PURDUE UNIVERSITY

FACTS FOR FANCY FRUIT

Issue: 23-05
May 26, 2023

A Newsletter for Commercial and Advanced Amateur fruit growers.

In This Issue

Near-Normal Temperatures with Strong Cold Front; Sparse Precipitation Forecasted

(Kat Slover, kslover@purdue.edu)

Temperatures throughout the state remained pleasant, but low temperatures briefly dipped into the upper 30s and low 40s as a strong cold front pushed through the Midwest. Through the first 23 days of May, Indiana average temperatures were 0.3˚F above normal (Figure 1). Climate Divisions 1 and 7 had the largest departures, which were 0.9˚F and 1.1˚F above normal, respectively. Since April 1, growing degree days (GDD) have accumulated between 250 and 650 units (Figure 2, left). GDD accumulations were below normal through the south and eastern Indiana and were above normal in central and northwestern Indiana (Figure 2, right).

Precipitation trended increasingly below normal for the first 23 days of May, as no Climate Divisions recorded above normal totals (Figure 1). Climate Divisions 3 and 6, both located in eastern Indiana, received the closest to normal precipitation totals this month (88 and 90 percent of normal, respectively). Since April 25, only a small pocket near Fort Wayne and a cutout of Wayne and Randolph counties measured above-normal precipitation (Figure 3, right). Much of the recent rain can be attributed to lingering precipitation along the cold front that extended through the southern Midwest on May 20. The dryness experienced throughout the state brought expansion of abnormally dry conditions in the May 25 US Drought Monitor, which included 8.11 percent more area than last week (Figure 4). The May 22 Indiana Crop Weather Report indicated that both corn and soybean planting and emergence remain above the 5-year average; 77 percent of corn and 72 percent of soybeans have been planted.

Dry conditions will continue into the near future, as the 7-day precipitation forecast has the entire state missing out on rain (Figure 5). The Climate Prediction Center's 6-10 (Figure 6) and 8–14-day (Figure 7) temperature outlooks both show more than likely chances for above-normal temperatures and below-normal precipitation. These warm and dry conditions will likely worsen

drought conditions over the coming weeks. Throughout the summer season, the Climate Prediction Center's seasonal outlooks have equal chances of above and below normal temperatures in Indiana and is leaning towards above-normal precipitation (Figure 8).

Climate Division Data by State between Two Dates
From Midwestern Regional Climate Center

Indiana
5/ 1/2023 to 5/23/2023

	Temperature			Precipitation			
cd	temp	norm	dev	prcp	norm	dev	percent
1	60.5	59.6	0.9	2.26	2.81	-0.56	80
2	59.4	59.0	0.3	2.29	2.69	-0.40	85
3	58.4	58.7	-0.3	2.24	2.54	-0.30	88
4	61.7	61.1	0.6	2.39	3.10	-0.71	77
5	60.2	60.5	-0.3	2.50	3.10	-0.60	81
6	59.1	59.7	-0.5	2.69	2.98	-0.30	90
7	64.5	63.4	1.1	2.95	3.63	-0.68	81
8	63.4	62.7	0.7	2.87	3.57	-0.70	80
9	61.1	61.9	-0.8	2.53	3.46	-0.93	73
State	61.1	60.8	0.3	2.53	3.11	-0.58	81

Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at:
Wed May 24 06:50:53 CDT 2023

Figure 1: Indiana climate division and state temperature, normal temperature, temperature departure from normal, precipitation, normal precipitation, precipitation departure from normal, and percent of mean precipitation for May 1-23, 2023.

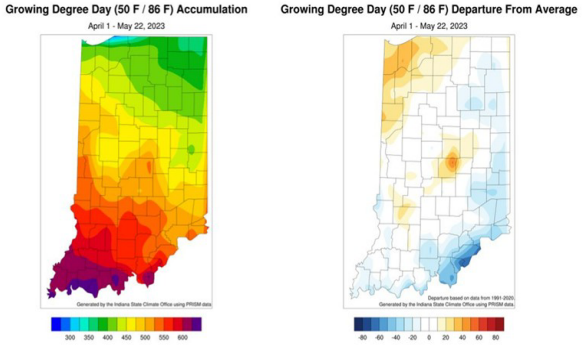


Figure 2: Total Accumulated Indiana Modified Growing Degree Days (MGDDs) April 1-May 22, 2023 (left) and Total Accumulated MGDDs represented as the departure from the 1991-2020 climatological normal (right).

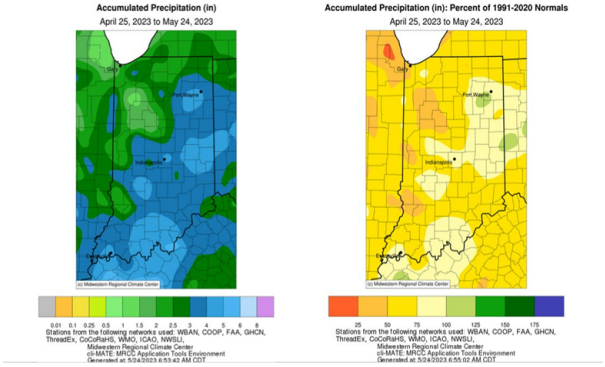


Figure 3: Interpolated map displaying accumulated precipitation for April 25-May 24, 2023 (left). Interpolated map displaying accumulated precipitation as a percent of the 1991-2020 climatological normal (right).

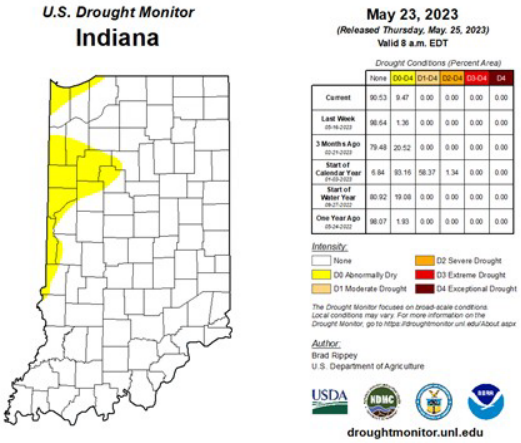


Figure 4: May 23, 2023, US Drought Monitor. The US Drought Monitor is released every Thursday morning by 8:30 AM.

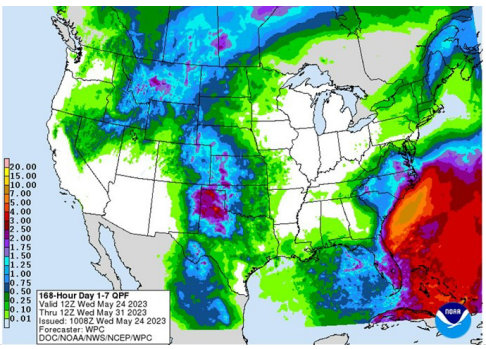


Figure 5: NWS Weather Prediction Center 7-day quantitative precipitation forecast for the continental United States, valid May 24-May 31, 2023.

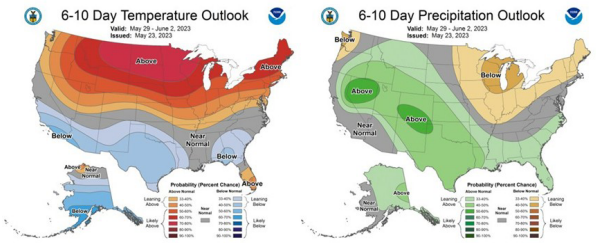


Figure 6: The CPC's 6–10-day temperature and precipitation outlooks, valid for May 29 through June 2, 2023.

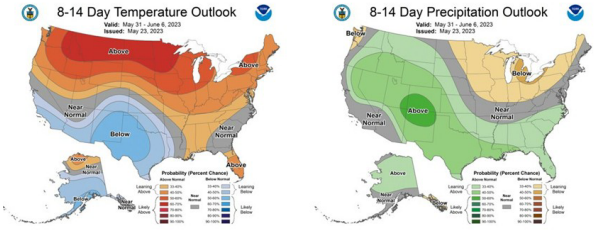


Figure 7: The CPC's 8–14-day temperature and precipitation outlooks, valid for May 31 through June 6,

2023.

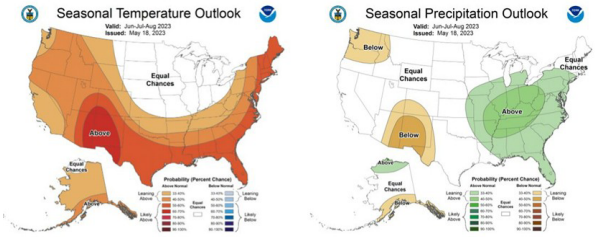


Figure 8: The CPC's Seasonal temperature and precipitation outlooks, valid for June, July, and August 2023.

Research Update: Insect Pest Management for the High Tunnel Strawberry Production System

(Samantha Anne Willden, swillden@purdue.edu)

Growing strawberries under high tunnels can extend the harvest season, provide protection against rain, frost, and disease, and improve overall yield and fruit marketability. Pest pressure, however, can be higher on protected culture strawberry compared to the open field. This is especially true for small, soft-bodied pests such as spider mites, aphids, and thrips. Even during the winter, temperatures can be warm enough under the high tunnels to allow these pest populations to slowly build, leading to large pest outbreaks in the spring. Management recommendations are therefore needed that are effective during the winter and early spring to prevent economic injury.

Our team is determining how row cover management impacts pest presence, and which biological control agents are effective against pests during the winter. At the Southwest Purdue Ag Center and Meigs research farms, 'Chandler' strawberries were transplanted under high tunnels in the Fall 2022. Row covers were either actively managed (i.e., removed daily when temperatures were above 50°F) or passively managed (i.e., covers were left in place during the winter until spring). Control rows were also included that did not receive any row covering. Pests were monitored every two weeks until early May.

Aphids and twospotted spider mites (TSSM) were the dominant pests identified on strawberries during the 2022-23 winter / spring season. At Meigs, three predator species were tested against aphids (*Chrysoperla carnea, Orius insidiosus* and *Adalia bipunctata*) and the predatory mite species *Neoseiulus fallacis* was released against TSSM at SWPAC. Aphid predators were released in mid-February and *N. fallacis* in early March 2023.

We found that row covering profoundly affected the presence of TSSM and aphids (Fig. 1). For both pests, higher densities were observed under row covers compared to open beds, regardless of how the row covers were managed. Both pest populations crashed when row covers were removed in February, likely due to cold temperature and natural enemy exposure. Both TSSM and aphids increased in density during March. Markedly high numbers of TSSM were observed in the "passive" covering treatment in March (after covers were removed), indicating a high number of eggs or overwintering individuals in this treatment that reinitiated activity and reproduction in March.

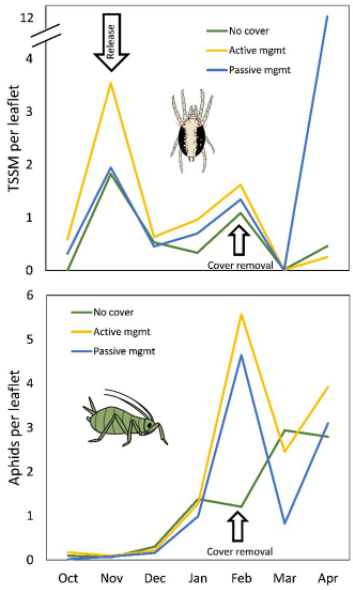


Figure 1. Change in TSSM and aphid populations from Oct 2022 to April 2023 as affected by row covering treatment at SWPAC. The "release" arrow indicates when predatory mites were released against TSSM. A second arrow indicates when row coverings were permanently removed due to warming Spring temperatures.

TSSM populations decreased rapidly after predatory mites were first released (Fig. 2). Predatory mites did not seem to have a consistent preference for any covering type and were less impacted by the removal of the row covers compared to TSSM. Fewest predatory mite numbers were recovered during the cold winter months, and increasing numbers were observed starting in February. However, TSSM populations were observed to increase in the Spring, warranting additional biocontrol agent releases or management practices. These results indicate that *N. fallacis*, and potentially other naturally occurring predatory mites, overwinter well under high tunnels but additional management may be necessary in the Spring to prevent TSSM outbreaks.

Figure 2. Photo of predatory mite (right) feeding on TSSM adult (left).

When comparing efficacy of aphid predators at Meigs, our first release indicated that *Adalia bipunctata* was most effective in reducing aphid densities. This research is ongoing, however, so definitive results are pending. Recovery of all released biocontrol agents at the Meigs site was low. Syrphid fly larvae, however, are naturally occurring and voracious aphid predators and were recovered at higher densities compared to the augmented biocontrol agents. The adults of this fly are also important strawberry pollinators, so they are a great insect to have around. Syrphids were first observed in early April, as well as natural parasitoids as indicated by the presence of aphid mummies (Fig. 3). We therefore suggest avoiding the application of broad-spectrum insecticides and unnecessary pesticides to strawberries in early April when natural biocontrol agents and pollinators are present. See Fig. 3 for photos of common aphid natural enemies and syrphid fly adults.

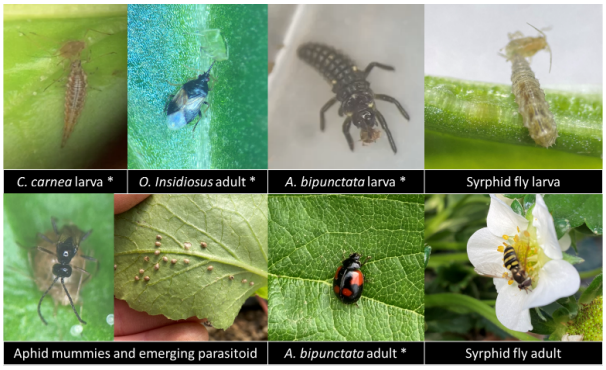


Figure 3. Common aphid predators that can be purchased (indicated by an asterisk next to the species name) or found naturally.

Please see this video and podcast for more information on the high-tunnel strawberry production system and the biological control of insect pests.

Choosing insecticides to manage insect pests in your home/backyard orchard

(Elizabeth Yim Long, long132@purdue.edu)

Some of our readers may have small, backyard orchards, or even just a couple of fruit trees (or vines, canes, and bushes!), that you enjoy for the aesthetics and also the fruit! If you're like me, you're thinking that having just a few fruit trees to manage won't be so hard, and the effort will be worth the delicious fruit you'll have to share with your friends and family. While most information about pest management will hold true for both small and large scale orchards, something that differs is the availability of pesticides; namely, if you have just 2 or 3 fruit trees in your backyard, you're unlikely to have access to as many pesticides as someone with a pesticide applicator's license. So, what insecticides are available to backyard fruit growers, who may not have an applicator's license? In this issue, I'll highlight some integrated pest management tips in fruit production, as well as insecticide options that are available at most home improvement/gardening stores.

First-things-first: Scout and use monitoring tools *before you spray* to help you detect and identify potential fruit pests. We all know insecticides are good at killing insects, but they also incur an economic and environmental cost. Although it is often necessary to spray fruit trees, vines, canes, bushes, etc, to protect fruit from insect pests, using monitoring tools, like pheromone traps or sticky traps, can help you detect pests and determine when it is time to spray, so you don't spray more than necessary. Also, ensuring you know the signs and symptoms of insects and their damage (see previous issue!), will help you identify the pest and choose the best product to stop it in its tracks.

When a spray is needed, which kind of insecticide is best for your needs? Regardless of the kind of fruit you're growing, there are generally three kinds of insecticide products you can find: **organic insecticides**, which are naturally-derived products made from plant extracts or bacteria; **inorganic products**, which are made from chemicals that don't contain carbon, and **synthetic insecticides**, which are created using man-made chemicals. Some important differences between each of these types of insecticides in terms of their use are: 1) their specificity: some are broad spectrum and will kill many kinds of insects (even good ones!), while some are very specific and kill only one kind of insect, and 2) their residual activity: some are effective against pests for a longer period of time and hold up to rain or ultraviolet (UV) light better.

I've listed some examples below of insecticides in each category that you can typically find in home improvement/gardening stores (Figure 1). These products may be available for use as a foliar spray, a dust/powder, or a soil-applied drench:

Organic insecticides (naturally-derived active ingredients): Pyrethrum, Neem, *Bacillus thuringiensis* (commonly called Bt), Spinosad.

Inorganic insecticides (active ingredients are not carbon based): Sulfur, Kaolin clay, Horticultural oils, Insecticidal soap, Boric acid, Diatomaceous earth

Synthetic insecticides (man-made active ingredients): Pyrethoids, Organophoshates, Carbamates, Neonicotinoids, etc.

Figure 1. Examples of organic (A), inorganic (B), and synthetic (C) insecticides you can find at most home improvement/gardening stores for use against insect pests on fruit.

Tips for choosing the appropriate product for insect pests. Many insecticides that you will find in home improvement/gardening stores must come into direct contact with the insect pest to kill it. This means that you need to have the product in place a bit before and during the time that the pest is active and good coverage is key! A key exception are the Bt products, which are specific to caterpillars (and some beetles) – these must be ingested by the insect to kill it. However, if the insect is already inside the plant part or fruit, Bt products applied to the outside surface will have no effect against the pest. Finally, when considering an insecticide for a fruit insect pest, keep in mind that some are more effective against piercing-sucking pests, like aphids, while others are more effective against chewing pests, like beetles or caterpillars. Also note that some products advertised for use in the orchard may be a combination of a fungicide and an insecticide. **So, please always read the label carefully and in its entirety to make sure the pest you are targeting is listed on the label.** Otherwise you may be applying a product that won't take care of the problem. If you have questions or want feedback on whether a product will be effective and safe to use on your backyard fruit trees/plants, reach out to your local county extension educator!

Answers to "insect signs and symptoms" images from the previous issue of *Facts for Fancy Fruit* (Issue 23-04). I asked our readers to put on their insect detective hats and determine if the images below are examples of signs or symptoms. Read on below to get the full scoop!

Figure 1. Sign or symptom? Hint: these are peaches
Answer. This is a symptom. The oozing wounds on these immature peaches are symptoms of damage by larvae (caterpillars) of the Oriental fruit moth.

Figure 2. Sign or symptom? Hint: this is crabapple
Answer. This is a sign. This white, fuzzy-looking residue is actually a secretion produced by the woolly apple aphid, as protection from the environment and predators. If you brushed aside the white stuff, you'd spot the purplish-colored aphids.

Figure 3. Sign or symptom? Hint: this is apple
Answer. This is a symptom. The curling leaves of this apple tree are symptoms of feeding by the rosy apple aphid, which injects a toxin while feeding that causes leaf curl. Sometimes, you can pull the leaves back and spot the aphids in the act!

Figure 4. Sign or symptom? Hint: this is grapevine
Answer. This is a sign. This was a tricky one though, and one that stumped me when I was asked to help identify the issue! These are the eggs of a katydid, laid on a grape cane at some point. Many thought they were scale insects!

Diagnosing Herbicide Injury is Easy… Sometimes.

(Stephen Meyers, slmeyers@purdue.edu)

This time of year, my email inbox and phone text messages are filled with ugly photos of fruit and vegetable crops affected by suspected herbicide exposure. Sometimes the symptomology points toward a clear cause and effect, but most of the time the answer is not so clear-cut. Here are a couple recent examples:

Cupping and discolored cabbage leaves:

I recently received grower photos from a cabbage field with plants displaying cupping of new leaves and discoloration on older leaves (Figure 1). The grower believed the symptoms to be the result of a micronutrient deficiency, but wanted to rule out carryover from herbicides applied in last year's corn crop. In scenarios like this one, I find that it can be helpful to look at plants from other fields or farms to draw comparisons. In some cabbage cultivars leaf cupping is a common occurrence. In this case, I compared the grower photos with 'Tiara' cabbage grown at the Purdue Student Farm (Figure 2), which were planted into a field with no recent history of herbicide application. The leaf cupping symptoms were similar between the two fields, but the discolored older leaves were unique to the grower's cabbage. Soil and plant tissue samples from symptomatic and asymptomatic portions of the field can be used to rule out nutrient deficiency. If nutrient analyses do not reveal any clues, it is possible that herbicide carryover is playing a role in the grower-observed crop symptoms.

Photo by: Oliver Book

Photo by: Chris Adair

Leaf spotting and chlorosis on strawberry and red raspberry:

The pattern of crop injury is an excellent indicator of if herbicides are at fault and their source. Injury that matches the width of a spray boom suggests a potential herbicide misapplication. Strips of injury or injury at field edges can indicate overlapping herbicide applications, resulting in an excessive application rate. Injury at the start of a sprayer pass can indicate tank contamination or insufficient sprayer agitation. In the scenario below, I document a confirmed case of physical herbicide drift.

In mid-April I noticed a neighboring farmer spraying his soybean field along our shared property line. The next day, speckled leaves appeared across my small farm. A week later, strawberry (Figure 3) and red raspberry plants (Figure 4) demonstrated chlorotic (yellow) leaves on their newest growth. When I contacted the neighboring farmer, he told me that Zidua® PRO and glyphosate were applied. Zidua® PRO is a premix of imazethapyr, saflufenacil, and pyroxasulfone. The saflufenacil resulted in the leaf spotting soon after application, but the chlorosis was the result of the glyphosate component of the tank-mix. It is very common for systemic herbicides, like glyphosate, to take several days to result in symptoms of sensitive plants. Weeds growing in the field edge were highly symptomatic with gradually decreasing severity as the distance from the soybean field increased (Figure 5). Plants up to 50 feet in the downwind direction also exhibited glyphosate injury, including a wild rose growing in a fencerow (Figure 6). In this instance, a clear pattern existed in space and time that pointed toward a herbicide drift event that was later confirmed by the herbicide applicator.

Photo by: Stephen Meyers

Photo by: Stephen Meyers

Photo by: Stephen Meyers

Photo by: Stephen Meyers

Additional Resources:

For a quick reference of corn and soybean herbicide rotation restriction information, turn to pages 68 and 69 of the 2023 Midwest Vegetable Production Guide: Corn-and-Soy-Herbicide-Rotation-Restriction-Tables.pdf (mwveguide.org)

To register your specialty crop fields with Drift Watch, visit: DriftWatch – Home

Weed scientists at Purdue and other midwestern universities put together a series of herbicide drift bulletins available here: Dicamba and 2,4-D Fact Sheet Series | Herbicide-Drift Risk Management for Specialty Crops (ohio-state.edu)

To file an off-target herbicide complaint, use this form from the Office of Indiana State Chemist: complainant_form.pdf (purdue.edu). The current form allows those filing a complaint to indicate if they would like to document the incident only or pursue potential enforcement actions.

To learn more about properly removing herbicide residues from agricultural application equipment, visit Removing Herbicide Residues from Agricultural Application Equipment | Purdue Pesticide Programs

To submit an ugly plant (or insect) for diagnosis, visit the Purdue Plant and Pest Diagnostic Lab here: Plant & Pest Diagnostic Lab (purdue.edu)

Purdue Fruit & Veg Field day 2023

(Lori K Jolly-Brown, ljollybr@purdue.edu)

REGISTER HERE

Purdue Fruit & Vegetable Field Day 2023
Thursday, July 20, 2023
Purdue Meigs Ag Center
9101 S. 100 E, Lafayette, IN 47909

Coordinator: Petrus Langenhoven
Extension Staff: Lori Jolly-Brown, Jay Young, Chloe Richard, and Paul Howard

FIELD DEMONSTRATIONS

- Sweet Corn Pest Management Updates
- Silage Tarps for Weed Management in Potatoess
- Watermelon Weed Management
- Summer 2023 Collard Insect Management Trial
- Black Soldier Fly Composting and Specialty Crop Production
- Two-year Plasticulture Strawberry Research Update
- High Tunnel Diversification and Biological Control
- Does Increasing Soil Health Improve Pepper Yield?
- Unmanned Aerial Vehicle Demonstration

Contact Lori Jolly-Brown or Petrus Langenhoven if you have any questions.

Purdue Small Farm Education Field day

(Lori K Jolly-Brown, ljollybr@purdue.edu)

REGISTER HERE

2023 FIELD DAY SCHEDULE

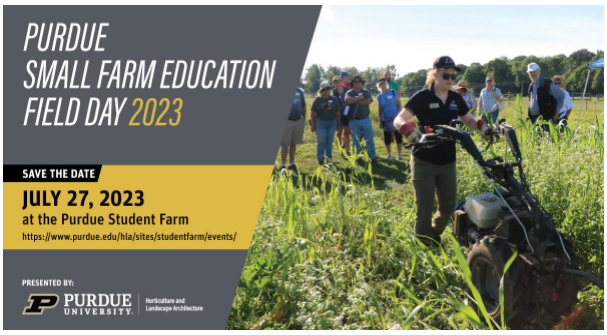
Thursday, July 27, 2023
Registration 8:00 – 9:00 am EST
Demonstrations at 9:00 am – 12:00 pm EST
Coordinator: Petrus Langenhoven
Extension Staff: Lori Jolly-Brown, Lais McCartney, and Patrick Williams

Please join us for the 2023 Small Farm Education Field Day!

The EMT food truck will be on site for those who would like to purchase lunch after the educational demonstrations end. The Kona Ice truck will also be on site for a FREE cool summer treat for all attendees, compliments of Purdue Extension and Purdue Horticulture and Landscape Architecture!

Demonstrations at the Field Day

- High Tunnel Table Grape Production
  Miranda Purcell
- High Tunnel Pepper Production and Variety Selection
  Petrus Langenhoven and Dennis Gustavo Toc Mo
- Growing Grains on the Small Farm – Dry Edible Bean Variety Trial
  Wil Brown-Grimm and Ashley Adair
- Predator-Prey Dynamics in High Tunnel Crop Production
  Sam Willden
- Biorational Pesticide Efficacy for Controlling Caterpillars and Flea Beetles in Crucifer Crop Production
  Laura Ingwell
- Black Soldier Fly Composting and Specialty Crop Production
  Milena Agila and Laura Ingwell
- Raised Garden Beds for Vegetable Production
  Amy Thompson and Nathan Shoaf
- Postharvest Food Safety Demonstration
  Scott Monroe and Amanda Deering
- Silage Tarps and Their Potential Uses on Small Farms
  Steve Meyers and Josue Cerritos
- Choosing Fertilizer Injectors for Drip Irrigation for Small Plots
  Wenjing Guan



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