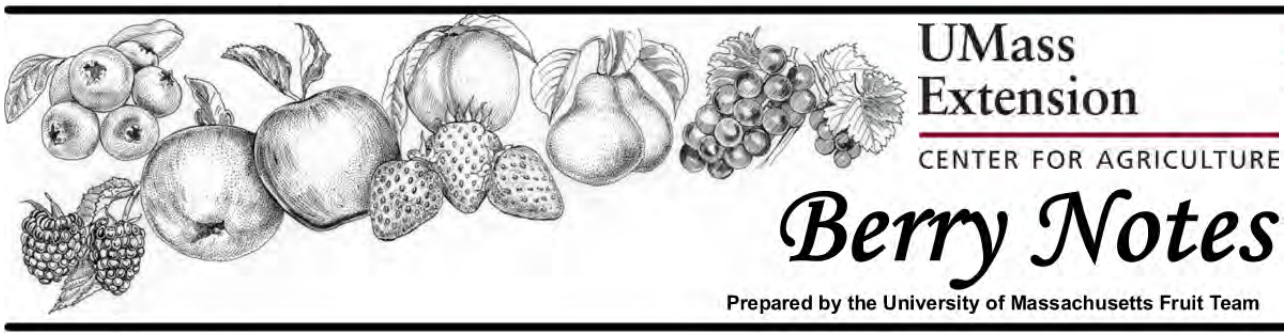

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IN THIS ISSUE:

CROP CONDITIONS:

Strawberry harvest is underway 10-14 days late in most cases. Fruit-set appears strong in general and yields should be strong. Late starts like this may result in a compression of varieties all coming ripe at once later in the month if weather turns hot. Tarnished plant bug have been scarce so far. **Raspberry** bloom is underway. Fall raspberry new cane growth is about 24". Watch for potato leafhopper feeding on new leaves. Cane borers damage may be found on primocanes. Cut out infested canes as they appear and remove from the field. Thin canes in primocane varieties to allow for better air circulation and spray penetration later in the season when SWD becomes active. **Blueberries** are in the green fruit stage and set appears heavy this year except where winter injury is heavy. Mummy berry infections seem to be light following the dry hot weather we had during the primary infection phase of the disease. Some reports have come in on botrytis blossom blight from infections during the wet and humid stretch that followed. Now is the time to set out monitoring traps for Blueberry Maggot. See more on this below. **Grapes** are in bloom to early fruit set. This is a critical time for disease management. Potato leaf hopper, spider mites, phylloxera, timid gallmaker are all things to watch for now. Final rounds of shoot thinning are best done now before tendrils start to wrap around stuff. Thin for good air movement and sunlight penetration into the canopy. **Currants and Gooseberries** are well into fruit development and may begin coloring up soon. Watch for fruit drop if hot weather arrives, especially in gooseberries. Overhead irrigation to cool the field down can help lessen this problem, but watch out for increased disease problems where irrigation is frequent.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for an approximately 1 week period, June 12 through June 18. Soil temperature and phenological indicators were observed on or about June 18. Total accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments for the 2014 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** (1-Week Gain)	**GDD** (Total 2014 Accumulation)	**Soil Temp** (°F at 4" depth)	**Precipitation** (1-Week Gain in inches)
Cape Cod	107	536	73	1.25
Southeast (Wareham)	95	521	68	1.31
Southeast (Hanson)	120	622	77	0.82
East	112	603	73	0.77
Metro West	100	521	71	0.89
Central (Boylston)	104	458	63	0.76
Pioneer Valley	126	639	73	0.76
Berkshires	86	462	69	1.39
AVERAGE	106	545	71	0.99
n/a = information not available				

(***Source**: UMass Landscape Message #14, June 20, 2014*)

STRAWBERRY

Root Problems in Strawberries

Laura McDermott, Cornell Cooperative Extension

This year strawberry plantings have looked particularly weak after going through the winter. Perhaps this should be expected as the lack of winter snow cover left plants vulnerable to winter desiccation and cold injury. The hot dry spring also stressed plants followed by lots of cold weather to hold them back, so the fact that they are finally hitting their growth stride is quite amazing.

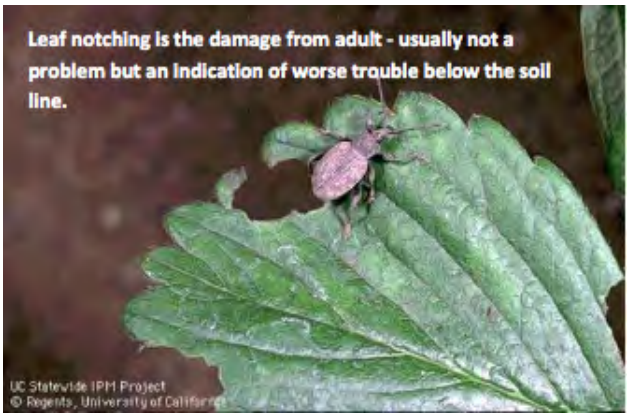
Some plantings however are not rebounding even with the plentiful moisture and occasional nitrogen application. These plants remain unthrifty looking, and some are even wilting. If you dig them up, look at the roots and try to determine if there is root feeding. Keep your eyes open for white grubs as these have been reported to be a problem in strawberry fields this year from Ontario to Maine. Similar plant symptoms can be the result of root weevil, and Verticillium wilt, so a root examination is important.

White grubs are immature scarab beetles and are traditional turf pests. Japanese Beetle, Asiatic beetle, European chafers and June beetles make up the white grub complex that can infest strawberry plantings. All of these beetles are largish, hard-shelled beetles which fly at night and are seldom seen on plants, but their C-shaped larvae are found in the soil and these grubs are what do the most damage. The adult beetles actively lay eggs beginning in late May through August (egg laying period depends on the species). The eggs are laid in grassy places where they hatch into larvae (white grubs) and feed on roots. Most species larvae feed in late summer and then again in the spring until the adults emerge, but June beetle larvae remain in the soil for three seasons where they feed continually on plant roots.

To control white grubs, do not follow sod or pasture crops with strawberry plantings. Use a cover crop for at least one season to break the cycle. Sites that have light soil and are surrounded by grassy parking areas may experience the heaviest pressure. Admire- Pro can be used to control white grubs.

Verticillium Wilt is a soil borne fungal disease that like white grubs is most devastating to plants in their first year of growth. Outer leaves turn brown and eventually collapse, but inner leaves will remain green until the bitter end. The affected plants typically appear throughout the planting in a random fashion. Many weeds are host of Verticillium including nightshade, groundcherry, redroot pig-weed, lambsquarters and horsenettle making weed control critical to Verticillium management. Actinovate AG can be used as a preventative soil drench, but fumigation is the only sure way to eradicate Verticillium. Resistant varieties include Earliglow, Guardian, Allstar, Tribute and Tristar.

Root weevils including the strawberry root weevil, the black vine weevil and the rough strawberry root weevil all attack the roots or crowns of plants while in the grub stage. The larvae cause serious damage by tunneling in the roots and crowns in the spring of the year. Injured plants appear stunted; the leaves are closely bunched and are dark and blue-green. The fine roots have been destroyed, and sometimes even the hard fibrous roots have been eaten.



Heavily damaged areas in the field can be large and circular, because of the beetles' behavior of gathering in groups. Newly transplanted straw-berries are particularly susceptible to black vine weevils.

There are no resistant cultivars known. If root weevils exist, rotation away from infested area for at least 1 year will help. Setting up barriers might also be effective this limits the movement of the adult. Parasitic nematodes have been shown to be effective. Brigade is the only insecticide labeled in NYS for the control of root weevil. This should be applied at a rate of 8-32 oz/A in mid-late June. (***Source**: Capital District Veg & Small Fruit Program Weekly Update. Vol. 4, No. 12, June 14, 2012*)

Fungicide Resistance in Strawberries

Kathy Demchak, Penn State Extension

Botrytis or gray mold is a major disease for strawberry growers, and there is some new information on fungicide resistance that growers should have.

I'd like to thank Dr. Guido Schnabel, Clemson University, for his input and work, as what he and his colleagues are doing is very helpful to growers everywhere. This information is summarized from work being conducted in the southeastern U.S. - at the Univ. of FL and Clemson Univ. – where researchers have been testing botrytis isolates from strawberry fields for resistance to commonly-used fungicides. They tested over 1800 samples from 183 farms in 2012 and 2013, and found the following:

1. More than 75% of the isolates tested were resistant to thiophanate-methyl (Topsin M). Resistance to this material is not a big surprise, as this is an older material that was known to be at high risk for resistance development.
2. Roughly half of the isolates tested in each year were resistant to pyraclostrobin (the active ingredient in Cabrio, and one of the active ingredients in Pristine), though a smaller percentage (29% and 5% in 2012 and 2013, respectively) were resistant to boscalid, the other active ingredient in Pristine.
3. Resistance to both thiophanate-methyl and pyraclostrobin were found in essentially every location in both years, though not in all samples, meaning that resistant isolates existed on nearly every farm.

4. In 2012 and 2013, respectively, 29 and 17% of isolates were resistant to cyprodinil, which is one of the active ingredients in Switch, with very low levels of resistance to fludioxinil, the other active ingredient in Switch.
5. About 1/4 of botrytis isolates were resistant to fenhexamid (the active ingredient in Elevate). And, of extreme interest…
6. More than half of the isolates were resistant to fungicides in more than one chemical class. 33% of the isolates were resistant to fungicides in either three or four different chemical classes.

This cannot be dismissed as purely a problem in other states – Dr. Schnabel has done limited testing in MD and PA, with the help of Bob Rouse, and found significant resistance in those samples, too.

The first question some folks might have is whether you could buy plants infected with resistant isolates. Nurseries are very aware of potential resistance issues, and are generally very careful about fungicide rotations – after all, they have a lot at stake if they can't control diseases. Also, some materials that are at high risk of resistance development are prohibited from nursery use. So I'm more concerned about use on individual farms. Every now and then, I talk to someone who thinks they are rotating fungicides, but then when asked which ones they use, lists the names of 2 or 3 products with ingredients in the same fungicide class. I also know that when you have small acreages, it's tempting to buy one or two products at a time, and use those until they are gone, rather than accumulate products in your pesticide shed. So, those practices are a concern. Please read on for what you can do to help.

First, be sure to use any cultural controls that you can to avoid disease issues, cut down on botrytis inoculum on your farm, and minimize the need for sprays. Every spray avoided is avoidance of an opportunity for resistance development. Cultural controls consist of removing dead leaves from plasticulture fields in the spring (that's where a lot of inoculum overwinters), and basically, anything that helps the field to stay dry, because diseases need moisture to sporulate. So, keep weeds controlled, rows narrowed back, and possibly consider a wider row spacing in matted-row production, or slightly wider plant spacing on plasticulture beds. Keep fields picked to the greatest extent that you can, and encourage harvesters to remove rotten fruit from the field. Cultural controls generally have other benefits like improving plant growth and fruit quality.

Second, don't just spray on a schedule – spray only when you have a reason. Even if you don't see botrytis, inoculum is out there, and every spray exposes what inoculum is there to the material you are using. This applies to any crop – not just strawberries. If the weather is dry and no rain is forecast, there is probably no reason to spray, at least not for diseases.

Third, consider a break from any at-risk fungicides that you have used more commonly in the past. Dr. Schnabel mentioned that resistance development has not progressed on farms where growers moved to other products and then were careful about how they used them.

Fourth, either rotate at-risk products with a broad-spectrum fungicide like captan (0-day PHI but 24-hr REI) or thiram (3-day PHIand 24-hr REI), or include them in a tank mix. You may have seen last month's article about concern with captan use during bloom and bees, but by now, you should be past bloom, and so for any disease issues for the remainder of the year, you should be able to use broad-spectrum materials, IF you need to spray.

Finally, be sure to consult FRAC codes on the fungicide package, or Table 6.14 in the Mid-Atlantic Berry guide for information on the fungicides that fall under different chemical classes.

Reference:

Fernandez-Ortuno, D., A. Grabke, P. K. Bryson, A. Amiri, N. A. Peres, and G. Schnabel. 2014.

Fungicide Resistance Profiles in Botrytis cinerea from Strawberries Fields of Seven Southern U.S. States. Plant Disease 98(6):825-833. Online at http://dx.doi.org/10.1094/PDIS-09-13-0970-RE with access limited. A summary of the work can be found here: http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-09-13-0970-RE?journalCode=pdis

(***Source**: Penn State Vegetable and Small Fruit Gazette, June 2, 2014*)

RASPBERRIES/BLACKBERRIES

Summer Tipping Brambles

Bruce Bordelon, Purdue Univ.

Tipping of primocanes is an important management practice for summer bearing blackberries and black raspberries. Tipping the new primocanes causes lateral branching and most of the fruit production next year will be from buds on those lateral branches rather than buds off the main cane. Tipping also helps increase the diameter and strengthen the main cane. Height to tip is relative to vigor. Vigorous thornless blackberries can be

tipped at 40-48 inches for best results. Black raspberries should be tipped no higher than 36-40 inches to help develop a stout cane capable of supporting itself. Ideally primocanes should be tipped as they reach the appropriate height with minimal tissue removed. Just pinch or break the tip off. However, if some canes have escaped notice and are taller than desired, it's still preferable to tip at the appropriate height, even if that means removing a foot or more of cane Tipping red raspberries a recent study suggest that tipping primocane fruiting blackberries can increase yields. (***Source**: Facts for Fancy Fruit, Vol. 12, No. 5. May 29, 2012*)

Potato Leafhoppers and Berries

Kathy Demchak, Penn State University

Potato leafhoppers cause varying levels of damage to small fruit crops in different years, and this year we are seeing a fair amount of leafhopper damage to both strawberries and raspberries. In many cases where leafhopper feeding injury is severe, dry conditions cause plant growth to slow down, and damage from the leafhoppers then accrues and symptoms become more severe.

This is evidenced in the photo shown at the top, where the strawberry leaf curling is a sign of drought stress in addition to "hopperburn", the characteristic leaf yellowing and distortion that the leafhoppers cause. In some cases, people have confused the symptoms of leafhopper damage with either herbicide injury or a nutrient deficiency, rather than the real cause. Damage from potato leafhoppers can severely stunt plant growth, especially in newly-established plantings.

Similar symptoms from potato leafhopper damage are also often seen on raspberries (lower photo). With raspberries, damage often appears in the middle of the cane. Potato leafhoppers overwinter in southern states, and move northward as the growing season progresses; thus they are not typically present when the raspberry canes are first growing, so symptoms aren't present until the plants are one or two feet tall. Potato leafhoppers have three to four generations in Pennsylvania and are present for the remainder of the summer.

Leafhopper feeding results in a plugging of the portion of the leaves' vascular system that is used for moving photosynthates. Thus, symptoms are similar on different types of plants–snapbeans and potatoes can be similarly affected. It should be noted however, that there are large cultivar differences in amount of damage noted, and to some extent, in details of symptoms among different crops.

Potato leafhoppers are light-green wedge-shaped insects that are about 1/8-inch long, and are found primarily on the leaf undersides. The adults fly quickly when disturbed. Nymphs cannot fly, and tend to move diagonally when disturbed. Because potato leafhoppers move in from other areas, there are no effective cultural controls for avoiding their appearance. Alfalfa is a favored host, so leafhoppers frequently move into other host crops in large numbers when alfalfa is mowed. A number of insecticides, including Provado and Assail, will provide control. For organic growers, insecticidal soap may provide some control but must be targeted against first generation nymphs.

Additional information regarding control can be found in the Mid-Atlantic Berry Guide. Penn State's Department of Entomology has a detailed factsheet on potato leafhopper life cycle and biology. (***Source**: Penn State Tree Fruit News, July 2012*)

BLUEBERRY

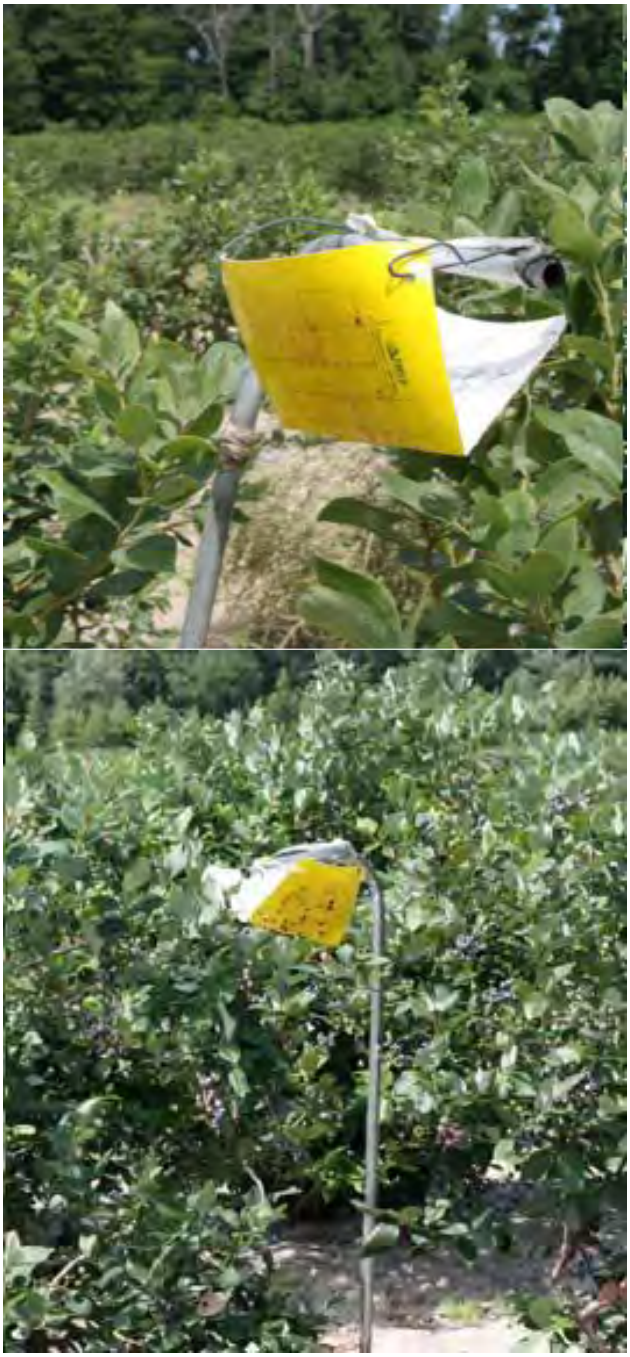
Blueberry Maggot

Cesar Rodrigues-Saona, Dean Polk, Gene Rizio, Rutgers University

As of June 12, no BBM adults have been seen in the traps that we have up. Insects are arriving a little later than usual this year, but we expect them soon.

Life Cycle: There is 1 generation per growing season. BBM overwinters in the soil below blueberry bushes enclosed in a brown puparium buried 1 to 2 inches deep in the soil. Pupae lay dormant until environmental conditions become suitable to emerge as adults (early through mid-June). Peak emergence and migration from wild hosts continues from mid-July through mid-August. Female blueberry maggot flies do not begin laying eggs until 10 days after emergence, typically corresponding to when the blueberry fruit turns blue. Adult females live for about 30 days, feeding on nectar, dew, and honey dew. Female flies lay 1 egg per berry under the fruit skin, which hatches in 5 to 7 days. Maggots feed for about 3 weeks inside ripening and harvested fruit. The full-grown larva is about 7/16 to ½ inch long and white. The body is tapered, with an indistinguishable head at the narrow end. As the larvae mature, infested fruit become soft and watery, and drop to the ground. The cycle is perpetuated for the following year as larvae then pupate in the soil under the bushes from which they have dropped. Pupae may remain in the soil for up to 2 - 3 years.

Monitoring and Management: Determining the onset of adult fly activity is essential to the control of BBM as protective sprays must be applied in the 7 – 10 day period before oviposition begins. Regular monitoring of blueberry maggot emergence is done with yellow baited sticky traps. A trap and lure system has been developed that increases blueberry fly capture. Pherocon AM yellow sticky boards baited with ammonium acetate work effectively in monitoring blueberry maggot flies. Traps should be hung in a 'V' orientation within the top 6 – 8" of the bush canopy, not above it, with the yellow surface facing down. Sometime this means cutting away a little foliage so it doesn't stick to the trap. If the trap is hung above the foliage then fewer to no maggot flies will be caught. The traps should ideally remain open at a 90˚ angle. As the trap gets wet, it looses form and gets heavier. Use of a #14 or 12 wire in place of the plastic coated wires that come with the traps will help maintain proper orientation and shape. Traps should be placed at least a week before first flies are expected to emergence (early June in NJ). Traps should also be changed every 2 weeks, since the ammonium acetate will volatilize off the traps. Place traps on field boarders near wooded areas, with a few traps in the field interior.



Trap Orientation and Placement – Upside down tent or 'V' in top 6" of canopy

Blueberry Maggot Insecticide Options

Material	Rate/A	REI	PHI	Rating
Diazinon 50W	1 lb	5 days	7 days	G
Imidan 70WSB	1.33 lb	24 hr	3 days	E
Lannate 90SP	1 lb	48 hr	3 days	G
Malathion 8	1.5 pt	12 hr	1 day	G
Sevin 80WSP /4F	1.5 lb / 3 pt	12 hr	7 days	G
Asana XL	8 oz	12 hr	14 days	G
Danitol	10 2/3 – 16 oz	24 hr	3 days	G
Hero	4 – 10.3 oz	12 hr	1 day	G
Provado 1.6F	6–8 oz	12 hr	3 days	G
Actara	4 oz	12 hr	3 days	G
Assail 30SG	4.5 – 5.3 oz	12 hr	1 day	E
Rimon	20-30 fl oz	12 hr	8 days	G
Delegate	6 oz	4 hr	3 days	F
Surround	25 lb	4 hr	day of harvest	suppression
Entrust	2 oz	4 hr	3 days	suppression
GF120	20 oz	4 hr	day of harvest	F

E=excellent, G=good, F=fair, suppression=suppression only
Assail, Provado, Actara, Rimon, and Delegate are reduced-risk/OP replacement products.
Surround, Entrust, and GF120 are organically-approved insecticides.

(***Source***: *Blueberry Bulletin, Vol. XXX, No. 9, June 9, 2014*)

GRAPE

Developing Grape Clusters Are Very Susceptible To Fungal Diseases And Need To Be Protected

Annemiek Schilder, Michigan State University Extension

Young fruit clusters are highly susceptible to all major diseases, including downy mildew, powdery mildew, 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. However, with continued dry, warm conditions, it is unlikely that bloom will be an important time for Botrytis infection. Black rot and Phomopsis lesions have been seen in the last couple of weeks and indicate that the pathogens are active. Grape anthracnose symptoms are also visible on shoots, leaves and cluster stems of susceptible varieties. The first powdery mildew colonies have been seen on unsprayed Chardonnay vines in Clarksville, Mich. Powdery mildew has also been spotted near Traverse City, Mich., but this report is still being confirmed. Downy mildew so far has only been seen in low-lying wild grapes, which often show symptoms at least a week before cultivated grapes. However, it has been relatively dry, so downy mildew development may be a bit late this year. Careful scouting is advised on a weekly basis.

It is possible to have powdery mildew fruit infection without seeing any foliar infections, so protect the fruit of susceptible cultivars even if no powdery mildew has been seen on the leaves. Often, downy mildew infections of flower clusters in cv. Chancellor are seen before leaf infections as well. In 2009, we first observed downy mildew in Chancellor in Fennville, Mich., during the first week of June and in 2010 during the second week of June. Growers are strongly advised to protect flower and fruit clusters from infection by all these pathogens using effective fungicides. The risk of infection is especially high if we have multiple rain events and moderate to high temperatures.

In general, aim to protect the clusters from the major diseases from immediate pre-bloom until four to five weeks after bloom. As the berries develop, they become naturally resistant to black rot, 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 it is about four weeks after bloom. 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 post bloom. However, be aware that the cluster stem (rachis) and berry stems can remain susceptible longer than the berries in most cases. The only disease to which berries remain susceptible throughout their development is Phomopsis, but the risk of infection diminishes after bunch closure because inoculum levels drop off then. Botrytis is just the opposite in that berries actually become more susceptible as they get closer to harvest, especially in tight-clustered varieties.

Powdery mildew

Sterol inhibitor (e.g., Elite, Rally, Procure, etc.) and strobilurin (e.g., Sovran, Flint, Abound, Pristine) fungicides have the ability to cure early infections, but will not eliminate colonies that are already established. JMS Stylet Oil and potassium bicarbonate fungicides (Kaligreen, Armicarb, MilStop) can be used to eradicate visible powdery mildew colonies. If you use eradicants, make sure that coverage is thorough (use sufficient spray volume), as only those colonies contacted by the fungicide will be killed. Since strobilurin-resistant powdery mildew isolates have been found in Michigan (mostly in MSU experimental vineyards and wine grape vineyards with a history of strobilurin use) and we have circumstantial evidence for sterol inhibitor (SI) 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.

Over the past two years, we have noticed that Ziram as a tank-mix partner did improve control of powdery mildew in a spray program on the research stations where we have strobilurin resistance. Also, alternate fungicides with different modes of action, for example Sulfur, Quintec, Vivando, Luna Experience, Endura, Serenade, Sonata or Regalia. Revus Top is a new fungicide for powdery and downy mildew and black rot control in grapes. However, the ingredient that is active against powdery mildew is difenoconazole, which belongs to the sterol inhibitor class. This fungicide is phytotoxic on Concord and Noiret grapes, so do not use on these cultivars. Inspire Super also contains difenoconazole. Luna Experience is a new fungicide for control of powdery mildew, black rot, Phomopsis and anthracnose.

Downy mildew

For most varieties, foliar infections are the main phase to be concerned about. However, the downy mildew pathogen can also infect clusters. Cultivar Chancellor is the poster child for downy mildew cluster infection. Both the rachis and berries can be destroyed. If 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 like 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 preferentially be used in a preventive mode.

Newer fungicides for downy mildew control are Presidio, Revus and 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 new fungicides have post-infection (curative) activity, they are best applied on a preventative basis. They are good for integration into a fungicide resistance management program as many of them represent new and different chemistries.

Black rot

Black rot lesions have been seen on grape leaves in various locations and range from 1 to 5 mm in size. They can be recognized by the tiny, black pimples (pycnidia) in a ring along the inner edge of the lesion. Temperatures in the high 70s and low 80s are perfect for black rot. At these temperatures, only six to seven hours of wetness are needed for infection, so a nightly dew period may be sufficient for infection.

Black rot is a tricky disease because infections can remain latent (invisible) for a long period of time, so you won't know the berries are infected until is it too late to do anything about it. However, one can scout for the small, roundish leaf spots – a lot of black rot leaf lesions indicate high disease pressure from ascospore inoculum and will also contribute conidia for fruit infections. Conidia produced in leaf spots are rainsplashed, whereas the old fruit mummies produce airborne ascospores. In a field with a history of black rot, old fruit cluster remnants left hanging in the trellis are major contributors to infection. 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.

The approach to black rot control now focuses 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 on the foliage

early in the season. In five years of trials in New York, good black rot control was achieved with one immediate pre-bloom and one to two post-bloom fungicide sprays. A second post-bloom application is strongly advised if black rot has been a problem in the vineyard the previous year, and should be considered prudent if wet weather is anticipated. During three years of fungicide trials in a 'Concord' vineyard in Fennville, Mich., just two post-bloom applications of SI fungicides (Rally, Elite) provided very good control under high black rot pressure.

Sterol inhibitor fungicides (e.g., Rally, Elite) continue to provide outstanding control of black rot and provide several days of post-infection activity. Currently, there are various "generic" tebuconazole products on the market, like 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 on a post-infection schedule, use the highest label rates because post-infection activity is strongly rate dependent, particularly when extended "kickback" activity is required. The strobilurin fungicides (Abound, Flint, Sovran, Pristine) and Luna Experience are also excellent against black rot, but provide only limited post-infection activity. Flint, Pristine, Inspire Super and Revus Top should **not be used on Concord grapes** because of potential phytotoxicity.

Phomopsis

Cane and leaf lesions have been showing up in fairly high numbers in susceptible varieties. Each rainfall event will lead to spore dispersal and can also lead to successful infection if the tissue remains wet for a sufficient amount of time. The optimum temperature for infection is 59 to 68 degrees Fahrenheit, 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. At this time, we should be concerned with preventing Phomopsis infection of the rachis and fruit, especially in mechanically pruned vineyards and vineyards with a history of the disease. Rachis infections are most closely correlated with yield losses due to berry drop at harvest in Niagara vines, whereas fruit infections are more of a problem in wine grapes.

If at this time you find a lot of lesions on the leaves and canes, infection pressure will be high for the fruit also. It is not too late to apply fungicides for cluster protection from Phomopsis. Sterol inhibitors, overall, do not have good efficacy against Phomopsis, although fungicides containing difenoconazole (Revus, Revus Top, Inspire Super) are among the more effective. 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 good and cost-effective alternatives. These are systemic and will likely provide some kickback 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. Luna Experience is also quite effective. Ziram is a moderate to good protectant against Phomopsis and can be a tank-mix partner with any of the phosphorous acid fungicides. EBDC fungicides and Captan are good protectants, but cannot be applied after bloom has started in grapes grown for the National Grape Cooperative (these fungicides are suspected carcinogens). EBDC's have a 66-day pre-harvest interval. (***Source**: Michigan Fruit Crop Advisory, June 12, 2012*)

Grape Bloom and Fruit Set

Luke Haggerty, Lake Erie Regional Grape Program

Bloom was declared on check vines at the Fredonia lab on Sunday, June 15th and Monday, June 16th at the Portland lab. The warm weather has helped move bloom along ahead of early predictions. However, cooler sites and areas along Route 5 are further behind with vineyards going into bloom
now or will be in the next few days.

Fruit set: Pollen tubes respond to temperature. Florets will fertilize within 12 hours when temperatures are between77˚F and 86˚F and 24 hours with temperatures at 68˚F and 48 hours with temperatures at 59˚F. When temperatures fall below 59˚F fertilization will not occur. The past week of weather has been favorable for fruit set in the areas that are in bloom. A question I've been getting at coffee pot meetings is, "what causes poor fruit set?" To address the question, I have compiled some of the reasons.

Causes for poor fruit set:

• **Weather**: Cool, wet, and overcast conditions.

• **Weather Events**: Basically any event that damages the vine or the canopy can result in poor

fruit set, for example winter damage, hail, and early fall frosts.

• **Vine Nutrition**: Healthy vines have the best potential for vine fruitfulness. C:N ratio plays a large role in fruit set (needs to be balanced), and micronutrients boron and zinc are important for early season shoot growth.

• **Vine Balance and C:N ratio**: Vines with high vigor have high N and a low C:N ratio, small or weak vines tend to have low N and a high C:N ratio; both cases can lead to poor flower development and fruit set. (***Source**: LERGP Crop Update for June 19, 2014*)

GENERAL INFORMATION

Rainfast Characteristics of Insecticides on Fruit Crops

John Wise, Michigan State University Extension

The rainfall events experienced in Michigan have prompted questions about the relative "rainfastness" of the insecticides used in fruit production. In 2006, AgBioResearch provided funds to purchase and install a state-of-the-art rainfall simulation chamber at the MSU Trevor Nichols Research Center (TNRC), after which Michigan State University Extension has conducted trials – with generous funding support from Michigan fruit commodity groups – on fruit crops for a range of insecticides.

There are several critical factors that influence impact of precipitation on a pesticide's performance. First is the plant penetrative characteristic of the various compounds. Some pesticide chemistries, like organophosphates, have limited penetrative potential in plant tissue, and thus are considered primarily as surface materials. Some compounds, such as carbamates, oxadiazines and pyrethroids, penetrate plant cuticles, providing some resistance to wash-off. Many newer compounds, such as spinosyns, diamides, avermectins, and Insect Growth Regulators (IGR) readily penetrate plant cuticles and have translaminar movement in leaf tissue. Others, like the neonicotinoid insecticides, are systemic and can have translaminar as well as acropetal movement in the plant's vascular system. Penetration of plant tissue is generally expected to enhance rainfastness of pesticides.

The second factor is the inherent toxicity of an insecticide to the target pest and the persistence of the compound in the environment. In some cases, a compound may be highly susceptible to wash-off, but its persistence and inherent toxicity to the target pest compensates for the loss of residue, thus delaying the need for immediate re-application.

The third factor is the amount of precipitation. In general, organophosphate insecticides have the highest susceptibility to wash-off from precipitation, but their high level of toxicity to most insect pests overcomes the necessity for an immediate re-application. Neonicotinoid insecticides are moderately susceptible to wash-off with residues that have moved systemically into plant tissue being highly rainfast, and surface residues less so. Carbamate, IGR and oxadiazine insecticides are moderately susceptible to wash-off, and vary in their toxicity to the range of relevant fruit pests. Diamide, spinosyn, avermectin and pyrethroid insecticides have proven to be moderate to highly rainfast on most fruit crops.

For most insecticides, a drying time of two to six hours is sufficient to "set" the compound in the plant. With neonicotinoids, for which plant penetration is important, drying time can significantly influence rainfastness. For neonicotinoids, up to 24 hours is needed for optimal plant penetration, thus the time proximity of precipitation after application should be considered carefully. Spray adjuvants, materials intended to aid the retention, penetration or spread on the plant, can also improve the performance of insecticides.

Based on the results from the current studies, the following charts have been developed to serve as a guide for general rainfastness characteristics and re-application recommendations for certain insect pests (also printed in the MSU Extension E-154 bulletin, "2013 Michigan Fruit Management Guide"). Note that these recommendations should not supersede insecticide label restrictions or farm-level knowledge based on site-specific pest scouting, but rather are meant to compliment a comprehensive pest management decision-making process.

Rainfastness rating chart: General characteristics for insecticide chemical classes.

Insecticide Class	Rainfastness ≤ 0.5 inch		Rainfastness ≤ 1.0 inch		Rainfastness ≤ 2.0 inch	
	Fruit	Leaves	Fruit	Leaves	Fruit	Leaves
Organophosphates	L	M	L	M	L	L
Pyrethroids	M	M/H	L	M	L	L
Carbamates	M	M	L	M	L	L
IGRs	M	H	M	M		
Oxadiazines	M	M/H	M	M	L	L
Neonicotinoids	M,S	H,S	L,S	L,S	L,S	L,S
Spinosyns	H	H	H	M	M	L
Diamides	H	H	H	M	M	L
Avermectins	M,S	H,S	L,S	M,S	L	L

* H – highly rainfast (≤ 30% residue wash-off), M – moderately rainfast (≤ 50% residue wash-off), L – low rainfast (≤70% residue wash-off), S-systemic residues remain within plant tissue

Apple insecticide precipitation wash-off re-application decision chart: Expected codling moth control in apples, based on each compound's inherent toxicity to codling moth larvae, maximum residual and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inches	
	*1 day	*7 days	*1 day	*7 days	*1 day	*7 days
Guthion				X	X	X
Imidan		X		X	X	X
Asana		X	X	X	X	X
Calypso			X	X	X	X
Assail			X	X	X	X
Proclaim		X		X	X	X
Rimon			X	X	X	X
Delegate					X	X
Altacor					X	X
Belt					X	X

*Number of days after insecticide application that the precipitation event occurred.
X – Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
(An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.)

Grape insecticide precipitation wash-off re-application decision chart: Expected Japanese beetle control in juice grapes, based on each compound's inherent toxicity to Japanese beetle adults, maximum residual and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inches	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Imidan		X	X	X	X	X
Sevin			X	X	X	X
Brigade				X	X	X
Actara		X		X	X	X
Avaunt		X		X	X	X

Number of days after insecticide application that the precipitation event occurred.
X – Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
(An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.)

Blueberry insecticide precipitation wash-off re-application decision chart: Expected cranberry fruitworm control in blueberries, based on each compound's inherent toxicity to cranberry fruitworm larvae, maximum residual and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inches	
	*1 day	*7 days	*1 day	*7 days	*1 day	*7 days
Guthion		X	X	X	X	X
Asana		X	X	X	X	X
Intrepid		X	X	X	X	X
Assail		X		X	X	X
Delegate		X		X	X	X

*Number of days after insecticide application that the precipitation event occurred.
X – Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
(An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.)

Blueberry insecticide precipitation wash-off re-application decision chart: Expected Japanese beetle control in blueberries, based on each compound's inherent toxicity to Japanese beetle adults, maximum residual and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inches	
	*1 day	*7 days	*1 day	*7 days	*1 day	*7 days
Imidan	X	X	X	X	X	X
Mustang Max		X		X	X	X
Sevin		X	X	X	X	X
Provado		X	X	X	X	X

* Number of days after insecticide application that the precipitation event occurred.
X – Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
(An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.)

Insecticide persistence, plant penetration and rainfastness rating

Compound Class	Persistence (residual on plant)	Plant Penetration Characteristics	Rainfast Rating
Organophosphates	Medium - Long	Surface	Low
Carbamates	Short	Cuticle Penetration	Moderate
Pyrethroids	Short	Cuticle Penetration	Moderate-High
Neonicotinoids	Medium	Translaminar & Acropetal	Moderate
Oxadiazines	Medium	Cuticle Penetration	Moderate
Avermectins	Medium	Translaminar	Moderate
IGRs	Medium - Long	Translaminar	Moderate
Spinosyns	Short - Medium	Translaminar	Moderate - High
Diamides	Medium - Long	Translaminar	Moderate - High

(***Source**: Michigan Fruit Crop Advisory, June 3, 2013*)

UPCOMING MEETINGS:

June 7, 2014 – *Massachusetts Cultivated Blueberry Growers' Summer Meeting*. 12:00 – 3:00. Turkey Hill Farm, 380 Middle Rd., Haverhill, MA 01830. This meeting will feature Dr. Alan Eaton from the University of New Hampshire who will provide the most updated information on the identification and management of the new invasive fruit fly pest, Spotted Wing Drosophila. Cost: Free to members; others $10 payable at the meeting. For more information contact Pat Concree at theblueberryfarm@comcast.net. 1 pesticide credit is approved for this meeting.

June 10, 2014 – *CT Pomological Society Fruit Twilight Meeting***.** 5:30-8:30pm Belltown Hill Orchards, 483 Matson Hill Rd., South Glastonbury CT. Don and Mike Preli, growers of table grapes, blueberries, stone fruits and apples, will provide a tour of the farm. In addition there will be a pest, disease & thinning update, CT Pomological Society update and dinner. A great evening visiting with old and new friends. For more information contact Mary Conklin at mary.concklin@uconn.edu.

June 10, 2014 – *Broadleaf Weed Identification Workshop*. University of Massachusetts French Hall, 230 Stockbridge Rd., Amherst MA. 9:00 – 3:00 Correct weed identification is an important first step in the development of an effective weed management program. Using a classroom presentation, potted weed herbarium and weed walk, UMass Extension Specialist Randy Prostak will help participants enhance their broadleaf weed identification skills. Feel free to bring a weed or two to identify. Workshop held rain or shine (lunch not provided). Grassy Weed Identification will be offered next in 2015. Registration: Cost $95 per person (pre-registration is required). 5 pesticide contact hours for categories 36, 37 and Applicators License available; valid for equivalent categories in all New England states For more information and to register, go to: https://extension.umass.edu/vegetable/events/broadleaf-weed-identification-workshop.

June 10, 2014 – *UMass Extension Fruit Team Spotted Wing Drosophila Management Update Meeting*. 5:00 – 7:30. Nourse Farms, 41 River Rd. Whately, MA. For more information on this meeting contact Sonia Schloemann at sgs@umext.umass.edu.

July 12, 2014 – Essex County Fruit Growers' Meeting. 5:30 – 8:00. Russell Orchards, 143 Argilla Rd., Ipswich MA 01938. This meeting will feature discussion of how to manage Spotted Wing Drosophila in susceptible crops this year. For more information contact Pat Kriksceonaitis at kfamily13@verizon.net. 1 Pesticide Credit is approved for this meeting.

July 9, 2014 – *Annual Summer Meeting of the Massachusetts Fruit Growers' Association*. 10am – 3pm, UMass Cold Spring Orchard, 391 Sabin St., Belchertown MA. Details will be available soon at http://extension.umass.edu/fruitadvisor/.

August 20-21, 2014 – *NASGA Summer Tour*, Abbotsford, British Colombia, Canada. For more information or to register, go to: http://www.nasga.org.