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In This Issue

Crop Conditions

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In Lafayette grapes are at bud break to 2-inch shoots. Blackberries are at 3 to 4-inch shoots with flower clusters showing, and raspberries are at 2-3 inch shoots. Strawberries are just starting to bloom.
Apples in the northern half of the state are approaching full bloom whereas petal fall is more common in more southern areas of the state. Bloom has typically been heavy and weather has been favorable for pollination.

Important Sprays for Grape Disease Management

(Bruce Bordelon, bordelon@purdue.edu, (765) 494-8212)

Grape growth is a bit ahead of normal this year. Grapes are at the critical 1 to 3 inch shoot length when Phomopsis cane and leaf spot infections occur. This is a critical time to take control measures for this disease. If left unchecked, the early shoot infections will spread to cluster stems and developing berries. The disease remains latent during most of the season until fruit maturity begins. Then the fungus develops in berries or cluster stems and causes a soft, brown rot. Losses can be 50% or higher and overall fruit quality is greatly diminished.

Control of Phomopsis is relatively easy with captan or mancozeb. Mancozeb is the preferred fungicide because it is broad-spectrum and also controls black rot and downy mildew. It is important to understand that captan and mancozeb are protectant fungicides and must be on the plant before any infection periods occur. So they must be applied before the next rain event and reapplied after a major rain event. Fungicide applications are needed on a 7-10 day interval through bloom. This is usually about four sprays. Addition of a sterol inhibitor fungicide in the final early season sprays (immediate pre-bloom, bloom and post bloom) will provide additional control of black rot. Many of the popular varieties grown in Indiana such as Traminette, Seyval, Chardonel, La Crescent, and Marquette are highly susceptible to Phomopsis.

Grapes at 1 to 3 inch shoots

Shoot and Cluster Thinning in Grapes

(Bruce Bordelon, bordelon@purdue.edu, (765) 494-8212)

Crop management through shoot and cluster thinning is a critical management practice for most varieties. Many varieties grown in Indiana tend to produce a large number of “non-count” shoots from adventitious buds and basal buds at count nodes. This lead to excess crop and shading in the canopy.

Shoot thinning reduces excess shoot number to both adjust crop and reduce shading. Growers typically select 40-60 nodes per vine during dormant pruning. If delayed-double pruning was done, that number may be much higher. Now that the danger of frost is mostly past, it is time to go through the vineyard and assess shoot number and adjust it to the desired number. Five to six shoots per foot of row is generally considered to be the optimum density. That equates to 40-50 shoots per vine at typical 8 foot vine spacing. It is very easy to accomplish now while the shoots are short and tender. They are not attached to the vines very firmly so the break off easily. If you wait too long, the shoot attachment toughens and the shoots many need to be cut, greatly increasing the time required for removal.

Cluster thinning will also be necessary on most large clustered

varieties. Typically each shoot is allowed to carry only one or two clusters. Excess clusters are removed, and all clusters from “short shoots” are removed. Growers should try to adjust the crop to balance the fruit production to about 10 times the vine pruning weight. e.g. vines that average 2 lb of pruning wood should be able to produce 20 lb of fruit (and 2 lb of pruning wood again). If you have taken pruning weight data in your vineyard you should be able to estimate the appropriate number of clusters to leave to produce the optimum yield. If you do not know the average cluster weights, see HO-221 Grape Varieties for Indiana for average cluster weight data from my trials and a discussion about crop load ratio. Large clustered varieties such as Chambourcin and Vidal typically have clusters that weigh 0.3 to 0.4 lb. That means you will have 1 lb of yield for every 2.5 to 3 clusters. If you leave 50 shoots per vine and each one produces 2 large clusters, you could have twice as much fruit as desired. So thinning is very important at maintaining vine size and producing high quality fruit.

Codling Moth Pheromone Traps

(Ricky E Foster, fosterre@purdue.edu)

Apple growers should have their codling moth pheromone traps in place now. See the April 12 edition of Facts for Fancy Fruit for details of where traps and pheromone lures can be purchased. Traps should be checked for moths several times per week, if not daily. Pheromone lures should be replace about every 3 weeks. Growers should use the catch data to improve the timing of their insecticide applications. In the May 11, 2015 edition of Facts for Fancy Fruit, I went through the determination of biofix and calculation of degree days in our orchard at the Meigs Farm near Lafayette last year to demonstrate how the traps can be used.

Pollinator Protection

(Ricky E Foster, fosterre@purdue.edu)

Everyone knows that pollinators, including but not limited to honey bees, are important for the production of fruit crops. A big topic in recent years has been the stresses that reduce honey bee populations. Although not most important, pesticides are one factor that can reduce the populations of pollinators. Here are some things fruit growers can do to minimize the negative impacts of pesticides on pollinators.

1. *Read and Follow Insecticide Labels*

Insecticide labels contain specific instructions to help you reduce risks. All insecticides that are toxic to bees have warnings on the label. These warnings are often hard to find on some older insecticide labels. However, many newer insecticides have special bee icons on their labels that draw attention to the potential for harm to pollinators. They often have specific instructions for minimizing the risk.

2. *Follow IPM Principles*

Integrated Pest Management (IPM) is a system that combines different methods to keep pest populations low while allowing for profitable production and minimizing adverse environmental effects. To reduce the risk of harming pollinators, IPM principles guide producers to take advantage of non-insecticidal practices that can reduce pest damage. Oil sprays, conservation of natural enemies, planting disease resistant cultivars and rootstocks, and proper tree pruning and training are examples of non-chemical approaches

Make sure that you know the target pest when you make an insecticide application. When deciding whether to apply an insecticide, determine if the net profit from applying the insecticide is greater than the cost of applying it. Making an informed decision usually involves scouting your field or orchard to determine the level of pests that are present. It doesn’t make good sense to spend $50 per acre to avoid $30 per acre in losses. Using IPM principles will often reduce the amount of insecticides you need to apply.

3. *Register with DriftWatch*

The DriftWatch website (driftwatch.org) is a place where specialty crop producers can register their production sites on a map. Pesticide applicators can access this data before applying anything to nearby fields. The rationale behind this site is to provide applicators with the locations of sensitive sites, so they can take precautions to avoid overspray or drift to locations where they are not wanted.

4. *Don’t Treat Areas Where Pollinators Visit*

For crops that have a very well-defined bloom period, such as most tree fruits, growers should just avoid the use of insecticides during that period of time. For other fruit crops, such as raspberries and blackberries, plants are in bloom over an extended period of time, including when fruit are ripening and need to be protected. Spotted wing drosophila is a good example of a pest that needs to be managed when plants are still blooming. In these situations, growers should make their insecticide applications during the late evening hours after the bees have returned to the hive. The worker bees will still be exposed to insecticide residual the next day, but they will not be directly sprayed and the residue levels will be somewhat reduced when they return.

5. *Avoid Use of the Most Toxic Insecticides*

Not all insecticides are equally toxic to pollinators. When possible, choose the least toxic option that will effectively control the target pests. See the publication “Protecting Honey Bees from Pesticides” at https://extension.entm.purdue.edu/publications/E-53.pdf for a listing of the toxicity levels of many common pesticides. Among the neonicotinoid insecticides that have been implicated in harming pollinators, Assail (acetamiprid) is the least toxic to bees and should be selected preferentially over other members of this class of insecticide.

6. *Communicate with Your Bee Provider*

If you rent bees to pollinate your crops, both you and your beekeeper have a stake in maintain the health of the honey bees. Talk with your beekeeper about the pests that you have to deal with and the need for any insecticides you may apply. Coordinate the arrival and departure of the bees with your insecticide applications to ensure minimize any potential harm to the bees.

Chemical Thinning

(Peter M Hirst, hirst@purdue.edu)

We're getting close to the time when growers need to make chemical thinning decisions – for many the most perplexing and risky decision they will make all year. This is usually a tricky call to make, even more so when we have had spring frosts. Luckily in most places the spring frosts have not been severe enough to affect the crops to any great extent.

As apple crops approach petal fall, it's time to start chemical thinning. Generally speaking, flowering has been heavy and pollinating weather favorable, therefore we expect fruit set to be heavy. The exception has been northern areas of the state where apples are currently in full bloom, just in time to coincide with some cooler, cloudy weather. These conditions will likely result in slightly lower fruit set and heavier fruit drop. Growers should consider the impact of the weather during and after bloom when developing their chemical thinning strategy.

The effectiveness of a chemical thinner application depends on many factors, and to hit it just right takes as much art as science. That's a fancy way of saying that we don't really understand why different orchards respond differently to a given thinner applications. But we know they do. That's why it's impossible to develop a recipe approach to thinning. So let me explain a little about how thinners work, then discuss some specific strategies.

From the time of bloom and for the next month or so, there are thousands of flowers and developing fruitlets on the tree, struggling to get enough resources to grow. By resources I mean food in the form of carbohydrates. These carbohydrates come from stored sources in the tree but especially from leaves taking light energy and converting it to carbohydrates through the photosynthetic process. At this time of year, leaf area for photosynthesis is limited, so there is a shortage in the supply of carbohydrates. Because the demand exceeds the supply, fruitlets compete for carbohydrates and the strong survive. The weak flowers or fruitlets lose out and drop off, which we call fruit drop or June drop. The thinners we commonly use in Indiana exacerbate this shortage, so that even more fruitlets drop off. Some, like NAA, reduce photosynthesis so there is less carbohydrate supply. Others (such as Sevin) decrease the flow of carbohydrates from leaves to fruitlets, thereby also decreasing the supply. The Maxcell-type thinners increase respiration, burning up more carbohydrates so less is left over for developing fruitlets. So in these 3 different ways, thinners increase the shortfall of carbohydrates resulting in increased fruit drop. Keeping this in mind allows growers to predict the response to thinners from year to year. For example, a lot of cloudy weather soon after bloom means less light for photosynthesis, less carbohydrate and increased fruit drop. In that situation growers may want to back off a little with their thinner rates. Thinners work best when the weather is warmer. The optimal temperature is around 70˚F and below 60 you may as well not bother – most thinners are not going to have much effect when it's that cool. When the temperature is 80˚F or above, be careful – thinners can have very strong effects at those temperatures.

It turns out that some of our most biennial varieties (Fuji, Golden Delicious) are also some of the more difficult to thin. So not only is thinning more difficult, the consequences of inadequate thinning are greater. Keep in mind your own experience on your orchard, but with Fuji you might want to start with a full rate of Maxcell soon after petal fall. Wait a full 2 weeks to see the response to the thinner application before applying more thinners. If another application is needed, I'd suggest ONE of the following, depending on how aggressive you want to be. In order from conservative to most aggressive, I'd suggest:

Maxcell again

Sevin

Maxcell + sevin

Maxcell + ethrel

Maxcell + oil

Keep in mind these are general thoughts based on my experience and published research, but as you know things work a little differently on different farms, so mix these thoughts with your own experience to come up with a plan. Most products do not thin Fuji enough. I'd put NAA/NAD, carbaryl and ethephon in this category. I'd stay away from NAA and NAD because of the tendency to form pygmies. Starting at petal fall gives you some time for a follow up application 2 weeks later if necessary and spreads the risk. This is often referred to as "The Nibble Approach". The single application approach is putting all your eggs in one basket and too risky for many growers.

Fire Blight

(Janna L Beckerman, jbeckerm@purdue.edu)

Fire blight, caused by the bacterium *Erwinia amylovora*, is a devastating disease of apples and pears. Epidemics of the disease develop quickly, particularly in a climate of warm, wet weather, with hail events—like last night's 0.75" to 1.5" hail! The type of management program developed by each orchard will vary considerably based upon a variety of orchard factors, including apple variety, rootstock, age of planting, and weather conditions. With the current extreme weather events, a review of fire blight seems timely.

At this point in the season, we have passed through the blossom blight period, but I haven't heard of any reports of fire blight. Early spring weather conditions were not conducive to blight infection due to the cool, dry weather. This means that any observed infection came from damage from the previous year.

This shoot blight probably developed from the long wet spring/summer that prevented growth from hardening off, or even the hail and severe wind damage from some of the incredible storms that have blown through our region (trauma blight). After last night's event, it is important to continue to scout!

Figure 1. The characteristic shepherd's crook in fire blight.

Often times, the first symptoms of infection are shoot blight. Shoot blight usually develops in late spring or early summer, when the bacteria moves from infected flower spurs into the tree. Soon, this new growth on the infected branch begins to wilt and becomes shoot blight. Shoot blight can develop rapidly under favorable conditions; as young shoots wilt and die, bacterial ooze may be visible. Blighted shoots will often form the characteristic "shepard's crook" at their tip.

When infection is severe, the appearance of blighted shoots gives the impression that the tree (particularly pear) has been scorched by fire, hence the name fire blight. Canker blight forms when the bacteria causing shoot blight spread from the new green tissue of the shoot into the woody tissue of the tree.

Figure 2. Apple fire blight canker

The cankers appear sunken and dark and, when the outer bark is cut away the underlying tissue may appear water soaked. Preventing the development these cankers is important, as these are the main areas where the bacteria overwinter. These cankers are always associated with shoots that were killed last year.

Regular scouting is essential for effective fire blight management. Many popular varieties (Gala, Silken, Ambrosia, Fuji, Braeburn) are very susceptible to fire blight. The question remains as to whether you should prune immediately after blossom infection, or wait until the trees are dormant. Previously, management recommendations were to prune out infections as soon as they were observed. One group in Israel tested this on pears (Shtienberg, D. et al.. 2003. "New considerations for pruning in management of fire blight in pears." Plant Dis. 87:1083-1088.), and the results of these tests show that other factors profoundly affect the time of pruning, and affect the success of pruning and its contribution to tree health.

So, what is the how and the when that affects fire blight? They found that how the plant is growing (i.e., health and vigor) and when the growth is occurring [called the phenological status of the host (i.e., bloom, pink, petal fall, etc.)] are factors that affect success in fire blight pruning management. Because of these factors, there are situations in which pruning can be expected to improve tree health, but there are also cases in which pruning would make no difference, as the disease would not endanger the host plants if left untouched. Furthermore, it was found that sometimes it was preferable not to cut at all, because pruning affected tree health negatively. So, the question still remains: To cut, or not to cut? And if so, when to cut?

These researcher found that when pruning was carried out as recommended to growers (that is, using disinfected tools and making the cuts in a healthy area approximately 12" below the site of infection), pruning did not result in successful eradication of the pathogen.

Figure 3. Pruning failed to eliminate fireblight, which continues to spread.

This could be due to several reasons, including that the fire blight bacteria infected tissues beyond the sites of visible symptoms, and even beyond the cuts into "healthy" appearing tissue 12" away. The fact that the bacteria spread beyond the 12" pruning

cut is not too surprising and may explain why pruning did not successfully eradicate the pathogen from treated trees. It is also possible that despite the fact that the pruning tools were disinfected with bleach between cuts, not all of the bacteria were killed and colonized the cut stubs. Last but not least, it is possible that the bacteria invaded the host tissues directly through the new wounds created during pruning the ugly stub in the first place!

Regardless of what happened, the fact remains that pruning out fire blight was not successful in eradicating the bacteria from most treated trees. These researchers found that the effectiveness of cutting and removing infected branches and limbs was directly related to time of treatment: That is, pruning worked best the later in the season it was performed, and the best results were obtained when pruning was carried out while the trees were dormant. None of these dormant-pruned trees had a severely infected canopy the following spring.

Obviously, postponing the cutting of fire blight–infected tissues to winter may create two problems. First, the bacteria may continue to progress in the infected tissues and result in greater damage; ad second, the problem caused by delayed cutting is that infected tissues may serve as an active source of inoculum that could endanger the entire orchard. What needs to be remembered is that the blossoms are most susceptible to the bacteria; assuming that there are no rat-tail or autumn blossoms, and in the absence of a hail event, the probability of secondary infections in orchards is minimal. Where off-season blossoms are apparent, special care should be taken to prevent their infection.

Using this current information, growers need to distinguish between situations in which the disease is detected on blossom clusters, succulent shoots, or lateral branches, versus first detected on main branches and limbs. In the first situation, growers are advised to make a distinction between spring and autumn infections. In the spring, recommendations are not to touch trees with limited growth vigor. On these trees, fire blight infections are likely to be restricted to the spurs and not to invade the main branches of the trees. Cutting these infections off, if it did not successfully eradicate the bacteria from the trees, could make the situation worse. If trees with vigorous growth are infected, growers need to differentiate between those bearing few and those bearing numerous infections. With limited infections, growers should eradicate the infections by cutting back to a healthy section of the plant, about 20-25” from the site of visual symptoms. If numerous infections are observed on vigorous trees, the experience from this study suggests that the eradication efforts will likely be unsuccessful and may even make situation worse. Thus, to minimize unsuccessful pruning efforts, growers should postpone the pruning until winter. In these cases, the infections limbs and branches should be marked with colored paint so growers know what to prune in the late winter when the plants are dormant.

Trees that repeatedly show symptoms of fire blight (more than three years in a row) should probably be removed and burned. I say this for three reasons: First, continuous pruning of the same infected trees year after year is not sustainable; Second, the repeating infection indicates that the tree is systemically infected, and third, this tree now serves as a reservoir for additional infections. In this scenario, you are best advised to literally “cut your losses” and prune at ground level.

Finally, unless you are still at bloom, streptomycin use is not recommended. Its efficacy (along with the plant growth regulator, Apogee) is restricted to use at bloom, followed up once or twice through petal fall. No antibiotic is recommended for trauma blight. In Indiana, where there are no reports of streptomycin resistant fire blight bacteria, there is no need to use any other antibiotic.

Upcoming Meetings

(Peter M Hirst, hirst@purdue.edu)

Purdue Wine Grape Team’s 2016 Spring Workshop May 4, 9:00 am. Holtkamp Winery, 10868 Woliung Rd, New Alsace, 47041, Rettig Hill Winery & Vineyard, 2679 E State Road 350 Osgood, IN 47037 Due to limited class size, advance registration and fees are required. Registration fee $50 per person and includes lunch.Make checks payable to Purdue University and mail with registration to: Jill Blume Purdue University Department of Food Science 745 Agriculture Mall Drive West Lafayette, IN 47907 blume@purdue.edu

Southwest Purdue Ag Center High Tunnel Tour May 9, 3:00 pm-5:00pm. Tour is free, to register please call: 812- 886-0198, or contact Wenjing Guan guan40@purdue.edu https://ag.purdue.edu/hla/Extension/Documents/High%20Tunnel%20Field%20Day%20Flyer%20May%20 2016.pdf

Blueberry Growers of Indiana Spring Meeting and potluck June 9, 4:00 pm. Sider’s Blueberry Farm. 6254 W. 200 North, Rochester, IN. More information will follow.

Indiana Winery and Vineyard Association Summer meeting July 19-20. Brown County Inn. Nashville, IN. More information will follow.

Indiana Hort Society Summer Field Day June 22. David Doud’s Countyline Orchard 7877 W 400 N, Wabash, IN 46992 More information will follow.

Current Growth Stages in Lafayette, IN

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Strawberry: full bloom

Grape: 1-2 inch shoots; 2 leaves unfolded

Blackberry: 3-4 inch shoots; king blossom visible

black raspberry: 2-3 inch shoots

Sweet cherry: shucks on

Peach: shucks on

Apple: petal fall