

VEGETABLE CROPS HOTLINE

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



Issue: 704
May 19, 2022

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New Strawberry Disease

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

A new strawberry disease has been found in Indiana and researchers are looking for samples to determine the extent of the problem. The disease, caused by a species of the fungus *Neopestalotiopsis*, has been reported in several southeastern states and other countries where it causes leafspots, fruit spots and a plant decline. In Indiana, the disease has been reported to cause a leafspot (Figure 1) and a plant decline.

Researchers are asking commercial growers who believe that they may have observed the disease to contact the Purdue University Plant and Pest Diagnostic Clinic. The PPDL will waive sample handling fees for these samples until the researchers obtain the desired number of samples for the survey. Updates will be posted to the Hotline and to the PPDL website. Samples from multiple strawberry varieties and different types of production fields (matted row, plasticulture, high tunnel) are encouraged.

Information required for each sample:

1. Strawberry variety
2. Growing method: Matted row or plasticulture
3. Location (state and county) where grown

4. Approximate date of planting or year of matted row culture.
5. Symptoms observed: Leaf spot, fruit rot, crown rot, or a combination of these.

This research will attempt to determine where the disease exists in Indiana and how the disease may be controlled. Results of these studies will be reported here when completed. The North American Strawberry Growers Association is sponsoring this research.



Figure 1. A leaf spot caused by *Neopestalotiopsis* sp., a new strawberry disease to Indiana.

Foliar Diseases of Tomato in Greenhouses

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

This article is a brief review of symptoms of foliar diseases of tomato in greenhouses or high tunnels. Remember that foliar diseases of tomato that are observed in greenhouses or high tunnels are different than those found in the field. This is because fungal diseases commonly found in the field require leaf moisture from rain or overhead irrigation. Below I list three common foliar diseases of tomato often found in

greenhouses and discuss symptoms. For more information on this subject, see [this link](#). Additional information and photos can be found [here](#). For information about spotted wilt of tomatoes see [this link](#).

Gray Mold (*Botrytis cinerea*) Lesions are often a light brown or gray color (Figure 1). One can easily observe the growth of the causal fungus with a 10x hand lens. Gray mold may also cause lesions on stems and fruit. A fruit lesion is shown here (Figure 2).



Figure 1: Gray mold causes light brown or gray necrotic lesions on tomato leaves. The growth of the fungus may be visible on the leaf.



Figure 2: Gray mold may infect tomato fruit causing the fruit to become soft.

Leaf Mold (*Passalora fulva*) Tomato leaves affected by leaf mold will often have light yellow lesions with diffuse edges (Figure 3). On the undersides of leaves, the fungus that causes leaf mold can clearly be seen as an olive-green “fuzz” (Figure 4). Under severe conditions, the fungus can be seen growing on the top of the leaf as well. Lesions do not appear on stems or fruit.



Figure 3: Leaf mold of tomato causes a light yellow lesion with diffuse edges.



Figure 4: Leaf mold lesions on tomato can be recognized by the gray-green mold on the bottom of leaves

White Mold (*Sclerotinia sclerotiorum*) The first symptom is often the wilting of scattered tomato plants. Upon closer inspection, the lower stem of an affected plant may have a light brown lesion that girdles the plant, causing it to wilt and possibly die. The lesions appear woody, which is how this disease got its alternate name: timber rot. The lesions are often accompanied by the white growth of the causal fungus as well as dark, irregularly shaped fungal structures (sclerotia) (see Figure 5). Sclerotia are found on the outside or inside of the stem and allow the fungus to overwinter several years in the soil without a host. White mold may also cause rot of tomato fruit.



Figure 5: White mold causes stems to appear woody. Note dark fungal bodies.

If you have questions about how to manage any one of these diseases, contact me. This article addresses possible confusion about the symptoms of these three diseases. It is always a good idea to submit plant samples that you are unsure about to the [Plant and Pest Diagnostic laboratory](#).

Early Cucumber Beetle Management

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167) & (Dan Egel, egel@purdue.edu, (812) 886-0198)

This time of year, when we are busy in the fields planting and prepping for a fruitful season, we need to be observant of the pest pressures that may be present. We have already had reports this year of cucumber beetles feeding on recently transplanted cucurbit crops, in particular melons and cucumbers. Let's review why we despise cucumber beetles so much...

Striped cucumber beetles (Figure 1) are specialists that only feed on crops in the family Cucurbitaceae (cucumber, melon, pumpkin, squash). They overwinter as adults. A proportion of these adults carry a damaging bacteria in their gut, more on this later. As the temperature warms the beetles move out of their overwintering habitat in search of food. They will congregate and feed on young plants. Their feeding causes physical damage to the plant through the loss of leaf material, and for some they transmit a disease. The beetles also mate at this time and lay their eggs at the soil surface. Generally, this emergence is synchronized and can result in a 1-2 week window of high pest pressure. The adults then die off and there is some relief to the crop. The larvae mature in the soil, feeding on plant roots but don't inflict economic damage. Sometimes they make their way into developing fruits contacting the ground causing damage. In late July-early August is typically when you will see the offspring from these individuals emerge and feeding on the foliage ripening fruit may result in the need for treatment.



Figure 1. Striped cucumber beetle.

The pathogen, *Erwinia tracheiphila*, which causes bacterial wilt in cucurbits is transmitted by cucumber beetles, primarily striped but also spotted. Check out [this video](#) to see what happens to a plant infected with bacterial wilt. The bacteria need an opening to enter the plant and can do this through a feeding wound. It also needs a moist substrate to live in until it enters the plant. In the case of the insect vectors, this is their frass (aka insect poop). The bacteria reside in the gut of the beetles and when the beetles defecate on the plant, this is the source of inoculum that starts infection. Cantaloupe and cucumbers are susceptible to the bacterial infection; watermelon, pumpkin, and squash generally are not. For the crops that do not suffer from the bacterial disease, we can tolerate a higher number of beetles on the plant. The economic threshold for cantaloupe and cucumber is therefore 1 beetle/plant and increases to 5 beetles/plant for watermelon, pumpkin, and squash.

If you grow cantaloupe in a region with high pest pressures early in the season, it may be beneficial to apply an insecticide to protect young seedlings from feeding and disease. One effective way to manage these beetles, and the disease they transmit, is through the application of a systemic insecticide. A soil or transplant tray drench of imidacloprid (Trade names include: Admire Pro®, Macho®, Midashe Forte®, Montana®) is commonly used. Imidacloprid is one compound from the neonicotinoid group of insecticides. They are water soluble and therefore move quickly into the plant from the soil drench and into the xylem tissues. As soon as the plant 'takes a drink' it is carried into the vascular tissues. One study measured lethal amounts of imidacloprid in floral tissues of buckwheat within one day of application killing parasitoid wasps that feed on flowers (Krischik, Landmark and Heimpel 2007, Environmental Entomology). Because of its solubility in water, we can

expect older leaf parts and shoots of the plant to be better protected through this application while we find less residues in storage organs, roots and fruits (Sur and Stork 2003, Bulletin of Insectology).

Take heed, though, because some of our own work at Purdue has shown that these chemicals linger in the plant through bloom and are present in concentrations that are deleterious to honey bees. Regardless of application rate (low vs. high label) soil drenches of imidacloprid and thiamethoxam (such as Admire Pro® and Platinum®) can be detrimental to the pollinators that we rely on in these systems. The low rate has been shown to provide sufficient protection against the beetles. If you choose this group of chemicals, apply the low rate. Alternatively, you can make a foliar application of other products such as acetamiprid (Assail®) or a pyrethroid at transplant to protect young seedlings and prevent bacterial wilt while minimizing risks posed to pollinators. These products are not systemic and need to be reapplied to protect new growth if beetles are still present in the crop.

The take-home message? In areas with high beetle pressure, cucumbers and cantaloupe may require pesticide applications to prevent the transmission of bacterial wilt. A systemic compound applied at the low rate is a good choice. Pumpkins and watermelon, which do not become infected with the bacterial wilt, can be protected with a foliar application of a pyrethroid or acetamiprid.

References

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Robin Sur and Andreas Stork, Uptake, translocation and metabolism of imidacloprid in plants, *Bulletin of Insectology*, Volume 56, Issue 1, January 2003.

Tomato Leaf Curling

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

We received calls reporting observations of leaf curling on tomatoes. This article reviews factors contributing to the symptom. It was updated from an article published in June 2020, Issue 676.

In a similar way as other vegetables, hot and dry conditions may cause leaf curling on tomatoes. In late spring and early summer, plants that are actively growing and developing fruit have a high demand for water. Under hot and dry

conditions, plants respond by rolling the leaves to reduce the surface area exposed to high radiation. Lower leaves on a tomato plant are often affected first, they may recover if environmental stresses are reduced. Leaf curling itself due to the environmental stresses is not a significant concern, but if the stress condition continues, it may eventually lead to blossom end rot fruit and decreased yield. There is a great variation among tomato varieties in terms of whether the observation of leaf curling suggests the plant is suffering water stress that may eventually affect yield and quality. But as leaf curling is relatively easy to notice, it would be a good idea to check developing fruit for potential blossom end rot if severe leaf curling is detected.

Tomato leaf curling can be a response to heavy pruning (Figure 1). In this study, all branches below the first flower cluster were removed (0 branches); or 1, 2, 3, 4, branches below flower cluster were left. Unpruned plants were the control. Leaf curling was noticed on the most heavily pruned plants. It is believed that when a large amount of photosynthate is produced and there are not enough sinks to use it all (e.g. because branches have been removed), starch builds up in the leaves and causes them to curl. Note the difference between cultivar Mt. Spring (above) and Florida 91 (below), with Mt. Spring had heavier leaf curling. Excessive nitrogen may also contribute to leaf curling, especially when plants are heavily pruned. This symptom has also been associated with plant response to waterlogged soils.



Figure 1. Tomato leaf curling responded to pruning.

Except for the margins of the leaves which are rolled up, the leaves generally appear normal for the above-mentioned leaf curling situations. However, if the curling leaves are severely deformed or twisted, herbicide damage may be a concern. In Figure 2., leaf curling is likely caused by hormone-type herbicide damage (such as 2,4-D and dicamba). The symptom was more pronounced on top of the plants, where new growth occurs. Tomato plants are extremely sensitive to herbicide damage. Depending on the level of the injury, some plants may not be able to recover.

In less severe cases, about half a dozen leaves that were developing at the time of exposure show symptoms, along with flowers or fruit near those leaves, but later growth appears normal. There are no remedies for herbicide damage. More information about the herbicide damage can be found in the new [Dicamba and 2,4-D Fact Sheet Series](#).



Figure 2. Tomato leaf curling likely caused by a hormone-type herbicide damage.

Insect or disease damage may also cause tomato leaf rolling. Other symptoms such as mosaic, chlorosis or the signs of the insect itself may accompany with the leaf curling symptom. If you suspect the leaf curling was caused by these biotic factors. Samples should be sent to the Plant and Pest Diagnostic Laboratory for pest identification before taking action.

The Purdue Plant and Pest Diagnostic Lab – Ready to Serve You

(Tom Creswell, creswell@purdue.edu)

The Purdue University Plant and Pest Diagnostic Laboratory (PPDL) specializes in the identification of plant diseases, insects and plants, as well as in the diagnosis of plant-health related problems. The PPDL is a partner in the national Plant Diagnostic Network (<http://www.npdn.org>), a national consortium of diagnostic laboratories dedicated to enhancing the work of diagnostic labs through professional development.

We work to solving your plant problems with rapid and accurate diagnoses and identifications, including:

- Fungal, bacterial and viral plant diseases
- Insects and other arthropods
- Unknown plants
- Vertebrate pests
- Environmental or cultural injury to plants

We serve as a source of unbiased information regarding pest management strategies and provide training for diagnosis of

plant and pest related problems.

Sample handling fees for routine diagnosis: \$11 for Indiana samples and \$22 for samples originating outside of Indiana. An additional \$25 fee is charged for ELISA or ImmunoStrip (virus) testing. Tests requiring molecular (PCR) work are typically \$25-75. For more information on our fees and services and to download forms see our website at: <https://ag.purdue.edu/btny/ppdl/Pages/default.aspx>

Ten Tips for Collecting and Submitting Samples:

1. **Time is money:** Don't wait until the problem is widespread to send a sample. Many diseases and insects are manageable if caught early.
2. **Dead plants tell no tales:** Plants which are totally dead, dry or rotten are useless for diagnosis. Collect samples from declining plants but not completely dead ones.
3. **What's bugging you?** For insect ID collect several examples, just in case some are damaged, or if both males and females are needed. Most small insects can be shipped in vials with 70% alcohol. For more details on how to send other insects visit: <http://www.ppdl.purdue.edu/PPDL/physical.html>
4. **More is better:** The main concern may be overlooked if you send only one plant, one insect or a single branch. Send plenty of material, including whole plants when practical. Make sure samples are representative of what you are seeing.
5. **Get to the root of the problem:** Many plant problems are related to the roots and soil. For annuals and perennials in the landscape where the whole plant appears to be dying please dig up the entire plant to submit, rather than pulling them up. This will keep roots intact. For plants that are not removed please include a sample of the smallest diameter roots and at least a cup of soil. For problem plants in containers or plug trays, if possible, submit entire pots and plug trays to help maintain the integrity of the plants. We provide pH and EC readings of most soil samples submitted with a plant but for complete soil nutrient analysis you'll need a commercial lab. (Email us at ppdl-samples@purdue.edu to request a list of labs in the region)



Seedling tray covered in light foam material for shipping.

6. **A place for everything:** If soil gets on the leaves during shipment it can mask symptoms or even create a “disease” that wasn’t there when the sample was collected. Keep soil around roots so they don’t dry out. Bag the roots and soil and tie at the main stem or secure roots and soil within a double layer of heavy-duty aluminum foil. Wrap foliage in newspaper lightly then place a plastic bag over the rest of the plant and tie the top to keep foliage from drying out. Make sure foliage is dry before packaging.



Dig plants and contain soil and roots in plastic bag secured around base of stem.

7. **The devil is in the details:** The more you tell the diagnostic lab about the situation the better. Please give complete information; including name of plant, location, percent affected, symptoms of concern, distribution, soil type and drainage; and fertilizers or pesticides used recently. For Plant or Weed ID please give full details requested on submission form.
8. **Fresher is better:** Mail or deliver samples as soon as you can. Store samples in a cooler on hot days until you can deliver or ship them. Avoid mailing samples late in the week since most plants will start to rot after being in transit over a weekend. A next day delivery service is needed for urgent samples or those that may rot quickly in shipment.

9. **Fragile, handle with care:** Padded mailing envelopes may be used for samples that are not fragile, such as ears of corn, but sturdy cardboard boxes with crumpled newspaper for padding are preferred in most cases (essential for young and tender plant material). Insect vials must be padded to prevent breakage in shipment.



Packaging of plants in pots.

10. **A picture is worth a thousand words:** Photos are very helpful for Plant ID and Weed ID and critically important for diagnosis of tree, shrub and turf problems. See our guides for taking good photos of trees and turf and find links to our photo upload tools at our website (<https://ag.purdue.edu/btny/ppdl/Pages/digitalimages.aspx>). Photos can also be emailed to ppdl-samples@purdue.edu. We prefer you not send print photos unless they have been printed on a photo printer or at a store kiosk. The sample handling fee covers working with both photos and a physical sample.

Critical sample on the way?: Email us at ppdl-samples@purdue.edu to let us know you are planning on sending samples that may require special handling.

Our shipping address:

Plant and Pest Diagnostic Lab – Purdue University
915 West State Street, LSPS Room 116
West Lafayette IN 47907-2054

Too Dry or Too Wet?

(Beth Hall, hall556@purdue.edu)

Indiana has been receiving less precipitation than normal, particularly over the last 30 days (Figure 1). In fact, southern Indiana has only received 25%-50% of the precipitation amounts it normally sees during this period. One would think this would mean “Abnormally Dry (D0)” if not “Moderate Drought (D1)” classifications for the U.S. Drought Monitor.

However, as mentioned in previous articles, drought is not caused by just a lack of precipitation. This week, drought leadership teams from Indiana, Ohio, and Kentucky discussed this dilemma where precipitation data is suggesting the introduction of Abnormally Dry status for the tri-state area. Interestingly, other indicators such as soil moisture, stream flow, and local observations from residents in the area are indicating normal, if not wet, conditions are still prevailing. While the amount of precipitation has not recently kept up with what is normal for this time of year, there have been a lot of wet days. For example, Evansville, IN has had 10 wet days over the past 30 days (33% wet days), Indianapolis, IN has had 16 wet days (53%), and Fort Wayne, IN has had 13 wet days (43%). This has managed to keep conditions wet or near normal, even though total precipitation has been low.

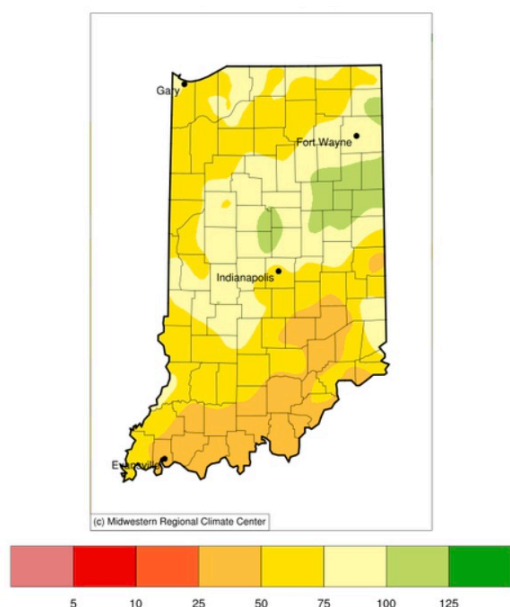


Figure 1. Accumulated precipitation presented as the percentage of the 1991-2020 normal amounts for April 19 - May 18, 2022.

Looking ahead, this pattern of rain every few days continues with predicted rain amounts ranging from 1-3 inches across Indiana for May 19-23, 2022. If this forecast come true, this would be more precipitation that what is normal for that period. Both the 6-10- and 8-14-day climate outlooks are favoring above-normal precipitation across the state, so expect this wet pattern to continue for a while. The 1-month (June) and 3-month (June-July-August) climate outlooks were just released on 19 May 2022 from the national Climate Prediction Center. For both periods, climate models are favoring above-normal temperatures, but were equally favoring below-normal, normal, and above-normal precipitation amounts. This suggests too much uncertainty regarding precipitation to know if this wetter period will continue, how many wet days to anticipate, and how much precipitation will be received.

Warm temperatures last week helped catch this year's

accumulated modified growing degree day value up to near normal. Figures 2 and 3 show the accumulation total and departure from normal for April 1 - May 18, 2022.

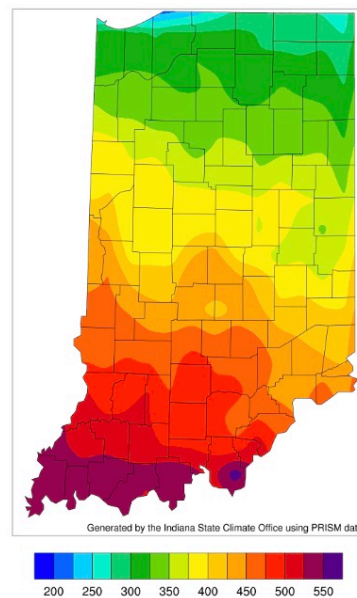


Figure 2. Modified growing degree day (50°F / 86°F) accumulation from April 1-May 18, 2022.

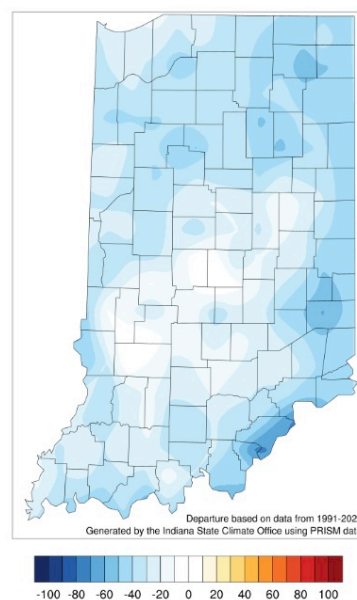


Figure 3. Modified growing degree day (50°F / 86°F) accumulation from April 1-May 18, 2022, represented as the departure from the 1991-2020 climatological average.

USDA Accepting Applications to Help Cover Costs of Organic, Transitioning Producers in Indiana

Agricultural producers and handlers who are certified organic, along with producers and handlers who are transitioning to organic production, can now apply for the U.S. Department of Agriculture's (USDA) [Organic and Transitional Education Certification Program \(OTECP\)](#) and [Organic Certification Cost Share Program \(OCCSP\)](#), which

help producers and handlers cover the cost of organic certification, along with other related expenses. Applications for OTECP and OCCSP are both due October 31, 2022.

“By helping with organic certification costs – long identified as a barrier to certification – USDA has helped producers participate in new markets while investing in the long-term health of their operations,” said Farm Service Agency State Executive Director, Julia A. Wickard. “We launched the Organic and Transitional Education Certification Program to build on the support offered through the Organic Certification Cost Share Program and provide additional assistance to organic and transitioning producers weathering the continued market impacts of the COVID-19 pandemic. This year, in response to stakeholder feedback, we have aligned the signup dates for these two organic programs and encourage Indiana producers to work with the local USDA Service Centers and State agencies to complete the applications. We’re committed to making sure our Nation’s organic producers and handlers have the tools they need to continue positively shaping our local and regional food systems.”

Cost Share for 2022

OTECP covers:

- Certification costs for organic producers and handlers (25% up to \$250 per category).
- Eligible expenses for transitional producers, including fees for pre-certification inspections and development of an organic system plan (75% up to \$750).
- Registration fees for educational events (75% up to \$200).
- Soil testing (75% up to \$100).

Meanwhile, OCCSP covers 50% or up to \$500 per category of certification costs in 2022.

This cost share for certification is available for each of these categories: crops, wild crops, livestock, processing/handling and State organic program fees.

Producers can receive cost share through both OTECP and OCCSP. Both OTECP and OCCSP cover costs incurred from October 1, 2021, to September 30, 2022. Producers have until October 31, 2022 to file applications, and FSA will make payments as applications are received.

How to Apply

To apply, producers and handlers should contact the Farm Service Agency (FSA) at their local USDA Service Center. As part of completing the OCCSP applications, producers and handlers will need to provide documentation of their organic certification and eligible expenses. Organic producers and handlers may also apply for OCCSP through participating State agencies.

Additional details can be found on the [OTECF](#) and [OCCSP](#) webpages.

Opportunity for State Agencies

FSA is accepting applications for State agencies to administer OCCSP through July 18, 2022. If a State department of agriculture chooses to participate in OCCSP, both the State department of agriculture and FSA County Offices in that State will accept OCCSP applications and make payments to eligible certified operations. However, the producer or handler may only receive OCCSP assistance by either FSA or the participating State department of agriculture.

More Information

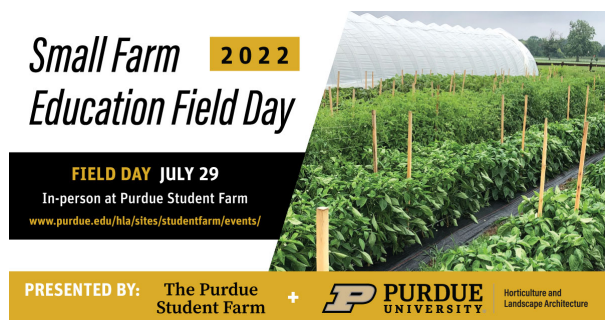
OTECP builds upon OCCSP, providing additional relief to help producers during the pandemic. OTECP uses funds from the Coronavirus Aid, Relief, and Economic Security (CARES) Act; OCCSP is funded through the Farm Bill.

USDA has made other strides to assist organic producers. In 2022, USDA’s Risk Management Agency (RMA) increased expansion limits for organic producers with coverage through Whole-Farm Revenue Protection (WFRP). RMA also updated the insurance option to allow producers to report acreage as certified organic or transitioning, as long as organic certification was requested by the acreage reporting date. Also, this year, RMA introduced a new option – Micro Farm – through WFRP designed for producers with small-scale operations that sell locally, which includes organic producers.

USDA touches the lives of all Americans each day in so many positive ways. Under the Biden-Harris administration, USDA is transforming America’s food system with a greater focus on more resilient local and regional food production, fairer markets for all producers, ensuring access to safe, healthy and nutritious food in all communities, building new markets and streams of income for farmers and producers using climate smart food and forestry practices, making historic investments in infrastructure and clean energy capabilities in rural America, and committing to equity across the Department by removing systemic barriers and building a workforce more representative of America. To learn more, visit [usda.gov](#).

Purdue Small Farm Education Field Day – Save the Date!

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. Watch this newsletter and Purdue Extension social media for more information, or contact Petrus Langenhoven (765-496-7955, plangenh@purdue.edu) or Lori Jolly-Brown (765-494-1296, ljollybr@purdue.edu)



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

Pinney Purdue Vegetable Field Day August 9, 2022 – Save the Date!

The Pinney Purdue Vegetable Field Day/Twilight Meeting will be held August 9, 2022 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, soil health and cover crops. An afternoon session for farm advisors and educators will include demonstration and discussion of drip irrigation, cover crops, high tunnels, and equipment for vegetable farms, with an emphasis on small-scale farms.

Watch this newsletter and Purdue Extension social media for more information, or contact Liz Maynard at (219) 548-3674, emaynard@purdue.edu.