

VEGETABLE CROPS HOTLINE

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



Issue: 657
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Abnormal Transplant Symptoms might be Caused by Poor Media

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Producing healthy transplants is a critical step for a successful growing season. Choosing the proper growing media is an important first step. Supported by a USDA Specialty Crops Block Grant through the Indiana State Department of Agriculture, researchers from Purdue have been evaluating different organic growing media with and without adding supplemental organic fertilizers for tomato and cucurbit transplant production.

In this article, we have highlighted a few transplant symptoms that are associated with growing media with excessively high or low electrical conductivity (EC) or pH. It is always a good idea to test EC, pH, and other important nutrient content of a medium when you are making your own or using an unfamiliar media. Most soil

laboratories provide a saturated media extract test that provides information on these important parameters. More information about this test and suggested range of EC and pH can be found in this article

<http://www.soiltest.uconn.edu/factsheets/InterpSMEGreenMedia.pdf>

Many of these abnormal symptoms may be caused by disease or insect damage. It is always a good idea to send unusual plant symptoms to the Purdue University Plant and Pest Diagnostic Laboratory for an official diagnosis.

Uneven seed germination



Figure 1. Uneven germination of tomatoes.

The above tomato tray had uneven and delayed seed germination (Figure 1). This was observed in a treatment that we excessively fertilized with an organic product. This resulted in high electrical conductivity (EC) of the medium. High EC suppresses seed germination. This effect is more pronounced for tomato seeds than

cucurbit seeds.

Plant wilt



Figure 2. Wilt of watermelon seedlings due to growing in a high EC medium.

The above wilt symptom (Figure 2) was observed when watermelons were grown in an excessively fertilized medium. When plants were removed from the medium, a brown discoloration was observed on the base of the plants. There was little root growth. The symptom shown above can easily be confused with an infectious disease. We were not able to isolate any pathogens from the seedlings. However, seedlings damaged as above can be infected by many different types of fungi that cause damping-off.

Chlorosis and stunted growth on new leaves



Figure 3. Chlorosis and stunted growth on new leaves of tomato and cucumber seedlings.

The above two pictures (Figure 3) show tomato and cucumber seedlings grown in a medium with high pH and EC. The high soil pH led to unbalanced plant nutrient uptake, resulting in chlorosis on new leaves. For the cucumber seedling, we also observed stunted and misshapen new leaves, which might be caused by high EC. These symptoms, particularly misshapen leaves, can be confused with symptoms caused by insect damage or virus diseases.

Necrosis on old leaves



Figure 4. Necrosis on old leaves of watermelon seedlings.

The above photos (Figure 4) show watermelon seedlings with necrosis on cotyledon (seed leaves) and older true leaves. Both plants were grown in a greenhouse for three weeks. The left plant was grown in a medium with very low fertility. The right plant was grown in a medium that was excessively treated with organic fertilizers. Although it is not surprising to observe seedlings develop necrosis with age, those grown in poor media are likely to develop these symptoms early. Necrosis can also be caused by several pathogens. Usually, symptoms caused by an infectious disease can be observed to spread. However, symptoms caused by a poor medium are likely to be more uniformly distributed.

Bottom Rot of Lettuce

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

Although Indiana is not known for lettuce production, an increasing number of growers find that augmenting retail sales with leaf lettuce can be profitable. Since lettuce is a cool season crop, field planted leaf lettuce around Indiana may be reaching harvest stage. Leaf lettuce can generally be grown with few pests. However, bottom rot of lettuce was recently observed in a field of leaf lettuce.

Lettuce affected with bottom rot often first appears stunted. A closer inspection may reveal that outer leaves are wilted and necrotic (Figure 1). Eventually, the entire plant may die. If the plant is removed from the ground and observed, the leaf ribs that touch the ground may exhibit a dark, rotten appearing lesion (Figure 2). Fortunately, bottom rot does not spread from plant to plant. The plants that are diseased will most likely die without spreading the disease to other plants. This fact limits the seriousness of the disease.



Figure 1. Bottom rot of lettuce often causes stunting and wilting.



Figure 2. Symptoms of bottom rot of lettuce may include brown, rotten lesions on leaf mid-ribs. In addition, the stem of the lettuce plant may appear rotten.

The reason that bottom rot does not spread from plant to plant is that it is caused by a fungus which lives in the soil. The fungus that causes bottom rot is *Rhizoctonia solani*. Some growers may recognize this name. *Rhizoctonia* species may cause disease on many different hosts. For example, this fungus may cause damping-off of many seedlings. Plus, this fungus survives well in the soil.

There are several cultural methods that can help to reduce the damage caused by this disease. Deep plowing of residue buries the fungus that causes bottom rot. Crop rotation also helps. Anything that increases drainage, such as raised beds, should also reduce disease severity. Finally, although most growers do not find the disease severity sufficient to require fungicides, several are listed in the *Midwest Vegetable Production Guide for Commercial Growers*. These include: Endura 70WG®, Luna Sensation®, Nevado 4F® and Quadris®. The timing and application methods of these fungicides vary widely.

Bottom rot of lettuce is usually not a serious disease.

However, it makes sense to make oneself familiar with the symptoms and management of this disease.

Pest Monitoring

(Laura Ingwell, lingwell@purdue.edu)

As we wait patiently for the ground to dry and our seedlings to grow, take a moment to consider your strategy for maintaining plant health. If you haven't started already, it is time to make sure that your pest monitoring programs are in place for the season. For those of you growing in high tunnels, you may already be encountering some of the troublesome insects that can keep us up at night, such as aphids and spider mites. Here, I want to review some basic considerations for monitoring and detecting insect pests.

First, it is important to recognize that the best way to avoid insect damage is prevention. This includes sanitation practices and monitoring of transplants. Regardless of your production method (greenhouse, high tunnel, field) you want to be sure that any plants that have overwintered in the area free from overwintering pests. This can include disease residue on plant debris that may not have been cleaned up from last year or aphids lingering on some of the annual weeds that creep in. In Figure 1 you can see an early infestation of aphids on the annual weed henbit. If these are not removed prior to transplanting, they can move into the crop quickly. Be sure to carefully inspect your transplants prior to putting them in the field. It is much easier to remove a pest in the flats before they are spread throughout the field.



Figure 1. An early infestation of aphids on the annual weed henbit.

Second, familiarize yourself with the common pests that you tend to encounter in your crop and learn to recognize the early symptoms of infestations. For

aphids, this can be the exuvia (skin) they shed which remains on the leaves after they molt (Figure 2) or the honeydew they produce that drips down onto the leaf surface below their feeding site where sooty mold then grows (Figure 3). Mites are difficult to see but can cause different symptoms such as bronzing (tomato russet mite, Figure 4) or yellowing and webbing on the underside (two-spotted spider mites, Figure 5). Larger pests can cause more apparent damage such as holes in the leaves but may not necessarily be easier to detect.

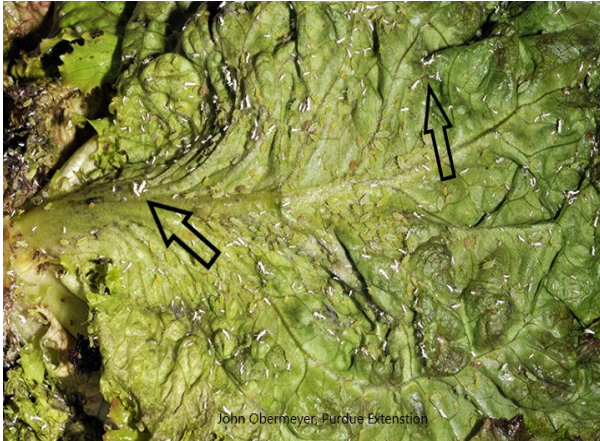


Figure 2. Aphid skin remain on the leaves.



Figure 3. Mold growing on honeydew produced by aphids.



Figure 4. Bronzing caused by tomato russet mite.



Figure 5. Yellowing and webbing caused by two-spotted spider mites.

My advice is to be monitoring your crop on a weekly basis. The frequency of scouting events, locations to scout and number of plants to observe will vary depending on the crop and anticipated pest. In general, it is best practice to start at the edge of the crop and walk inward, perpendicular to the edge. Some insects colonize edges of fields preferentially (aphids, spider mites) and other are randomly distributed or can occur in aggregations (cucumber beetles, caterpillars). Therefore, walking from the edge in, along a few different entry points, will give you better coverage of the field. Be sure to examine the growing point and the underside of leaves. For those that are difficult to see (thrips, mites) use a white piece of paper and shake the plant vigorously to dislodge the pest. You will see them crawling on the paper.

If you rely on natural enemies to control the pest, scout for those as well when walking through the crop. If you are going to supplement the naturally-occurring beneficial insects with commercially-available natural enemies, purchase at the first sign of the pest. Many times it will take at least one week for the organisms to arrive so you need to be prepared because the pests can grow quickly. For information on biological control suppliers see

<https://vegcropshotline.org/article/considerations-and-suppliers-for-biological-control/>.

If you use conventional insecticides, see the latest *Midwest Vegetable Production Guide ID-56* for up-to-date recommendations.

<https://ag.purdue.edu/btny/midwest-vegetable-guide/Pages/default.aspx>

Tips for Submitting Samples to the Purdue Plant and Pest Diagnostic Lab (PPDL)

(Tom Creswell, creswell@purdue.edu)

Thinking of sending samples of your vegetables to the Plant and Pest Diagnostic Lab for diagnosis or insect ID? Here are some tips to help the samples arrive in the best possible condition for testing.

Fill out a sample submission form. Download at: <https://ag.purdue.edu/btny/ppdl/Pages/physicalspecimens.aspx>

If sending more than one kind of plant or problem be sure to label each bag specifically and fill out a separate form. The PPDL is closed on weekend so if you are sending samples make sure you send them early in the week so they are not in transit over a weekend. Express delivery (next day or second day) is preferred for samples that may not hold up well. You are also welcome to deliver samples to us on campus. See our website for location, parking and other information.

Information we need to make the most of your sample:

- Symptoms you are seeing (your main concerns)
- When did it start?
- How widespread is the problem?
- What varieties or types of plants are affected?
- Is there a pattern in the greenhouse/high tunnel/field?
- Recent pesticide applications: Dates, rates, combinations
- Any notes about recent growing conditions

Select sample material that is representative of the main problem. The sample should include a range of symptoms from early onset, to most severely affected plants.

Seedlings: Keep seedlings in the plug tray so media stays put and doesn't end up on the leaves. About half the tray is a good sample size. Place crumpled dry newspaper on top of seedlings then place inside a plastic bag with some vent holes for shipping. Alternatively, floating row cover fabric or other light fabric/mesh also makes a good cover to keep seedlings in place instead of the newspaper and plastic bag

(Figure 1).

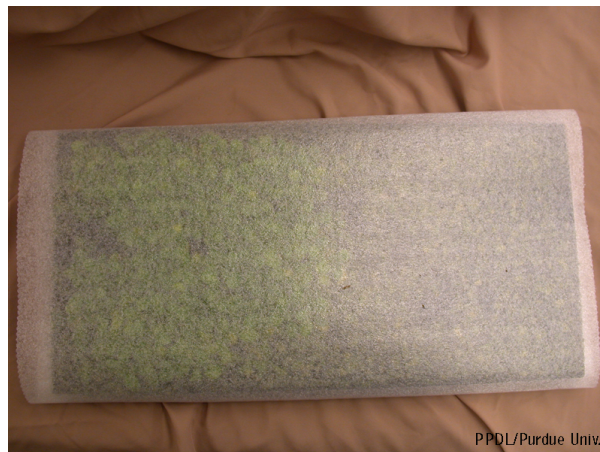


Figure 1. Seedling tray covered in light foam material for shipping.

Small plants in pots: Keep the plant in the pot and wrap the media surface with plastic wrap or foil to keep soil intact. About 6-8 plants would be ideal. Ship with ample padding in a sturdy box to prevent shifting during handling (Figure 2).



Figure 2. Small pot covered with plastic wrap for shipping.

Larger plants in pots or from ground beds: Dig (don't pull) up a plant or several plants for submission. Leaving some soil around the roots, enclose the root system in a plastic bag and tie at the main stem to contain soil. Wrap the top of the plant in dry newspaper then enclose the entire plant in another plastic bag for shipping. Also collect additional leaves/stems/fruit from other affected plants in separate bags. (Figure 3)



Figure 3. Tomato plant in high tunnel. Dig the entire plant if practical.

Photos: Sending photos of a problem is always helpful to give us a better idea of the extent of a problem; (Figure 4 & 5) and may be a good way to let us help decide what kind of sample you will need. The same sample handling fee covers photos, a physical sample or both. Upload your photos and fill out our online form at: <https://ag.purdue.edu/btny/ppdl/Pages/digitalimages.asp>

x You can also email photos to ppdl-samples@purdue.edu (15 MB size limit).



Figure 4. A broad view like this gives an idea of the extent and distribution of the problem.



Figure 5. A close-up view shows symptoms of leaf distortion to assist with diagnosis.

Questions? Visit our website:

<https://ag.purdue.edu/btny/ppdl/Pages/default.aspx> or call Todd Abrahamson: (765) 494-7071

Update your FieldWatch Information and Report Off-target Damage

(Bruce Bordelon, bordelon@purdue.edu)

FieldWatch is an easy-to-use, reliable, accurate and secure on-line mapping tool intended to enhance communications that promotes awareness and stewardship activities between producers of specialty crops, beekeepers, and pesticide applicators. Originally developed at Purdue University, FieldWatch is now a non-profit company with support from producers, applicators, agricultural chemical companies and other organizations.

The program allows specialty crop producers and beekeepers to enter their locations on a secure on-line map. The map is viewed by pesticide applicators so they know what crops are in the area they intend to treat. For the past couple of years, applicators planning to apply the new dicamba products (XtendiMax®, FeXapan®, Engenia®) have been required to check Fieldwatch.

All you need to do to sign up is visit

<http://www.fieldwatch.com/> and follow the easy tutorials under the resources tab. Once you have an account, you should be asked to update your FieldWatch information each year. If you have not heard from FieldWatch recently, log on to to update your account information. The service is free. You can purchase signs at reasonable prices to post at your location as a visible notification to applicators. See signs below.



As most of you know, 2019 will likely be another challenging year for drift and off-target damage. The past two years, 2017 and 2018, saw a record number of drift complaints in Indiana and across the Midwest, mostly due to dicamba products used in soybeans (XtendiMax®, FeXapan®, Engenia®). A very large increase in the acreage of Monsanto's Dicamba-Tolerant "Xtendimax®" soybeans is expected in the state this year. Millions of acres of DT beans may be sprayed with dicamba in May and June so the potential for off-target damage is enormous. Special training programs have been held for applicators and new label restrictions have been added. All dicamba applicators are required attend the training. A requirement of the dicamba product labels is to check FieldWatch to determine where sensitive crops exist. Your orchard, vineyard, blueberry farm, high tunnel, vegetable planting, etc is protected by product labels that restrict making an application if the wind is blowing toward your crop. But if the applicator doesn't know you are there, they can't make the right decision. So be sure to sign up on FieldWatch today or update your account information. The spray season for row crops is coming up soon.

Report Damage:

The Office of the Indiana State Chemist is attempting to monitor off target damage due to dicamba and other pesticides in 2019 to measure success of their training programs. They are interesting in reports of damage and will inspect a report even if an official drift complaint is not filed. This is a change from past years. This takes the "discomfort" out of reporting an incident. Your neighbors will not inspected if you report an incident, unless you decide to file an official complaint. So please help us keep track of the situation this growing season. Keep your eyes open and report incidences of off-target damage if you see them. Contact the State Chemist Pesticide Section at (765) 494-1582. Or just let me know and I'll let them know so they can check out the report. They need your help in assessing the situation.

Gleaning America's Fields – Feeding America's Hungry

Does your farm sometimes have surplus produce? Produce that is perfectly good to eat, but isn't going to make it to market? Society of St. Andrew can help you harvest and transport the excess to help feed those struggling to get enough to eat.

Gleaning America's Fields - Feeding America's Hungry.

We do it simply, effectively, and efficiently. Since 1983, Society of St. Andrew has worked to save fresh produce from America's farms – produce that would otherwise go to waste – and deliver it to hunger-relief agencies.

More than 900,000 Indiana resident sometimes don't know where their next meal will come from, and one-third of those residents are children. Through gleaning, Indiana farmers and volunteers provide fresh, nutritious food to those who need it most.

Since opening the Indiana office in January of 2018, with the help of over **700 volunteers**, SoSA-Indiana has helped to save and distribute over **300,000 pounds** of fresh food to Indiana's hungry residents.

We are currently working to build and create relationships between local farmers, volunteers and hunger relief providers to continue to help keep our neighbors fed.

It's simple. Farmers give us a call when there is produce to donate. We reach out to volunteers and organize the logistics, transportation and training to harvest and

deliver the produce to a hunger relief agency. We keep track of all the pounds donated and where there were donated. At the end of the year farmers will receive an itemized letter listing the total number of pounds for each product which can then be used for tax deduction purposes.

For more information on how, together, we can help feed hungry Hoosiers or for more information on the **Federal Enhanced Tax Deduction** for donated food please contact Ann Radtke at in-glean@endhunger.org or (317) 607-0004.

USDA Accepting Applications to Help Cover Producers' Costs for Organic Certification

WASHINGTON, May 6, 2019 - USDA's Farm Service Agency (FSA) announced that organic producers and handlers can apply for federal funds to assist with the cost of receiving and maintaining organic certification through the [Organic Certification Cost Share Program](#) (OCCSP). Applications for fiscal 2019 funding are due Oct. 31, 2019.

"Producers can visit their local FSA county offices to apply for up to 75 percent of the cost of organic certification," said FSA Administrator Richard Fordyce. "This also gives organic producers an opportunity to learn about other valuable USDA resources, like farm loans and conservation assistance, that can help them succeed. Organic producers can take advantage of a variety of USDA programs from help with field buffers to routine operating expenses to storage and handling equipment."

OCCSP received continued support through the 2018 Farm Bill. It provides cost-share assistance to producers and handlers of agricultural products for the costs of obtaining or maintaining organic certification under the USDA's National Organic Program. Eligible producers include any certified producers or handlers who have paid organic certification fees to a USDA-accredited certifying agent. Eligible expenses for cost-share reimbursement include application fees, inspection costs, fees related to equivalency agreement and arrangement requirements, travel expenses for inspectors, user fees, sales assessments and postage. Certified producers and handlers are eligible to receive

reimbursement for up to 75 percent of certification costs each year, up to a maximum of \$750 per certification scope, including crops, livestock, wild crops, handling and state organic program fees.

Opportunities for State Agencies

Today's announcement also includes the opportunity for state agencies to apply for grant agreements to administer the OCCSP program in fiscal 2019. State agencies that establish agreements for fiscal year 2019 may be able to extend their agreements and receive additional funds to administer the program in future years.

FSA will accept applications from state agencies for fiscal year 2019 funding for cost-share assistance through May 29, 2019.

More Information

To learn more about organic certification cost share, please visit the [OCCSP webpage](#) view the [notice of funds availability on the Federal Register](#), or contact your [FSA county office](#). To learn more about USDA support for organic agriculture, visit usda.gov/organic.



Indiana Climate and Weather Report

(Beth Hall, hall556@purdue.edu)

The biggest topic seems to be how wet it is and how much more rain Indiana can expect. So far, May has experienced near-normal precipitation throughout the central part of the state with 0.5"-2" in southern and northern regions (Figure 1). Combining this with April's precipitation, however, means the soil moisture is still 60mm to over 80mm above average (Figure 2), causing saturated soils and the propensity for flooding anytime precipitation occurs. Speaking of which, 0.25"-1.5" of additional precipitation is expected over the next 7 days with the lower amounts favoring the northwestern part of the state. Could there be drying beyond that? The climate outlook for May 16-22 is indicating slight probabilities for below-normal precipitation in the northern counties, but the rest of the state is statistically uncertain to predict above- or below-normal precipitation with confidence. However, keep in mind

that normal precipitation (based upon 1981-2010 data) during that time period is still 1"-1.5".

Modified growing degree-days (MGDDs) since April 1 have accumulated to 150-400 (from north to south) across the state, which is within 40 units of the climatological average. Northern Indiana is most behind in MGDDs with a departure of -40 to -60 units. The climate outlook for May has significant probabilities of above normal temperatures so hopefully on days when it is not raining, skies will clear enough to allow more rapid MGDD accumulation.

Accumulated Precipitation (in): Departure from 1981-2010 Normals
May 01, 2019 to May 09, 2019

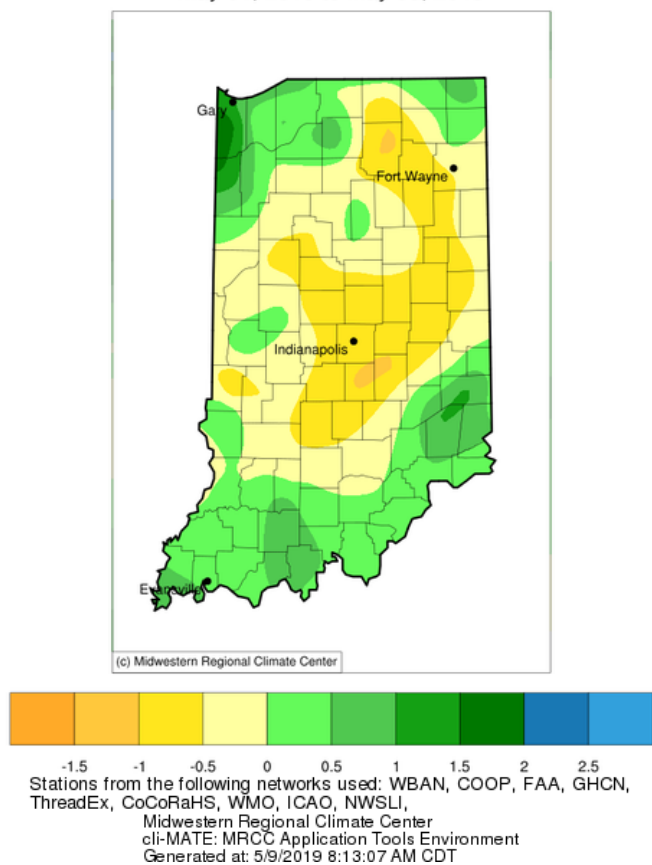


Figure 1.

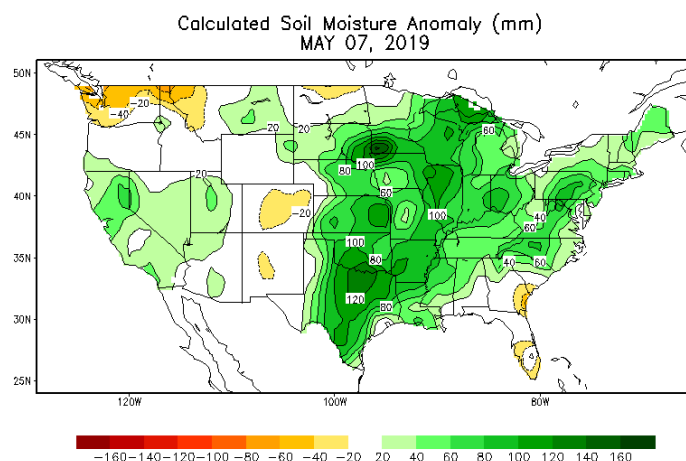


Figure 2.

Upcoming Events

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

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_8pnF8z1CwyglrGl by **Monday, June 17**.



Meigs High Tunnel Field Day

Date: July 18, 2019

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

The field day will focus on high tunnel production of cucurbit crops. It will feature tours of conventional and hydroponic high tunnel cucumber and melon production. The use of insect-exclusion screens to control cucumber beetles and bacterial wilt will be on display in the

conventional high tunnel systems. Vegetable grafting and future research in tomato systems will be presented. Attendees will also have an opportunity to discuss current challenges and future directions of research areas for high tunnel production systems. Please contact Lori Jolly-Brown ljollybr@purdue.edu for more information.

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_3qQfl05iryF3COp

Registration closes July 29, 2019.

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