries are self-fruitful, but bees are necessary to move pollen from the anthers to the stigma for full fruit set. Inadequate numbers of bees, both native and introduced, can cause small and crumbly fruit. Careless pesticide applications can reduce pollination by killing foraging bees. Some pesticides may also repel bees for some time after applications.

Poor pollination weather can potentially limit bee activity, but raspberries are extremely attractive to bees, so weather has to be unusually poor. Extremes in daily temperatures (too cold or too hot) over several days will contribute to crumbly berries; this could affect the bees or pollen tube growth. Most often these extremes occur over a few days, so only those flowers and subsequent fruit exposed to these conditions will express crumbliness. Crumbly fruit then would be found through the whole field only at a certain height of cane or length of fruiting lateral in the case of exposure to extremes in weather.

Tarnished plant bugs

Tarnished plant bugs cause crumbly fruit by feeding on the flowers or developing fruit. As a result, some drupelets do not develop and berries are irregular in shape, small and crumbly. To prevent this damage, scout for the pest early in the season and apply appropriate controls. This pest also feeds on a variety of fruit crops. This season very few tarnished plant bugs were found by growers and scouts in any of our fruit crops.

Two-spotted spider mites

Two-spotted spider mite infections have been referenced in the literature occasionally to contribute to crumbly berries, but there is not a clear link here. This year, two-spotted spider mite populations have generally been very low.

Virus diseases

Virus diseases are a potential cause of crumbly berries. There are three known viruses; tomato ringspot virus, raspberry bushy dwarf virus and raspberry leaf curl virus. All three are systemic diseases with no cure other than removing the plants. Tomato ringspot is spread by dagger nematodes so the disease tends to start in certain locations and spread slowly to neighboring plants. Raspberry bushy dwarf virus is spread by bees carrying infected pollen. It can become widespread in plantings in a short time. Raspberry leaf curl virus is one of the most damaging viruses in raspberries and is spread by the small raspberry aphid (*Aphis rubicola*).

In the case of virus diseases, affected bushes tend to be spotty or clustered in the field and express foliar symptoms such as stunting, leaf crinkling or unusual color patterns, although plants with tomato ringspot virus often appear quite normal aside from having low vigor. In addition, the problem would become gradually worse over the season or over several years. If the plants look healthy and berry crumbliness came on suddenly and fairly uniformly, other causes are more likely.

Botrytis

Botrytis or gray mold is common on ripening raspberry fruit, but this fungus can also infect flowers if bloom occurs during rainy periods or when dew is particularly heavy such as in the fall. Bloom infections usually kill whole flowers and no fruit are set, but partial damage can also result in small crumbly fruit. Based on where we are in harvest this year, this is most likely not the problem.

Boron deficiency

Boron deficiency can also cause poor fruit set and crumbly fruit. This nutrient is particularly important for pollen germination and pollen tube growth. Deficiencies are most likely on very sandy soils. Check boron levels by submitting leaf samples for nutrient analysis. If levels are low, apply 0.5 to 1.0 pounds of boron as a soil application in the spring, or 0.5 pounds B as a foliar spray prior to bloom in summer bearing varieties or in mid-summer on fall-bearing types. Be careful not to apply too much boron; excess levels can kill plants. The chances of this shortage being seen just this year and in so many locations across the state make this cause unlikely.

In our opinion, the crumbly berry disorder is most likely caused by a combination of poor pollination and extreme weather conditions (too warm or too cold during bloom).

This article was published by [Michigan State University Extension](http://www.msue.msu.edu). For more information, visit <http://www.msue.msu.edu>. To contact an expert in your area, visit <http://expert.msue.msu.edu>, or call 888-MSUE4MI (888-678-3464).

HARVEST TIME APPROACHING FOR HOP GROWERS

Determining the correct harvest date is a mix of art and science and has a big impact on the quality of the final product.

Posted on **August 23, 2013, MSUE News**, by **Erin Lizotte**, Michigan State University Extension

[Hop](#) harvest in Michigan occurs primarily from late August through September with actual dates depending on cultivar, exact location and conditions during the growing season. When attempting to determine harvest timing, [Michigan State University Extension](#) recommends growers should consider cone maturity and moisture content, weather conditions, pest pressures and market influences.

The three primary components of brewing value of the hop are the alpha-acids (bittering agent), beta-acids (preservative) and essential oils (aroma). Recent work at [Oregon State University](#) (OSU) by [Tom Shellhammer](#) continues to shed light on the importance of harvest date and the

potential effects on these brewing qualities. Of particular importance to Michigan's aromatic hops producers is the data generated regarding essential oil content, thought to be the primary source of aroma. Essential oil content is found to increase well past the typical commercial harvest dates, perhaps lending credence to concerns that we may be harvesting our hops before the optimal timing. Not surprisingly, hops harvested at different dates produced beer with significant, distinguishable differences in sensory analysis testing indicating the importance of harvest date on beer quality.

Given the findings at OSU, a late harvest timing appears ideal at first, however harvesting hops cones late can actually reduce aroma and shorten the storage life of the hops if stored in bales. When harvested too late, accelerated oxidation and loss of volatile aroma compounds can occur in storage; these problems can be exacerbated by pest damage to the cones. This knowledge must be balanced with the previously mentioned findings that essential oil content increases in hop cones harvested later. Conversely, harvesting cones too early reduces yield and flavor and can reduce vigor and yield in subsequent seasons due to a disruption in the natural reallocation of carbohydrates to the root system late in the season.

In the major hop growing regions, harvest is generally targeted when cones reach an average of 23 percent dry matter. The [Oregon Hop Commission](#) provides some limited varietal [recommendations for specific dry matter targets](#). Growers can expect dry matter content to increase by 1 percent every four to seven days, depending on variety and environment.

The [University of Vermont Extension](#) provided the following protocol to determine the percentage of dry matter. Begin by randomly sampling five to 10 sidearms of the same variety from throughout the hopyard. Samples should be taken from near the top of the trellis, approximately 2 feet below the trellis wire. The sample should reflect the state of your yard and should be taken when there isn't excess moisture in the hopyard, i.e., after the morning dew has dried, when it isn't raining, etc. Pick the cones off of the sidearm into a bucket and mix thoroughly before selecting a subsample of 100 to 150 cones. Once you have your subsample, you can begin the determination of dry matter.

Weigh an empty container in grams. Weigh the freshly picked hops in the container and record both weights. Dry the hops down to 0 percent moisture. This can be done one of several ways:

1. Overnight in a food dehydrator at 140 to 150 degrees Fahrenheit.
2. In a Koster Moisture Tester (commonly used to test forage moisture).
3. In a microwave oven or conventional oven, being sure to remove the sample every minute or less to prevent scorching. Samples dried in a microwave oven must be watched very closely (every 30 to 45 seconds) and dried at around 50 percent power to prevent heat buildup in the microwave oven that can damage it.

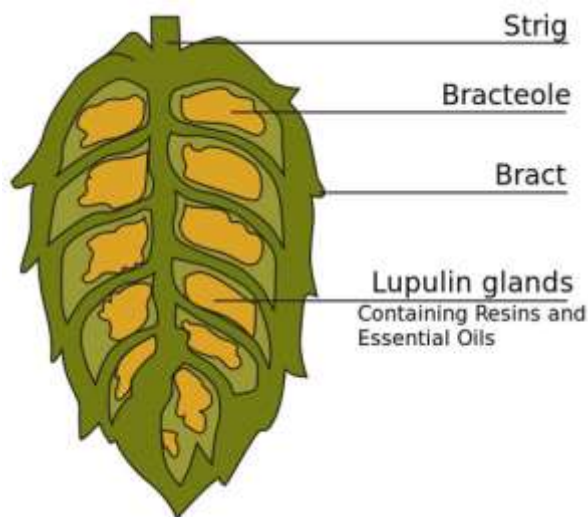
Using a food dehydrator will allow the cones to dry to 0 percent moisture overnight. However, the Koster tester and microwave methods require constant monitoring as they will dry the cones relatively quickly. Once the sample has reached a stable weight, the hops are at 0 percent moisture. Weigh the dry hops and record the weight in grams.

To calculate the percent dry matter, use the following

$$\text{Percent Dry Matter} = 100 \times \frac{(\text{Dry cone weight} - \text{container})}{(\text{Green cone weight} - \text{container})}$$

equation:

Some additional wisdom from the field suggests that cones approaching maturity become light green to yellowish and take on a dry, papery feel. The lupulin gland will turn from a pale yellow to a dark yellow-orange hue. When crushed in the hand, mature cones may crumble and do not rebound. Cones should not be completely brown at harvest.



Cross section of a hop cone showing the location of the lupulin gland.

Photo credit: Wikimedia Commons

This article was published by [Michigan State University Extension](http://www.msue.msu.edu). For more information, visit <http://www.msue.msu.edu>. To contact an expert in your area, visit <http://expert.msue.msu.edu>, or call 888-MSUE4MI (888-678-3464).

NEW MIGRANT LABOR HOUSING PROGRAM NEWSLETTER

Welcome to Michigan Department of Agriculture and Rural Development's (MDARD) first Migrant Labor Housing Program (MLH) Newsletter.

Our goal is to publish two issues of this newsletter on an annual basis. Realizing the importance of adequate and safe migrant labor housing, we hope that this newsletter serves as a tool to reach out to growers and housing providers and provide housing related information related to migrant labor housing in Michigan. **See attached newsletter for more information.**

WEBSITES OF INTEREST

Insect and disease predictive information is available at:

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

This issue and past issues of the weekly FruitNet report are posted on our website

<http://agbioresearch.msu.edu/nwmihort/faxnet.htm>

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 has moved to MSU News <http://news.msue.msu.edu>

Tart Cherry Raw Product Reports – 2013

<http://www.cherryboard.org/Week82013.pdf>