

FANCY FRUIT

Issue: 23-03
April 27, 2023

A Newsletter for Commercial and Advanced Amateur fruit growers.

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Crop Conditions

(Chloe Richard, richa267@purdue.edu)

At the Meigs Horticultural facility on April 24th we experienced freezing temperatures from 2 am until 7 am, with a low of 26.8 degrees Fahrenheit for one hour. The damage to fruit crops on the farm is scattered depending on varieties. A rough estimate would be 10% cold damage on the crops.

The growth stages on our Apple trees fluctuates across the farm depending on variety, but almost all have started to bloom.

I can now say in confidence, that we lost our Peach buds from the -9.2 degrees Fahrenheit on December 23rd.



Apple: Pink



Blackberry



Plums: Fruit Set



Peaches



Grapes: 4-8 Inch Shoots



Gooseberries



Black Currant

Below-Normal Temperatures and Precipitation Continue

(Austin Pearson, pearsona@purdue.edu)

Despite the cooler weather we've experienced the last couple of weeks, temperatures from April 1st through 26th averaged 2.3°F above normal for the entire state (Figure 1). Departures have steadily declined as the weather pattern shifted to cold and dry as a result of an upper atmosphere blocking pattern. Since April 21st, temperatures averaged 9-12°F below normal, and a large portion of the state experienced a hard freeze on April 24th (Figure 2). Indianapolis recorded a low temperature of 28°F, which tied the record low set in 1910. Many locations

experienced additional frost events throughout the week, posing a risk to nearly all horticultural crops.

Modified Growing Degree Days (MGDDs), being temperature driven, ran above normal for nearly the whole state (Figure 3). As of late, accumulations have slowed, and the highest departures occurred in northwestern Indiana. Soil temperatures have dropped slightly with the colder air temperatures but have continued to meander between 40-55°F statewide (Figure 4). Many producers planted over the past few weeks and have yet to see crops emerge, which is likely a good thing in light of the ongoing frost and freeze events. Soil moisture, especially in the topsoil, has dried due to the lack of rain and the rapid drying events this month (high wind, low humidity, abundant sun, etc.). Statewide, precipitation ran 1.22 inches below normal (64 percent of normal) for April 1st through 26th and does not look to rebound at least for the next couple of weeks.

The Weather Prediction Center's 7-day forecast expects 0.01-1.00 inch of precipitation, with the heaviest amounts along the Ohio River. This pattern continues providing agricultural producers the opportunity to conduct fieldwork. The Climate Prediction Center's (CPC) below-normal precipitation outlooks through May 10th (Figures 6 and 7) are also conducive to accessible fields. Let's get to the bad news, shall we? Temperatures do not look to rebound for the next couple of weeks as the CPC's outlooks indicate elevated chances for below-normal temperatures. Current models hint at a few days with warm temperatures sprinkled in, but overall, we're trending below normal through the first couple weeks of May. We certainly are not out of the woods for frost/freeze potential as models have low 30s forecast through May 5th. Be sure to pay attention to any alerts issued by your local

National Weather Service Forecast Office.

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

Indiana
4/ 1/2023 to 4/26/2023

cd	Temperature			Precipitation			
	temp	norm	dev	prcp	norm	dev	percent
1	51.1	48.8	2.3	2.01	3.09	-1.09	65
2	51.1	48.3	2.8	1.94	3.09	-1.15	63
3	50.7	47.8	2.9	1.69	3.04	-1.35	56
4	52.9	50.8	2.0	1.98	3.28	-1.29	61
5	52.4	50.2	2.2	1.78	3.34	-1.56	53
6	51.7	49.2	2.5	1.74	3.27	-1.53	53
7	56.1	54.2	1.9	2.86	3.69	-0.83	77
8	55.9	53.6	2.3	2.58	3.71	-1.14	69
9	54.4	52.5	1.9	2.56	3.56	-0.99	72
State	53.0	50.7	2.3	2.13	3.35	-1.22	64



Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at:
Thu Apr 27 06:42:23 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 April 1-26, 2023.

Average Minimum Temperature (°F)
April 24, 2023 to April 24, 2023

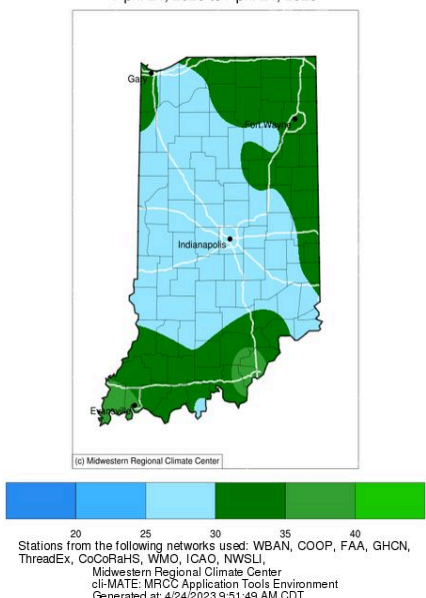
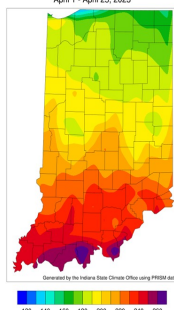


Figure 2: An interpolated map displaying average Minimum Temperatures for the April 24, 2023 freeze event.

Growing Degree Day (50 F / 86 F) Accumulation
April 1 - April 25, 2023



Growing Degree Day (50 F / 86 F) Departure From Average
April 1 - April 25, 2023

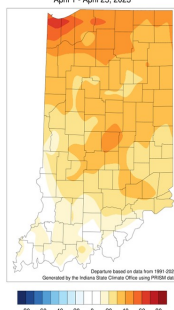


Figure 3: Total Accumulated Indiana Modified Growing Degree Days (MGDDs) April 1-25, 2023 (left) and Total Accumulated MGDDs represented as the departure from the 1991-2020 climatological normal (right).

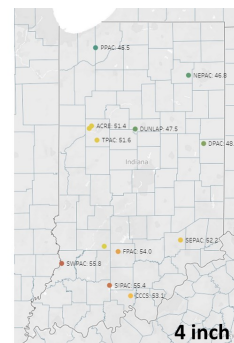
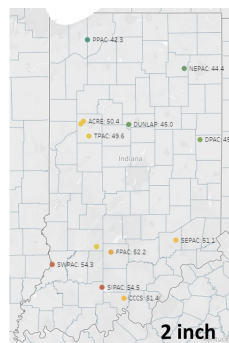


Figure 4: Two-inch (left) and four-inch (right) soil temperatures for stations located at Purdue Mesonet sites in Indiana. Data can be obtained from the Purdue Mesonet Data Hub.

Purdue Mesonet Data Hub



Figure 5: NWS Weather Prediction Center 7-day quantitative precipitation forecasts for the continental United States.

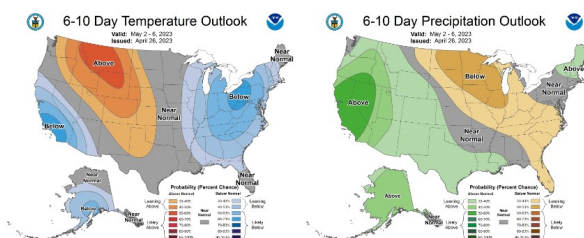


Figure 6: The CPC's 6-10-day temperature and precipitation outlooks, valid for May 2-6, 2023.

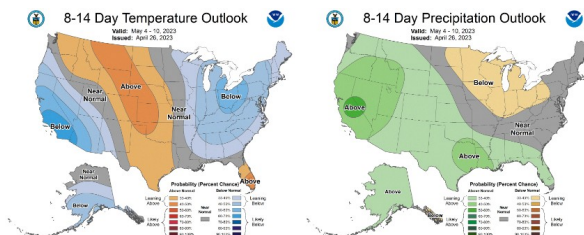


Figure 7: The CPC's 8-14-day temperature and precipitation outlooks, valid for May 4-10, 2023.

Grapevine Freeze Damage Update

(Miranda Purcell, mrpurcel@purdue.edu)

Grapevines are in various stages of early growth throughout Indiana, ranging from bud swell to 6-8 in shoot growth, depending on variety. A cold weather event came across the state on 4/24 bringing temperatures as low as 25°F (see Figure

1).

The minimum temperatures in the following areas were reported as follows:

Lafayette, IN: 28.9°F

Spencer, IN: 27.0°F

Vincennes, IN: 29.8°F

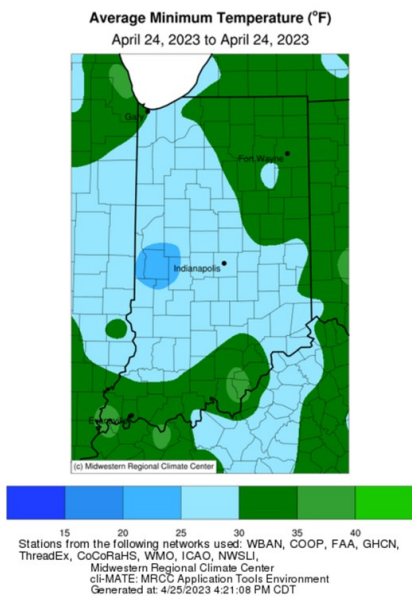


Figure 1. Midwest Regional Climate Center

Frost damage at the Meigs Horticulture Research Center in Lafayette, IN ranged from 10-15% (Figure 2). There was less damage to shoots at SWPAC (Figure 3). Damage is focused on early budding varieties with more progressed shoots. It is likely that primary bud injury occurred, and in these cases we will expect to see emergence of secondary buds.



Figure 2. Frost damage on grapevine shoot at Meigs Horticulture Research Center in Lafayette, IN after low temperature of 28.9°F on April 24, 2023



Freeze damage April 24 2023 SWPAC

Preventing Frost Damage:

Delayed pruning: The act of pruning encourages bud development. Therefore, delay pruning until late April/early May until much of the risk of frost has passed. Also, prune your most cold tender varieties later than your cold hardy varieties.

Double pruning: Double pruning involves pruning the canes to 2-3x the desired amount of buds during the winter, which delays bud break (and the risk of frost damage) by several days for the buds near the base of the cane. Then, after assessing cold injury and adjusting bud number accordingly, go through and prune to the desired number of buds shortly after bud break. It is

important to remember that the act of pruning encourages bud development. Therefore, prune your most cold tender varieties later in the Spring than your cold hardy varieties.

Resources for Assessing the Extent of Injury:

[Guide to Assess Freeze Damage of Grapevines](#) | The Ohio State University

[Prevention and Management of Frost Injury in Wine Grapes](#) | NC State Extension

Without Protection, Freezing Temperatures Monday Morning Caused Damage on Plasticulture Strawberries in Southern Indiana

(Wenjing Guan, guan40@purdue.edu)

We received a freeze warning in Vincennes last Sunday with a predicted low temperature of 33 °F. Growers in southern Indiana reported minimal damage on plants covered with floating row covers. But significant damage was observed in fields that were not protected or covered with a thin layer of floating row cover.

At Southwest Purdue Ag Center in Vincennes, the recorded low temperature at the strawberry plant canopy height was 26.5 °F. Open blooms and some pop-corn stage flowers were killed. Without protection, we saw varied damage among cultivars. The yield loss might be more than 70% on cultivars with the most open blooms. The early cultivars that have developed green berries suffered less yield loss as green berries can tolerate lower temperatures than open blooms. The very late cultivars that have not have flower clusters grown out of the crown survived the freeze event.

Lessons learned for the frost/free protection:

1. Take action for frost protection whenever

there is a frost/freeze risk, especially if strawberries enter full bloom.

2. The actual temperatures at the canopy height could be lower than those recorded a few feet above the ground.
3. Heavy row cover at least 1.5 oz/sq. yard should be used for frost protection.
4. Planting a combination of early, middle, and late-season cultivars could reduce the risk

Tips for managing plum curculio in tree fruit

(Elizabeth Yim Long, long132@purdue.edu)



Figure 1. Caught red handed: two adult plum curculio beetles feeding on an apple (left), and a plum curculio larva inside a peach (right). Photo credit: J. Obermeyer

The plum curculio (*Conotrachelus nenuphar*) is a small “snout” beetle (also known as a weevil – one of my favorite beetle groups!) that will feed on apples, peaches, pears, plums, and cherries. Both adults and larvae have chewing mouthparts and can damage fruits; adults by feeding and laying eggs in newly set fruit and larvae by feeding internally within fruits, causing premature fruit drop in some cases. Studies have reported that if plum curculio is not managed effectively, up to 85% of fruit may be damaged at harvest! So, in this issue, I wanted to highlight a bit about the biology and behavior of plum curculio and provide some helpful tips on management.

Plum curculio overwinters in the adult stage in ground litter or the soil, and when spring arrives, they migrate to trees and are most active from petal fall through first and second cover. The adult beetles can walk and fly and are primarily

active at night when temperatures are 70°F or warmer. Diagnostic symptoms of plum curculio in the orchard include: 1) physical distortion of newly set fruit, called “cat-facing”, caused by adult feeding damage, 2) appearance of “c-shaped” or “crescent-shaped” wounds on fruit, caused by egg laying, and 3) premature fruit drop, caused by larvae as they feed within the fruit. Aside from losing fruit prematurely, plum curculio can also hurt your bottom line when injury caused by adult feeding or egg laying leaves scars that make fruit unmarketable.



Figure 2. Symptoms of plum curculio egg-laying damage to young fruit (left) and mature fruit that did not drop from the tree (right). Photo credit: J. Obermeyer.

So, what steps can you take or add to what you are already doing to improve management of plum curculio in your orchard?

#1: Use cultural control strategies

Plum curculio is native to North America, so it is adapted to survive and feed on other non-cultivated hosts in the plant family Rosaceae. Beyond your orchard, you can reduce plum curculio success by removing unmanaged or wild fruit trees, which provide alternative food sources and mating sites for adult beetles. Within your orchard, you can prune fruit trees during the dormant period to create an environment that is less favorable for the adult beetles during the growing season.

#2: Monitor adult activity

You can fine-tune the start of your monitoring and management efforts to coincide with key periods of plum curculio activity using degree-day models.

Tracking degree days (the accumulation of

temperature units, based on average daily high and low temperatures) can help us predict the biological activity of insects more reliably than calendar dates, because insect development and activity are dependent on temperature.

Researchers have identified the lower developmental threshold for plum curculio to be 50°F, which means any time the average daily temperature is greater than 50°F, degree days are accumulating, and this insect is active and developing towards the next life stage. Based on research in the northcentral region, there are key degree-day time points that are associated with plum curculio activity. For example, using a start date of March 1st to begin tracking degree days, researchers at Michigan State found:

At 275 DD₅₀: plum curculio females will likely have mature eggs and will be ready to lay eggs in developing fruits.

At 340 DD₅₀ after petal fall: 40% of egg-laying by plum curculio will be complete.

Along with tracking the accumulation of degree days, you can monitor adults using plum essence or benzaldehyde lures and pyramid traps (beginning at bloom), as well as beating sheets, which are placed beneath the canopy while you shake or beat branches with a stick or similar. Place pyramid traps on the borders of your orchard, or where damage has been observed previously, to get the best sense of pressure this year. Use beating sheets earlier in the morning when adults are less active and easier to dislodge. Beating sheets are also effective because adult weevils are notorious for playing dead (ha!), so they will readily fall from the branches and land on the sheet, where they will be easier for you to spot. Last, but not least, monitor traps several times a week (the more frequently you can check the better!), and once fruits begin to set, monitor them regularly for signs of feeding or egg-laying injury.

Step 3: Consider using biological control agents

There are naturally occurring predatory and parasitic insects, fungi, and insect-parasitic nematodes that attack plum curculio. These biological control agents can be thought of more as a long-term, sustainable approach to reducing plum curculio populations and associated damage. So, in other words, these are not agents that will reduce populations quickly, so you will want to plan ahead and allow time for these organisms to do their work! More recently, the success of insect-parasitic nematodes against plum curculio has received more attention. These nematodes only attack insects (not plants!), and when applied to the soil at the base of trees in the orchard, insect-parasitic nematodes are available in high densities to attack plum curculio larvae as they leave dropped fruit and enter the soil to pupate. By reducing the number of larvae and pupae surviving each season, there will be fewer adults that overwinter, and therefore fewer adults to emerge the following spring! There are several factors that impact the success of biological control agents, so these strategies may not work equally well for everyone, but they can be a valuable complement to chemical control strategies.

#4: Apply chemical control strategically

The adult beetles are the main target of insecticide applications. Time insecticide applications at the petal fall through first and second cover stages of tree development to kill adults before they feed and lay eggs. Typically, an insecticide application timed at petal fall will be sufficient to manage plum curculio. Several classes of insecticides, including the neonicotinoids, pyrethroids, diamides, and carbamates have good to excellent efficacy against plum curculio. However, keep in mind the use of pyrethroids at petal fall are not recommended because they kill off predatory

mites, leading to potential outbreaks of pest mites like European red mite and two-spotted spider mite. Also, take care if using Sevin (active ingredient carbaryl) against plum curculio within 30 days of bloom because fruit thinning may also occur. To get the best out of your insecticide sprays, time them carefully using degree days if possible, consider residual activity and whether one insecticide spray can target other insect pests at the same time as plum curculio, and be mindful of which insecticides are labelled for use on stone or pome fruits, because some are labelled for use on one crop group but not the other.

Tank Mixes

(Janna L Beckerman, jbeckerm@purdue.edu, (765) 494-4628)

Tank mixtures (or tank-mixing) describes the process where multiple crop protection chemicals are combined in a single tank for simultaneous application. Tank-mixing pesticides allows the grower to make a single application but manage multiple pests AND pesticide resistance issues. All specialty crops, especially fruit crops, have more pests and pathogens than field crops, along with higher insect and disease pressures by these pests. As a result, fruit crops require more a greater number of pesticides, with more frequent applications, over a longer period of time. One way to improve efficiencies with these applications is by tank-mixing.

Many new growers are unclear and/or uncertain about tank mixes. Obviously, tank mixes save both time (during application) and money (improved pest management) as the grower only sprays the field once to manage multiple pests,

instead of spraying two to three times to manage different insects and diseases. However, there are additional savings in that there is less chance of soil compaction, rutting or damaging trees or vines.

Tank mixing also improves pesticide resistance management. By combining two products (e.g., Rally+mancozeb, to control scab, rust, powdery mildew, bitter rot) the applicator is also controlling resistant isolates of the pathogens that cause widespread fungicide failures. If Rally fails to control a pathogen, mancozeb can follow up. Growers may opt to add insect management as well and include a product like Actara for plum curculio control during first cover, for example. For all these pesticides, labels provide information and recommendations as to how to best do this (Fig. 1). Remember: The label isn't just a legal document, but also a history lesson of everything that has gone wrong. It pays to review the label even though it is tedious.

So, what can go wrong? Not all pesticides can be tank mixed, and some chemical or biological incompatibilities exist. How chemicals interact can be positive (synergism) or negative (antagonism) in a tank mix. Synergy of pesticides can increase potency which can harm the plants, which is why labels say to never tank mix copper with Aliette or other phosphorous acid fungicides. We harness synergy by adding an acidifier to captan to maintain a neutral or acid pH, but too much can result in phytotoxicity. The captan label warns about this (Fig. 2).

Unfortunately, some tank mixes result in antagonism, where the chemicals cross react in a way that reduces their efficacy resulting in less control of the problem. This usually results usually from physical incompatibilities (e.g., tank sludge) that occur when liquid pesticides crash out of solution or dry products fail to dissolve in the tank. Both result in clogging of lines, screens

and nozzles, prevent spraying, and result in a loss of time, instead of savings, which is why reading the label to avoid this occurrence is so important.

Avoiding sludge can be as simple as following the prescribed mixing order. Remember, we aren't witches over a cauldron (although it may feel like that sometimes). Make sure the tank is ~ 1/2 full of water before adding the first product. Check the water to make sure pH is where you think it should be (usually around pH 7, but check the label), and make sure water quality is good (hardness, salts and salinity, bicarbonates, turbidity). Although we have good water in Indiana, it is fairly hard and alkaline. Most pesticides are formulated to address this issue, so water conditioners usually aren't needed for insect and pathogen control.

Mixing order of pesticides matters. Use the **W.A.L.E.S.** acronym to order what you put in the tank.

- **W**ettable powders
 - **A**gitate
 - **L**iquid flowables
 - **E**mulsifiable concentrates
 - **S**urfactants

Compatibility agents and/or anti-foaming agents should go in the tank before the pesticides. If adding adjuvants, be sure to read the label to know when to add, recognizing that many pesticides are formulated with adjuvants and that additional adjuvants may not be necessary, and may actually cause additional phytotoxicity issues (Fig. 3). Finally, don't rush your mixing, especially if water is extremely cold (spring in Indiana!) or using dry products.

Tank mixing is a great way to improve applications and save time, but they aren't a silver bullet (which only work on werewolves, anyway). Keep in mind that there is too much of

a good thing, and that the more products in the tank mix increases the chance for problems (antagonism, synergism, or just plain incompatibility). To prevent these problems, or end up having to clean a tank instead of spraying, plan ahead as to what you are managing and what you plan to apply. Check the label! Instead of pulling out the readers and searching through 6 point font, download the pdf version (google the name of the product. E.g., search for “Rally fungicide label” or “Actara insecticide label). Open up the pdf and search (Command+F on Macintosh or CTRL+F on a PC) for “mixing procedure”, “tank mix”, “mix”, or “compatibility”.



Figure 1. The Actara label provides information for effective tank mixing.

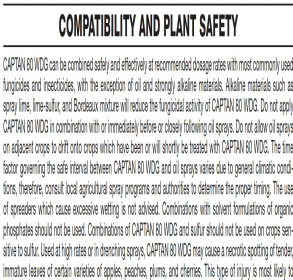


Figure 2. The captan label warns against specific pesticides and tank mixes.



Figure 3. What happens when you ignore the warnings! Photo by Janna Beckerman.

For more information:

Avoiding Tank Mixing Errors

– <https://ppp.purdue.edu/wp-content/uploads/files/PPP-122.pdf>

Tank Mix Compatibility

– <https://sprayers101.com/tankmix/>

Purdue Fruit Veg Field day- Registration now open!

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

[Register here](#)

Purdue Extension presented its first Fruit, Vegetable and Hemp Field Day post-pandemic at the Meigs Ag Center in July 2022. Extension Specialists and Graduate Students presented specialty crop research to 45 attendees.

Attendees had only good things to say about the event. “Great information and research.” “Great variety of experiences and knowledge.” “I felt welcomed and it was in an educational environment with like-minded people.” “It was such a great informative event to learn about Purdue’s current research.” “Quality and variety of information.” “The speakers seemed to give good context to their subjects.” Below are some of the production topics presented at the field day and we expect to have a similar lineup for the 2023 field day.

- Cold Hardy Grape Varieties for Indiana
- Apple Disease Management and IR4 Trial
- Management of Dwarf Apple Trees
- Managing Caterpillars with Homeowner Products on Swiss Chard and Collard Green Varieties
- Planting Vegetables into Cover Crops
- Vegetable Weed Management Research
- Row Covers for Insect Management on Leafy Greens
- Sweetcorn Insect Management
- Mite Management in High Tunnel

Cucumbers

- Two-system Approach to Vegetable Farming
- Cannabinoid Hemp Variety Trial / Hemp Propagation Study

We are happy to announce that Purdue Extension is presenting its annual Fruit and Vegetable Field Day on July 20, 2023, at the Throckmorton/Meigs Horticulture Farm, Lafayette, IN.

Contact [Lori Jolly-Brown](#) or [Petrus Langenhoven](#) if you have any questions.



Purdue Small Farm Education Field Day- Registration now open!

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

[Register here](#)

The 2022 [Purdue Small Farm Education Field Day](#) was a big success. Nearly 72% of attendees reported that they learned something new. Nearly half indicated they plan to adopt recommended practices for diversified farming systems, and over a third (36.0%) plan to adopt recommended practices for creating, improving, or strengthening their business. Half (52.0%) indicated they plan to adopt practices for horticulture and the environment or practices that reduce negative environmental impact due to horticultural operations. Nearly half plan to adopt practices/technologies for the conservation of resources (48.0%) or increased efficiencies

(44.0%).

Attendees commented

- 'Diversity of information presented.
- Great field day. Jam-packed with information and experts. Lots of opportunities to question the experts.
- Great people and resources!
- I believe the diversity accurately represented many aspects of Indiana agriculture for large and small-scale operations.
- I recently got into the urban farming industry in Fort Wayne, Indiana, and this program has helped me get the wheels in my head turning.
- I think it was a great event to learn about small farms and different practices or crops. It was also a great networking event.
- I think it was a very informative event. Lots of good resources and networking as well as practices. Very educational.
- I thought the field day was well organized.
- New information presented in an understandable format by very competent professionals.
- The event was educational, local, had very knowledgeable presenters, helpful exhibitors, good handouts, and I got a free frozen treat.
- Up-to-date practices, evidence-based knowledge, concrete
- Very informative to see a high-volume production set up, including plant training systems and watering/fertigation systems, applied to a wide variety of crops.'

The event was held at the Purdue Student Farm located in West Lafayette, Indiana. The field day featured an array of "demonstration stations" on the farm where participants learned about a variety of topics:

- Student farm packhouse tour and overview of good agriculture practices (GAPs)
- Weed identification and understanding of thresholds
- Summer cover crops for weed suppression
- Infield soil diagnostics and soil health
- Vegetable disease, prevention, identification, and management
- Scouting for mites in high tunnel crops
- Black soldier fly composting
- Caterpillar tunnels
- Beans, onion, sweet pepper, eggplant, and tomato varieties in various production

- July 27, 2023

Educational topics for the 2023 field day will be available in May. To learn more about the field day, visit

our [webpage](http://www.purdue.edu/hla/sites/studentfarm/events/) at www.purdue.edu/hla/sites/studentfarm/events/ or contact [Lori Jolly-Brown](#) or [Petrus Langenhoven](#).



Save the date for the next field day

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