

VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service



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Watch for Two-spotted Spider Mites on High Tunnel Cucumbers

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198) & (Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

Supported by NC SARE (LNC17-390), we are continuing research for improving high tunnel cucumber production.

One of the biggest challenges for growing cucumbers in high tunnels in the summer is two-spotted spider mites. Dry and hot environments featured in high tunnels allow two-spotted spider mite populations to increase rapidly. The mites cause leaf yellowing, necrosis, and defoliation that interfere with plant photosynthesis. Yield can be significantly reduced. The pest also causes direct damage on cucumber fruit, resulting in a sandpaper-like texture to the rind (Figure 1).



Figure 1. Two-spotted spider mite damage on cucumber fruit.

Early detection is the key for controlling two-spotted spider mites.

As soon as two-spotted spider mites are detected, control efforts need to be taken. In the early stage, yellowish specks on the upper side of the leaves may be noticed (Figure 2). Turn the leaf over, on the other side of where the yellow specks are, you may find the presence of two-spotted spider mites. A 10× hand lens may be needed to see the pests. Infestations are highest on older leaves and at the base of the leaf near the petiole. In severe cases, two-spotted spider mites cause webbing appearance on the leaves and lead to leaf defoliation. In hot, dry conditions, mite populations can increase up to 70 times in a week.



Figure 2. Initial two-spotted spider mite damage on cucumber leaves.

Almost all the high tunnel cucumber cultivars are susceptible to two-spotted spider mite damage. Nevertheless, we noticed that Japanese cucumber cultivars such as Taurus seem to be more tolerant of two-spotted spider mite damage.



Figure 3. Taurus was grown in the front, Corinto was grown in the back.

Several miticides are labeled for controlling two-spotted spider mites, however, they are not always allowed for greenhouse and high tunnel use on cucumbers. Frequent harvest interval of cucumbers also limits the use of some synthetic miticides. Miticides that can be used on high tunnel cucumbers and have relatively shorter preharvest intervals include [Acramite®](#), [Shuttle® O](#), [Kanemite®](#) etc.

Insecticide soap such as M-Pede® is commonly used to manage two-spotted spider mites in organic production. It has no residual control, so good coverage and frequent application are important to suppress pest populations. Automated water mixing systems that wet plant leaves frequently may be used to suppress the pest population.

Biological control with predatory mites is successfully used in greenhouse cucumber production. Multiple species of predatory mites are commercially available, and their efficiency may differ according to pest populations, temperature, humidity conditions, and cultural practices. Multiple releases may be required for effective control. For high tunnel production, currently, there is little information on the efficacy and economic feasibility of using predatory mites to control two-spotted spider mites.

Strawberry Disease Update

(Dan Egel, egel@purdue.edu, (812) 886-0198)

At the Southwest Purdue Ag Center, we are studying annual strawberry production on plastic mulch. Our hope is to gather information on the best methods and varieties to use for annual strawberry production in Indiana. As we learn about insect and disease problems, we will pass this information on to producers. This article is about the diseases we have observed in our strawberries which were planted in March 2019.

Strawberry leaf spot-Lesions on leaves start out purple. As the lesions enlarge, the center becomes gray-brown (Figure 1). Under rainy conditions, lesions may coalesce across leaves and cause large necrotic areas. Lesions on stems and petioles may cause dieback. Yield or fruit quality loss can be caused by leaf spot under severe conditions. Although leaf spot symptoms are spread throughout our trial, this disease has not become serious for us.



Figure 1. Leaf spot lesions on strawberry often have purple margins and a gray center.

There are several cultural methods of managing leaf spot. Host resistance or incomplete resistance to leaf spot exists in several strawberry varieties. Since leaf wetness is necessary to initiate leaf spot, avoid overhead irrigation and plant strawberries at the proper spacing so that there is plenty of airflow between plants and rows. If annual culture is used, crop rotation will help to lessen the severity of this disease. Fungicides may not be necessary for management; however, several fungicides are listed in the *Midwest Fruit Pest Management Guide 2019-2020*.

Botrytis fruit rot/gray mold-Whereas leaf spot affects fruit only indirectly, Botrytis fruit rot affects fruit directly. Symptoms include the rot of fruit and the production of a gray mold over the surface of the fruit (Figure 2). Blossoms may also be affected.



Figure 2. Strawberry fruit or gray mold causes a rot of the fruit often with the appearance of gray mold.

Gray mold is favored by rain fall and high humidity. In fact, we have observed this disease in high tunnel situations where there is no rainfall. Since gray mold can affect many different crops, crop rotation may not be very effective for this disease. Although there are no resistant varieties, cultivars with an upright growth habit may be less severely affected. Plants spaced adequately will have better airflow and less humid conditions. There are a few fungicides listed in the *Midwest Fruit Pest Management Guide*,

however, the most critical time for control is during bloom. Sanitation, that is proper disposal of old leaves and fruit, is more important for perennial strawberry production than for annual production.

Anthracnose-This disease is the most serious disease problem we have faced this year. The most common symptom is sunken lesions on fruit (Figure 3). Occasionally, the lesions can cover a significant portion of the fruit. The lesions can be a pink or salmon color during wet conditions due to the color of the spores. Under severe conditions, lesions can occur on the stem or crowns. However, in our trials, we have only observed fruit symptoms.



Figure 3. Anthracnose of strawberry causes sunken lesions.

Warm, wet weather favors this disease; rain can splash the spores from plant to plant. Therefore, avoid overhead irrigation. The fungus that causes anthracnose of strawberry is related to but different from the anthracnose fungi that cause anthracnose of, for example, tomato or watermelon; crop rotation will help to lessen disease symptoms. Planting materials may harbor the disease, fungicides for control of anthracnose may be applied through pre-plant dip or foliar application. Several fungicides are listed in the *Midwest Fruit Pest Management Guide*.

The *Midwest Fruit Pest Management Guide* noted earlier has many resources. Note that there is a table for cultivar resistance on page 118 (information for leaf spot varieties are listed) and a table for fungicide effectiveness on page 119. When selecting products, be sure to keep track of which products are recommended pre-bloom, post-bloom and harvest. Once harvest has started, note preharvest intervals.

Strawberry production can be a profitable venture. Keeping track of disease will help to maintain yields and fruit quality.

Indiana Climate Weather Report

(Austin Pearson, pearsona@purdue.edu, (765) 675-1177)

As we close the doors on May for the year, one of the biggest stories throughout the month was the precipitation. The entire

state was above normal. Northwestern Indiana was 3.41" above normal and southeastern Indiana was 0.18" above normal for the month (Figure 1). Temperatures were near normal in the northern and above normal in the central and southern tiers of the state. Some stations in Central Indiana recorded rainfall on 24 out of 31 days.

Accumulated Precipitation (in): Departure from Mean
May 1, 2019 to May 31, 2019

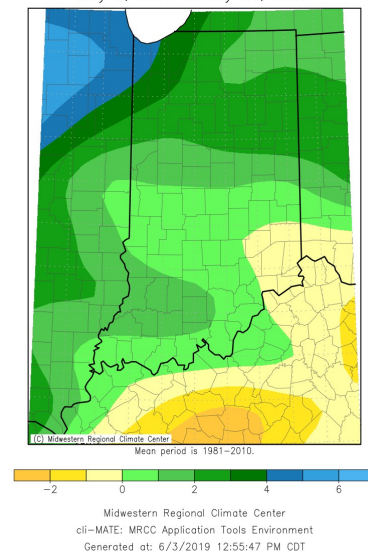


Figure 1. Indiana Precipitation - Departure from Mean May 2019

The good news is that many areas saw dry conditions set in the last week of May and beginning of June and helped alleviate some of the saturated soils. This actually provided a very limited window of opportunity for the agriculture industry. Unfortunately, the weather looks to turn off wet again with 1 to 4 inches of rainfall projected through June 10th. The wet pattern looks to continue through the first three weeks of June with higher confidence in below normal temperatures and above normal precipitation (Figure 2 & 3).

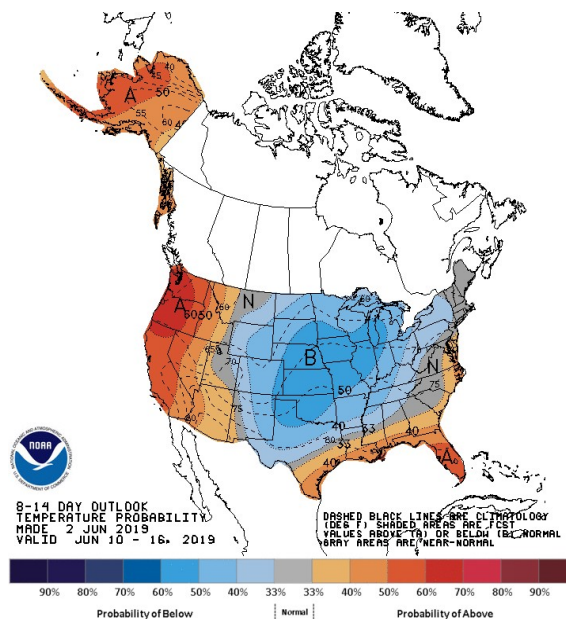


Figure 2. 8-14 Day Temperature Outlook

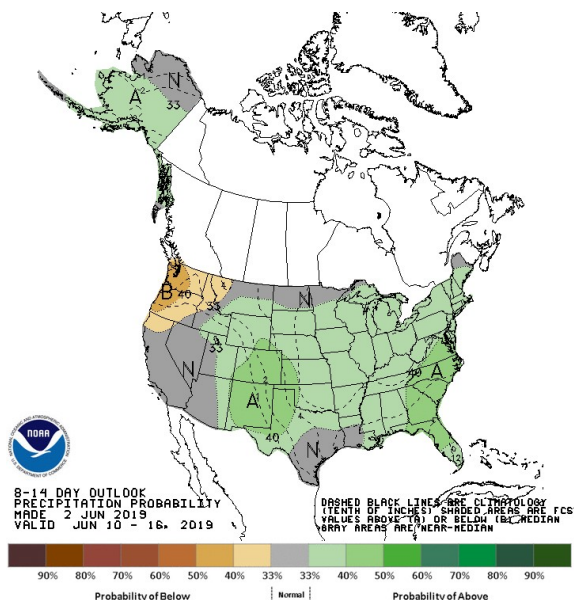


Figure 3. 8-14 Day Precipitation Outlook

Taking this forecast into consideration, it is extremely important to keep an eye on vegetation as conditions may be favorable for disease development. Purdue Extension has various publications about disease management that may be utilized to assist with various diseases.

Upcoming Events

Indiana Horticultural Society Summer Meeting

Date: June 25, 2019. 9:30 am.

Location: Huber Orchard and Winery, 19816 Huber Road, Starlight, IN 47106

The summer meeting is co-sponsored by Indiana Horticultural Society and Indiana Vegetable Growers' Association. The meeting will focus on commercial production of fruits and vegetables and farm marketing. All those interested are welcome to attend.

A registration fee of \$5.00 per family or farm is payable at registration. A catered lunch will be served onsite. This will most likely be fried chicken with vegetables and drinks. There is a \$10/person charge for lunch, collected onsite. Please go to the following website to RSVP

https://purdue.ca1.qualtrics.com/jfe/form/SV_6oqUlioiJOUNb0x

9:30 am Convene and registration at Huber Orchard and Winery.

10:00 am Introductions, a brief walking tour of facilities – winery, market, icecream store, banquet hall

10:30 am Field tour – apples

11:45 pm Lunch – \$10 – RSVP requested (see below)

1:00 pm Field tours – peaches, vegetables, small fruit

4:00 pm Wrap up and conclude (Optional winery and distillery tour for those interested)

Southwest Purdue Agricultural Center Field Day

Date: June 27, 2019. Registration begins at 8:30 am.

Location: Southwest Purdue Agricultural Center, 4669 N. Purdue Road in Vincennes, IN 47591

Topics related to vegetable production include:

- **Organic Tomato Production:** Dan Egel will discuss the Tomato Organic Management and Improvement Project — including foliar disease management of tomatoes.
- **High Tunnel Grafted Cucumber & Specialty Melon Production:** Wenjing Guan and Petrus Langenhoven will discuss cucumber and melon production in high tunnels.
- **Applying IPM Principles across Cropping Systems to Increase Insect Pollination and Profitability:** Laura Ingwell will discuss best management practices for watermelon production by quantifying pest pressures, pollinator health, and crop yields.
- **Annual Strawberry Production:** Wenjing Guan will discuss annual plastic culture for strawberry production in southern Indiana.

Other topics include:

- **Termites to the Rescue:** In this presentation, Rick Meilan will discuss the use of enzymes derived from termites to control invasive woody species.
- **Removing Invasive and Cultivating Natives:** Join Will Drews to see SWPAC's work to remove invasive plants around the property and create a native pollinator habitat.
- **Growing Hemp in Indiana:** Chuck Mansfield and Valerie Clingerman will offer an update on the use of this versatile plant — grown for its fiber, seed, or oil — across the state.
- **Eyes in the Sky...Decisions on the Ground:** Bob Nielsen discusses the benefit of aerial "reconnaissance" via unmanned aerial drones to scout crop problems or augment data.

A meal will be included, and PARP classes also will be available after lunch. To register, email joynerb@purdue.edu, call (812) 886-0198, or go online at https://purdue.ca1.qualtrics.com/jfe/form/SV_8pnF8z1CwyglrGI by **Monday, June 17.**

Don't Miss the SWPAC Field Day!

Thursday, June 27

Southwest Purdue Agricultural Center, 4669 N. Purdue Road, Vincennes, Ind.

Observe production techniques, hear from Purdue experts, and enjoy lunch!

The Southwest Purdue Agricultural Center (SWPAC) field day is free, but advance registration is required by Monday, June 17. Registration begins at 8:30 a.m. EDT.

Highlights include a lunch presentation with Fred Whitford, clinical engagement professor and director of Purdue Pesticide Programs, to discuss "A 150-Year Friendship With Farmers"; a presentation from Jamie Campbell Petty, founder and strategy advisor for the Indiana Hemp Industries Association Team; and a health fair provided by Vincennes' Good Samaritan Hospital. Private Applicator Recertification Program (PARP) classes also will be offered.

Presentation Topics Include:

- Organic tomato production
- High tunnel grafting cucumbers & specialty melons
- Pest management to boost pollination
- Termite use to control invasive species
- Cultivating native plants
- Growing hemp in Indiana
- Unmanned aerial vehicles to gather data
- Annual strawberry production



Register today by email (joynab@purdue.edu), phone (812-886-0198) or purdue.ag/swpac2019



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Meigs High Tunnel Field Day

Date: July 18, 2019

Location: Purdue Meigs Farm, 9101 S 100E, Lafayette, IN 47909

Topics of the field day include Production of specialty melons in high tunnels; Early detection of bacterial wilt; Impact of crop rotation and rootstock on the resilience of high tunnel tomatoes. Lunch and refreshments are provided. Registration is free, but required.

Register here

https://purdue.ca1.qualtrics.com/jfe/form/SV_0HXQwDluRiOnwAB

For questions please contact Lori Jolly-Brown at

ljollybr@purdue.edu or 765-494-1296

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Meigs High Tunnel Field Day

Thursday July 18, 2019 from 10:00 am to 1:00 pm

Meigs Horticulture Research Farm
9101 S. 100 E., Lafayette IN, 47909



The field day at Meigs Horticulture Farm, presented by the Horticulture and Landscape Architecture Department and the Department of Entomology, will focus on aspects of high tunnel cantaloupe, cucumber, and tomato crop production. It will feature tours of conventional and hydroponic high tunnel production research. Eighteen high quality specialty melon varieties will be on display, grown vertically or the conventional way. Research have shown that the yield of personal sized melons grown in high tunnels are about three times higher than conventionally grown melons. Past research with insect exclusion netting have shown to exclude cucumber beetles effectively from the high tunnel environment. This year, we are working on implementing new technology to detect bacterial infection in the plants, prior to visual wilting symptoms, in order to improve management. The sensors we are using for early detection will be available and on display. New research are looking at the known risks involved when growing tomatoes without crop rotation in high tunnels. We are comparing the impact of mono cropped tomato vs. a more diverse rotation on soil microbial communities, crop resistance to insect pests and pathogens and yield. In addition, we are grafting heirloom tomato scions onto wild tomato rootstock to determine whether grafting provides greater resiliency in buffering high tunnel tomatoes against yield decline in monoculture over time. Attendees will also have an opportunity to discuss current challenges and future directions of research areas for high tunnel production systems.

Presentations and Tours

1. Production of Specialty melons in High Tunnels
2. Early Detection of Bacterial Wilt
3. Impact of Crop Rotation and Rootstock on the Resilience of High Tunnel Tomatoes

Lunch and Refreshments are provided.

Registration is free, but required.

Register here https://purdue.ca1.qualtrics.com/jfe/form/SV_0HXQwDluRiOnwAB

For questions please contact Lori Jolly-Brown at ljollybr@purdue.edu or 765-494-1296

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Small Farm Education Field Day at Purdue Student Farm

Date: August 1, 2019

Location: Purdue Student Farm, West Lafayette, IN 47907

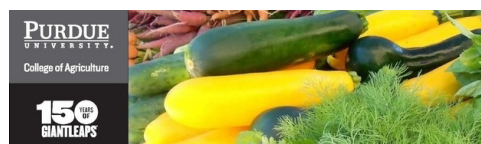
The Purdue Student Farm is proud to announce its second annual Small Farm Education Field Day. The event is packed with educational sessions during the morning, followed by a tour and hands-on experiences on the farm. Topics of discussion throughout the day include basic planning tools for a sustainable small farm operation, testing and restoring soils in urban and peri-urban systems, scheduling crops in high tunnels, using different cover crops to build your soil, calculating profits and return on investment using enterprise budgets and food safety plans for small growers and gardeners. During the afternoon there will be a rototiller versus power harrow, high tunnel tomato and sweet pepper production, leaf mold composting, vegetable wash station design, and solar dryer demonstrations.

Registration fee is \$20.

Register here

https://purdue.ca1.qualtrics.com/jfe/form/SV_3qQf05iryF3COp

Registration closes July 29, 2019.



Join us for

Purdue Small Farm Education Field Day

August 1, 2019

EDUCATIONAL SESSIONS

- Basic planning tools for increasing the sustainability of your farm
- Testing and restoring soils in urban and peri-urban systems
- Scheduling crops in high tunnels
- Dynamic tools to calculate your profits and return on investment
- Food safety plans and certification process for gardeners
- Rototiller versus power harrow and seeder demonstration
- High tunnel tomato and bell pepper production
- Practical applications of leaf mold composting
- Vegetable wash station design
- Solar dryers for postharvest processing of fruits and vegetables

Lunch catered by Juniper Spoon

More information:

Lori Jolly-Brown;
ljollybr@purdue.edu
https://purdue.ca1.qualtrics.com/jfe/form/SV_3qQf05iryF3COp

Registration fee: \$20
Additional attendees: \$10
Purdue Daniel Turf Center
1340 Cherry Lane
West Lafayette, IN 47907

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