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PURDUE EXTENSION

FACTS FOR Fancy Fruit

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In This Issue

Crop conditions

Apples crops have set quite heavy and hand thinning is continuing. The time when hand thinning can increase fruit size in peaches is running short. Grapes are at the buck shot stage in central and northern areas. Strawberry harvest is essentially over and renovation has begun. Summer bearing red and black raspberry harvest has begun and blackberry harvest will start in the next couple of weeks or so. Blueberry harvest is underway in the south and will start soon in central and northern areas. Overall, berry crops look very good.

Hort Society summer meeting

A small but enthusiastic group of groups were treated to an excellent tour of County Line Orchard and Fair Oaks Farms during the summer meeting of the Indiana Horticultural Society last week. Attendees were universally impressed with County Line Orchard and it is no surprise it is in the very top tier of agri-tourism operations in the state. From weddings, to school tours, to the kids farm, pumpkin patch and corn maze, they do it all. Not only that, but all activities are run at a very high level. Owner Ryan Richardson and his staff were very hospitable. Fair Oaks Farms has established itself as a major agri-tourism destination, attracting over 500,000 people last year, however the orchard is relatively new. Orchard and horticulture manager Greg Stahl has only been on the job about 3 weeks, but he did a great job in showing us their considerable apple, peach and pear plantings. Growers were quick to offer their opinions and advice and the tour was worthwhile from both sides. Greg was very candid about some of the challenges they face and we welcome their addition to the Indiana fruit industry. (Hirst)

When do I start spraying for spotted wing drosophila?

When entomologist are confronted with a new insect pest like spotted wing drosophila, there is a very predictable sequence of actions that we take in response to the new threat. First, we try to assess the extent of the threat. In this case, we can look at states where SWD was a problem first and determine that all small fruits and possibly some soft-skinned tree fruits are at risk. Next, we look for methods of control, usually pesticides, that will allow growers to survive until we can figure things out more completely. Again we look to states that were invaded first and see what worked there. With SWD, we get a lot of information from Dr. Rufus Isaacs at Michigan State University that is helpful to us. The table below comes largely from Dr. Isaacs' work. Next, we try to figure out how to sample for the pest so that we can make smart spray decisions. For SWD, effective traps have been developed that are simple, cheap, and can be made by any grower. Once those things are in place, we then start the process of developing pest management programs, which would include such items as looking for alternative control methods (often non-chemical), developing economic (spray) thresholds, looking for less toxic pesticide alternatives, etc.

Right now we are at the stage of buying time until we can develop the more advanced pest management program. We have a good sampling method and a

good idea of which insecticides will provide acceptable levels of control. A question I have heard repeatedly in the past few weeks is "How do I know when I should spray?" I wish that I had a hard answer to that question based on lots of data and years of experience with SWD. In the absence of data and experience, here are a few ideas that you should consider as you make spray decisions.

1. If you had a problem last year, I would recommend that you have traps in place and begin spraying when your crop is in a vulnerable stage (just starting to ripen or beyond) when you catch SWD in your traps. I know some blueberry and fall raspberries growers had severe problems last year and the likelihood is that the problem will be just as bad or worse this year. In those extreme situations, I would not object if you sprayed when the crop is vulnerable, regardless of trap catch. I still think it is a good idea to have the traps, but you don't want a repeat of problems from last year.
2. If you had some SWD last year, but the damage was not severe, again it is likely that the populations will be as high or higher this year. Have your traps in place and be prepared to spray when you are consistently catch SWD in the traps. See No. 3 below for a further discussion on this topic.
3. If you have not had a SWD problem in the past, do not assume that you will not have one this year. It's possible that you may not, but don't count on it. You should have traps in place now. So, what should you do if you catch one SWD in your trap? I had a strawberry grower who caught one fly in his trap earlier. This grower has never sprayed during harvest before. After much discussion, he decided that he would not spray based on a single catch. He caught no more SWD and had no problems with his strawberries. I think that because of the time of the season, strawberries are the least vulnerable small fruit but I think the principle

			PHI			
Insecticide	Efficacy[2]	Class	Grape	Caneberries	Blueberry	Strawberry
Imidan	****	Organophosphate	7-14	---	3	---
Malathion	***	Organophosphate	3	1	1	---
Lannate	***	Carbamate	---	---	3	---
Asana	****	Pyrethroid	---	7	14	---
Brigade	****	Pyrethroid	30	3	1	0
Mustang Max	****	Pyrethroid	1	1	1	---
Hero	****	Pyrethroid	30	3	1	---
Danitol	****	Pyrethroid	21	3	3	2
Delegate/Radiant	****	Spinosad	7	1	3	1
Entrust[1]	***	Spinosad	7	1	3	1
Pyganic[1]	**	Botanical	0	0	0	0

[1]OMRI approved insecticides

[2]Efficacy data are courtesy of Dr. Rufus Isaacs, Michigan State University.

Facts for Fancy Fruit is a newsletter for commercial and advanced amateur fruit growers. It provides timely information on pest control, production practices, and other topics likely to be of interest to fruit growers. All growers and interested persons are welcome to subscribe.

Subscriptions are $15 per year. Subscribers will receive 12-15 issues biweekly during the growing season and monthly otherwise.

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applies to other fruit. It takes a population of SWD to cause problems. Catching one means you have some, but are there enough to cause you economic loss? I caution you against over-reacting. I think you should wait until you catch multiple SWD before you begin spraying. Again, I wish we had a number to give you based on data, but we just don't yet. If you typically don't spray your crop with insecticides, make sure that you have a sprayer and have access to an appropriate insecticide, either in hand or you have a dealer lined up to supply it quickly if you need it.

Some people have been suggesting that alternating between more than one class of insecticides would be a good idea to avoid the development of resistance. I think this is a prudent course of action. For a crop like blueberries, the pyrethroids look like a good choice with good efficacy and short pre-harvest intervals, but it would probably be a good idea to use some other class of insecticide if you spray multiple times.

The table on page 2, lists the insecticide control options for SWD on various small fruits. The efficacy ratings are courtesy of Dr. Rufus Isaacs from Michigan State University. (Foster)

Trouble with Traminette?

There is no such thing as the perfect grape variety and that is the case with Traminette, Indiana's signature wine grape. Traminette was named the signature grape because of its outstanding wine quality and adaptation to all parts of the state. It can be grown anywhere from north to south and makes excellent wines of styles that reflect the growing condition of the particular region. But, it is not without its faults. A couple of those weaknesses are showing up this year. First, poor fruit set: Traminette occasionally exhibits poor fruit set. Clusters fail to set fruit, dry up and fall off, either partially or entirely. This might affect 10-40% of the clusters on a vine and seems to occur at random. We see this every few years and it does not necessarily coincide with poor pollination conditions such as heavy rains, cool, cloudy conditions, etc. In fact, I've seen poor pollination in Traminette this year from across the state where environmental conditions during bloom were quite different at each location. And it occurs in both high vigor and low vigor vineyards. See figure 1.

Figure 1. Traminette cluster with die back.

There does not seem to be an obvious cause for the condition. It does not appear to be caused by disease, even though Traminette is very susceptible to Phomopsis. We have sent samples to the Purdue Plant and Pest Diagnostic lab and no pathogens can be consistently found. We have applied boron at bloom with no obvious beneficial effects. Shoot tipping to alter to carbon balance showed no improvement in fruit set. We are not alone as this problem occurs throughout the East and Midwest. Fortunately, there is usually adequate fruit set for a full crop despite the poor set on some clusters so this is more of a aggravation that a real problem. But I sure wish I knew the cause.

The second issue we've seen with Traminette is dieback of young vines. There was a lack of shoot growth from 2nd and 3rd leaf vineyards this spring. Vines that were planted last year, or the year before, and had grown well and made top wire last year failed to bud out this spring. See figure 2.

Figure 2. Traminette vines dead to the ground and regrowing.

We don't know what caused this problem. The vines went into the fall in a healthy condition, we did not have any extreme winter temperatures this year, nor did we have fluctuating temperatures this spring. Yet, the vines appear to have suffered significant winter injury. The canes that failed to bud out this spring are essentially dead to the ground. Most of the vines are growing back from the roots, but this is costing growers an extra year of vineyard establishment and a year delay in fruiting. This problem is not new. Traminette was officially released in 1996 and significant planting occurred over the next few years. In 1999-2000 this same phenomenon occurred. Many growers assumed that Traminette was not as cold hardy as promised, but it had proven to be adequately hardy in many different trials. Following that 1999-2000 episode, growers retrained vines and have not experienced any similar symptoms in those vineyards. And many plantings of Traminette have been made over the past 10 years that have not had any problems, including our research plantings. So this is another mystery with our signature grape. Maybe this just adds to the appeal of Traminette. (Bordelon)

Japanese beetles

The first adult Japanese beetles showed up in the Lafayette area last week. They could be out in full force very soon unless last year's drought killed them all. Yeah, sure. Most growers know they can be very damaging on grapes (leaves) and blueberries (fruit), brambles (leaves, fruit and flowers) and peaches (fruit). Scout for adult feeding activity and treat as necessary. Recommendations for control can be found in the spray guides: Midwest Small Fruit and Grape Spray Guide (https://ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx), and Midwest Tree Fruit Spray Guide (http://www.extension.iastate.edu/publications/pm1282.pdf). (Bordelon)

Herbicide drift damage widespread this year

Whenever we have a late corn and soybean planting season, we have herbicide drift problems. See FFF Volume 13 Issue 2. Growers from all corners of the state are calling with concerns. Damage from the growth regulator herbicide 2,4-D is the most commonly reported problem. This is probably due to the fact that: 1) 2,4-D symptoms are very easy to recognize, especially on grapes (and redbud trees, tomatoes, etc.), 2) most 2,4-D applied to row crops is the low volatile ester (LV-4) formulation, which despite its name is highly volatile and very prone to off-target movement and damage, and 3) certain plant species (such as grapes) are highly sensitive to 2,4-D and respond with classic, easily recognized symptoms. If you have a concern about herbicide drift, contact the Office of the Indiana State Chemist www.isco.purdue.edu. All the information you need to file a report is available at the web site. (Bordelon)

Tis the season of sooty blotch and flyspeck

Sooty blotch/flyspeck infection period is underway and growers are encouraged to apply a cover spray. The latest infection periods have been posted, which include sooty blotch/flyspeck.

Figure 3. Dr. Kari Peter, Penn State Fruit Research and Extension Center Plant Pathologist

Summer officially started last Friday and there's no doubt it is here: late afternoon thunderstorms, the corn is knee-high, Gettysburg is getting crazier by the day as 150th Anniversary nears, and the spores of sooty blotch and flyspeck are raring to go. Much like peas and carrots, sooty blotch and flyspeck diseases often appear together on the surfaces of apples and pears. The fungal pathogens causing these diseases are superficial on the waxy surface of the fruit and no decay results. Consequently, the fungi are superficial and can be removed from the fruit. Since consumers are visually driven when choosing their apples or pears, these pathogens decrease fruit quality and reduce marketability.

Sooty blotch/flyspeck (SBFS) is considered a disease complex since these diseases are caused by multiple species of fungi. Depending on the fungal species, sooty blotch appears on mature fruit as olive green spots or smudges that are either discreet colonies or large diffuse lesions, giving a "sooty" appearance. Flyspeck, on the other hand, appears as clusters of small black shiny specks. Although both diseases commonly appear on the same fruit, the colonies are mutually exclusive (i.e., one colony won't have both pathogens present). Unfortunately, all cultivars of apples are susceptible to these pathogens.

SBFS survives one season to the next on infected twigs of apple and pear trees, and is found on many woody plants surrounding orchards, such as brambles, oaks, and maples. The optimal conditions for spores to cause infection are temperatures ranging from 60 to 80ºF (depending on the fungal species), relative humidity greater than 96%, and frequent rain periods with slow drying conditions. Typically, spores require a 3 week incubation period in the orchard before symptoms develop; however optimum conditions favor a shorter incubation period and symptoms can manifest in as little as 8 – 12 days.

SBFS disease control

SBFS can be managed by removing reservoir hosts, particularly brambles, from the orchard. This reduces external inoculum, but this practice may not be enough during wet years. Improving air movement in orchards by dormant or summer pruning or thinning to separate fruit clusters also helps in preventing and/or reducing the severity of the diseases. These practices also aid in better spray coverage.

Predictive models exist for determining infection periods for SBFS. The ultimate goal is to time the first spray for SBFS. Unfortunately, there are variations among the models and mixed results. The Tree Fruit Pathology Lab follows the Brown/Sutton model where 10 days after petal fall, wetting hours begin to accumulate. At approximately 220 accumulated wetting hours, treatment is recommended. Some models have a lower treatment threshold for wetting hours, whereas others have a higher treatment threshold. For example, those using NEWA for predicting SBFS, the treatment threshold is 175 hours; Skybit is 350 hours. According to the model we use, we have entered an infection period, so growers are encouraged to apply a cover spray for SBFS. Using the recommendations posted on NEWA and the regional tree fruit spray guides, the following fungicides/tank mixes are recommended:

Current bud stages West Lafayette, IN		
Apple	Peach	Grape
		
fruit sizing well	*early varieties being harvested*	*Buckshot to bunch close*
Blackberry	Blueberry	Red Raspberry
		
Slowing approaching harvest	*Early varieties being harvested*	*Harvest underway*

4 oz/100 gal Topsin + 1 lb/100 gal. Captan 50W (or Captan-80 10 oz/100 gal); or 0.67 oz/100 gal Flint 50WG; or 1.6 oz/100 gal Sovran WDG; or 6.1 oz/100 gal Pristine WG; or 1 lb/100 gal Captan 50W (or Captan-80 10 oz/100 gal) + 21 fl. oz./100 gal ProPhyt Infection periods

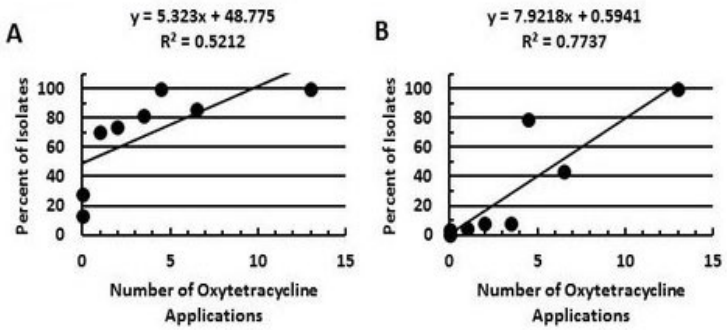
(Source: Penn. State Fruit Times)

Evaluating the risk of bacterial spot resistance to the antibiotic oxytetracycline

Bacterial spot of stone fruit (caused by Xanthomonas arboricola pv. pruni [Xap]) remains the most important bacterial disease of peach and nectarine in the eastern United States. We conducted a study in 2012 to monitor and identify populations of bacteria in stone fruit orchards, including bacteria resistant to the antibiotic oxytetracycline and to determine the current levels of oxytetracycline sensitivity in Xap populations. Of the 237 isolates tested, 99% and 81% grew in media amended with 5 and 10 mg/L oxytetracycline, respectively, while 25% and 22% of isolates grew in media amended with 15 and 20 mg/L and greater of oxytetracycline, respectively. Prudent use of this antibiotic is advised to prevent the loss of sensitivity.

The number of oxytetracycline applications influenced the sensitivity of Xap isolates at higher oxytetracycline concentrations (See figure 4 right) but not at lower concentrations (See figure 4 left).

Figure 4.



Sarah J. Bardsley and Maria del Mar Jimenez-Gasco, Penn State Department of Plant Pathology and Environmental Microbiology

Peach is the second most important fruit crop in the eastern United States after apple. In 2011, the eastern US peach crop was valued at over $220 million with significant production from the states of Georgia, South Carolina, Pennsylvania, Michigan, New Jersey, North Carolina, Alabama, Virginia, West Virginia, New York, Ohio, and Maryland. Peach production, however, is severely limited by bacterial spot of stone fruit (caused by Xanthomonas arboricola pv. pruni [Xap]). Considered the most important bacterial disease of peach and nectarine in the eastern US, bacterial spot epidemics are especially severe in the southeastern US and the mid-Atlantic regions where the weather is warm, wet, and conducive to rapid disease development. The two main strategies for managing bacterial spot are to plant resistant stone fruit cultivars and to use chemical bactericides, including coppers and antibiotics. However, no stone fruit cultivar is completely resistant to bacterial spot, necessitating the use of bactericides to mitigate symptoms. The only antibiotic that has been used with significant disease suppression is oxytetracycline, marketed as Mycoshield(R) or FlameOut(R). Applied at a 7 to 10 day interval, up to 10 applications of the antibiotic oxytetracycline may be made per season depending when the cultivar is harvested. This amount of antibiotic use applies a strong selective pressure on bacterial populations favoring antibiotic resistant bacteria not only in populations of Xap but in closely associated populations of nonpathogenic bacteria as well. Studying epiphytic populations is crucial because in many instances, pathogenic and nonpathogenic bacteria in close association have the same tetracycline resistance genes and transposable elements. In some genera, nonpathogenic bacteria carry more antibiotic resistance genes and acquire them before pathogenic species. Therefore, the objectives of this research were to monitor and identify populations of bacterial epiphytes in stone fruit orchards, including bacterial epiphytes resistant to the antibiotic oxytetracycline and to screen isolates of Xap collected from commercial orchards to determine the current levels of oxytetracycline sensitivity.

Monitoring bacteria in commercial stone fruit orchards

In the 2012 growing season, leaf samples were taken from 5 conventional and 2 organic stone fruit orchards in Adams, Delaware, Chester, and Lancaster Counties, PA. Three 15 gram leaf samples from each sampled block were rinsed in potassium phosphate buffer in order to wash bacterial epiphytes from the leaves. The rinsate was serially diluted and plated on King's B media (a semi-selective medium) amended with the antibiotic oxytetracycline at three different concentrations (0, 10, and 25 mg/L). The formation of bacterial colonies on these plates was counted and recorded and in total, 366 single colonies were collected, preserved, and stored at -80° C for further characterization. Bacteria growing on media amended with 10 and 25 mg/L oxytetracycline were recovered from all orchards, including both organic orchards where no oxytetracycline had been applied. Interestingly, there was a large percentage of isolates recovered from media amended with 10 and 25 mg/L oxytetracycline from the sampled organic orchards. This is due to the type of bacteria recovered from the organic orchards. Visual comparisons made between culturable bacteria recovered from conventional and organic orchards showed that populations were completely different. Nevertheless, the recovery of bacteria growing in the presence of the antibiotic oxytetracycline provides evidence that tetracycline resistance genes are present in all the orchards sampled. Further investigation is needed to determine the specific genetic makeup of these resistance genes, if they differ among organic and conventional orchards, and if they are transferable to and stable in isolates of *Xap*.

Collection of bacteria that cause bacterial spot and screening for resistance to antibiotics

Bacterial spot samples were collected from 8 commercial stone fruit orchards in Adams, Delaware, Chester, Lancaster, and Franklin Counties, PA, and 2 peach blocks from the Penn State Fruit Research and Extension Center (Adams County, PA) in order to obtain isolates of Xap to screen for oxytetracycline sensitivity. Two organic stone fruit orchards were visited; however, no bacterial spot was found from either organic orchard despite rigorous inspection. In addition to the sample collection, a survey from each orchard was completed to acquire an orchard history, including cultivar, tree age, and bactericide use. A total of 615 positively identified isolates of Xap were collected from 10 sites and were preserved and stored at -80 ° for future use. The isolates were screened for oxytetracycline sensitivity. Of 237 isolates tested, 98.6% and 81.0% grew in media amended with 5 and 10 mg/L oxytetracycline, respectively, while 24.9% and 22.0% grew in media amended with 15 and 20 mg/L and greater of oxytetracycline, respectively. Xap sensitivity varied among the sampled orchards. The number of oxytetracycline applications made in 2011 and 2012 was weakly correlated ($R^2 = 0.5212$) with the percentage of isolates growing in media amended with 10 mg/L or less of oxytetracycline. However, the number of oxytetracycline applications made in 2011 and 2012 had a stronger positive correlation ($R^2 = 0.7737$) with the percentage of Xap isolates growing in media amended with 15 mg/L oxytetracycline or above. This indicates that the majority of Xap isolates tested grow at lower concentrations (i.e.: 10 mg/L and below) of oxytetracycline regardless of the number of applications made in the past two

years. The number of oxytetracycline applications, however, influences the number of Xap isolates that grow in media amended with higher concentrations (i.e.: 15 mg/L and above) of oxytetracycline. Despite variable loss of sensitivity, the current recommended rate of mycoshield holds an oxytetracycline concentration far greater (approx. 900 mg/L of oxytetracycline) than the concentrations tested in this antibiotic screen. Nevertheless, prudent use of this antibiotic is advised to prevent additional loss of sensitivity. Further analysis will address the influence of cultivar, tree age, copper use, and bactericide application method (i.e.: complete sprays vs. alternate row middle). The remaining Xap isolates will be screened for tetracycline resistance genes conferring resistance to oxytetracycline.

(Source: Penn State Fruit Times)

Heavy apple crops

We are seeing heavy crops of apples set around many orchards in the state. A consequence of poor crops from freeze damage last year seems to have been not only heavy return bloom this spring, but the quality of flowers was also strong. Therefore it is not surprising that our chemical thinners did not work as well as we would have liked. So here we are, passed the window for chemical thinning but with crops that are still too heavy. What should we do? Manual thinning is about all we can do at this stage. Hand thinning to space fruit about 6" apart allows the best control, but is very time consuming. Using "bumpers" or branch shaking is a less precise method, but less labor intensive. Do whatever is practical for you in your situation.

In the last issue of FFF, I mentioned the use of summer NAA applications to encourage return bloom. This is especially important on biennial cultivars and those with heavy crop loads. If you haven't tried this previously, this might be the year to try summer NAA applications, at least on the most heavily cropping trees. (Hirst)

Upcoming events

July 9, 2013.
Michigan State University Cherry Variety and High-tech Research Showcase. MSU Clarksville Horticultural Experiment Station. 10:30 am Apple thinning mini-workshop. 1:00 pm Cherry varieties, training systems, coverings, and high-tech research. For more information call 1-800-424-2765 or refer to: http://agbioresearch.msu.edu/events/cherry_variety_and_high_tech_research_showcase

July 15, 2013.
Summer meeting of the Indiana Winery and Vineyard Association. Contact Larry Pampel for details. (574) 583-2345.

August 19-21, 2013.
Midwest Produce Conference and Expo. Hyatt Regency Chicago. Chicago, IL. For more information and to register go to, http://www.midwestproduceexpo.com/

January 7, 2014.
Illiana Vegetable Growers Symposium. The meeting will be held from 8:00 - 4:00 Central time at Teibel's Restaurant in Schererville, IN. Registration and additional info will be available in early December at https://www2.ag.purdue.edu/hla/fruitveg under "Events" or by phoning, 219-531-4200 x4201.

January, 21-23, 2014.
Indiana Horticultural Congress and Trade Show, Wyndham Indianapolis West, Indianapolis, IN.
http://www.inhortcongress.org

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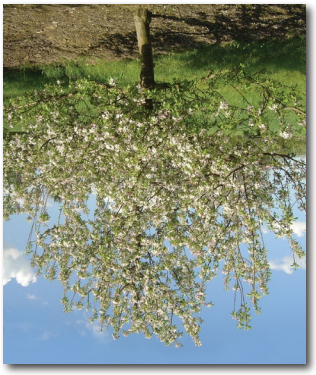

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