PURDUE UNIVERSITY

FACTS FOR FANCY FRUIT

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A Newsletter for Commercial and Advanced Amateur fruit growers.

In This Issue

Indiana is entirely free of drought (Climate & Weather)

(Beth Hall, hall556@purdue.edu)

There is some very exciting news this week for Indiana with respect to the U.S. Drought Monitor. For the first time since April 25, 2023, the entire state is void of any Abnormally Dry (D0) or Drought (D1-D4) conditions. I would include the map but … drumroll, please … there's nothing to show! This is incredible! Soil moistures are near or above normal; streamflow is mostly near or above normal, and groundwater levels are indicating a rising trend. Certainly, flood warnings are still occurring and there are some areas that could use a break from all this rain. However, this is an ideal time of year to try and replenish all moisture deficits Indiana can, since this is the rainier time of year and soon temperatures will increase causing rates of evapotranspiration to climb.

Modified growing degree day (MGDD) accumulations have slowed a bit in northern Indiana but are greater than normal for the southern half of the state (Figures 1 and 2). While recent conditions have felt cooler, climate outlooks for the next two weeks are strongly favoring above-normal temperatures. This will likely cause a rapid increase in MGDDs as well as soil temperatures. Precipitation outlooks are slightly favoring below-normal amounts for the May 1-5, with more near-normal conditions through May 8th.

The 7-day precipitation forecast is highlighting a very strong precipitation event to the west of Indiana (Figure 3) mostly occurring over this coming weekend and into early next week. Forecast models have stayed relatively consistent with this location, but certainly keep an eye on the forecasts in case this system decides to shift slightly to the east.

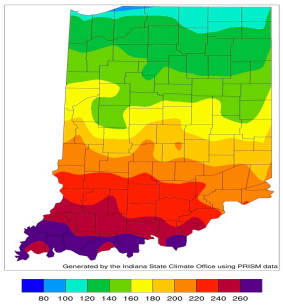

Figure 1. Modified growing degree day (50°F / 86°F) accumulation from April 1-25, 2024.

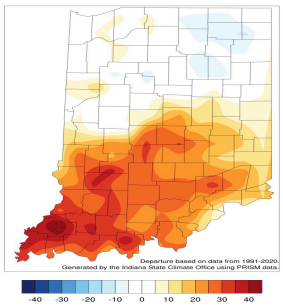

Figure 2. Modified growing degree day (50°F / 86°F) accumulation from April 1-August 25, 2024, represented as the departure from the 1991-2020 climatological average.

Figure 3. Seven-day total precipitation forecasted for the period from April 26 through May 3, 2024.

How to setup monitoring traps for tree fruit insect pests, like codling moth

(Elizabeth Yim Long, long132@purdue.edu)

Each spring, I know some of you may be using insect-pest monitoring traps for the first time, whether it's in your orchard or backyard! It's exciting to have these tools – they do the work for you, luring insects into a single location so you don't have to guess when pests might appear. Moreover, you can use trap counts to inform your decision to take action at the best time to protect your fruits. With all this said, it can a little stressful, or even overwhelming, to setup these traps if you haven't used them before or don't have someone close by to ask. So, in this article, I will share some tips for when and where to place insect monitoring traps, and I'll use codling moth as an example, since it's a key tree fruit pest that can be detected easily and reliably with pheromone-baited traps!

Figure 1. Codling moth caterpillar in an apple. Photo credit: John Obermeyer

Codling moth, also known as the classic "worm in the apple" is an important apple pest to manage. The caterpillars (Figure 1) are the actual damaging life stage, burrowing into apples to feed and destroying the fruit in the process. However, the caterpillars won't appear until later in the growing season, so management efforts are focused on the adult moths (Figure 2). By using monitoring traps to track adult activity, you can use degree-day models to estimate when they will begin laying eggs on the fruit, which can inform when you should spray to stop those very hungry caterpillars before they damage the fruit.

Figure 2. Adult codling moth (~1/2 inch long) captured on a sticky trap panel. Photo credit: John Obermeyer.

There are several kinds of monitoring traps for

the codling moth, but the key differences are cost and use of a sticky panel versus a closed container to capture adult moths. What's in common among these traps however, is the use of a pheromone lure, which draws male moths into the trap by mimicking the smell of a female moth. The pheromone lure is placed inside the trap, near or above the sticky panel or closed container, and male moths fly into the trap, thinking they will find a female. It's amazing technology! If you've never used these traps before, here's the key steps you need to know and follow to use them correctly:

1. **Where can you buy your monitoring supplies?** There are several online vendors, but Great Lakes IPM is my go-to shop. You can order a few pheromone lures, or get a discount if you are buying in bulk. For the codling moth, you can purchase ready-to-use monitoring kits that typically include a tent-style trap with sticky panel, or a bucket trap, which is reusable and may capture fewer non-target insects. Be sure to wear disposable gloves when you handle pheromone lures and don't use different lures in the same insect trap (i.e., don't place lures for different insects in the same trap, and if you've used a trap to monitor codling moth, only use it for codling moth moving forward in the future).
2. **When and Where to place your monitoring traps?** Place your monitoring traps shortly before bloom so you can detect the earliest flight of male moths. At the research orchard here, we typically place traps mid to late April and monitor through August. To get the best capture, codling moth traps should be hung in the top-third of the tree and towards the edge of the canopy. This allows easy access for moths to enter the trap and allows the wind to move through the trap and carry the smell of the pheromone lure throughout the area, so male moths can detect it! Place traps within blocks of apple trees, rather than hanging them on trees located on the edge. In a backyard setting, you may only need a single trap, while in orchards you will probably want two traps per block of trees, with traps spaced at least 25 feet apart. In blocks of 5 acres or less, two traps (spaced as described above) is typically sufficient to detect codling moth activity.
3. **How often should you check your monitoring trap?** Once you place pheromone traps for codling moth, you will get the most helpful information from them if you check them daily, until you begin to see sustained (regular) capture of moths in the trap. So for example, you may check the trap daily and record many zeros, but then capture 1 moth here, 3 moths there…up until you capture many more, like 10 or 15 "all of a sudden," on the same day (numbers are an example here, based on monitoring two traps in our Lafayette, IN research orchard). At this point, you have established biofix, which is key for those who are using degree-day models to estimate codling moth activity. Now you can begin checking traps twice a week rather than daily. Don't forget to place new pheromone lures in the trap according to the manufacturer's instructions – many lures are good for 1 month or so.

Last, but not least: be sure that you have correctly identified the insect in the trap! There are many similar-looking moths out there, and other kinds of insects that may end up in the trap accidently. After all your efforts monitoring codling moth, you want to be sure you've got the right pest so you can be confident that the management strategy you're applying is

effective against it! You can send pictures or insect specimens to us at the Purdue Plant and Pest Diagnostic Laboratory for confirmation.

I hope this is a helpful overview for how, when, and where to monitor codling moth! If you have other questions, don't hesitate to reach out to your local county extension office or me by email (long132@purdue.edu).

Insect Spotlight: Lacewing (Chrysoperla carnea)

(Cristhian Ochoa, cochoaro@purdue.edu) & *(Laura Ingwell, lingwell@purdue.edu)*

Lacewings are a group of insects commonly found in Indiana and throughout the world. There are several species, but the most common that you will see in Indiana include the green lacewing and the brown lacewing. They belong to a unique order of insects, Neuroptera, and are commonly referred to as aphid lions. The life cycle of lacewings consists of four stages. First is the egg stage; they are oval shaped with a pale green color and are deposited atop a silk stalk (Fig. 1). This is to protect them from predators and eating one another when they hatch! The larvae emerge around five days after the egg is laid. The larvae are recognizable by their grey to brown long segmented body and large pincer-like mouthparts (Fig. 2). The larval stage lasts two-three weeks, during which time they look the same but get progressively larger. The larvae then form a silken cocoon in which they stay for 10-14 days while resting and transforming into an adult. The adults are easily recognizable by their big lacey wings (transparent or brown), long antennae, and 12-20 mm long soft body (Fig. 3)

Figure 1: Lacewing eggs deposited on silk stalk (Photo by S. Willden).

Figure 2: Lacewings larval stage (Photo by Cristhian Ochoa).

Figure 3: Lacewing adult specimen (Photo by John Obermeyer).

Lacewings play an important role in our agricultural ecosystems. While the adults mainly feed on pollen or nectar, the larval stages are voracious predators that use their long mouthparts to capture and feed on small soft-bodied insects (Fig. 4). It is this trait, and our ability to rear them, that has made lacewings a viable augmentative biological control option. We often use lacewing larvae for aphid management, as they have the capacity to eat around 200-400 aphids in their larval stage. Lacewings are also effective at controlling mealybugs, leafhoppers, spider mites and other pests (Fig. 5).

Figure 4: Lacewing larva eating an aphid (Photo by Cristhian Ochoa).

Figure 5: Lacewing larva eating western been cutworm eggs (Photo by John Obermeyer).

You can find lacewings naturally in early spring and they will disperse and breed throughout the summer. In winter they prefer to stay as cocoons or in some cases as adults, so you might not be able to see any lacewing larvae in your overwintering crops. However, recent studies have shown that lacewings are an effective aphid predator for winter season crops in high tunnels, making them a viable option to purchase and augment in these systems.

Naturally occurring lacewings can be attracted to crops by providing floral resources that will recruit adults, who will then lay eggs near prey populations. Lacewings can also be purchased and released in a crop for augmentative pest management. They can be purchased as eggs, larvae or adults, but to choose one, you will have to consider the purpose of your application. Eggs are easy to disperse but they take some time to hatch which makes them the best choice for preventive applications. On the other hand, purchasing larvae is a better option for immediate pest suppression but it is more expensive, and you would have to apply them upon receipt because the larvae eat each other. Purchasing them as adults would take longer to have a predation response, you would have to wait for them until they start laying eggs and those eggs hatch, adults are not predators so their only advantage is that they can disperse by themselves because of their flying behavior.

Fire Blight

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

Fire blight, caused by the bacterium *Erwinia amylovora*, is a devastating disease of apples and pears. Epidemics of the disease develop quickly, particularly in a climate of warm, wet weather, with hail events. The type of management program developed by each orchard will vary considerably based upon a variety of orchard factors, including apple variety, rootstock, age of planting, and weather conditions.

At this point in the season, most of us have passed through the blossom blight period, but I haven’t heard of any reports of fire blight. Early spring weather conditions were not entirely conducive to blight infection due to the cool, dry weather, but some areas with warm, wet weather should be extra vigilant!

Often times, the first symptoms of infection are **shoot blight**. Shoot blight usually develops in late spring or early summer when the bacteria move from infected flower spurs into the tree. Soon, this new growth on the infected branch begins to wilt. Shoot blight can develop rapidly under favorable conditions; as young shoots wilt and die, bacterial ooze may be visible. Blighted shoots will often form the characteristic “shepard’s crook” at their tip (Fig. 1). When infection is severe, the appearance of blighted

shoots gives the impression that the tree (particularly pear—Fig. 2) has been scorched by fire, hence the name fire blight. **Canker blight** forms when the bacteria causing shoot blight spread from the new green tissue of the shoot into the woody tissue of the tree (Fig. 3). The cankers appear sunken and dark and, when the outer bark is cut away the underlying tissue may appear water soaked. Preventing the development these cankers is important, as these are the main areas where the bacteria overwinter. These cankers are always associated with shoots that were killed last year.

Regular scouting is essential for effective fire blight management. Many popular varieties (Gala, Silken, Evercrisp, Ambrosia, Fuji, Braeburn; the list is here!) are very susceptible to fire blight. The question remains as to whether you should prune immediately after blossom infection or wait until the trees are dormant. Previously, management recommendations were to prune out infections as soon as they were observed. One group in Israel tested this on pears (Shtienberg, D. et al. 2003. "New considerations for pruning in management of fire blight in pears." Plant Dis. 87:1083-1088.), and the results of these tests show that other factors profoundly affect the success of pruning and its contribution to tree health. They found that how the plant is growing (i.e., health and vigor) and when the growth is occurring [called the phenological status of the host (i.e., bloom, pink, petal fall, etc.)] are factors that affect success in fire blight pruning management. Because of these factors, there are situations in which pruning can be expected to improve tree health, but there are also cases in which pruning would make no difference, as the disease would not endanger the host plants if left untouched. Furthermore, it was found that sometimes it was preferable not to cut at all, because pruning affected tree health negatively. So, the question still remains: To cut, or not to cut? And if so, when to cut?

These researchers found that when pruning was carried out as recommended to growers (that is, using disinfected tools and making the cuts in a healthy area approximately 12" below the site of infection), **pruning did not result in successful eradication of the pathogen** (Fig. 4). Period. This could be due to several reasons, including that the fire blight bacteria infected tissues beyond the sites of visible symptoms, and even beyond the cuts into "healthy" appearing tissue 12" away. The fact that the bacteria spread beyond the 12" pruning cut is not too surprising and may explain why pruning did not successfully eradicate the pathogen from treated trees. It is also possible that even though the pruning tools were disinfected with bleach between cuts, not all of the bacteria were killed and colonized the cut stubs. Finally, it is possible that the bacteria invaded the host tissues directly through the new wounds created during pruning the ugly stub in the first place!

Regardless of what happened, the fact remains that pruning out fire blight was not successful in eradicating the bacteria from most treated trees. These researchers found that the effectiveness of cutting and removing infected branches and limbs was directly related to time of treatment: That is, pruning worked best the later in the season it was performed, and the best results were obtained when pruning was carried out while the trees were dormant. None of these dormant-pruned trees had a severely infected canopy the following spring.

Obviously, postponing the cutting of fire blight–infected tissues to winter may create two problems. First, the bacteria may continue to progress in the infected tissues and result in greater damage; ad second, the problem caused by delayed cutting is that infected tissues may serve as an active source of inoculum that could

endanger the entire orchard. What needs to be remembered is that the blossoms are most susceptible to the bacteria; assuming that there are no rat-tail or autumn blossoms, and in the absence of a hail event, the probability of secondary infections in orchards is minimal. Where off-season blossoms are apparent, special care should be taken to prevent their infection.

Using this current information, growers need to distinguish between situations in which the disease is detected on blossom clusters, succulent shoots, or lateral branches, versus first detected on main branches and limbs. In the first situation, growers are advised to make a distinction between spring and autumn infections. In the spring, recommendations are not to touch trees with limited growth vigor. On these trees, fire blight infections are likely to be restricted to the spurs and not to invade the main branches of the trees. Cutting these infections off, if it did not successfully eradicate the bacteria from the trees, could make the situation worse. If trees with vigorous growth are infected, growers need to differentiate between those bearing few and those bearing numerous infections. With limited infections, growers should eradicate the infections by cutting back to a healthy section of the plant, about 20-25" from the site of visual symptoms. If numerous infections are observed on vigorous trees, the experience from this study suggests that the eradication efforts will likely be unsuccessful and may even make situation worse. Thus, to minimize unsuccessful pruning efforts, growers should postpone the pruning until winter. In these cases, the infections limbs and branches should be marked with colored paint so growers know what to prune in the late winter when the plants are dormant.

Trees that repeatedly show symptoms of fire blight (more than three years in a row) should probably be removed and burned. I say this for three reasons: First, continuous pruning of the same infected trees year after year is not sustainable; Second, the repeating infection indicates that the tree is systemically infected, and third, this tree now serves as a reservoir for additional infections. In this scenario, you are best advised to literally "cut your losses" and prune at ground level.

Finally, unless you are still at bloom, streptomycin use is not recommended. Its efficacy (along with the plant growth regulator, Apogee) is restricted to use at bloom, followed up once or twice through petal fall. No antibiotic is recommended for trauma blight. In Indiana, where there are no reports of streptomycin resistant fire blight bacteria, there is no need to use any other antibiotic.

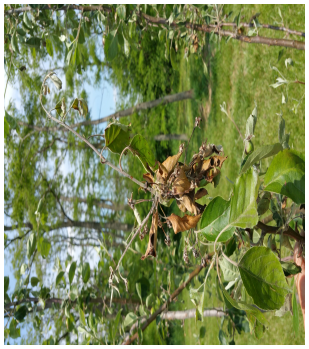

Figure 1. The characteristic shepherd's crook in fire blight. Photo by Janna Beckerman.

Figure 2. Fire blight gets its name from the blackened shoots on pear. Photo by Janna Beckerman.

Figure 3. Fire blight causing a canker, and oozing. Photo by George Sundin.

Figure 4. Pruning failed to eliminate fire blight—instead, it made it worse. Photo by Gene Matzat.

Strawberry Chat with Dr. Marvin Pritts

(Wenjing Guan, guan40@purdue.edu)

Dear Strawberry Chat Listeners,

We will talk with Dr. Marvin Pritts on Wednesday, May 1st, 12:00-1:00 pm EST. Dr. Pritts is a professor in the horticulture department at Cornell and a very well-known expert in the strawberry industry. Many of you may have heard and read the book *Strawberry Production Guide for the Northeast, Midwest, and Eastern Canada.* The 2nd edition of this book was published late last year. Dr. Pritts is one of the main authors of this production guide. We will hear from him about this new edition, as well as his long-term experience in strawberry production in the northeast.

If you are interested in participating the Strawberry Chat live, please register at https://purdue-edu.zoom.us/meeting/register/tJcod-2hrzsqH9DPgTzfUIdWU_2QQ-EdeM1S

The previously recorded Strawberry Chat Podcast is on this link https://podcasters.spotify.com/pod/show/strawberrychat

Strawberry Disease Management Considerations at Blooming and Fruiting

(Wenjing Guan, guan40@purdue.edu)

In addition to frost protection, disease management is pivotal during the blooming stage, particularly concerning gray mold (caused by *Botrytis* spp.) and Anthracnose. To protect the fruit, fungicide application should commence at or even before blooming. The pressure of both diseases is heavily influenced by weather conditions, with Botrytis favoring wet and cool climates and Anthracnose thriving in wet and warm conditions. While Botrytis is widespread, plasticulture generally experiences lower Botrytis pressure compared to matted row systems. Conversely, the primary source of anthracnose infection is likely from asymptomatic planting materials, and the disease could be more severe in plasticulture than in matted row systems. Dry weather during blooming and harvest stages may mitigate disease risks. However, in the event of a wet spring, timely fungicide application becomes imperative to disease management.

How often should apply fungicide? The best way to decide fungicide application frequency is through a weather-based forecasting tool. The Network for Environment and Weather Applications (NEWA) offers infection risk levels for Botrytis and Anthracnose and gives recommendations for application frequency. The system has three weather stations currently operational in Indiana—Romney, Converse, and

New Castle. Growers in nearby areas can leverage this tool to guide fungicide applications. A weather station is not yet available in southern Indiana. Please let me know if you are interested in setting up one at Southwest Purdue Agriculture Center (SWPAC). Growers may also consider investing in one for their farm.

For specific fungicide recommendations, please consult the Midwest Fruit Pest Management Guide. Dr. Janna Beckerman had fungicide recommendations for each strawberry growth stage in the production guide.

For additional information about strawberry diseases and disease management considerations during the spring, please refer to the Strawberry Chat podcast Spring Diseases and Management Episode 9. March 9, 2023

Strawberry Crop Status Update

(Wenjing Guan, guan40@purdue.edu)

This article was written on April 17.

Harvesting of high tunnel-grown strawberries has started from southern to central Indiana.

Early cultivars in open-field plasticulture are fruiting in southern Indiana, with harvest right around the corner. The crops are generally a week earlier than last year. Late cultivars, second-year patches, and fields covered with straw in the winter are slightly lagging behind.

Moving north, early cultivars grown on plasticulture have begun to bloom, while plants on matted row systems are generally behind.

For the open-field grown strawberries, growers across Indiana should remain vigilant in safeguarding the crops against frost damage. The last frosts at the end of March caused some damage in southern Indiana. Still, the flowers were generally okay if protection was applied using either row covers or overhead irrigation (Figure 1). Set fruits can tolerate lower temperatures than open blooms.

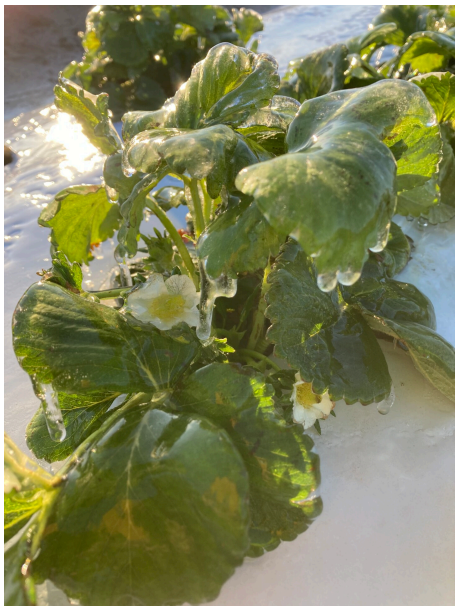

Figure 1. Frost protection using overhead irrigation. The picture was taken on the morning of Mar. 28 at Southwest Purdue Agricultural Center.

Purdue Fruit and Vegetable Field Day Registration now open

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

REGISTRATION NOW OPEN!

Register here: Purdue Fruit and Vegetable Field Day

Purdue Extension presented its second Fruit and Vegetable Field Day post-pandemic at the Throckmorton Purdue Agriculture Center's Meigs Horticulture Research Farm, located in Lafayette, on July 20th, 2023. Extension Specialists and Graduate Students presented specialty crop research to 90 attendees. Attendees had only good things to say about the event. 'It was an interesting program, I learned quite a bit." "Excellent information and material." "Excellent information and resources on new horticultural technology and techniques." "Diversity of the

tales, well explained and some topics never heard of before." "I learned new techniques and gained some new ideas for the future". As a result of the Fruit and Vegetable Field Day, 96% of survey respondents indicated (agree or strongly agree) that they learned something they didn't know before, nearly half indicated they plan to adopt practices for horticulture and the environment (41%), and a third plan to adopt practices that increased yields (36%) and conserve resources (32%). Nearly three-quarters of past field day participants (71%) indicated that they had adopted new, recommended practices for their farm or operation. When asked what new practice they had adopted, participants responded: alteration of insect control program, refrain from using pesticides in high tunnels, and new ideas of types of trees to plant. All of the participants (100%) reported that they had experienced financial improvements because of adopting new, recommended practices from information presented at past field days.

Below are some of the production topics presented at the field day. We expect to have a similar lineup for the 2024 field day.

- Black Soldier fly composting and specialty crop production
- Collard insect management trial
- High tunnel diversification and biological control
- Plasticulture strawberry research
- Silage tarps for weed management in potatoes
- Soil health and pepper yield
- Sweet corn pest management
- Unmanned aerial vehicle demonstration
- Watermelon weed management

We are happy to announce that Purdue Extension is presenting its annual Fruit and Vegetable Field Day on July 18, 2024, 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)

REGISTRATION NOW OPEN!

Attendees, exhibitors, and sponsors register here: Purdue Small Farm Education Field Day

July 25, 2024

The 2023 Purdue Small Farm Education Field Day was held at the Purdue Student Farm in West Lafayette, Indiana. With 105 participants registered, the in-person event featured an array of on-farm demonstrations and was a resounding success.

Nearly 84% of attendees reported that they learned something they didn't know before. A third (34%) indicated they plan to adopt recommended practices for diversified farming systems, and a quarter (24%) plan to adopt recommended practices for creating, improving, or strengthening their business. Nearly half (45%) indicated they plan to adopt practices for horticulture and the environment or practices that will increase efficiency (42%). Over a third

plan to adopt practices/technologies for the conservation of resources (37%). Nearly half (46%) of past field day attendees indicated that they had adopted new, recommended practices for their farm or operation. When asked what new practice they had adopted, participants responded:

- Alternate BT and Spinosad on brassicas.
- Pest scouting.
- Applied BT for brassica caterpillar complex control.
- Integrated pest management

Over three-quarters (80%) of participants reported that they had experienced financial improvements because of adopting new, recommended practices from the information presented at past field days.

Attendees commented ……

- "I recommend this event to any beginner small-scale producer.
- I brought my sons and my father to this event. It was a family education day for sure, and each one of us learned several things we didn't know. Please continue to offer these events. It's very helpful!
- Good information and a fun, interesting presentation
- I like the wide variety of topics, and I think that so much could be covered in such a short amount of time.
- Lots of helpful information covering a wide variety of topics.
- Always learn, gain knowledge, and learn from questions others ask. When I get home, I can read the literature provided and share it with family in Virginia who farm.
- Very informative and builds on previous research.
- Everyone should learn about these topics.
- It was a good way to be exposed to a variety of horticultural crops.
- I am just beginning to develop my vegetable garden. The information given at the Field Day program was very useful, and I am confident I will create a beautiful garden space with plants that will give me a great yield. Also, I appreciate learning what insects I should keep an eye on."

The event featured an array of "demonstration stations" on the farm where participants learned about a variety of topics:

- High Tunnel Pepper Production and Variety Selection
- High Tunnel Table Grape Production
- Silage Tarps and Their Potential Uses on Small Farms
- Growing Grains on the Small Farm – Dry Edible Bean Variety Trial
- Predator-Prey Dynamics in High Tunnel Crop Production
- Biorational Pesticide Efficacy for Controlling Caterpillars and Flea Beetles in Crucifer Crop Production
- Black Soldier Fly Composting and Specialty Crop Production
- Raised Garden Beds for Vegetable Production
- Postharvest Food Safety Demonstration
- Choosing Fertilizer Injectors for Drip Irrigation for Small Plots

Educational topics for the 2024 field day will be available in May. To learn more about the field day, visit our webpage at www.purdue.edu/hla/sites/studentfarm/events/ or contact Lori Jolly-Brown or Petrus Langenhoven.

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