VEGETABLE CROPS HOTLINE

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

Issue: 649
August 16, 2018

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Cucurbit Downy Mildew

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

Cucurbit downy mildew has been observed on cucumber in La Porte County and LaGrange Counties, Indiana. Downy mildew of cucurbits has also been reported in southern and central Kentucky. All cucurbit growers in Indiana should be scouting and managing for downy mildew.

The organism that causes downy mildew of cucurbits doesn't overwinter in Indiana. It has to be blown in every year. It is common for downy mildew to start the season in the Gulf States and migrate north with the cucurbit crops. Downy mildew apparently overwinters in northern Michigan/southern Ontario in greenhouses where cucumbers are grown year round. Therefore, downy mildew is often found in Michigan before it is found in Indiana.

Many cucumber varieties have some resistance to downy mildew. For susceptible cucumber varieties or other types of cucurbits, specialized systemic fungicides will help to reduce the severity of downy mildew. Unfortunately, many of the most effective systemic fungicides for downy mildew are not effective on our more common cucurbit diseases. This is because the organism that causes downy mildew, *Pseudoperonospora cubensis*, is not really a fungus at all. *P. cubensis* is more closely related to a brown algae. This fungus-like organism is related to the organism that causes Phytophthora blight (*Phytophthora capsici*). Therefore, many of the same fungicides that are effective against downy mildew are also effective against Phytophthora blight.

The Midwest Vegetable Production Guide for Commercial Growers lists several products that will help to slow the progress of downy mildew of cucurbits. Among the products listed as likely to be effective against downy mildew include: Elumin®, Forum®, Gavel®, Orondis Opti®, Orondis Gold®, Orondis Ultra®, Ranman®, Zampro® and Zing®. Be sure to check the label for the re-entry interval, the pre-harvest interval, the FRAC group and other important information. Always alternate FRAC groups.

One other item of interest: Downy mildew of cucurbits is not caused by the same organism which causes downy mildew of soybeans. Therefore, downy mildew of soybeans will not spread to the pumpkin field immediately adjacent.

Below, find a photo of downy mildew of cucumber. Note that the yellow lesions are scattered across the leaf, not concentrated on the edge of the leaf. Under moist conditions the underside of the lesions will have the dark, fuzzy growth of the fungus-like organism that causes downy mildew.

Figure 1: Downy mildew of cucumber can be recognized by the yellow lesions scattered across the leaf. Downy mildew of cucurbits has been reported in Indiana.

Tomato Leaf Mold Diseases

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

In the fall of 2015, I wrote an article for the *Hotline* about Cercospora leaf mold of tomato since this disease had been observed twice in the 2015 season. I wrote that Cercospora leaf mold was normally a subtropical disease. There have been

several observations of Cercospora leaf mold on tomato in Indiana this year. I'm still not certain of the importance of this disease, but this article will compare Cercospora leaf mold and leaf mold of tomato.

Leaf mold of tomato is caused by *Passalora fulva* and is common in Indiana, especially in high tunnels where the high relative humidity favors this disease. Cercospora leaf mold is caused by *Pseudocercospora fuligena* and is more common in the warm, humid climate of the tropics or subtropics than in the Midwest. Both diseases cause chlorotic (yellow) lesions which are visible on the upper side of the leaf. The chlorotic area caused by Cercospora leaf mold is more of a mustard yellow than that caused by *P. fulva* leaf mold in which the lesions are a brighter yellow (see Figures 1 and 2). Some literature suggests that *P. fulva* causes an olive-green growth only on the underside of tomato leaves. However, I have observed a green mold on both sides of leaves affected by leaf mold, in severe cases. Cercospora leaf mold can normally be differentiated from *P. fulva* leaf mold because the former is caused by a black fungus that grows primarily on the underside of the leaf (see Figures 3 and 4). Literature suggests that Cercospora leaf mold can occur on stems, however, I have never observed this. Leaf mold caused by *P. fulva* occurs only on leaves. Neither disease causes lesions on fruit.

Figure 1: Cercospora leaf mold symptoms on the upper leaf surface. Note distinct chlorotic lesions.

Figure 2: Lesions of leaf mold caused by *P. fulva* on tomato. Note indistinct chlorosis.

Figure 3: Underside of tomato leaf with Cercospora leaf mold. Note dark fungal growth.

Figure 4: Underside of leaf with symptoms of leaf mold caused by P. fulva. Note olive-green fuzz of fungal growth.

Both pathogens are reported to overwinter in soil. The reason why leaf mold caused by *P. fulva* is more common in Indiana than Cercospora leaf mold caused by *P. fuligena* may be that the optimum temperature for leaf mold is 71° to 75° F, while the optimum for Cercospora leaf mold is 82° F. Both diseases may be managed by sanitation. Clean out high tunnel tomatoes between crops. A floor covering that prevents infected leaves from entering the soil will help lessen disease severity. In the field, practice crop rotation and till under the crop as soon as the last fruit is picked.

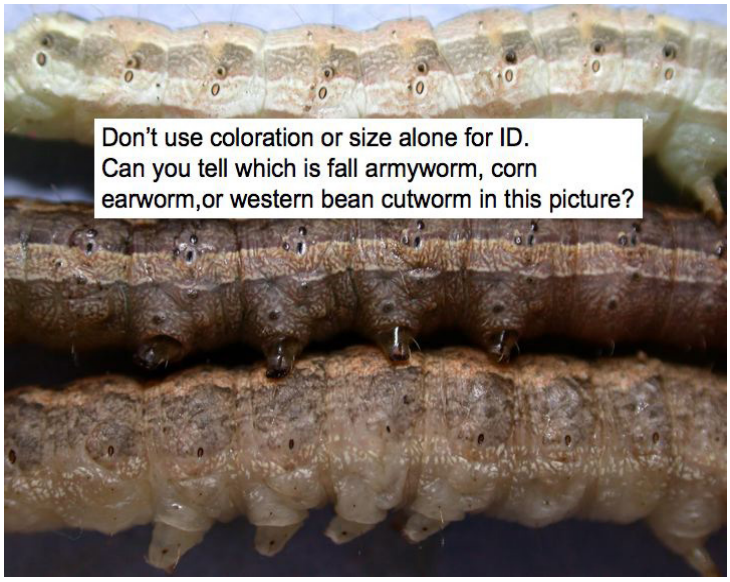
Varieties with partial or complete resistance exist for both diseases. Ask your seed representative.

Fungicides which control *P. fulva* leaf mold should help to lessen disease severity in *P. fuligena* Cercospora leaf mold. Products that have been effective for leaf mold include: products with the active ingredient mancozeb (e.g., Dithane®, Manzate®, Penncozeb®), Inspire Super®, Tanos® and Quadris top®. See *The Midwest Vegetable Production Guide for Commercial Growers 2019* more information. Be certain to watch the pre-harvest intervals. My experience with leaf mold has been that 2 to 3 applications of a fungicide once symptoms are observed should be enough to manage the disease. Fungicide applications can be stopped, in most cases, once harvest has started. If symptoms don't show up until harvest has started, the disease will probably not become severe enough to reduce yields or fruit quality of determinate tomato plants. Always be sure to choose a fungicide labeled for greenhouse use if necessary. And always read the label.

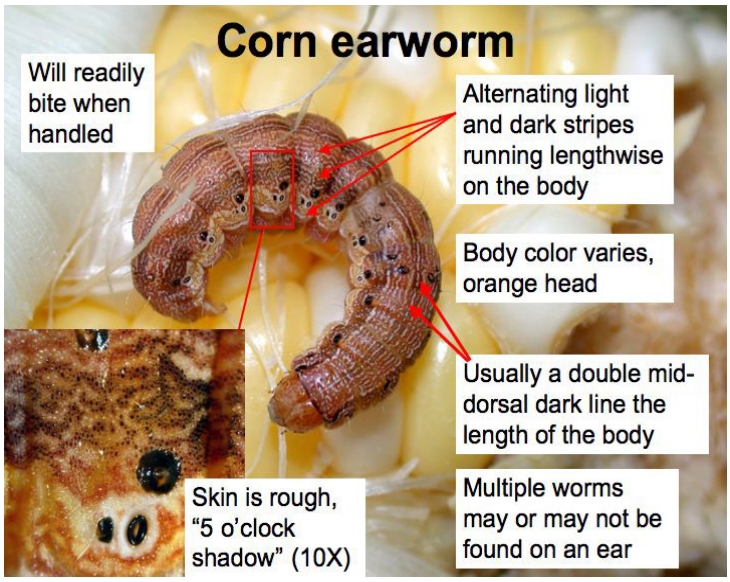
Know Your Worms in the Ear

(John Obermeyer, obe@purdue.edu)

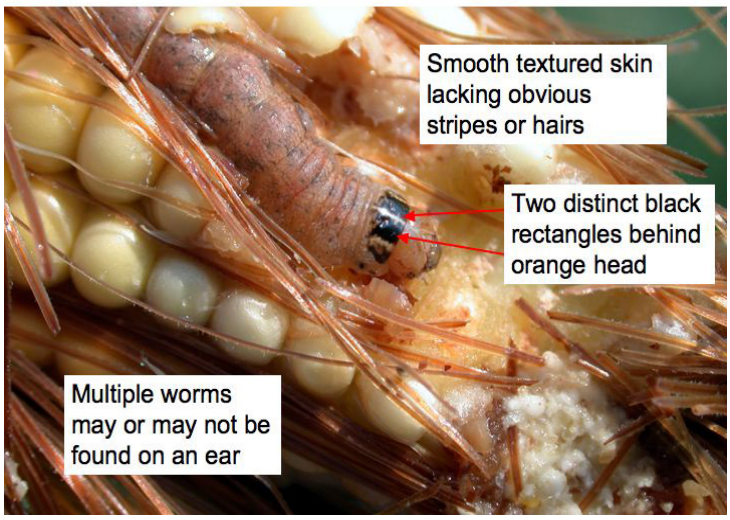
Several caterpillars in the ear can be very similar in appearance and habits, so identification to species of some of the worms in ears can be tricky. Note that, in general, you cannot use overall body color or damage for identification. Some identification tips, though not foolproof, appear below for the corn earworm, western bean cutworm, fall armyworm and European corn borer. We suggest you inspect cornfields soon before the larvae leave the ear and pupate.



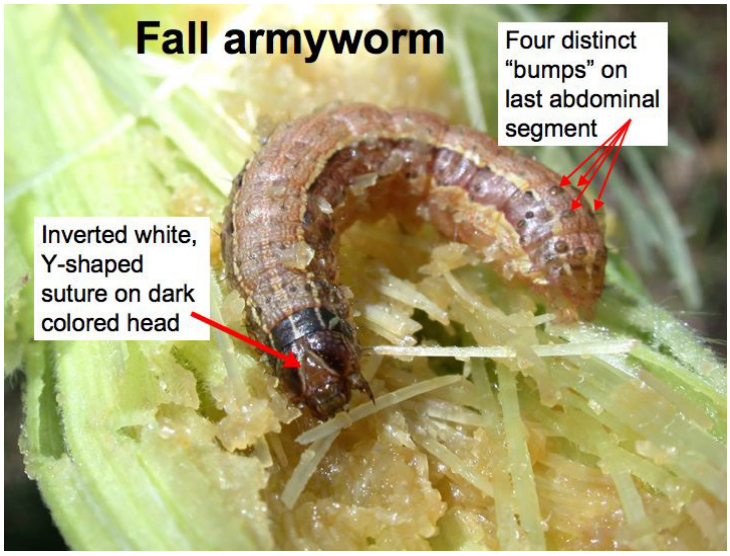
Don't use coloration or size alone for ID. Can you tell which is fall armyworm, corn earworm, or western bean cutworm in this picture?



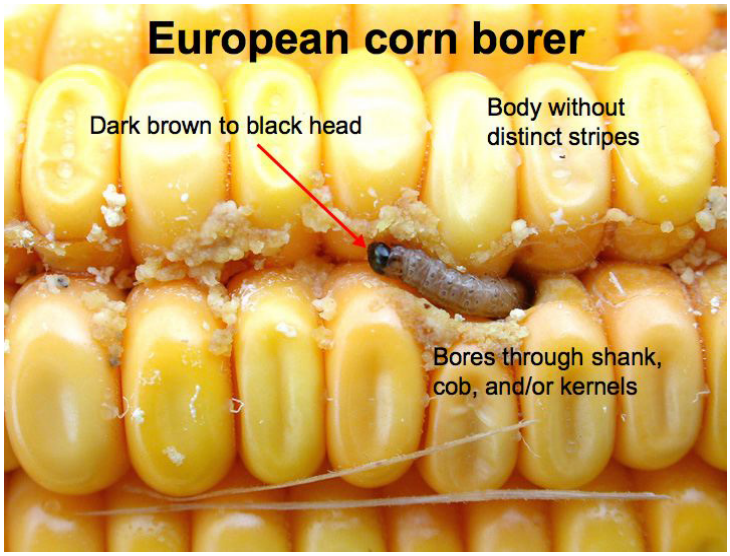
3 Corn earworm.



Western bean cutworm



Fall armyworm



European corn borer

This article was previously published in the Purdue Extension Pest & Crop Newsletter.

Cercospora blight of Aspragus

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

This disease was confirmed in Indiana recently. Cercospora blight initially causes small, oval, gray to tan lesions with red borders (Figure 1). If a 10X hand lens is used, dark flecks within the lesions may be observed; these flecks are where the spores of the causal fungus are produced. Severe infections may cause entire ferns to turn yellow or brown. Cercospora blight may cause reduced vigor and yield of spears the next spring. The causal fungus overwinters on fern residues left on the soil. When weather in the late spring or summer becomes favorable, spores on this debris may cause disease on the ferns. High humidity in the fern canopy of 95% or higher and average temperatures of 77 to 86°F favor infection. Splashing water from rain or irrigation is important in spread of this disease. Any practice that minimizes fern debris will help to lessen the impact of Cercospora blight on yields. Growers must balance the benefits of crop residue for preventing erosion and maintaining soil organic matter with the possible disease problems associated with the survival of the Cercospora blight fungus on crop residue. Management practices that minimize crop residue include burning (in accordance with local ordinances), mowing/chopping ferns and then tilling them or re-ridging or even removing ferns in small acreages. It may be necessary to apply fungicides to keep Cercospora blight from spreading. Three to five applications should be made starting prior to row closure when ferns are about 4 feet in height. Volume of the fungicide applications should be sufficient to get good coverage of the ferns. Drop nozzles may increase fungicide coverage. Chlorothalonil products (e.g., Bravo®, Echo®, Equus®) and mancozeb products (e.g., Dithane®, Manzate®, Penncozeb®) are labeled and will help reduce the severity of Cercospora blight.


Figure 1: Lesions of Cercospora blight of asparagus are gray to tan and may have red borders.

Annual Strawberry Production in Southern Indiana

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)

Strawberries are primarily grown in the mattered row system in Indiana, in which bare-root strawberry plants are set in the spring, fruit is first harvested in the second year and plantings are renovated each year for a few seasons. Growers in southern Indiana have expressed interest in growing strawberries in the annual plasticultural system. With this annual system, plants are set in the fall and harvested in the spring of the following year. Plantings are not normally carried over a second year. Although the annual plasticultural system is very popular in the southern states, its usage is limited in Indiana mainly because our short fall weather conditions pose a challenge for strawberry plants to develop enough branch crowns, which allows them to achieve the optimal yield in the following spring.

In the past two years, we have been testing the annual strawberry production system with additional protection from high tunnels and low tunnels at the Southwest Purdue Ag Center in Vincennes, IN. Although we are far from coming to a conclusion about the production system in Southern Indiana. I would like to

share with you some of the facts we have learned in this journey.

Plant materials

The most commonly used strawberry plant materials are bare-root strawberry plants and strawberry plugs. Strawberry plugs are more expensive than bare-root plants. However, plugs survive better, grow faster, and establish earlier. They are suitable for mechanical transplanting with a water-wheel. This is particularly beneficial for large-scale planting. Easy transplanting is also an advantage for less experienced growers.

Strawberry plugs are normally not available until the end of August. Sometimes, it is a dilemma whether to plant them in late summer. It is true that any of the warm days in the end of summer and fall are very good for plant growth. But on the other hand, extremely high temperatures (above 95 °F) can cause plant leaf burn (Figure 1) and eventually kill the plants. This could particularly be a problem in high tunnels.

Figure 1. A servere case of leaf burn under high temperatures.

To gain the same plant growth in the fall, bare-root strawberry plants should be planted 1-2 months earlier than the plugs. It is important to note that bare-root plants do not have an actively growing root system, in addition, they are planted in the middle of summer. Continuous overhead watering in the first week following transplanting is essential to ensure plant survival.

Day-neutral and June bearers

Most strawberries grown in Indiana are June bearing, or short-day plants. Interest exists among growers in growing day-neutral strawberries for extended season production. However, in the experimental trials we have done in Southern Indiana, we did not see a dramatic benefit in terms of season extension with day-neutral strawberries in field and high tunnel situation. Day-neutral cultivars could produce some fruit in the fall, but the yield is normally too low to justify the labor cost. It is also true that day-neutral strawberries can be continuously harvested in the summer, but the temperature is usually too high to allow the plants to produce high quality berries. Using shade cloth may help to solve the issue. This is an idea that we would like to test in our future trials. So far, growing a combination of varieties with the different flowering habit, and the use of season extension tools, such as high and low tunnels, row covers, etc. is recommended to extend the harvest period.

Winter cold and spring frost protection

In southern Indiana, we recommend using floating row covers for the annual strawberry production system (Figure 2). Although row covers are much more expensive than straw mulch, benefits gained from using row covers can normally justify the cost. First, row covers can be easily removed and recovered. If strawberries were grown inside high tunnels, the plants would benefit from additional growth in late winter if row covers were removed in sunny days and covered back at night. In the open field, it is not recommended to remove row covers in the winter, but temporarily removing and recovering the plants is needed to protect blooms from late frost in the spring. Second, compared with straw mulch, strawberry plants covered with row covers normally recover faster in the spring which leads to early yields. It should be noted that straw mulch is more effective at retaining heat compared with row covers when temperature is extremely low in the winter. A detailed comparison of winter temperatures under straw mulch and row covers can be found in this article https://vegcropshotline.org/article/strawberry-winter-protection-straw-mulch-vs-row-covers/

Figure 2. Strawberry plants were covered with straw mulch and row covers in the winter.

This article was previously published in Purdue University Facts for Fancy Fruit newsletter.

High Tunnel Webinar Recording Available

(Liz Maynard, emaynard@purdue.edu, (219) 548-3674)

On April 17, 2018, Purdue University and Indiana University Bloomington teamed up to present a webinar about using high tunnels in Indiana. The recording is now available on the Purdue Extension Youtube channel at https://youtu.be/dpm4t4Ws5nQ. The 95-minute webinar introduces the upcoming High Tunnel Handbook for Indiana growers and summarizes key findings and recommendations from a recent study about high tunnel use in

Indiana. Key points about winter production from a SARE partnership project wrap up the session.

Watch the webinar recording at https://youtu.be/dpm4t4Ws5nQ.

Purdue Extension Offers Produce Food Safety Training Across Indiana

(Scott Monroe, jsmonroe@purdue.edu, (812) 886-0198), (Amanda J Deering, adeering@purdue.edu) & (Rhonda Taylor, taylorrm@purdue.edu)

Beginning in August, Purdue Extension will offer produce food safety trainings throughout Indiana. The trainings utilize the Produce Safety Alliance (PSA) training curriculum and will be offered at multiple locations across the state.

For produce farms that are covered under the Food Safety Modernization Act Produce Safety Rule, at least one manager or responsible person is required to receive food safety training equivalent to FDA's standardized curriculum. Completion of a PSA grower training is one way to meet that requirement.

For growers who are not covered by the Produce Safety Rule, the trainings are an excellent introduction to produce food safety and will be useful to those who are beginning to develop a food safety program on their farm, or who want to learn more about this topic.

There are currently 14 confirmed offerings across the state. Classes are from 9:00 am – 5:00 pm local time. Cost is $100. This includes a curriculum manual, certificate of completion, and lunch. Participants may register for any location at www.SafeProduceIN.com by clicking on the "Get Trained" option. All classes will be posted on the website. Check back often for new offerings that have been added. Current offerings are:

Date	Location	Contact
Aug. 25, 2018	Purdue University Phillip E. Nelson Hall of Food Science 745 Agriculture Mall Dr. West Lafayette, IN 47907	Amanda Deering 765-494-6702
Aug. 29, 2018	Purdue Extension – Johnson County 484 North Morton St. Franklin, IN 46131	Sarah Hanson 317-736-3724
Sept. 21, 2018	Purdue Extension – Randolph County 1885 S. US Hwy 27 Winchester, IN 47394	Amy Alka 765-584-2271
Sept. 28, 2018	Southwest Purdue Agricultural Center 4369 N. Purdue Rd. Vincennes, IN 47591	Scott Monroe 812-886-0198
Oct. 3, 2018	Purdue Extension – Madison County 3424 Mounds Rd. Anderson, IN 46017	Karen Mitchell 765-641-9514
Oct. 30, 2018	Purdue Extension – Tippecanoe County 3150 Sagamore Pkwy South Lafayette, IN 47905	Karen Mitchell 765-474-0793
Nov. 7, 2018	Purdue Extension – Hancock County 802 North Apple St. Greenfield, IN 46140-1338	Roy Ballard 317-462-1113
Nov. 30, 2018	Purdue Extension – Marshall County 112 W. Jefferson St. Plymouth, IN 46563-1764	Bob Yoder 574-935-8545
Dec. 19, 2018	Purdue Extension – Daviess County Daviess Co. Security Center 101 N.E. 4th St. Washington, IN 47501	Luis Santiago 812-254-8668
Jan. 8, 2019	Purdue Extension – Washington County 806 Martinsburg Rd., Suite 104 Salem, IN 47167-5907	Danielle Walker 812-883-4601
Jan. 11, 2019	Purdue Extension – Monroe County 3400 S. Walnut St. Bloomington, IN 47401	Amy Thompson 812-349-2575
Jan. 31, 2019	Purdue Extension – Boone County 1300 E. 100 S. Lebanon, IN 46052-9697	Curt Emanuel 765-482-0750
Feb. 14, 2019	2019 Indiana Horticultural Congress Indianapolis Marriott East 7202 E. 21st St. Indianapolis, IN 46219	Rhonda Taylor 765-494-6702
Feb. 19, 2019	Pinney Purdue Agricultural Center 11402 S. County Line Rd. Wanatah, IN 46390	Nikky Witkowski 219-755-3240

On Farm Readiness Review is Available for Growers

(Scott Monroe, jsmonroe@purdue.edu, (812) 886-0198) & (Amanda J Deering, adeering@purdue.edu)

The On Farm Readiness Review (OFRR) is now available and being

offered to Indiana produce growers. The OFRR is a VOLUNTARY assessment of your farm's readiness to be in compliance with the Produce Safety Rule. This is not an audit or inspection, but a chance for you to have a team of reviewers visit your farm to assess how well your food safety program lines up with the requirements set forth in the Produce Safety Rule.

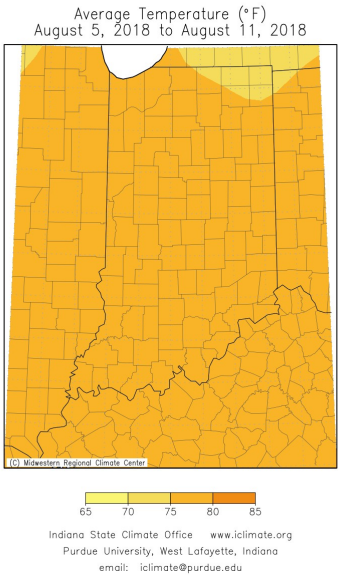
Once a review is requested, a team consisting of individuals from the Indiana State Department of Health (ISDH), the Indiana State Department of Agriculture (ISDA), and Purdue Extension will visit your farm. The review takes approximately two hours. During that time, the team will ask questions and tour your farm in order to:

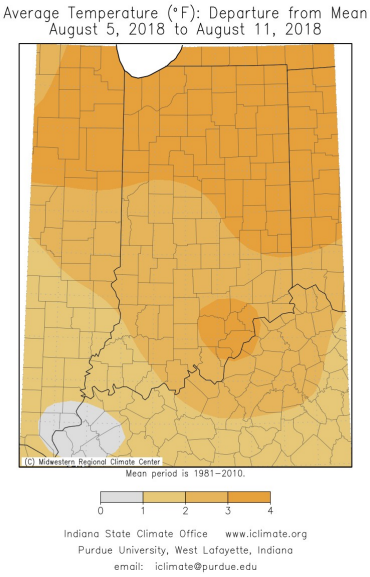
1. Determine your coverage under the Produce Safety Rule
2. Assess your farm's current state of readiness for ISDH inspections, which will begin in 2019.

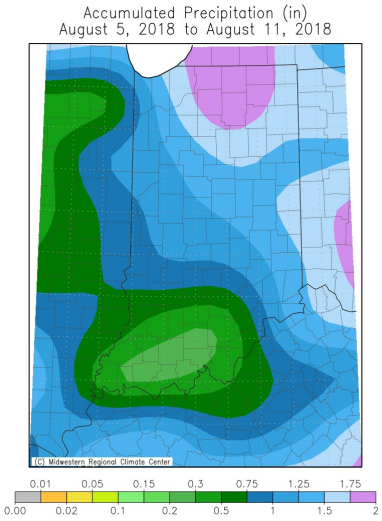
The review is completely confidential. No pictures will be taken and all notes from the review team will be left with the grower. The OFRR is available to any farm that has had at least one individual attend a Produce Safety Alliance, or equivalent, grower training. Those interested in scheduling an On Farm Readiness Review should contact ISDH at (317) 476-0056 or ProduceSafety@isdh.in.gov.

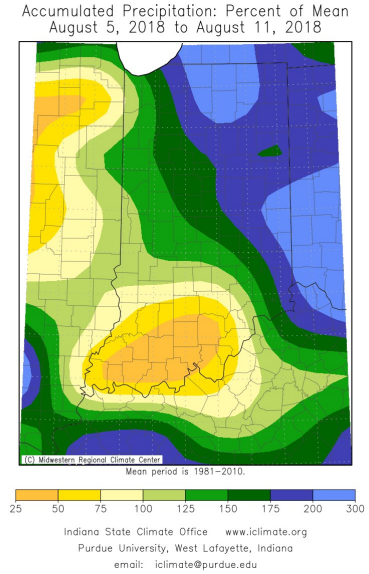
Temperature and Precipitation Aug 5 and Aug 11

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198)



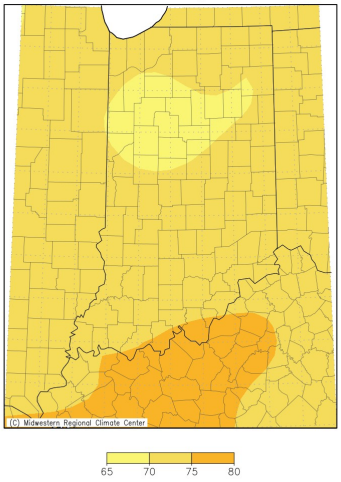






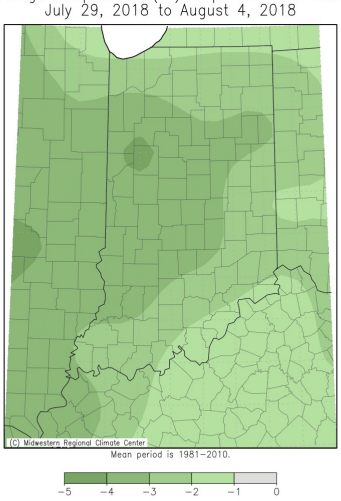
Temperature and Precipitation July 29 and Aug 4

Average Temperature (°F)
July 29, 2018 to August 4, 2018



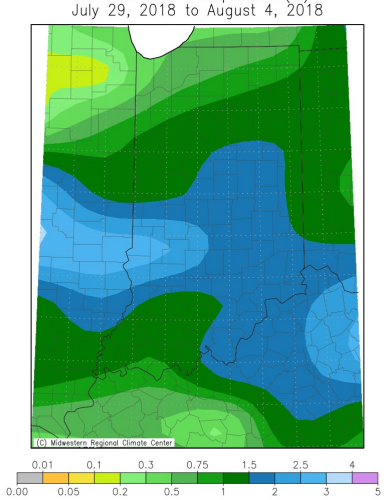
Indiana State Climate Office www.iclimate.org
Purdue University, West Lafayette, Indiana
email: iclimate@purdue.edu

Average Temperature (°F): Departure from Mean
July 29, 2018 to August 4, 2018



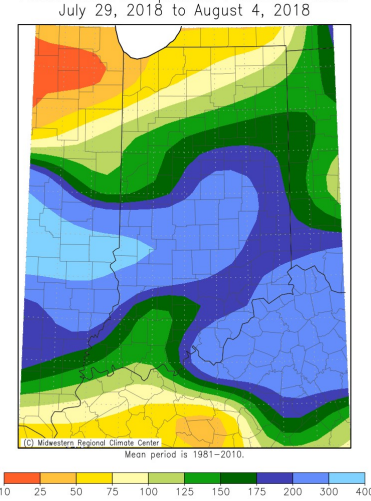
Indiana State Climate Office www.iclimate.org
Purdue University, West Lafayette, Indiana
email: iclimate@purdue.edu

Accumulated Precipitation (in)
July 29, 2018 to August 4, 2018



Indiana State Climate Office www.iclimate.org
Purdue University, West Lafayette, Indiana
email: iclimate@purdue.edu

Accumulated Precipitation: Percent of Mean
July 29, 2018 to August 4, 2018



Indiana State Climate Office www.iclimate.org
Purdue University, West Lafayette, Indiana
email: iclimate@purdue.edu

Upcoming Events

Small Farm Education Field Day

Date: Aug. 30, 2018
Location: Purdue Daniel Turf Center (1340 Cherry Lane, West Lafayette, IN 47907) and Purdue Student Farm (1491 Cherry Lane, West Lafayette, IN 47906)

Registration is $10, register at https://www.cvent.com/d/hgqx6g

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Small Farm Education Field Day

Thursday, August 30th 8:30am-2:00pm

Purdue Daniel Turf Center 8:30-11:30am
1340 Cherry Lane
West Lafayette, IN 47907

Purdue Student Farm noon-2pm
1491 Cherry Lane
West Lafayette, IN 47906

The Purdue University Student Farm is a working small farm. We grow vegetables and herbs using the principles that naturally govern balanced eco systems, including emphasis on diversity, healthy soil, healthy plants, and healthy people. Our educational work is all about food: how to grow it on a small, ecological scale, the art of production and marketing produce for profit, understanding how food intersects with environment, economy and community.

The Purdue Student Farm is proud to host its first Small Farm Field Day. The event is packed with educational sessions during the morning, followed by a tour and practical experiences on the farm. Topics of discussion throughout the day include Small Farm Design, Hoop House Production, Organic Nutrient and Pest Management, Social Media and Marketing, Food Safety (Good Agricultural Practices and Fresh Produce Safety - FSMA), and Small Farm Implements. Lunch will be provided by Juniper Spoon.

$10 registration
Register here http://www.cvent.com/d/hgqx6g
For questions or reasonable accommodation needs, contact Lori Jolly-Brown
ljollybr@purdue.edu, 765-494-1296

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Greenhouse and Indoor Hydroponics Workshop

Date: Sept. 5, 2018
Location: 625 Agriculture Mall Drive, West Lafayette, IN 47907

The work shop is free. Register at https://tinyurl.com/yaxd4k2z

PURDUE UNIVERSITY | Extension HORTICULTURE AND LANDSCAPE ARCHITECTURE

Greenhouse and Indoor Hydroponics Workshop

Wednesday, September 5, 2018
8:00am-3:00pm
(Lunch provided)

Classroom sessions 8am-noon
Deans Auditorium
Pfendler Hall- PFEN 1159
Purdue University, 715 W State St
West Lafayette, IN 47907

Hands-on activities/tours 1:00-3:00 pm
Horticulture Greenhouse
625 Agriculture Mall Drive
West Lafayette, IN 47907

You will learn about best varieties, nutrient recipes, production systems, artificial lighting and temperature needs for hydroponic lettuce produced in greenhouses and indoors. Attendees will tour our latest state-of-the art greenhouse and indoor hydroponic facilities (built this year!) and experience many hands-on activities. Hurry up! Seating is limited!

Registration is free but required
Register Here
https://tinyurl.com/yaxd4k2z

Questions? Contact Lori Jolly-Brown
ljollybr@purdue.edu, 765-494-1296 or
Dr. Krishna Nemali, knemali@purdue.edu

Workshop sponsored by: INDIANA STATE DEPARTMENT OF AGRICULTURE

2018 Pumpkin Field Day

Date: Sept. 6, 2018 starting at 10:00 am

Location: University of Illinois Extension Ewing Demonstration Center. 16132 N. Ewing Rd; Ewing, IL 62836 (Located 20 minutes south of Mt. Vernon, IL)

The field day is free. Please register by calling (618) 687-1727 or online at https://go.illinois.edu/pumpkinday2018 by Aug. 31, 2018.

Midwest Mechanical Weed Control Field Day

Date: Sept. 26, 9:30 -4:00

Location: PrairiErth Farm, 2073 2000 Ave, Atlanta, IL 61723

Registration is $20, register online at www.thelandconnection.org/farmers

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Editor: Wenjing Guan | Department of Horticulture and Landscape Architecture, 625 Agriculture Mall Dr., West Lafayette, IN 47907 | (812) 886-0198