

Fruit Production

OHIO FRUIT NEWS

Research and Recommendations from The Ohio State University

December 2018

Fungicide Resistance Reported in Colletotrichum from Strawberries

Rachel Kaufman and Melanie Lewis Ivey (Fruit Extension Pathologist)

Supporting^{*}

Over the past few years the incidence of anthracnose crown rot of strawberry, caused by the fungal pathogen *Colletotrichum* spp., has been increasing in Ohio. Symptoms of anthracnose crown rot include plant stunting, wilting, slightly sunken lesions on the petioles and internal red and white marbling of the crown. Generally, the roots remain fibrous and white.

Diseased transplants are the primary source of fruit inoculum during the season. Therefore, using disease-free transplants is the most effective method of controlling crown rot in production fields. While weekly foliar sprays of protectant fungicides such as captan are effective in slowing and reducing the spread of crown rot from infected to health transplants they do not adequately control the disease on infected plants. Therefore, single-site fungicides are recommended, unless resistant isolates are present. **Unfortunately, this year we detected resistant isolates of** *Colletotrichum* in transplants with anthracnose crown rot. These isolates, which were identified as *Colletotrichum nymphaeae*, were resistant to thiophanate methyl (FRAC 1) and the quinone outside inhibitors (Qol) fungicides (FRAC 11), including azoxystrobin. Based on current fungicide recommendations in the 2019-2020 Midwest Fruit Pest Management Guide for anthracnose crown rot, 58% contain a Qol mode of action including Abound, Cabrio, Luna Sensation, Merivon, and Pristine, to name a few. Because there is cross resistance between all members of the Qol group, the implication for effective management of anthracnose crown rot is serious.

Strawberry plants with Colletotrichum infection in the crown.

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The Ohio State University College of Food, Agricultural and Environmental Sciences

Recommendations to ensure highly effective disease and resistance management for the 2019 season include:

Implement IPM Practices. Purchase transplants from a reputable nursery and inspect the transplants for typical symptoms of anthracnose crown rot. Do not plant symptomatic transplants. If bare root plants are symptomatic and an alternative plant source is not available dipping the plants in Switch (FRAC 9 + 12) can reduce plant death by 30% or more.

Spray Strategically. Resistance to multiple fungicides is not uncommon, which can make fungicide selection difficult. Develop your spray program prior to the start of the season. While changes will most likely need to be made due to weather or other factors, thinking ahead about which fungicides to use and how many times they can be used will allow you to order the fungicides ahead of time, but more importantly consider fungicide resistance management strategies.

If fungicides are needed prior to bloom, protective fungicides such as captan or thiram should be used. During bloom, stick with captan as much as possible and only use FRAC 1 and FRAC 11 fungicides when the weather is favorable for disease development. Do not spray more than two applications of fungicides that contain Qol FRAC 11 only in a season. Remember that a season begins at planting and ends after the final harvest (or renovation for matted row plantings).

Spray Less. Spraying less reduces the selection pressure for resistance. However, it is only an option if disease control is not compromised. Monitoring the weather conditions and stretching the spray interval to the latest number of days recommended in the label can reduce the number of sprays that are needed in a season, especially in a dry year.

More information on anthracnose can be found here: ohioline.osu.edu/factsheet/plpath-fru-16

Fruit samples can be sent to the fruit pathology laboratory. Please review our website for instructions on submitting a diagnostic sample (<u>u.osu.edu/fruitpathology/diagnostics/</u>).

For more information on screening for fungicide resistance in fruit crops contact Dr. Melanie Lewis Ivey (<u>ivey.14@osu.edu</u>; 330-263-3849).

Strawberry patch with severe Colletotrichum infection.



Hard Cider Research in Progress at OSU

Diane Miller and Andy Kirk

We have completed a phase 1 project (2016-2018) funded by the Ohio Department of Agriculture Specialty Crop Block Grant program titled: *Ohio cider: Blending tradition and discovery for the modern market*. The goal of the project was to support the development of outstanding Ohio hard ciders. We evaluated a wide range of apple varieties, Midwest Apple Improvement Association (MAIA) selections, and wild *Malus* selections for their value as the needed components of hard cider: sweets, tarts, bittersweets and bittersharps.

Our selection bias was for apples with flavor complexity since we knew that the predominate apple type grown in Ohio is not flavor complex but sweet instead. Sweet apples are great for fresh cider and also a good base for hard cider but not of extra value to hard cider. The higher value juice comes from more complex apples, which is needed for blending with sweet juice to make desirable hard cider. So we went looking for more apples with more complexity. The 'flavor complex' apple selections we evaluated categorized predominately as tart. Tart category apples include dual purpose apples such as Goldrush and Stayman, which can be eaten fresh but have extra kick as compared with sweet snack apples such as Golden Delicious and EverCrisp.

We evaluated 180 different apple juice selections (85 distinct varieties/selections) pressed from Ohio grown apples, including some replication within and among locations and across years. Results of our analyses placed 50 selections into the sweet hard cider category, 90 selections into tart, 6 into bittersweet and 14 into bittersharp.

We collected a lot of documenting data including field pictures of selections, harvest time, fruit firmness and sugars. Peck quantities of each kind were pressed using a single bag Goodnature squeeze box press. Juice was tested for pH, total acidity and phenolic compounds. Single varietal small batch uncontrolled natural fermentations resulted in enough sample (approximately 750 ml) for tastings. We complicated the fermenting process by not killing natural organisms that were present in the juice so we have the extra factor of the working of unknown organisms in the samples. We conducted 4 tastings, each consisting of 13-15 tasters and 20 ciders.

The bottom line is that from our phase 1 process we could select 30 apple types that had considerable potential for hard cider. Most of these are extra complex flavor apples that have the chance to be an interesting varietal hard cider or of high value in cider blending. These are in the range, although at the edge, of being a 'dual purpose' eating/cider apple. We also identified the bittersweets and bittersharps wild apples (Kazakh), which can be grown here with extra tending and which would likely be single purpose, high value for cider.

In mid-2018 we received a phase 2 Ohio Department of Agriculture Specialty Crop Block Grant (2018-2020), with Andy Kirk as lead investigator, to evaluate these 30 apple types at a ramped up scale. In fall 2018 we worked with two bushel volumes of these selections, for juice and then controlled 'still' fermentations. These fermentations are in progress and tasting events that will be conducted by the MAIA will occur in winter 2019. If you are interested in being a taster, let us know (miller.87@osu.edu, kirk.197@osu.edu). If you are interested in additional information about this research, please attend the Ohio Produce Growers and Marketers Association meeting on Wednesday January 16, 2019 where we will be presenting research results or contact Diane or Andy by email. The mailing address for Diane and Andy are provided at the end of this newsletter.

An array of hard ciders from an MAIA-hosted tasting event at Bent Ladder Cidery, Rittman, OH; with Amy Miller, MAIA event leader.



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Managing Spotted Wing Drosophila – Exclusion Netting Video

Jim Jasinski

Spotted wing drosophila (SWD) has become a well-known pest for any grower producing small fruit such as raspberry, blueberry, blackberry, strawberry, grapes, or peaches. The Ohio State University Extension Educators and Department of Entomology faculty have been conducting workshops around the state since 2012 to help growers identify and manage this pest.

Over the past few years a new management technique has emerged that involves no pesticides but may only be economically feasible for smaller or organic growers. The use of insect proof exclusion netting such as ExcludeNet (80g) or similar netting has been tried in several states (MI, NY, MN, VT, MO) generally with good results (u.osu.edu/pestmanagement/pests/swd/).

One of the potential downfalls of wide adoption is the cost of the netting may run as high as \$840 for a roll measuring 13' x 328' (this includes shipping). A rough estimate for the netting alone would place the cost per acre close to \$8,600, not including the cost of the supporting structure. Based on the footprint of the area to protect, the netting may need to be cut and stitched by a tarp shop or similar business to create the appropriate size, which would also be an additional cost. Another issue to consider would be pollination and when to put the netting in place in relation to flowering and the use or addition of pollinators.

If you have been considering using netting to reduce SWD infestation on a particular crop, take a look at this video for some great information on how to get started including some of the other advantages and disadvantages. The SWD netting video is posted to the OSU IPM YouTube channel along with other videos on how to monitor and manage this pest. (youtu.be/_eAODdcYnXk) Additional information about SWD management can be found here u.osu.edu/pestmanagement/pests/swd/

Celeste Welty (Fruit Entomologist) and Ashley Kulhanek (Extension Educator, Medina County) were also involved in this project and can be contacted for more information on using exclusion netting.



Medina County grower talking about his exclusion netting project to manage SWD. (Image used with permission by grower)

Chestnut Blossom End Rot: A Growing Concern for Chestnut Producers in Ohio



Newly harvested chestnuts (Image courtesy of Route 9 Cooperative) Melanie Lewis Ivey

There may just be a few less chestnuts roasting on an open fire this holiday season thanks to a pesky fungus that many fruit and vegetable (and now nut) growers are familiar with: *Colletotrichum*. Chestnut producers in the state experienced abnormally high amounts of blossom end rot during the harvest this year. OSU Horticulture Extension Specialist Dr. Diane Miller reported that one farm in Ohio had at least a 50% grade out rate this harvest.

Species of *Colletotrichum* in the *Colletotrichum gloeosporiodes* complex and *Colletotrichum acutatum* complex have been associated with chestnut blossom end rot. Our lab is still working on deciphering the identity of the species causing blossom end rot in Ohio. No matter the species, *Colletotrichum* diseases are very difficult to manage and the timing of fungicides is critical. As we see changes in our weather patterns (more rain, higher temperatures) determining the timing of fungicides becomes even more challenging! The main reason timing is so critical is because this fungus doesn't require a wound for infection to occur (it has its own mechanism of penetrating tissue). Once it infects it can immediately cause disease or it can remain in a state of inactivity and cause disease when more favorable environmental conditions arise. After an infection occurs protective fungicides such as captan are less effective.

To further complicate the problem, the presence of Asian gall wasps may contribute to blossom end rot incidence and severity. Recent studies at the University of Kentucky suggest that *Colletotrichum* can infect gall wasps as well as nuts, making it both a bio-control of an insect pest and a crop disease. In order for us to be able to develop an effective and well timed fungicide spray program for chestnut blossom end rot we need to better understand the biology of the fungus and the disease cycle. Increasing our understanding of how the Asian gall wasp contributes to disease is also going to be important in the development of management tactics. In 2019, my lab will begin on-farm trials to study blossom end rot on chestnut.

To learn more about chestnut production in Ohio and other states visit the Chestnut Growers of America website (<u>chestnutgrowers.org/growers.html</u>) or Route 9 Cooperative (<u>route9cooperative.com/</u>).

Upcoming 2019 Events and Trainings

Post Fermentation Wine Quality Control Workshop (Jan. 8, 2019) Glenford, OH; <u>Link here</u>

Mid-Ohio Growers Meeting (Jan. 11, 2019) Mt. Hope, OH; <u>Link Here</u>

2019 Ohio Produce Network (Jan. 16-17, 2019) Dublin, OH; <u>Link here</u>

Southern Ohio Specialty Crop Conference (Feb. 5, 2019) Loveland, OH; Link here **2019 Hops Conference (Ohio Hop Growers Guild)** (Jan. 9-10, 2019) Columbus, OH; <u>Link here</u>

NW Michigan Orchard and Vineyard Show (Jan. 15-16, 2019) Acme, MI; <u>Link here</u>

Post Fermentation Wine Quality Control Workshop (Jan. 22, 2019) Madison, OH; <u>Link here</u>

2019 Ohio Grape and Wine Conference (Feb. 18-19, 2019) Dublin, OH; <u>Link here</u>

Good Agricultural Practices (GAPs) Trainings (producesafety.osu.edu/events):

For more information, contact Eileen Ramsey (Assistant GAPs Training Coordinator, 221 Selby Hall, 1680 Madison Ave, Wooster, OH, 44691; <u>Ramsey.18@osu.edu</u>; 330-202-3555x2861)

Feb. 5^{th} – Mt. Hope, OH Feb. 7^{th} – Wooster, OH Feb. 13^{th} – West Salem, OH Feb. 20^{th} – Homerville, OH Mar. 13^{th} – West Salem, OH Apr. 4^{th} – Georgetown, OH

Small Food Processors Workshops (<u>southcenters.osu.edu/marketing/events/value-</u> added-workshops): For more information contact Abigail Snyder (<u>Snyder.814@osu.edu</u>; 330-263-3831)

Jan. 7th – Athens, OH Jan. 10th – Bowling Green, OH Jan. 15th – Dayton, OH Jan. 29th – Cleveland, OH

Pesticide Recertification Conference (pested.osu.edu/commercialrecert)

Jan. 9th – Dayton, OH Jan. 15th – Akron, OH Feb. 22nd – Sandusky, OH Feb. 26th – Columbus, OH

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Avoid Costly Problems in the Spring by Proper Winterizing of Your Sprayer Now

Erdal Ozkan

It is very likely that you will not be using your sprayer again until next spring. If you want to avoid potential problems and save yourself from frustration and major headaches, you will be wise to give your sprayer a little bit of TLC (Tender Loving Care) these days. Yes this is still a busy time of the year for some of you, but don't delay winterizing your sprayer too long. You don't want a pump that is cracked and/or not working at its full capacity because you did not properly winterize it before the temperatures fall below freezing. Here are some important things you need to do with your sprayer this time of the year.

Rinsing

It is very likely that you did the right thing when you used the sprayer the last time: you rinsed the whole system (tank, hoses, filters, nozzles) thoroughly. If you did not, make sure this is done before storing the sprayer. A sprayer that is not rinsed thoroughly after each use, and especially after the spraying season is over, may lead to serious problems caused by cross-contamination of different products applied for different crops. Another problem that may result from lack of, or insufficient rinsing of all the sprayer parts is clogged nozzles. Once the nozzles are clogged, it is extremely difficult to bring them back to their operating conditions. Leaving chemical residues in nozzles will usually lead to changes in flow rate, as well as in spray patterns, resulting in uneven distribution of chemicals on the target.

Depending on the tank, proper rinsing of the interior of the tank could be easy or challenging. It will be very easy if the tank is relatively new and is equipped with special rinsing nozzles and mechanism inside the tank. If this is not the case, manual rinsing of the tank interior is more difficult, and poses some safety problems such as inhaling fumes of leftover chemicals during the rinsing process. To avoid these problems, either replace the tank with one that has the interior rinse nozzles, or install an interior tank rinse system in your existing tank.

For effective rinsing of all the sprayer components, circulate clean water through all the sprayer parts for several minutes, first with the nozzles off, then flush out the rinsate through the nozzles, preferably rinsing should be done in the field, or on a concrete chemical mixing/loading pad with a sump to recover rinse water. Regardless, dispose of the rinsate according to recommendations on the pesticide label. Always check the label for specific instructions! However, most labels recommend the following procedure:

- If rinsing is done on a concrete rinse pad with a sump, put the rinsate collected in the sump back in the tank, dilute it with water and spray it in the field where there is no potential for the rinsate to reach ditches and other water bodies nearby.
- If the rinsing is done in the field, make sure you are not flushing out the rinsate in the system in one area. It is best to further dilute the rinse water in the tank and, spray it on the field on areas where there is no potential for the rinsate to reach ditches and other water bodies nearby.

Cleaning

Rinsing the system with water as explained above may not be sufficient to get rid of chemicals from the sprayer, which can lead to cross-contamination. Residues of some pesticides left in the sprayer may cause serious problems when a spray mixture containing these residual materials is applied on a crop that is highly sensitive to that pesticide. To avoid such problems, clean and rinse the entire spraying system with a cleaning solution.

If the tank was cleaned immediately following the final spray application, use a mixture of 1 to 100 of household ammonia to water. Otherwise use a detergent before cleaning with ammonia. Some chemicals require specific rinsing solution. Always check the product label to find out the most recent recommendations on cleaning agents.

Cleaning the outside of the sprayer components deserves equal attention. Remove compacted deposits with a bristle brush. Then flush the exterior parts of the equipment with water using a pressure washer, if available. Wash the exterior of the equipment either in the field away from ditches and water sources, or on a concrete rinse pad with a sump. Again, the rinsate should be disposed of according to the label recommendations.

Winterizing

Check one more time to make sure there is no liquid left inside any of the sprayer parts to prevent freezing. The pump, the heart of a sprayer, requires special care. You don't want a pump that is cracked and/or not working at its full capacity because it froze. After draining the water, add a small amount of oil, and rotate the pump four or five revolutions by hand to completely coat interior surfaces. Make sure that this oil is not going to damage rubber rollers in a roller pump or rubber parts in a diaphragm pump. Check the operator's manual. If oil is not recommended, pouring one tablespoon of radiator rust inhibitor in the inlet and outlet part of the pump also keeps the pump from corroding. Another alternative is to put automotive antifreeze with rust inhibitor in the pump and other sprayer parts. This also protects against corrosion and prevents freezing in case all the water is not drained. To prevent corrosion, remove nozzle tips and strainers, dry them, and store them in a dry place. Putting them in a can of light oil such as diesel fuel or kerosene is another option.

Storage

Find ways to protect your sprayer against the harmful effects of snow, rain, sun, and strong winds. Moisture in the air, whether from snow, rain, or soil, rusts metal parts of unprotected equipment of any kind. Although, the sun usually helps reduce moisture in the air, it can also causes damage to the rubber and plastic parts of the sprayer. Ultraviolet light softens and weakens rubber materials such as hoses and tires and degrades some tank materials. The best protection from the environment is to store sprayers in a dry building. Storing sprayers in a building also gives you a chance to work on them any time during the off-season regardless of weather. If storing in a building is not possible, provide some sort of cover. When storing trailer-type sprayers, put blocks under the frame or axle and reduce tire pressure during storage.

Finally, check the condition of all sprayer parts one more time before leaving the sprayer behind. Identify the parts that may need to be worked on, or replaced. Check the tank, and hoses to make sure there are no signs of cracks starting to take place. Check the painted parts of the sprayer for scratched spots. Touch up these areas with paint to eliminate corrosion. By the way, don't forget to cover openings so that birds don't make a nest somewhere in your sprayer, and insects, dirt, and other foreign material cannot get into the system.

Monitoring for Powdery Mildew Resistance in Ohio



Powdery mildew on grape leaves (Pictures from: MSU at left and NMSU at middle, and Bayer at right)

Help us, Help you!

The FRAME Network, a national research and extension team working on fungicide resistance in grape powdery mildew, is interested in hearing about how you approach powdery mildew management and fungicide selection. If you are a vineyard owner, manager, consultant, or someone who provides fungicide recommendations for vineyards in the United States, please consider taking our survey! The survey should only take you about 10 minutes to complete. Click the link below to complete the survey OR you can e-mail us or write us to receive a copy of the survey. <u>Wsu.co1.qualtrics.com/jfe/forms/SV_2ly1QooeFKjMCwj</u>

Not sure if you have Powdery Mildew or Downy Mildew? Check out our previous article for tips to diagnosis the disease! <u>cpb-us-</u> <u>w2.wpmucdn.com/u.osu.edu/dist/b/289</u> <u>45/files/2017/04/Edition2_07042017-</u> <u>1a07pmr.pdf</u>



Grape Powdery Mildew on a grape cluster (Picture from pawinegrape.com)

Choosing the Right Food Safety Training Class

Lindsey Pender, Sanja Ilic and Melanie Lewis Ivey

Whether you are an experienced or new grower, sell to large grocery chains or have a roadside farm stand, or need to renew your certification, you will most likely be required to take some type of fresh produce safety training. Which food safety training course you select will depend on whether or not you are covered by the Food Safety Modernization Act (FSMA) Produce Safety Rule, previous trainings you may have taken, and/or requirements of your buyer. The quality of the various trainings and cost will also impact your decision. An overview of the fresh produce safety training classes available in Ohio by The Ohio State University Fruit and Vegetable Safety Team is provided below. Classes are taught by Extension Specialists and Educators with fresh produce safety expertise. Classes are available year-round with the bulk of the classes offered during the fall and winter months.

Produce Safety Alliance (PSA) Grower Training:

The PSA Grower Training is only required by farms covered by the Food Safety Modernization *Act (FSMA) Produce Safety Rule (see Figure)*. All covered farms must have the training to be compliant with the FSMA Produce Safety Rule. The training is only required once (i.e. not annually). Some buyers may be requesting that ALL growers complete the PSA FSMA training, however this is not required by federal law, and Good Agricultural Practices (GAPs) compliance should be considered sufficient to ensure food safety. The PSA Grower Training is a 7-hour training that encompasses FSMA Produce Safety Rule requirements. Trainings are offered by public and private sectors and the cost depends on the agency providing the training. The Ohio State University Fruit and Vegetable Safety Team offers PSA Grower Trainings at a minimum cost of \$85.

Good Agricultural Practices (GAP) Training:

Good Agricultural Practices Trainings are voluntary trainings that introduce growers to common onfarm food safety hazards and how to reduce these hazards. The trainings provide growers with examples of best practices for a wide range of farming operations. Trainings are aligned with the FSMA Fresh Produce Safety Rule. Good Agricultural Practices Trainings are not required by federal law, although buyers may require that farms have the training annually. Growers who have completed a GAP training and are utilizing GAPs on their farm are demonstrating their commitment to fresh produce safety and ensuring that food safety risks are being reduced on their farm. The Ohio State University Fruit and Vegetable Safety Team offers 3-hour GAP Trainings at a cost of \$30.

To request a food safety training or to sign-up for a scheduled training please contact Eileen Ramsay (330-202-3555 Extension 2861 or <u>ramsay.18@osu.edu</u>). Schedules trainings are also posted on The Ohio State University Fruit and Vegetable Safety Team website (<u>producesafety.osu.edu/events/calendar</u>).



Information available at: producesafety.osu.edu/resou rces-0 Image of courtesy Evan Elford, Ontario Ministry of Agriculture, Food and Rural Affairs Simcoe Research Station, Ontario Canada





Pawpaw Fruit: What is Normal?

Melanie Lewis Ivey and the Great Lakes Fruit Worker Group

Pawpaw is a native woodland edge tree in the eastern United States and the fruit is Ohio's official state native fruit (taking over from tomato in 2009). Once cherished by Native Americans for its delicious and nutritious fruit, pawpaw is gaining popularity with naturalists and local food enthusiasts.

I was first introduced to pawpaw fruit several years ago by a colleague in Louisiana. While I did not particularly enjoy the taste, many Ohioans love it. In fact, Ohio hosts a yearly Pawpaw Festival (ohiopawpawfest.com/) to celebrate the native tree and its fruit. The fruit flesh has a custard-like consistency and according to many, has a tropical flavor much like banana and mango. Pawpaw fruit are high in vitamin C, amino acids, potassium and iron and reportedly have therapeutic properties. However, people have also reported having allergic reactions after eating pawpaw. Similar to tropical fruit (although pawpaw are not a tropical fruit) they have a short shelf life and must be consumed or processed within 3 to 5 days after harvest. Locally, fruit are most often sold at farmers markets for about \$1 per fruit and some growers also sell the seed.

My second encounter with pawpaw came this summer when my lab received a sample for disease diagnostics. The leaves were covered with brown lesions that had tiny black specks in the center while the center of some of the lesions had dried up and dropped out. The fruit had large dark black, crusty blotches on the surface. The blotching on the skin was superficial and did not affect the fruit flesh. When I looked at the blotches under the microscope they had an interesting netting pattern, but I did not see any signs of a pathogen or insect pest.



Phyllosticta symptoms on Pawpaw leaves



Diseased Pawpaw Fruit

From the leaves we cultured a fungus called *Phyllosticta* spp. While this fungus usually affects the leaves, it can also affect the skin. From the skin we isolated several types of fungi, some known to be plant pathogens and others that are not. Interestingly we did not isolate *Phyllosticta* from the skin. The apple diseases sooty blotch and fly speck (SBFS) have been reported on pawpaw, however we also didn't isolate any of the fungi that cause SBFS. Determining the cause of the symptoms is going to take quite a bit more work!

While trying to learn more about pawpaw production and the diseases and pests that affect pawpaw I reached out to colleagues in the Great Lakes Fruit Workers Group. This group, which is funded by the North Central Integrated Pest Management (IPM) Center, has a membership of over 220 and includes industry consultants, extension educators and researchers from states surrounding the Great Lakes and Ontario, Canada. In addition to assisting me with this sample they provided me with some other interesting facts about pawpaw. Here is what I learned:

- Some skin discoloration is normal and some varieties have more blemishes than others.
- Pawpaw fruit are sensitive to physical damage such as high wind and sunscald and bruise easily.
- Over ripened fruit tend to have more skin discoloration than immature or ripe fruit.
- Commercial products include frozen pulp and pawpaw beer, wine and liqueur.
- There is a FaceBook page for pawpaw fanatics! <u>facebook.com/NorthAmericanPawpawGrowers/</u>

For more information on pawpaw production in Ohio contact **Brad Bergefurd**, Extension Educator Agriculture and Natural Resources, OSU South Centers; 740-354-7879

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Grower Resources:

NEW: Midwest Fruit Pest Management Guide 2019 (ag.purdue.edu/hla/hort/documents/id-465.pdf)

2018 Grape Spray Guide (u.osu.edu/fruitpathology/spray-guides/)

OSU Fruit Pathology Resources (u.osu.edu/fruitpathology)

OSU Fruit and Vegetable Pest Management (entomology.osu.edu)

OSU Fruit and Vegetable Diagnostic Laboratory (u.osu.edu/vegetablediseasefacts/)

OSU Bramble: Production Management and Marketing Guide (Bulletin 782) (extensionpubs.osu.edu)





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