

# FANCY FRUIT

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*A Newsletter for Commercial and Advanced Amateur fruit growers.*

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## Crop Conditions

*(Chloe Richard, richa267@purdue.edu)*

In just two weeks there has been significant bud development on our fruit trees here in Lafayette, IN. Our Shiro Plums are in full bloom and the bees are busy pollinating these trees. There is one Apricot and some early season Apple trees in our mixed variety blocks that are also in full bloom. All other fruit trees and small fruits are developing, there doesn't seem to be anything that remains dormant at this time. Our field

Strawberries are starting to grow out and the new growth looks fantastic. Our Strawberries in the high tunnels have started to develop berries.



Blackberry:



Plums (Shiro): Bloom



Black Currant:



Gooseberries:



Grapes: Late Bud Swell



Apple: Green Tip



Pears: Green Cluster



Peaches: Half-Inch Green

# Warm Temperatures, Dry Window Allows for Field Activity

(Austin Pearson, [pearsona@purdue.edu](mailto:pearsona@purdue.edu))

Much like March, April has gotten off to a warm start. Through the first eleven days, the state average temperature was 5.1°F above the 1991-2020 climatological normal (Figure 1). High temperatures ranged from 60-70°F, which was anywhere from 3-7°F above normal. Low temperatures were not as anomalous, but slightly above normal for most of the state. As a result, over a dozen Indiana stations either had daily high maximum and/or minimum temperature records broken or tied (Figure 2). Modified Growing Degree Days (MGDDs), derived by temperatures beginning April 1, were above normal for most of the state. Highest deviations occurred in central and southern Indiana (Figure 3). Warmer temperatures have allowed vegetation to break dormancy up to central Indiana. As a result, horticultural plants became susceptible to frost and freeze damage should there be another cold snap (Figure 4).

Rainfall averaged 1.37 inches across the state (April 1-11), with highest amounts falling in southern Indiana (Figure 1). All of the rain was measured in the first week and occurred nearly a week ago. Dry weather and abundant sun allowed soils to begin drying and warming. On April 12, [Purdue Mesonet](#) 4" soil temperatures were in the low to mid-50s statewide (Figure 5). Field work (anhydrous applications, spraying, and yes...even some planting) has begun for some producers given the recent pattern shift.

The dry trend should remain for the next week, which will allow for continued field work. The Climate Prediction Center expects near- to above-normal temperatures through the end of the month. Precipitation is expected to continue

below normal through April 21 and then shifting to near normal toward the end of the month.

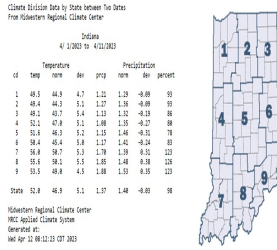


Figure 1: Indiana climate division and state temperature, normal temperature, temperature departure from normal, precipitation, normal precipitation, precipitation departure from normal, and percent of mean precipitation for April 1-11, 2023.

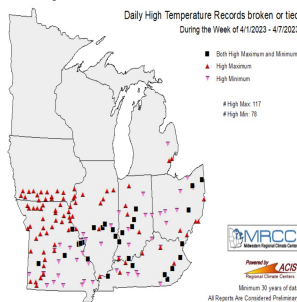


Figure 2: Midwest daily high temperature records broken or tied during the week of April 1-7, 2023.

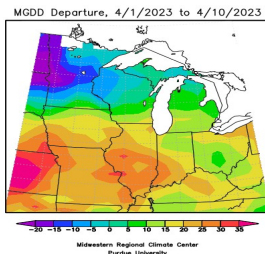


Figure 3: Accumulated Midwest Modified Growing Degree Days (MGDDs) (April 1-10, 2023) represented as the departure from the 1991-2020 climatological normal.

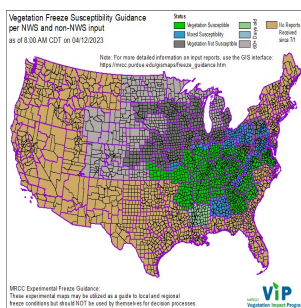


Figure 4: Vegetation Impact Program's Vegetation Freeze Guidance shows the locations with susceptibility to frost and or freeze damage. The map above depicts guidance submitted through April 12, 2023.

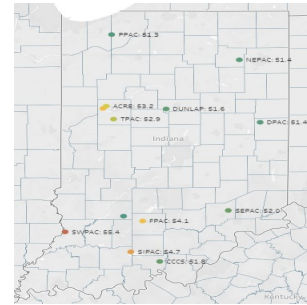


Figure 5: Purdue Mesonet 4'' soil temperature across the state. Data may be obtained through the Purdue Mesonet Data Hub.

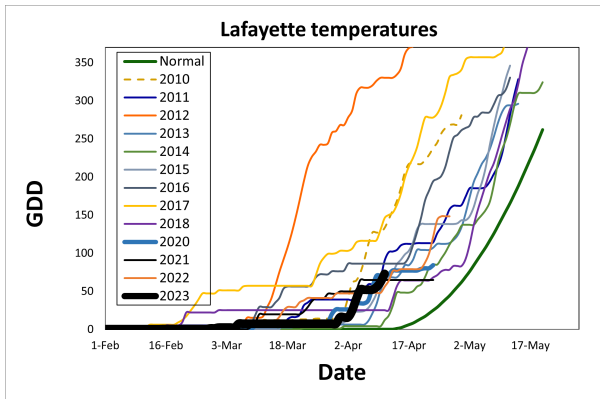
## Spring temperatures

(Peter M Hirst, hirst@purdue.edu, (765) 494-1323)

Something happened when the calendar switched from March to April. Spring finally sprung. As we discussed in the last issue of FFF, spring temperatures are so important because the rate of crop development in the spring is directly related to how warm it is. Here in Lafayette, April average temperatures have been in the 50s and 60s (average not maximum) which has pushed along crop development. We're currently at early tight cluster on apples and peaches are pushing along. I'd like to report the stage of peach flowering, but there's not a flower in sight. The lowest winter temperature was -9.6 which wouldn't usually cause extreme damage. But, that temp came after a couple of weeks in the 40s and 50s so I suspect the trees hadn't developed much hardiness at the time the cold temperatures hit.

As you can see from the graph where this year's data is shown in the heavy black line, we're not particularly early or late this year, although still ahead of the long -term average.

Further south in the state, apples are between pink and full bloom.



As a reminder, this photo shows where we were a year ago.



Apple flowers at the Purdue Meigs farm after snowfall on Monday April 18, 2022.

## Optogen® - a new herbicide available in select vegetables and strawberry.

(Stephen Meyers, [slmeyers@purdue.edu](mailto:slmeyers@purdue.edu))



### What is Optogen®?

The active ingredient in Optogen® (Figure 1) is bicyclopyrone. Corn growers may recognize bicyclopyrone as one of the four herbicide

ingredients in Acuron® herbicide. Bicyclopyrone is a Group 27 herbicide with both pre-emergence and post-emergence activity on select weed species. Group 27 herbicides inhibit an enzyme known as “HPPD”, resulting in an inhibition of carotenoid synthesis. Ultimately, symptomatic plants exhibit “bleaching” injury (white plant tissues) (Figure 2). For many of the registered crops, this is the only Group 27 herbicide labeled. Rotating among herbicide Groups is one way to slow the onset of herbicide resistance.



Figure 2. Mild and temporary Optogen® bleaching symptoms on a watermelon leaf.

### On what crops can Optogen® be used?

The current label includes broccoli, garlic, horseradish, onion (muck soils only), strawberry, sweetpotato, and watermelon. It is anticipated that additional crops will be added in the coming years.

### Important Notes:

Applications made to emerged weeds should target weed 2” tall or less and include a non-ionic surfactant or crop oil concentrate.

Applications made to row middles should be directed or applied with a hooded sprayer to keep the herbicide off of the crop.

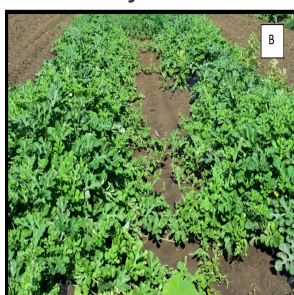
### What weeds are controlled by Optogen®?

Optogen® is supposed to provide control of pigweeds, velvetleaf, common ragweed, eastern black nightshade, and lambsquarters. Partial control of numerous other weed species is also expected. Like most herbicides, Optogen® will

work best in an integrated weed management program. For example, in 2022 research trials, we used Optogen® as a layby application in plasticulture-grown watermelon. This followed a preplant application of Chateau® and Dual Magnum® (Figure 3). This combination of herbicides resulted in excellent control of pigweeds, velvetleaf, and annual grasses.



Plots from 2022 research trials in watermelon:  
Weedy control.



Plots from 2022 research trials in watermelon:  
Chateau plus Dual Magnum pre-transplanting followed by Optogen at layby.

As with any new herbicide, it is best to avoid making whole-farm changes until you have experience with how the product fits into your production system and with the cultivars you grow.

For more information, consult the product label ([Print \(cdms.net\)](http://cdms.net)) or the Midwest Vegetable Production Guide ([mwvegguide.org](http://mwvegguide.org)). The release of this product was after the printing of the most recent Midwest Fruit Pest Management Guide.

## Fungicide resistance in a

## diversity of fruit crops

(Janna L Beckerman, [jbeckerm@purdue.edu](mailto:jbeckerm@purdue.edu), (765) 494-4628)

As we continue to walk on really expensive eggshells in 2023, it's important to recognize that fungicide availability along with the effectiveness of available fungicides (and their price) will impact orchard, vineyard and berry patch management 2023.

For all growers, the number 1 problem continues to be fungicide resistance in a diversity of fruit crops.

Table 1. Fungicide resistance reported or suspected in Indiana.

Crop	Disease	Fungicide resistant pathogen	Fungicide Class
Apple	Apple scab	<i>Venturia inaequalis</i>	FRAC 1, 3, 11, 7
	Powdery mildew	<i>Podosphaera leucotricha</i>	FRAC 1, 3, 11,
	Bitter rot	<i>Colletotrichum spp.</i>	FRAC 1, 3, 11,
Peach	Brown rot	<i>Monilinia spp.</i>	FRAC 1, 3, 11,
Grape	Downy mildew	<i>Plasmopara viticola</i>	FRAC 11
	Powdery mildew	<i>Uncinula necator</i>	FRAC 1, 3, 11,
Strawberry	Botrytis	<i>Botrytis spp.</i>	FRAC 1, 3, 11, 7
	Botrytis	<i>Botrytis spp.</i>	FRAC 1, 3, 11, 7
Strawberry	Anthracnose	<i>Colletotrichum spp.</i>	FRAC 1, 3, 11, 7
	Neopestalotiopsis	<i>Neopestalotiopsis spp.</i>	FRAC 1, 3, 11, 7

**Fungicide-resistance** remains a growing problem, increasing the cost of disease management, while resulting in lower levels of disease control. The FRAC 3 fungicides (Nova, Procure) have been relied upon in all areas of fruit production, especially for apple scab and powdery mildew. Newer FRAC 3 fungicides (Inspire Super, Indar, Cevya, Topguard Specialty Crop) provide control even against some FRAC 3 resistant strains—at least for now. The post-infection activity of these fungicides provide some 'wiggle-room' for growers as far as timing, providing flexibility in both timing and coverage. However, too many growers have relied too heavily on this wiggle room at their peril. Any post-infection use of the FRAC 3 should be limited to 48 hr (not the previous 96) to reduce pressure and minimize resistance risks. Early season use of Syllit (dodine) continues to provide this flexibility to apple growers, prior to pink, and remains an excellent tool if resistance is not an

issue.

Issue of fungicide resistance are also impacting the FRAC 11 (strobilurin, or strobies) fungicides (Flint and Sovran), resulting in a decreased level of activity in apple scab, bitter rot, powdery mildew (in apple, grape, strawberry), brown rot, and downy mildew control. Complete failures aren't a question of if, but when. Resistance is starting to be an issue in the FRAC 7 group (Endura, along with the boscalid component of Pristine), particularly for botrytis control in grape and strawberry. Tank-mixes or tight rotations are the best ways to minimize the risk of this occurring, using mancozeb and captan to knock down any fungicide resistant isolates that may have evolved.

There are a lot of new fungicides registered that growers should consider, but buyer beware! Over a decade ago, the US Environmental Protection Agency (EPA) no longer required efficacy data. This makes it challenging not just for growers, but for those of us putting together the Midwest Fruit Pest Management Guide. Fruit pathologists from New York/New Jersey, south to Georgia and throughout the Midwest have trialed these products and published their findings. These results determined what was and was not included in the Midwest Fruit Pest Management Guide, and efficacy results were standardized for comparison to help growers make informed decisions about what product should work best for them. Among new fungicides to consider are Aprovia, Kenja, Miravis (FRAC 7); Aprovia Top (grapes) and Miravis Duo (FRAC 7+3); Evito (FRAC 11) for berries; Gatten for powdery mildew on many fruit crops (FRAC U13).

Keep in mind that there are still supply chain issues, although not as bad as last year. Limited availability coupled with higher prices are becoming the norm for many tank mix partners (captan, mancozeb, and some formulation of

phosphorous acid). Rotation and tank-mixes are the best strategy to manage not only disease problems but also fungicide resistance.

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## Updates on new monitoring tools for fruit insects

(Elizabeth Yim Long, long132@purdue.edu)

It's that time of year to make sure you have all your fruit insect monitoring tools on hand and ready to place out in the orchard. Whether you're already experienced, or just learning how to use insect monitoring tools, they can be big a help in detecting the presence and activity of important pest insects during the production season. This is due in large part to the use of key attractants (smells, colors, and even shapes) in monitoring traps, which the pests simply cannot resist. When they arrive to check things out, they are captured and remain in the trap for you to spot! By tracking the number and seasonal trends of pests in monitoring traps, you can make an informed decision about the need to take action to protect your crop!

Many readers in our region likely use monitoring traps for pest insects such as codling moth, Oriental fruit moth and plum curculio (which are all tree fruit pests), as well as small fruit (berry) pests like spotted-wing drosophila. Although there several other insect pests that some of you monitor and manage based on specific fruit crops you grow, I wanted to bring your attention to the availability of new monitoring tools available for two of the more common pests I mentioned above: 1) codling moth (*Cydia pomonella*), and 2) spotted-wing drosophila (*Drosophila suzukii*).

Let's start with codling moth, since you'll want to be ready to start monitoring the adult moths soon! Several new Trécé brand lures are available for use with monitoring traps, and the key differences you'll find with these particular

lures are their longevity and the addition of chemical odors besides the pheromone, either to enhance attraction or for use as a complement to mating disruption. The new Trécé codling moth lures have a field life of 12 weeks, which is much longer than other lures, which last for 4-6 weeks in the field. Additionally, the new lures look a bit different from the gray or orange rubber septa you may be used to seeing – instead they are small black squares made from PVC. Finally, although these new lures have a longer field life, they are a bit more expensive: a single, basic pheromone lure will cost \$5-\$6, depending on the quantity you purchase, while the standard rubber septum lures that last 4-6 weeks cost just under \$2 each.



Example of new PVC codling moth lure.

Shifting to small fruit, the new monitoring trap for spotted-wing drosophila (SWD) is quite different – it's a red sticky card, used in tandem with a lure that lasts for 4-6 weeks! For those who are familiar with this pest and our efforts to monitor it in Indiana blueberry orchards over the last several years, we've monitored the adult flies using a large peanut butter jar-style trap that has liquid in the bottom and a lure hanging from the lid inside. The flies are attracted to the lure and enter through small holes in the container, where

they eventually fall into the liquid and drown. These traps work well, and the containers can be reused for years with care, but you must collect the liquid and sort through it to identify SWD adults, which does entail a bit of handling time. The new traps eliminate the need for drowning solution to trap the flies; instead, SWD flies will stick to the card when they land and that's where you can spot the male flies, by using a magnifying glass or hand lens to look for the diagnostic spots on the tips of the wings. *Just be sure to keep your hair away from the sticky trap!* The cost of the new SWD sticky-card traps is less than the jar-style trap, but keep in mind that the sticky cards must be replaced more often, so the final cost will depend on your use of the materials. The lures are within \$1 of each other in terms of cost, but some last 4 weeks, while others last 4-6 weeks. We will be evaluating these new monitoring traps this season and will compare them to the standard jar-style trap to see if we find any differences in date of first detection and total number captured over the season. Stay tuned for updates on what we learn! You can find these products and more details about prices at [Great Lakes IPM](#).

Last but not least, thank you to all who responded to my survey with fruit insect topics you'd like to learn more about! You have been heard and I will highlight pests, like plum curculio, in future articles! If you didn't have a chance to access the survey, you can still email suggested topics to me at [eylong@purdue.edu](mailto:eylong@purdue.edu).



Sticky card adhesive trap  
for spotted-wing  
drosophila.

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## Strawberry Chat Podcast — Strawberry Weed Management

(Wenjing Guan, [guan40@purdue.edu](mailto:guan40@purdue.edu)) & (Miranda Purcell, [mrpurcel@purdue.edu](mailto:mrpurcel@purdue.edu))

We will discuss weed management in the next Strawberry Chat. It will be held 8:30-9:30 am April 14 (Friday). Please note the time is different from previous events.

Our special guests are Kevin Schooley and Steve Meyers.

Kevin serves as the executive director of the North American Strawberry Growers Association. Kevin was also the general manager of the Berry Growers of Ontario for many years. He has tremendous practical knowledge of strawberry production. Steve is Purdue's weed scientist in specialty crop production. Steve is working with strawberry production in Indiana. We are excited to have Steve and Kevin join our program to discuss weed management.

If you are interested in participating the event live, please register at

<https://purdue-edu.zoom.us/meeting/register/tjUocOCpQd4tG9K8IGtX4yEv6PEsF5OIT2JL>

You will receive the Zoom link after registration.

If you have questions before the program, please send them to me, and we will include them in the discussion.

We will turn the discussion into a podcast and post it on the [Strawberry Chat Podcast site](#).

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## Pollination – a refresher

(Peter M Hirst, [hirst@purdue.edu](mailto:hirst@purdue.edu), (765) 494-1323)

Once flowers open in the spring, we're hoping for warmer weather so the bees will transfer pollen and for rapid pollen tube growth.

As we all know, apples require cross pollination, so for example Golden Delicious pollen will not fertilize Golden Delicious flowers. We rely on bees and other insects to transfer pollen from one apple variety to another. Most apples will successfully pollinate most other varieties, with the exception of triploid varieties such as Jonagold and Winesap. Once the pollen is transferred to the stigmatic surface of a flower, the pollen needs to be recognized and then grow down the style to fertilize the ovule resulting in a seed and fruit set. Generally, without seeds, apple fruits will not develop adequately. The problem here is that the ovule is only receptive for a few days so rapid pollen tube growth down the style is necessary. And this all depends on the temperature. When it's 50-60 F, pollen tube growth is slow, and pollen tubes hardly grow at all when it's cooler than 50F. Above 60 F and pollen tube growth is much quicker and fruit set is much more likely. So when we have open flowers, we're hoping for days above 60, and preferably in the 70s. Cooler weather in the forecast for next week is not favorable for good pollination. Let's hope it turns out to be warmer than the forecast is predicting.



# Chemical thinning

*(Peter M Hirst, hirst@purdue.edu, (765) 494-1323)*

We're getting close to the time when growers need to make chemical thinning decisions – for many the most perplexing and risky decision they will make all year. This is usually a tricky call to make. Remember that only about 5-10% fruit set is usually enough for a full crop. In other words, 90 out of 100 flowers can drop from the tree, and we would still have too many developing fruitlets and would need to thin.

When apple crops approach petal fall, it's time to start chemical thinning.

The effectiveness of a chemical thinner application depends on many factors, and to hit it just right takes as much art as science (not to mention luck). That's a fancy way of saying that we don't really understand why different orchards respond differently to a given thinner application. But we know they do. That's why it's impossible to develop a recipe approach to thinning. So let me explain a little about how thinners work, then discuss some specific strategies.

From the time of bloom and for the next month or so, there are thousands of flowers and developing fruitlets on the tree, struggling to get enough resources to grow. On a semi-dwarf tree, there can easily be 5000 flowers (yes, we've counted!). By resources I mean food in the form of carbohydrates. These carbohydrates come from stored sources in the tree but especially from leaves taking light energy and converting it to carbohydrates through the photosynthetic process. At this time of year, leaf area for photosynthesis is limited, so there's a shortage in the supply side for carbohydrates. Because the demand exceeds the supply, fruitlets compete for carbohydrates and the strong survive. The weak flowers or fruitlets lose out and drop off, which we call fruit drop or June drop. The thinners we

commonly use in Indiana exacerbate this shortage, so that even more fruitlets drop off. Some, like NAA, reduce photosynthesis so there is less carbohydrate supply. Others (such as Sevin) decrease the flow of carbohydrates from leaves to fruitlets, thereby also decreasing the supply. The Maxcell-type thinners increase respiration, burning up more carbohydrates so less is left over for developing fruitlets. So in these 3 different ways, thinners increase the shortfall of carbohydrates resulting in increased fruit drop. Keeping this in mind allows growers to predict the response to thinners from year to year. For example, a lot of cloudy weather soon after bloom means less light for photosynthesis, less carbohydrate and increased fruit drop. In that situation growers may want to back off a little with their thinner rates. Thinners work best when the weather is warmer. The optimal temperature is around 70°F and below 60 you may as well not bother – most thinners are not going to have much effect when it's that cool. When the temperature is 80°F or above, be careful – thinners can have very strong effects at those temperatures. Dr. Jim Schupp at Penn. State University knows more about thinning than anyone I know. Jim says **“There is no “safe” thinner at high temperatures”**. Tread carefully.

It turns out that some of our most biennial varieties (Fuji, Golden Delicious) are also some of the more difficult to thin. So not only is thinning more difficult, the consequences of inadequate thinning are greater. Keep in mind your own experience on your orchard, but with Fuji you might want to start with a full rate of Maxcell soon after petal fall. Wait a full 2 weeks to see the response to the thinner application before applying more thinners. If another application is needed, I'd suggest **ONE** of the following, depending on how aggressive you want to be. In order from conservative to most aggressive, I'd

suggest:

Maxcell again

Sevin

Maxcell + sevin

Maxcell + ethrel

Maxcell + oil

Keep in mind these are general thoughts based on my experience and published research, but things work a little differently on different farms, so mix these thoughts with your own experience to come up with a plan. Most products do not thin Fuji enough. I'd put NAA/NAD, carbaryl and ethephon in this category. I'd stay away from NAA and NAD because of the tendency to form pygmies. Starting at petal fall gives you some time for a follow up application 2 weeks later if necessary and spreads the risk. This is often referred to as "The Nibble Approach". The single application approach is putting all your eggs in one basket and too risky for many growers.

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## Purdue Fruit and Vegetable Field Day – July 20, 2023

(Lori K Jolly-Brown, [ljollybr@purdue.edu](mailto:ljollybr@purdue.edu))

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.

More information about the upcoming field day will be available in May 2023.

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



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## Small Farm Education Field

# Day – July 27, 2023

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

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

## Save the date for the next field day – 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/](http://www.purdue.edu/hla/sites/studentfarm/events/) or contact [Lori Jolly-Brown](#) or [Petrus Langenhoven](#).



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