VEGETABLE CROPS HOTLINE

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

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In This Issue

Tomato Bacterial Diseases — Bacterial Canker

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

In the Midwest, three major bacterial diseases threaten tomato production. These diseases are bacterial canker, bacterial spot and bacterial speck. Although these diseases are all caused by bacteria, they vary in symptomology, biology and management options. We will discuss symptoms, biology and management of the three bacterial diseases in a series of newsletter articles. This article focuses on Bacterial canker.

Bacterial canker can cause a severe wilt and decline of tomato plants. However, the symptoms for this disease vary widely.

Often the initial symptom observed in field tomatoes is the chlorotic and necrotic margins of leaves (Figure 1). The band of necrotic tissue on the leaf edge may increase with time, enveloping most or all the leaf. Another common symptom is a wilt and general decline of tomato plants. A brown canker may be observed along the stem. Vascular tissue may become brown and streaked. Finally, lesions may develop on the fruit. These lesions may be a light scabby brown with white halos and are often called bird's eye spots (Figure 2).

Figure 1: Bacterial canker of tomato often causes brown and yellow margins on leaves.

Figure 2: bacterial canker of tomato will sometimes result in birds-eye symptoms on fruit.

The bacterial pathogen that causes bacterial canker can become systemic in the tomato plant. That is, the bacterium, once inside the tomato plant, can move in the vascular tissue. This is an important difference between bacterial canker and bacterial spot and speck. The bacteria that cause the latter two diseases cause lesions on the surface of the plant and will not move inside the plant.

If the bacterial canker pathogen occurs in a transplant greenhouse, the pathogen may enter the plant. From that point, the bacteria are inside the plant; symptoms may

continue to increase in severity over time. Unfortunately, symptoms of bacterial canker on tomato transplants may not be obvious. However, if these plants are moved into a greenhouse or field production situation, the disease moves with them. Therefore, it is important to manage bacterial canker in the transplant greenhouse.

The bacterium which causes bacterial canker of tomato may survive in seed, crop debris, volunteer tomatoes and equipment such as wooden stakes. Use only new or sterilized planting stakes, transplant trays and other planting equipment. The most important factor in managing bacterial canker of tomato is to avoid seed contaminated with the pathogen or transplants that have symptoms. The bacterial canker pathogen will survive for 3-4 years in crop residue. So, crop rotation and fall tillage are a necessary part of disease management. Above, it was discussed how the bacterial canker pathogen can be systemic in the plant. This limits management options. Applications of a copper compound may limit the spread of the disease between plants in the field. However, copper applications will not affect bacteria inside the plant. Unfortunately, it is possible that bacterial canker has spread widely inside the transplant greenhouse. Since transplants are overhead watered regularly, spread is very possible. Finally, bacterial canker can be seed borne or arrive on transplants. Purchase seed that has been tested for bacterial canker and inspect transplants upon delivery or scout your transplant house regularly for symptoms.

The severity of bacterial canker depends in part on when the plant is affected. If transplants are infected, the disease is likely to be quite severe. If the disease affected plants after first fruit, then the disease may not be severe until late in the season. It is important to either avoid bacterial canker in your operations or delay the disease as much as possible.

For more information about bacterial canker of tomato including managing the disease on transplants, see this article in the *Vegetable Crops Hotline*.

We will discuss bacterial spot and speck in the next issues of the newsletter.

Strawberry Pests Observed in 2022 Season

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

Strawberry harvest is coming to an end in most states. A couple of diseases were found. In addition to botrytis fruit rot and common leaf spot that farmers are familiar with, anthracnose was found caused severe damage in plasticulture production in southern Indiana. Part of the reason is the high temperature followed by frequent rainfalls in the middle of May that overlapped with the harvest period of plasticulture strawberries. The article Managing Anthracnose in Strawberry provides information about the disease and the pathogen. For the third year, we found *Neopestalotiopsis* in our plasticulture variety trial at Southwest Purdue Ag Center. Plant & Pest Diagnostic Lab also identified the disease from commercial samples. More information about this disease can be found in the article New Strawberry Disease. As farmers are gaining interest in using plasticulture and plug plants, diseases that may not have had a significant concern may become more important in strawberry production in the region. Regarding insect pests, thrips and sap beetles caused damage at one of the strawberry farms I visited.

Is it Okay to Propagate Your Own Strawberry Plug Plants?

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

Strawberry plug plants that have active growing root systems are easier to establish than bare-root plants. Interest in growing strawberries using plug plants and plastic mulch is growing.

Strawberry plug plants are produced from the runner tips of mother plants. In commercial production, mother plants may be grown in climate-controlled greenhouses or open fields in a colder climate. High temperatures and long days favor runner development; thus, runner production is typically in the summer. Plug producers in our region may receive runner tips from runner producers further north. The runner tips are planted in 50-cell trays with a moist growing medium. The plants require frequent misting, especially in the first few days until roots start to grow.

Farmers have asked me whether it is okay to produce their plug plants by harvesting runner tips from established strawberry fields. Technically, this is possible as long as a misting system is available and farmers have the time and space to produce the plug plants. Farmers may also consider doing that because their favorite cultivars may not be available in plug plant forms, and/or it may allow them to plant earlier than purchasing plug plants. However, two things are crucial for folks who want to propagate their own plants.

Firstly, the patent. Recently released strawberry cultivars are patented. These cultivars cannot be propagated without a license agreement with the patent holder, even for small acreage use. Varieties such as Albion, San Andreas, AC valley Sunset, Galletta, Malwina etc. are still in the patent-protected period. It is illegal to propagate cultivars that are still on patent.

Secondly, disease control. It is almost impossible to ensure disease-free of runners harvested from plants used for fruit production in the field. In commercial runner tip production, mother plants are grown for producing runners not fruit. They are grown either in greenhouses or fields and with strict disease control. Highly destructive strawberry diseases could show on daughter plants from diseases-infected mother plants. Furthermore, the high humidity condition in growing plug plants is prone to disease development. In commercial plug production, fungicide are periodically applied which may not be feasible for a small-scale system.

Because of the aforementioned reasons, folks should be particularly cautious when considering propagating their own plug plants.

Irrigation Demonstration Update 1

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198), (Liz Maynard, emaynard@purdue.edu, (219) 548-3674) & (Emerson Luna Espinoza, elunaesp@purdue.edu)

Vegetable growers understand that water deficiency decreases yield, reduces fruit marketability and quality, and, in extreme case, causes plants to die. In Indiana, we are typically not short of precipitation during growing seasons; rainfall is the primary water source. However, concentrated heavy rains and extended dry periods are not desirable for vegetable production. Severe losses can happen if an extended dry period occurs at the plant growth stages most sensitive to drought stress. This is typical during the flowering and fruit set stages of most fruiting vegetables.

To avoid water deficiency, most vegetable production needs irrigation. Efficient irrigation scheduling can be complicated because the irrigation frequency and amount of water vary according to crop types, growth stage, current soil moisture, soil types, and weather conditions.

Evapotranspiration (Et)-based irrigation is one of the methods in scheduling irrigation. This method determines irrigation based on weather conditions and crop growth stages. At Southwest Purdue Ag Center (SWPAC) and Pinney Purdue Ag Center (PPAC), we demonstrate the Et-based irrigation scheduling on several fruiting vegetable crops. In other articles, we will explain the exact method of how we schedule the irrigation using this method. Here, we are updating what we have observed from the demonstration.

Tomato, pepper, eggplant, watermelon, and cantaloupe are planted on plastic-covered beds with drip tape. They grow on beds side-by-side with and without irrigation. To understand how well the irrigation scheduling performs, we installed sensors 12 inches deep that constantly monitor soil moisture levels.

At SWPAC, we conduct the demonstration in a field with sandy loam soil. We planted the crops on May 16. There were several heavy rainfalls in the last week of May. On the irrigated beds, the first irrigation event occurred on May 31, and then irrigation occurred again every 2-3 days based on the Et value. The beds were irrigated about 3 hours at every event. The soil moisture stayed at a constant level on the beds with irrigation, while the moisture level gradually decreased on the beds without irrigation (Figure 1). Tomatoes are setting fruit at the first flower cluster, and peppers and eggplants are at blooming stages. Watermelon and cantaloupe are in vegetative growth and early blooming (Figure 2). We can not observe any difference between irrigated and non-irrigated beds of all the crops at this point despite crops growing at the different soil moisture levels. An interesting note, tomatoes have curling leaves on both irrigated and non-irrigated beds. The tomato cultivar is Mountain Spring which tends to show the leaf symptom. It is a typical plant response to the environment, and often occurs after suckers are pruned off.

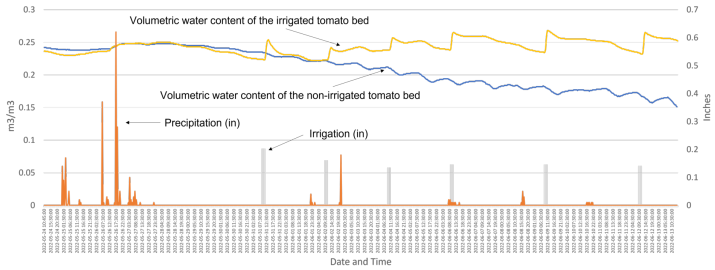


Figure 1. Soil moisture levels between irrigation and non-irrigated tomato bed at SWPAC.

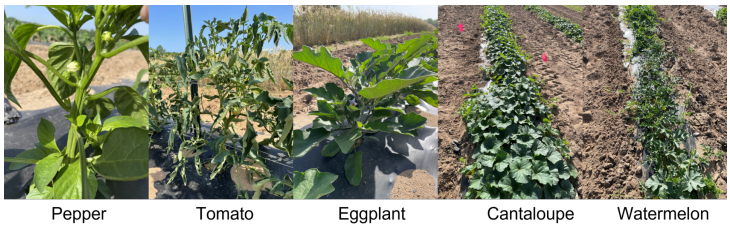


Figure 2. Crop stages of the vegetables in the irrigation demonstration at SWPAC.

Funding for project *Improve Drip Irrigation Management for Vegetables and Melon Production in Indiana* was made possible by the Indiana State Department of Agriculture through grant A337-22-SCBG-21-003. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the ISDA.

Keeping an Eye on Grass Herbicide PHI (Pre-Harvest Interval)

(Stephen Meyers, slmeyers@purdue.edu, (765) 496-6540)

Grass-selective herbicides are valuable to weed management in broadleaf vegetable crops.

As harvest season draws closer, it is important to note that not all grass herbicides have the same pre-harvest interval (PHI) requirements.

The two most commonly used grass-selective herbicides are clethodim and sethoxydim. While most PHI's are similar between the two (Table 1), there are some big differences.

For example, cantaloupe and cucumber require 14 days between the last application of clethodim and harvest. The interval for sethoxydim is only 3 days. The opposite is true for okra.

PHI should not be the only factor in choosing which grass-selective herbicide you use, but it needs to be part of the consideration. If you've already applied a herbicide and realize that harvest is sooner than the PHI requirement, you should delay harvest until the PHI is reached. This is easier for some crops than others. For example, a couple extra days may be a minor inconvenience for crops like carrot and potato. However, for summer squash the crop may need to be harvested and destroyed to avoid excessively large fruit and a reduction in new fruit production. Harvesting prior to the labeled PHI could result in excessive herbicide residue.

Please consult your product label before making any application. To find the PHI for crops not listed in Table 1, consult the label or the *Midwest Vegetable Production Guide* (Midwest Vegetable Production Guide (mwveguide.org).

Table 1. Pre-harvest intervals (in days) of vegetable crops for four grass-selective herbicides.

	SelectMax®	Poast®	Fusilade® DX	Assure® II
Active ingredient	clethodim	sethoxydim	fluazifop	quizalofop
Beans (edible pod types)	21	15	45	
Beets	30	60		
Brassica stems and heads (broccoli, cabbage, cauliflower)	30	30		
Brassica leafy greens (kale, mustard greens)	14	14*		
Cantaloupe	14	3		
Carrot	30	30	45	
Cucumber	14	3		
Eggplant	20	20		
Okra	3	14		
Onions (bulbing)	45	30	45	
Pepper	20	7		
Peppermint and spearmint	21	20		30
Potato	30	30		
Rhubarb	30	30**	14	
Root crops (parsnip, turnip)	30	14		
Squash/Pumpkin	14	14		
Tomato	20	20		
Watermelon	14	14		

*mustard greens only

**IL, IN, MI, MN, WI = 15 days

Strawberry Chat — June Record and July Topics

(Wenjing Guan, guan40@purdue.edu, (812) 886-0198) & (Miranda Purcell, mrpurcel@purdue.edu)

Topics of July strawberry chat are Weed Control and Insect Pest Management. Our guests are Dr. Steve Meyers and Dr. Samantha Willden. Dr. Meyers is an assistant professor and weed scientist at the Horticulture and Landscape Architecture Department, Purdue University. Dr. Meyers will discuss weed management and herbicide options in matted-row and plasticulture strawberry production. Dr. Willden is a postdoctoral research associate at the Entomology Department, Purdue University, working with Dr. Laura Ingwell. Dr. Willden did her PhD research on strawberry pest management at Cornell University in New York.

Register for the July strawberry chat on July 6, 12-1 pm EST. https://purdue-edu.zoom.us/meeting/register/tJ0ucO6ppz4sHtxsZVX9ZvdVWvxQ4XDbsYdR
After registering, you will receive a confirmation email containing information about joining the meeting.

Previous strawberry chat can be found at https://anchor.fm/strawberrychat

Heat Wave and Mugginess

(Beth Hall, hall556@purdue.edu)

This week has made me long for the time when I lived in Reno, Nevada. Further north and higher in elevation than Las Vegas, the climate was absolutely beautiful – particularly if you are not into green vegetation, bugs, and drink coasters. Reno was never quite as hot as Las Vegas, but still had the dry heat that made 90-degree days quite enjoyable, particularly when they were followed by 50-degree nights begging for jackets and a sweatshirt. This Midwest mugginess certainly brings out the bugs (window screens are mostly used for child protection and not bugs in the west) and did you know drink coasters aren't necessary in dry environments? That is because there is not enough moisture (humidity) in the air to condense around a cold drink. In a previous article, I mentioned how dew-point temperature is one of the best indicators of how humid the air is. Those dew-point temperatures have passed 80°F again this week and we're seeing evidence of this on our fogged-up windows (assuming you're running your air conditioning below 80°F) and eyeglasses when coming indoors. This week, not only have we experienced consecutive days with dew-point temperatures over 80°F,

but our nights have not been cooling off well, either. This can cause significant heat stress on humans, livestock and other animals, and our energy bills!

The climate outlooks are showing strong confidence that these hot temperatures will continue for a while. Precipitation outlooks, on the other hand, are favoring the probability for below-normal precipitation. However, that does not always translate to lower humidity. As we have seen over the last few days, rain does not always correspond with high humidity. Therefore, if the atmospheric flow continues to pull moisture in from the Gulf of Mexico, these high dew-point temperature days are likely to continue! The July climate outlooks continue to favor above-normal temperature (Figure 1) and below-normal precipitation (Figure 2), but the confidence is slightly weaker for that period compared to the confidence for both conditions to continue for the rest of June. The precipitation forecast over the next 7 days (Figure 3) is predicting less than 0.5" of rain across Indiana, with the greater amounts focused on southwest Indiana. There are early concerns of a rapid intensification of drought ("flash drought") occurring over the next few weeks, so keep an eye on those forecasts and start preparing now for that potential to occur.

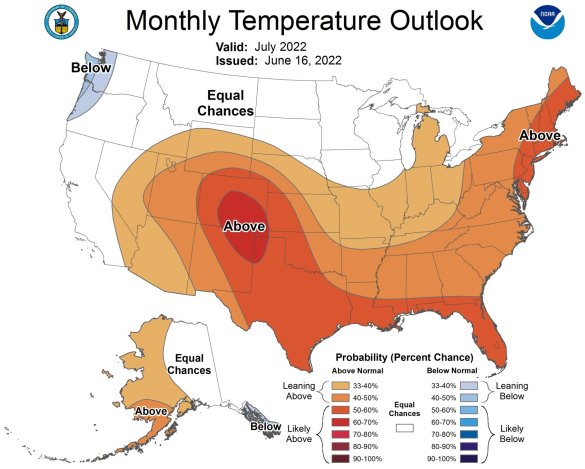


Figure 1. Temperature outlook for the July 2022. These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

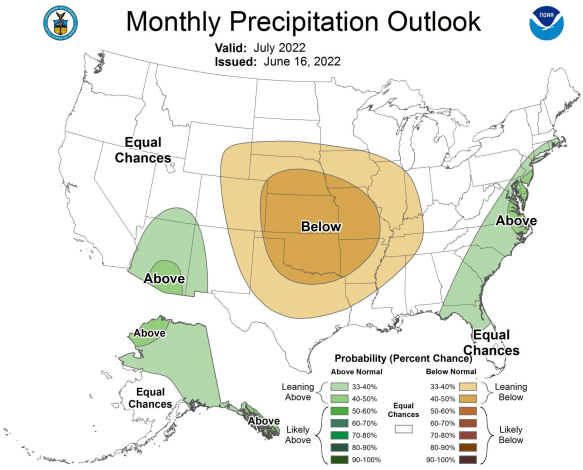


Figure 2. Precipitation outlook for the July 2022 period. These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

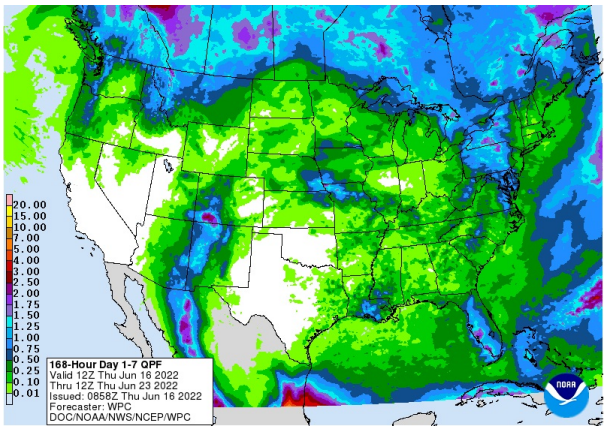


Figure 3. Quantitative precipitation forecast (in inches) for June 16-23, 2022. Source: National Weather Service.

Modified growing degree-day values continue to accumulate (Figure 4). When considering a start date of April 15th, the southern two-thirds of Indiana is 20 to 80 units ahead of the 1991-2020 climatological normal (Figure 5).

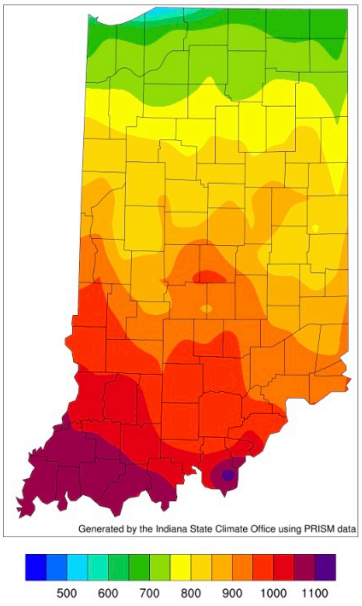


Figure 4. Modified growing degree day (50°F / 86°F) accumulation from April 15-June 15, 2022.

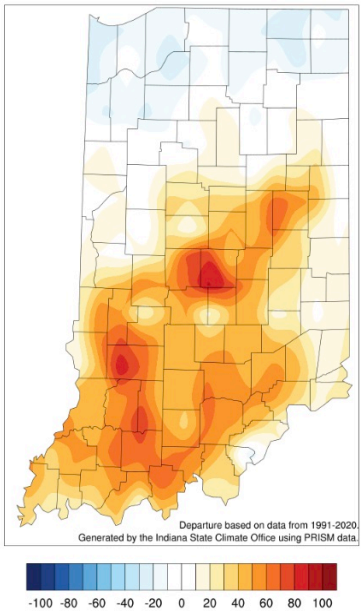
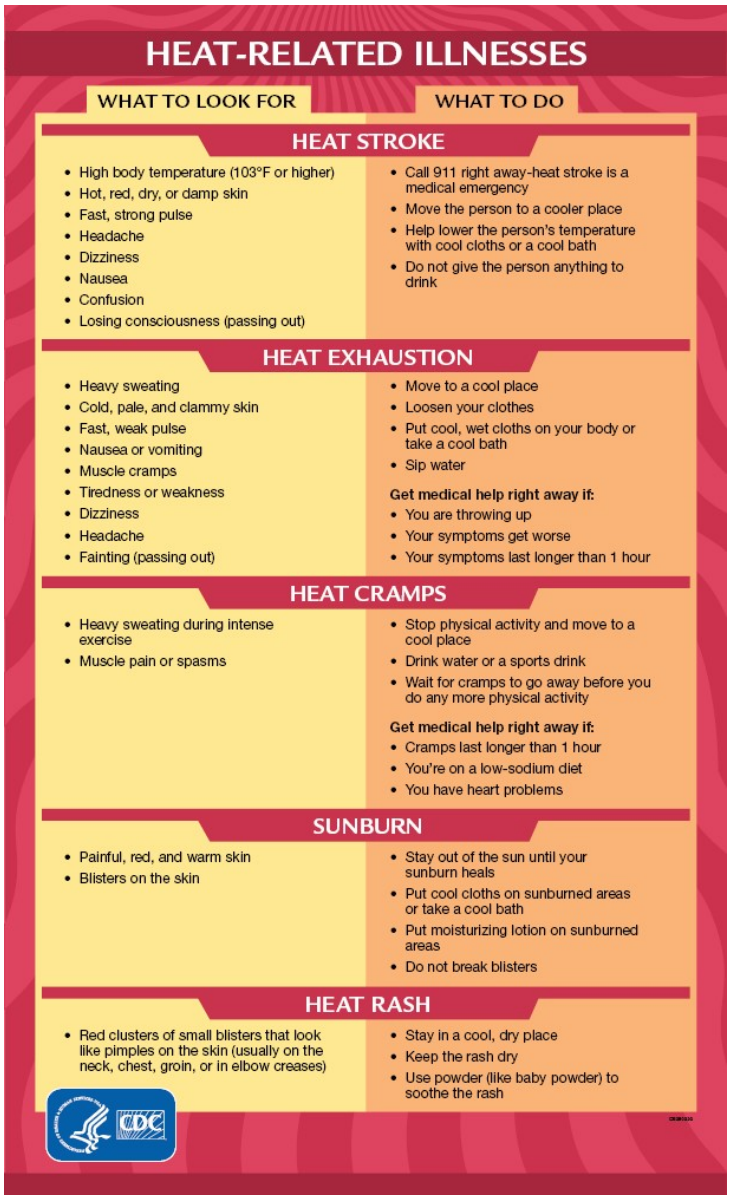


Figure 5. Modified growing degree day (50°F / 86°F) accumulation from April 15-June 15, 2022, represented as the departure from the 1991-2020 climatological average.

Working in the Heat

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

Please be careful while working in the heat. Here is a quick-reference guide from CDC on heat-related illness that is particularly helpful this time of the year.



Heat-Related Illness

Purdue Fruit, Veg & Hemp Field Day July 21

Purdue Fruit, Veg & Hemp Field Day will be held at Meigs Purdue Ag Center (9101 S 100 E, Lafayette, IN 47909) on July 21, 2022.

Register the event https://tinyurl.com/ypfubpkp

If you have any questions about this event, please contact Petrus Langenhoven at (765) 496-7955, plangenh@purdue.edu or Lori Jolly-Brown (765) 494-1296, ljollybr@purdue.edu.

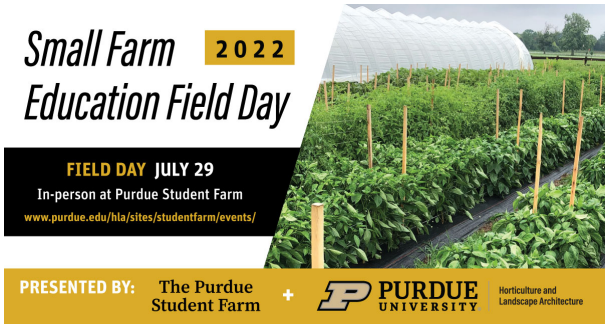
Purdue Fruit, Veg, and Hemp Field Day

Purdue Small Farm Education Field Day July 29

The annual Purdue Small Farm Education Field Day will be presented on July 29th from 9 am – 12 pm at the Purdue Student Farm, West Lafayette.

Register the event https://purdue.ca1.qualtrics.com/jfe/form/SV_25gK2j29sF7Is9o

If you have any questions about this event, please contact Petrus Langenhoven at (765) 496-7955, plangenh@purdue.edu or Lori Jolly-Brown (765) 494-1296, ljollybr@purdue.edu.



Pinney Purdue Field Day Aug. 9, 2022 – Registration Open

The Pinney Purdue Vegetable Field Day/Twilight Meeting will be held August 9, 2022, 5 to 8 p.m. Central time (6 to 9 p.m. Eastern time) at 11402 S. County Line Road, Wanatah, IN. The evening program will feature plot tours for farmers and for homeowners featuring topics of irrigation, sweet corn, pumpkins, dry beans, equipment, preserving produce, soil health and cover crops. A detailed program is available here https://extension.purdue.edu/events/county/porter/2022/08/pinney-purdue-vegetable-field-day.html. Dinner will be provided. Please register at puext.in/Veg/Evening2022.

For ag professionals and educators a similar program will be held 2 to 4 p.m. Central time (3 to 5 p.m. Eastern time). Separate registration is required.

For more information contact Nikky Witkowski at (219) 465-3555 or nikky@purdue.edu.

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