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# Mississippi *Vaccinium* Journal

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## May You Live in Interesting Times

You probably have heard this phrase before. At first it sounds like a blessing, but it really is a curse. Sometimes we feel cursed due to poor weather, poor markets, and pests. These make things difficult for us all., but know that some of these things can be controlled. And know that we (MSU and USDA-ARS) are working diligently on these topics. In this issue we give updates on the dreaded Spotted Wing Drosophila as well as Exobasidium Leaf and Fruit Spot. Over the last couple of years we have gained great knowledge about these two pests; however, since they are still relatively new, there his much more to be learned. Unfortunately, good research takes time., but at least we can pass along what we have learned along the way. Also in this issue are some brief recaps of events that occurred recently — the Blueberry Jubilee, the Legislator Tour, and the North American Blueberry Research and Extension Workers (NABREW) conference. One can never say that the blueberry industry isn't interesting.

## NABREW meets in New Jersey


The NABREW attendees in New Jersey at the P.E. Marucci Center for Blueberry & Cranberry Research & Extension in Chatsworth.

# Exobasidium Leaf and Fruit Spot: Disease Management

**Barbara Smith**
[1]USDA-ARS Thad Cochran Southern Horticultural Research Laboratory, Poplarville, MS 39470

In recent years blueberry growers in south Mississippi have reported symptoms of the disease Exobasidium leaf and fruit spot on their blueberry plants. In the past this disease was considered to be of minor importance occasionally occurring on isolated farms. Now it is being reported more often and has been responsible for significant fruit loss on some farms. The fruit spot stage of this disease was identified in North Carolina in 1997, and the disease has now been reported on rabbiteye, highbush, and southern highbush blueberry cultivars throughout the blueberry growing areas of the southeastern United States. Losses up to 60-70% have been reported in specific locations.

The presence of Exobasidium leaf spot is first apparent in early spring. Leaf spots are round, about ¼ inches in diameter and light green on the upper side of the leaf (Figure 1a). On the underside of the leaf, spots are pure white due to the velvety growth of the fungus. Spots may darken as they age and are slightly thicker than the rest of the leaf, but they do not develop galls (Figure 1b).

Exobasidium fruit spot causes significant economic loss because infected berries are unmarketable and must be hand removed from the packing line before berries are packed for shipping. A green spot develops on an infected berry and the berry does not ripen normally causing it to be misshapen (Figure 1c). Fruit spots are about ¼ inches in diameter, sunken, and tinged with a red color. The spots do not become necrotic as the berries ripen and infected berries remain firm. Tissue in the affected area of the berry has a tough chewy texture that is undesirable.

The fungus causing Exobasidium leaf and fruit spot (previously identified as *Exobasidium vaccinii*) recently was classified as *Exobasidium maculosum* (Brewer et al. 2014) and is related to the causal pathogen of red leaf disease of cranberry and lowbush blueberry that occurs in the northeastern U.S. and Canada. The fungus appears be overwinter on or in infected bud scales and new leaves and fruit are infected each spring; however, the disease cycle has not been documented. It is possible that the initial infection in production fields is from native *Vaccinium* plants growing near the fields.

Exobasidium leaf and fruit spot has been reported in fields where there is poor air circulation in and around the planting. More severe symptoms have been associated with plants growing near ponds and low areas with periodic standing water which contributes to extended periods of high humidity. To improve air circulation, trees growing around the fields should be removed. Excessive growth within plants should be pruned out to open up the canopy. This also will allow fungicides to penetrate the interior of the plant. Some cultivars appear to be more susceptible than others with 'Premier' being very susceptible. The disease has also been seen on 'Tifblue', 'Star', and 'Powderblue'.

**-continued on page 3-**

## Exobasidium, cont.

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Observational data show that Exobasidium usually is not a problem in blueberry fields receiving fungicides to control mummy berry. Fungicide applications to control Exobasidium should begin pre-bloom as leaf buds are beginning to emerge and continue at a 7 to 10 day interval through bloom until preharvest (Table 1). It is important to alternate between fungicides with different modes of action as indicated by their FRAC group number. Note that both Indar and Orbit are in the same FRAC group and have preharvest intervals (PHI) of 30 days.

In a study in Mississippi in 2009 David Ingram compared the efficacy of nine fungicide treatments for control of Exobasidium. Pristine and Elevate were most effective in reducing the percentage leaf infection compared to the untreated control. Pristine, Elevate, Switch, and Indar were most effective in reducing the percentage of infected fruit. Pristine and Indar are both recommended for control of mummy berry, Elevate is used to control Botrytis Blight and Fruit Rot, and Switch is a broad spectrum fungicide for control of various fruit and foliar diseases.

A 2013 study in Georgia (Brannen 2013) found that a single late-dormant application of lime sulfur controlled Exobasidium better than multiple applications of either Captan or Indar when they were applied following the recommended mummy berry schedule. In the same study a comparison of multiple applications made between green tip and early cover sprays showed that Captan gave better control than Indar which gave better control than Pristine. Early season application of fungicides resulted in better control than later applications.

Based on the 2013 Georgia study, in blueberry fields where Exobasidium and other diseases such as Phomopsis and mummy berry are problems, **lime sulfur should be applied as a late dormant application about 1-2 weeks prior to bud break for Exobasidium and Phomopsis control**. This lime sulfur application should be followed by tank mix applications of Indar and Captan from green tip through petal fall for mummy berry management. Two or more cover sprays of Captan should then be applied for fruit rot control (Brannen 2013).

### References

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## Exobasidium, cont.

Barbara Smith

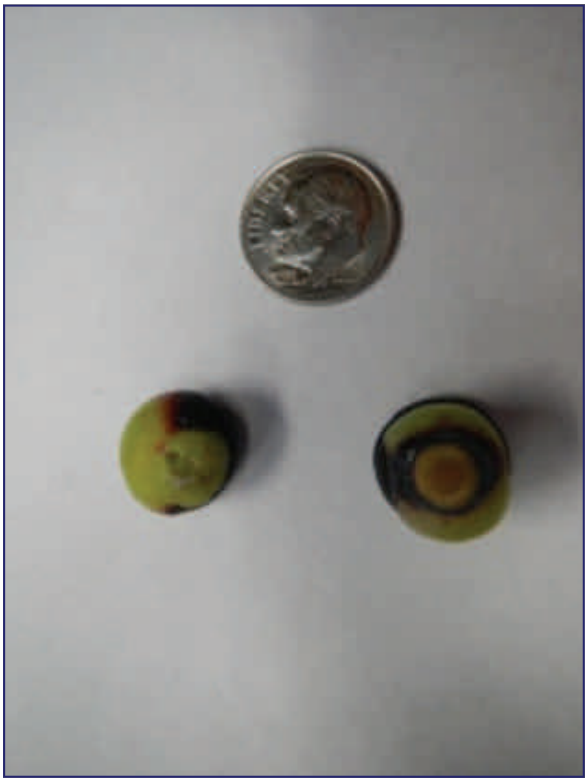

Figure 1. Exobasidium Leaf Spot viewed from upper and lower surfaces (1a, top left). Older leaf spots darken as they age (1b, top right). Green blueberry fruit infected with Exobasidium Fruit Spot (1c, bottom right).

Photos by Dr. Eric Stafne, Mississippi State University, Fruit Specialist.

# Exobasidum Control

Barbara Smith, USDA-ARS

Table 1. Fungicides recommended for control of Exobasidium Leaf and Fruit Spot. Applications should begin pre-bloom and continue through green tip (leaf buds) and pink bud (flower buds) until preharvest.

| **Fungicide** *(Mode of Action)* | **Formulation/Acre** | **PHI** | **Comments** |
|---|---|---|---|
| Lime Sulfur | 5 gal/100 gal water | 0 days | Apply at bud swell (late dormant about 2 weeks before bud break). Follow label directions carefully and follow all personal protective equipment recommendations. Lime sulfur will burn the eyes and skin. Do not apply within 14 days of an oil spray or when high temperatures may result in plant injury. |
| Fenbuconazole *FRAC 3* **(Indar 75WSP, Indar 2F)** | 2.0 to 6.0 fl oz | 30 days | Do not make more than 4 applications or apply more than 8 oz of Indar 75WSP /acre/year. |
| Captan (Captan 50WP) FRAC M4 **(Captan 50WP Captec 4L)** | 5 lb 2 qt | 0 days | Do not apply more than 70 lb Captan 50WP/A/year. Do not apply more than 35 qt Captec 4L/A/year. |
| Pyraclostrobin + boscalid (FRAC 11 + 7) **(Pristine WG)** | 18.5 to 23 oz | 0 days | No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than 4 applications of Pristine/A/crop year. |
| Cyprodinil + fludioxonil *FRAC 9 + 12* **(Switch 62.5WG)** | 11 to 14 oz | 0 days | Do not apply more than 56 oz. of product/A/year. Make no more than 2 sequential applications before using a fungicide with a different mode of action. |
| Fenhexamid *FRAC 17* **(Elevate 50WDG)** | 1.5 lb | 0 days | Do not make more than 2 consecutive applications without switching to a fungicide with a different mode of action. Do not apply more than 6.0 lb product/A. |
| Propiconazole *FRAC 3* **(Orbit 3.6E, Tilt 3.6E, Bumper 41.8 EC, PropiMax EC)** | 6.0 fl oz | 30 days | May be applied by either ground or aerial application. Do not apply more than 30 fl oz /A/season. More effective when allowed to dry before a rain. |

Table adapted from 2014 Southeast Regional Blueberry Integrated Management Guide, http://www.smallfruits.org/SmallFruitsRegGuide/Guides/2012/BlueberrySprayGuide2012.pdf

**Mention of a trademark or proprietary product is solely for the purpose of providing specific information and does not constitute a guarantee or warranty of the product by the USDA and does not imply its approval to the exclusion of other products that may be suitable.**

# Invasive Fruit Fly Research: An Update

**Chris Werle, John Adamczyk, and Blair Sampson, USDA-ARS, TCSHL, Poplarville, MS**

The past few years have seen several new emerging pests for southeastern fruit production, including some destructive fly species. Despite the many benefits of international trade, increases in trans-oceanic shipping volume and speed, and in the number of international trade partnerships, are the likely cause of these introductions. By now we are well aware of the spotted-wing Drosophila (*D. suzukii*), thanks to some informative workshops organized by the Gulf South Blueberry Growers' Association, Mississippi State University Extension Service and the USDA-ARS Thad Cochran Southern Horticultural Laboratory. With fruit now ripening, we have several SWD field studies underway, including a comparison of a lure developed by a prominent biocontrol company against a lure developed by ARS scientists. This trial should be the final step in determining the best combination of chemicals for a commercially-available SWD lure.

In addition, we recently discovered the African fig fly (*Zaprionus indianus*) in Mississippi blueberry orchards. An important pest at commercial orchards of tropical fruits in Central and South America, AFF exhibits a lifecycle similar to that of the SWD. Emerging slightly later than SWD, adults oviposit in fruits, and the subsequent damage is caused by larvae. A native of tropical regions in Africa, AFF is larger than SWD with a very striking pair of white stripes extending dorsally from the antennae to the tip of the thorax. Two additional shorter stripes extend laterally across the post-pronotum to the wing base, and the eyes are a very distinctive red color. The rest of the cuticle is of a yellow-orange color, slightly lighter in hue than the red-orange SWD. Seen side by side, there can be no mistaking the AFF for any other flies in your vinegar traps.

Captured in Florida as early as 2005, AFF impact on Mississippi fruit growers is not yet fully understood. It is possible that its co-occurrence with SWD will provide greater opportunity for infestation of blueberry orchards, or even packing houses. In conjunction with researchers in Washington and Florida, we have been monitoring blueberry orchards and plantations of four other crops using a new chemical lure designed specifically for the AFF. As of 28 May, we have made our first SWD captures, but still no AFF as of July 1. This season-long collection data will be used to pin down the lifecycle of the AFF, determine crop preferences in South Mississippi, and complete development of a commercially-available lure. In orchards that may be threatened by both AFF and SWD, a combination lure can be made available for a 2-in-1 trapping system.

A variety of cultural control measures may be used to augment any chemical treatments. As always, please contact your local County Agent for up-to-date information on products, and how best to apply them.

# North American Blueberry Research and Extension Workers Conference

Eric T. Stafne, MSU-ES

The 2014 North American Blueberry Research and Extension Workers (NABREW) conference was held in Atlantic City, New Jersey. This conference is held every 4 years and this was the first one I attended. It was highly informative with great presentations on blueberry viruses, genetics and genomics, insect pests, blueberry culture, blueberry pollinators, blueberry breeding, history, weed management, phenology prediction, fungal pests, and Extension. I was very interested in the sections on pest management because of the issues we are having with SWD and Exobasidium. Luckily, some of the national experts on these pests were in attendance. Below are some nuggets of information I gleaned from the presentations:

## SWD

-Crop losses have been variable in North Carolina, with 2% reported in 2013 and most occurring during Rabbiteye season

-Georgia reported 15% loss in 2012

-Fly captures within a field are not necessarily indicative of fruit infestation

-Sprays need to be applied frequently, probably in less than 7 day intervals

-Other pests like scale and whiteflies are becoming more of a problem due to the sprays used to control SWD

-Pyganic (organic spray) has not been effective in New Jersey or other states

-Entrust (organic spray) is effective

-Weed barrier fabric has been shown to suppress populations in Florida vs. pine bark mulch

-SWD comes in from wild hosts like blackberry and dewberry

-Trap bait with Yeast + Sugar + Water is effective but needs to be changed every week

-SWD prefers raspberry and strawberry to blueberry

-After a rain event, Mustang Max still had some activity, but Malathion not much

-Delegate and Mustang Max may kill eggs and larvae (especially young larvae) within 2 days of application based on research from Michigan

## EXOBASIDIUM

-Leaf infections worse in lower part of bush and fruit infections worse in interior of bush

-Disease does not appear to be systemic

-Disease prefers areas with high humidity and poor air circulation

-A single lime sulfur spray at 1 week before green tip was very effective in controlling the disease in Georgia

-Early season applications (begin late February) of Captan and Indar worked well too, but more applications needed

-Resistance to Pristine has been seen in Georgia

## Historical Perspective from NABREW

Dr. Mainland from North Carolina State University gives a presentation on Frederick Coville's serendipitous association with blueberries leading to the Whitesbog connection (with Elizabeth White). Coville was working with USDA in Washington, D.C. when he became concerned his children would not learn rural skills that he had in his youth. To remedy this, he bought a farm in New Hampshire. Near this farm were large wild blueberry fields. This sparked his interest in blueberry culture. He also started breeding blueberries in 1908. Among his studies he determined that blueberries require a moist but not wet soil and a low pH, blueberry nutrient requirements, winter chilling importance, propagation techniques, and breeding procedures. He published these in a 101 page bulletin entitled "Experiments in Blueberry Culture" in 1910. In 1911, Elizabeth White read the bulletin and wrote to offer assistance to Coville. After visiting Elizabeth White, their partnership lead to the commercialization of the modern highbush blueberry. In 1916 when the first commercial harvest of blueberry was conducted the total harvest was 6,000 quarts. By 1936 it grew to 600,000 quarts.

Photos from the NABREW conference

Top left: Rutgers and USDA-ARS Blueberry Research plots

Middle left: Very old blueberry varieties at Whitesbog

Bottom left: Driscoll's packing facility

Bottom right: Driscoll's blueberry field

Middle right: Blueberry stunt disease

## Successful Blueberry Jubilee held in Poplarville

**Eric T. Stafne, MSU-ES**

I was in charge of getting vendors for the 2014 Poplarville Blueberry Jubilee. This year we had about 20 vendors selling blueberry products and other related things. Some sold out before noon. Since this has been a good year for blueberries, there were plenty of fresh blueberries to be had (unlike last year which was dismal due to our late freezes). Below are a couple photos of the event in front of the courthouse in downtown Poplarville, MS.


Crowds were a little late getting started, but around 10 am things really started to pick up.

## Be Careful Out There

**Eric T. Stafne, MSU-ES**

This 5.5 foot rattlesnake was a visitor to our research plots earlier this summer. Photo by Trevor.

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# Legislator Tour

**Eric Stafne, MSU-ES**

On June 10, 2014 a group of legislators made the trek to Great Southern Farms in Richton, MS for a tour of their facilities. This tour was set up by Mississippi Farm Bureau and the Gulf South Blueberry Growers Association. Luckily the heaviest of the rain held off until we were able to get inside. The first stop was in the fields to look at well-managed 'Alapaha' and other cultivars. Attendees were impressed with the amount and quality of the fruit they saw. Next was the packing house where Jeremey Edwards led the way. After an insightful visit, we headed on to have lunch and a presentation given by Luis Monterde on the importance of labor for the blueberry industry. Gulf South Blueberry Growers Association president Tom Giles had this to say about the program, "Excellent overall session with obvious enlightenment from all legislators in attendance. Remarkably impressive operation at Great Southern Farms, which is clearly one of the most state-of-the-art blueberry operations in the country, without a date the very finest in MS.

Informative, enjoyable and highly productive day for everyone - Legislators and Growers alike!"

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