In This Issue

From the Editor's Desk

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

Welcome to the Vegetable Crops Hotline (VCH), Purdue Extension's exclusive newsletter for people in the business of growing vegetables.

This issue features articles on planning for fall and winter production in high tunnels, spotlight articles on flea beetles and Palmer amaranth, a new Spartan® label, and suggestions for vegetable disease management. We also examine the weather and get updates on auction prices from the Clearspring Produce Auction.

Timeless Articles

This issue features three articles.

Foliar Diseases of Tomato in Greenhouses. Issue 704, 719. https://vegcropshotline.org/article/foliar-diseases-of-tomato-in-greenhouses/

The Purdue Plant and Pest Diagnostic Lab – Ready to Serve You. Issue 704. https://vegcropshotline.org/article/the-purdue-plant-and-pest-diagnostic-lab-ready-to-serve-you-2/

Beware of Cutworms in Young Veggie Crops! Issue 674. https://vegcropshotline.org/article/beware-of-cutworms-in-young-veggie-crops/

Website Links

Frequently, we include links to websites or publications available online. If you can't access these resources, don't hesitate to contact your local Extension office or us to request a hard copy of the information.

Midwest Vegetable Production Guide

The Midwest Vegetable Production Guide is now available for growers to visit online at **mwveguide.org**. You can also download a free copy of the guide from your computer at **mwveguide.org/guide**. You may also purchase a hard copy for $12 from Stephen Meyers, slmeyers@purdue.edu.

Do not hesitate to contact me at plangenh@purdue.edu if you have any questions or suggestions for improving the newsletter. Let me know if there are specific topics you would like to see more of in the newsletter. Also, let us know if things are not working for you. We want to improve the newsletter, and your input is valuable.

We hope you enjoy the newsletter. Happy reading!

Planning for Fall and Winter Production in High Tunnels

(Liz Maynard, emaynard@purdue.edu, (219) 548-3674)

When we surveyed Indiana high tunnel producers eight years ago, about two-thirds of the operations grew cool season crops for harvest from November to March. Although spring field planting season is just underway, it is not too early to plan for markets and organize a production schedule for fall. This article summarizes common crops and their planting periods and is written for those new to winter production.

Baby-leaf greens for use in salads or cooked dishes are widely grown in high tunnels. Examples include mizuna, mustards, Swiss chard, tatsoi, kale, bok choi, and lettuce. They are commonly direct seeded in dense plantings (Figure 1). Direct seed in the tunnel from mid-September through early November. For early plantings, the first harvest is in about 3 or 4 weeks. Harvest by cutting an inch or two above the soil using shears or a greens harvester. Crops with a rosette growth habit will have the growing point below the point of cutting and will regrow to be harvested a second, third, or possibly more times. The time to regrow will depend on the environmental conditions: faster with warmer

temperatures. The different kinds can be planted in separate areas, and mixed together after harvesting if the product is mixed baby greens. Some growers may prefer to plant crops mixed together, and just harvest the mix. The drawback of this method is that different kinds and varieties of greens often grow at different speeds, and so the mix might not have the desired proportion and size of the different types of leaves.

Figure 1. Mustards were direct-seeded on September 29, and the photo was taken on October 28. Left to right, varieties Green Wave, Golden Frills, Giant Red, and Ruby Streaks (Photo by E. Maynard).

Spinach could also be classified as a baby-leaf green, although sometimes larger, older leaves are harvested. It may be direct seeded or transplanted, usually late August to early November (Figure 2). Very high soil temperature inhibits spinach germination so some prefer to transplant the earliest seeding rather than direct seed into hot soil. Because plants are normally spaced inches apart, the paper-pot transplanting system is especially helpful in reducing transplant labor (Figure 3). Typically, a single planting is harvested multiple times, with regrowth between harvests. Harvest can be done by clipping individual leaves (more labor intensive) or clipping above the growing point with shears or a greens harvester as for other baby-leaf crops. Entire plants can also harvested, but then there will be no regrowth. Spinach will routinely survive the winter, and harvest can continue into early spring. Earlier plantings, i.e., late August or early September, will produce more over the course of the crop than later plantings. Sometimes, multiple plantings from September to early November are planned to provide a steady supply of good quality leaves.

Figure 2. Spinach 'Gazelle' seeded October 3, photo January 2 (Photo by E. Maynard).

Figure 3. Paper pot transplanter saves labor, especially when transplanting closely-spaced seedlings (Photo by E. Maynard).

When leafy greens crops are harvested at a larger stage, for instance, full-size leaves of Swiss chard, kale, or collards, transplants are usually used to get a head start on production (Figure 4). Seed in trays about 4 weeks before transplanting into the high tunnel. Transplant kale and collards from early September to the first week of October, Swiss chard from mid-September to the first week of October, and mustard in October. A single planting of kale or collards can be harvested through the winter and into early spring. The earlier it is planted into the tunnel, the higher the yield will be. Swiss chard and mustard might not survive the winter, but earlier plantings will allow the most harvest before production is ended by extreme cold. These crops are typically harvested by removing leaves that have reached the desired size and then waiting for the next harvest

until younger leaves grow (Figure 5). The speed of leaf growth will depend to a great extent on temperature.

Figure 4. Month-old kale seedlings ready for transplanting into high tunnel (Photo by EA Bluhm).

Figure 5. Kale cv. 'Darkibor,' February 2 (Photo by E. Maynard).

Lettuce can also be grown for harvest at a larger stage after a head has developed (Figure 6). Transplants are useful to get a head start in that situation. Seed transplants about 4 weeks before transplanting. Sequential plantings can be done every one or two weeks to supply a steady harvest, with a final fall transplant date by early November. Multi-leaf lettuce types have a growth habit that makes it easy to cut just above the growing point and obtain a handful of leaves, similar to a baby-leaf harvest. With this harvest method, the multi-leaf types will regrow and can be harvested more than once. However, regrowth will depend on temperature, and some prefer not to rely on the regrowth but instead move on to another planting.

Figure 6. Multi-leaf lettuce 'Red Incised' (left) and 'Green Reef' (right), transplanted October 14, photo December 5 (Photo by E. A. Bluhm).

Root crops represent another category commonly grown in high tunnels. Multiple seedings of radishes and salad turnips from mid-September through early November should provide harvests into January (Figure 7).

Figure 7. Radishes 'Cherry Belle,' seeded September 29, photo November 11 (Photo by E. Maynard).

The suggested planting dates above are for Hardiness Zone 6a, assume a high tunnel with a single layer of plastic, no supplemental heat or light, and row covers used to protect crops when temperatures drop below 25°F. In high tunnels where supplemental heat is provided crops could probably be planted a month later in fall, but we have not collected as much information under those conditions.

Of course, this is not the complete list of crops. The publication *Scheduling Fall and Winter Vegetable Production in High Tunnels*, HO-330 (https://www.extension.purdue.edu/extmedia/HO/HO-330-W.pdf) includes additional crops, as well as more information on planting schedules in general, and suggested February and March planting dates for spring harvests.

For any crop in the fall high tunnel, it is important to recognize that the bulk of growth will occur by mid-November. After that, shorter days, lower light levels, and cooler temperatures mean that growth is very slow. Therefore, the goal is to plant so the crop is near the harvestable stage by mid-November. In order for that to happen, it makes sense to start planning now.

New Spartan® 4F Herbicide Label for Mint Growers

(Stephen Meyers, slmeyers@purdue.edu, (765) 496-6540)

Indiana mint growers have a newly registered use for a familiar herbicide. Spartan®, already labeled for use in newly planted and dormant mint, can now be applied as a post-harvest application in Indiana with a new 24(c) Special Local Needs label (Figure 1).

Figure 1. Spartan 24c label screen shot.

Here is what you need to know

-An application can only be made with ground equipment; not by air and not by chemigation (through irrigation equipment).

-A post-harvest application should be made after mint hay is removed from the field, but before the mint resprouts.

-The post-harvest use rate is 4 fl oz per acre with a total yearly limit of two applications and 12 fl oz per acre.

-If Spartan® was applied to dormant or newly planted mint, the post-harvest application must occur at least 100 days later.

-If mint will be double-cut, the post-harvest application must occur at least 55 days before the second harvest.

-Rainfall or overhead irrigation is required to “activate” the herbicide by moving it into the soil where weed seeds are actively germinating.

-The label prohibits the use of Spartan® on sands with less than 1% organic matter.

As with all agricultural practices, we recommend that you avoid farm-wide changes until you have a sense of how a post-harvest Spartan® application will work in your production system with your soils and your specific mint varieties.

Thank you to the Indiana Mint Market Development and Research Council for supporting the research used to develop this label. Thank you to FMC, the Office of the Indiana State Chemist, and the Mint Industry Research Council for their collaboration and support of this label for Indiana Mint Growers.

You can view the new label here https://oisc.purdue.edu/pesticide/special/updated_sln_label_spartan4f_in-240001.pdf or by scanning this QR code:

Figure 2. Spartan label QR code.

To learn more about the research that supported this label, visit https://ag.purdue.edu/department/hla/extension/_docs/2023-indiana-mint-weed-management-trial-report-immdc.pdf or scan this QR code:

Figure 3. Post-harvest research report QR code.

Ten Suggestions for Vegetable Disease Management

Here are 10 suggestions to help keep your vegetable crop healthy.

1. Get plant problems accurately diagnosed. Before deciding on a control measure, are you sure you know what the problem is? The optimum control of downy mildew on cucumbers, for example, requires specialized fungicides. On the other hand, no amount of fungicide will control blossom-end rot on tomatoes, which is a calcium deficiency. The Purdue Plant and Pest diagnostic lab can be contacted here. A library of vegetable disease photos can be found here.
2. Scout your fields for disease or disease-like symptoms. To determine when you need to send in samples for diagnosis, you must scout your crops. Develop a schedule, say, once a week, to scout your fields or greenhouses. In a field, use a zig-zag pattern as you cross the field (yes, it helps to get out of the pick-up!). Scout each field separately and scout varieties in the same field separately. Keep records.
3. Physically separate vegetable transplant varieties. Let’s imagine that you grow 6 tomato varieties from transplant

greenhouse to the field. If one of the varieties becomes diseased, it may quickly spread to all varieties. Therefore, physically separate the varieties so that overhead watering of the transplants in the greenhouse doesn't spread the disease from one variety to the others. For the same reason, separate the same variety if there are different seed lot numbers. The same advice holds for other vegetable crop transplants. Be sure to scout varieties separately whether as transplants or as mature plants in the field.

4. While we are discussing greenhouse transplant production, let me emphasize sanitation. If you are starting transplants from seed, purchase new trays each year or clean and sanitize the trays with bleach, quaternary ammonium, a chlorine solution, or a peroxide product. Use new soilless media each year. Avoid dumping the media on unsanitized surfaces. Clean and sanitize all tools and surfaces that the transplants may come into contact with.
5. Avoid fields with a history of disease, particularly soilborne disease. Disease organisms that survive in soil, soilborne pathogens, may survive for years in a field without a host. An example would be Fusarium wilt of watermelon. Another disease caused by an organism that may be soilborne is Phytophthora blight, which may affect many crops. In addition to avoiding fields with a history of Phytophthora blight, it is important to avoid areas of the field with poor drainage since this disease thrives in water.
6. A practice known as rogueing aims to remove diseased plants to slow the disease's spread. An article describing this practice in more detail can be found here.
7. Be smart about applying fungicides. Apply fungicides before a disease is observed, apply before a rain event, pay attention to fungicide modes of action, etc. This article describes fungicide application in much more detail.
8. Crop rotation and fall tillage are critical to vegetable disease management. This table describes many common crops and diseases and the crop rotation and tillage suggested.
9. Use resistant or partially resistant varieties when possible. Your seed company should be a good source of information about disease resistance. The table in #8 above also has information about disease resistance.
10. A good vegetable farm will be well organized. Written records are kept and ordered. Tools and equipment are accessible, arranged, and clean. Buildings are kept clean and well-ordered. Surfaces are clean if not sanitized. Think of your operation as a restaurant-one at which you would feel comfortable dining.

Cucumber Beetles Are Out In Full Force

(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)

It was timely that in last week's issue, we chose to spotlight cucumber beetles because they are on the move and hungry. Friday afternoon, I received an email from a grower reporting that his squash transplants were getting hammered (Figure 1). This weekend, I decided to take a look in my own garden, where I transplanted various cucurbits over a week ago, and sure enough, amidst all of the chickweed and purple dead nettle, my plants were holding on by a fine thread, being devoured by striped cucumber beetles. I say all this to bring them to your attention. Especially as we get close to melon planting, it is important for you to be scouting your fields and protecting young transplants so they can get a healthy start (Figures 2-3). A foliar application at planting or seedling tray drench just prior should provide that window of protection to allow young transplants to get established while we battle the hungry adult beetles that have just survived the winter and are looking for food. Consult the *Midwest Vegetable Production Guide* for the most recent recommendations. Imidacloprid products can be applied as a soil drench, and acetamiprid through foliar applications. The low-rate recommendations have provided control.

Figure 1. Striped cucumber beetles attacking squash transplant (Photo by C. Vogelwede).

Figure 2. Striped cucumber beetle feeding damage on melon transplant (Photo by John Obermeyer).

Figure 3. Adult striped cucumber beetle (Photo by John Obermeyer).

Donating Produce to Food Banks and Food Rescue Organizations in Indiana

(Sarah Hanson, sspeedy@purdue.edu) & *(Liz Maynard, emaynard@purdue.edu, (219) 548-3674)*

Many produce farmers donate food to various organizations around the area. At a time when food pantries are seeing high numbers of people coming for assistance with food insecurity, the fact that farmers can help out is wonderful. My goal is to give you more information so that donating is even easier. Let's briefly start with understanding the difference between a food bank and a food pantry. Food *banks* are usually large organizations collecting food that they will distribute to food pantries, shelters, etc. They often have the ability to store great quantities of food. Food *pantries* are the individual sites where people can go to receive boxes/bags of food. Some food banks are also open to the public. Since food banks are larger, they offer purchasing power that is passed on to pantries.

So, if families are struggling to buy food, ideally, a visit to the food pantry results in them receiving nutritious food. This is where your produce comes into the story. Your produce can be picked up by some large Indiana organizations that have cold storage and trucks. Other organizations have access to volunteers who can glean a field. Either way, it is possible for excess produce (or things that didn't meet size / cosmetic grades) to go home with people in need of healthy food. Visit Feeding America's website to find food banks near you*:* *https://www.feedingamerica.org/find-your-local-foodbank*.

We have talked with Cultivate Food Rescue in South Bend, IN, who will be getting new cooling infrastructure. **They are looking for more donors of nutritious, fresh food**. They pick up 7 days per week and prefer pallets of produce, but can handle boxes also. They offer a range of trucking options to meet your needs and do everything possible to make the process seamless and easy for the donor. It is ideal if you can provide advance notice of 1-2 weeks, but they will do everything possible to work within your schedule. Feel free to reach out to Bob Hebert with Cultivate Food Rescue at (269) 479-9553 or bobh@cultivatefoodrescue.com. For more information about Cultivate's programs, you can also check out their website at https://cultivatefoodrescue.com/.

I realize that if you are a produce farmer reading this, you might be thinking about some of the possible downsides to this. "This will take extra time (and maybe labor)". Yes, those are potential issues that you might run into. You may also worry about liability. Food donations are protected by federal law. In fact, protections were recently expanded under the Food Donation Improvement Act of 2022. The Food Law and Policy Clinic at Harvard Law School provides a summary of these limited liability protections here: https://chlpi.org/wp-content/uploads/2023/03/Emerson-Fact-Sheet.pdf Additionally, the federal government recognizes the importance of food donation and provides tax incentives to encourage businesses to donate food. With this information now in your pocket, I leave the decision to you since you know what is best for your situation.

Written by Liz Maynard and Sarah Hanson (Purdue Extension) with contributions from employees of Cultivate Food Rescue.

Insect Spotlight: Flea Beetles

(Milena Agila, magilaen@purdue.edu), *(Julia Wooby, jwooby@purdue.edu)* & *(Laura Ingwell, lingwell@purdue.edu, (765) 494-6167)*

Introduction

Flea beetles are small, often metallic, and dark-colored beetles in the family Chrysomelidae. They are given their common name due to their impressive jumping abilities, afforded by their enlarged hind legs, which serve as a near-foolproof escape from predators. Most flea beetle species are oligophagous herbivores, feeding on several related species of plants. For example, many species in the genus *Epitrix* feed exclusively on potatoes, tomatoes, eggplant, and other solanaceous crops, while those in the genera *Phyllotreta* and *Psylliodes* are specialists on plants in the family Brassicaceae. In North America, these crucifer specialists are economically significant pests of commodity crops like canola, as well as specialty crops such as cabbages, turnips, bok choy, kale, and radishes. In Indiana, there are at least nine different species of flea beetles, which you can learn more about here. The striped flea beetle, *Phyllotreta striolata* is the most common species on crucifer crops. This beetle, roughly 2mm in

size, is marked by two curved yellow stripes, sometimes appearing as four broken marks, on its shiny black elytra (hard wings that cover the abdomen; Figure 1).

Figure 1. The striped flea beetle, Phyllotreta striolata (Photo by John L. Obermeyer).

Life cycle

Flea beetles overwinter as adults, seeking refuge either in soil and leaf litter or on the surface of host plant leaves. Striped flea beetles and other crucifer feeders in the genus *Phyllotreta* will emerge in spring and often feed first on volunteer Brassicaceous weeds prior to making their way to the crop (Figure 2). Depending on the species, flea beetles lay their eggs either in the soil or on plants throughout the summer, producing 1-3 generations per year. Larvae hatch from the eggs in approximately 14 days and begin to feed on leaves or roots until entering the pupal stage. The larvae pupate in the soil before adult emergence occurs.

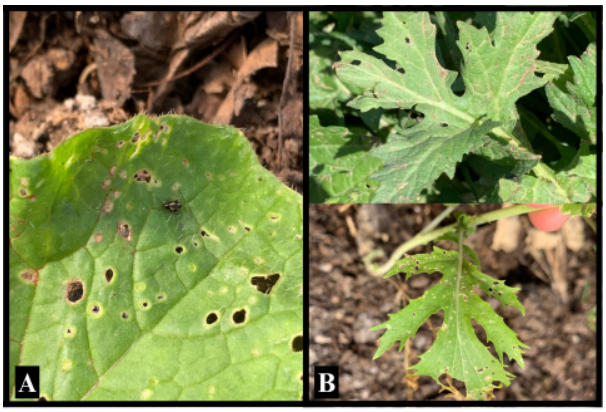

Figure 2: Striped flea beetle damage on (A) radish and (B) volunteer Brassicaceous weeds (Photo by Julia Wooby).

Damage

Flea beetles cause damage throughout their larval and adult stages, but the most significant harm typically arises during their adult phase. Varying by species, flea beetle larvae can cause damage to leaves or roots as they mine stem and leaf veins and feed on plant roots. *P. striolata* larvae are minor root pests during their underground life stage, which can cause stunted growth in severe cases, but this damage is usually insignificant compared to adult foliar feeding. Adult flea beetles are voracious feeders on host plant stems and leaves, resulting in the formation of small "shot-gun" holes (Figure 3). The consequences of flea beetle attacks can be severe, potentially leading to the death of emerging plants, stunted plant growth, and reduced crop yield or marketability. The extent of damage inflicted by flea beetles correlates directly with their population density.

Figure 3. Damage to the leaves of bok choy (Photo by Milena Agila).

Management

Flea beetles are a notoriously difficult pest to control due to their high mobility and small size. When it comes to management, preventative measures and prophylactic insecticide applications to seedlings are often more effective than trying to treat an existing population. Cultural controls play an important role in their management and include manipulating planting times to prevent damage to small transplants and using row covers or fine netting to exclude adult beetles traveling to the crop. Removing weedy areas consisting of early-season hosts for flea beetles can also decrease populations in and around susceptible crops. Flea beetle populations are easily monitored by placing yellow sticky cards at crop height and by carefully observing young brassica crops for "shotgun" damage to determine if and when insecticide applications are necessary. Thresholds vary based on the crop, namely whether the insects are causing direct damage to the marketable portion of the plant (i.e. bok choy, cabbage), or the foliage supporting fruit or root production (i.e. tomato, potato, radish, turnip) (Figure 4). There are multiple insecticides, including some certified for organic use, that are recommended for control of flea beetles. Please refer to the *Midwest Vegetable Production Guide* for the most recent recommendations. Additionally, trap cropping, the use of implementing a physical barrier of a highly attractive crop to intercept overwintering flea beetles moving into the crop fields, has been used effectively. While the trap crop alone can reduce feeding on the cash crop, combining this approach with insecticide applications to the trap crop can further reduce subsequent generations of beetles in the crop. Trap crops should be selected in consultation with the research literature, so contact your local Extension professional if

you are interested in this method. Research into biological control of flea beetles is in its early stages, but several species of commercial entomopathogenic nematodes and fungi have been identified as promising agents of population control for *Phyllotreta* flea beetles, with the former targeting the soil-dwelling larvae, while the latter can also cause mortality in adult beetles.

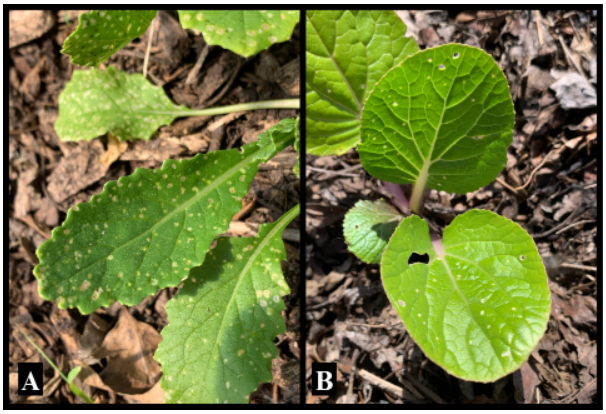

Figure 4. Damage to the leaves supporting turnip growth (A) compared to flea beetle damage on the marketable foliage of young bok choy (B) (Photo by Julia Wooby).

Weed Spotlight: Palmer Amaranth

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Common names: Palmer amaranth, Palmer pigweed, carelessweed, and dioecious amaranth.

Latin name: *Amaranthus palmeri.*

- "Amaranthus" is derived from the Greek word "amarantus" meaning "everlasting flowers". This is a reference to the showy bracts (modified floral leaves) of *Amaranthus* species that persist well after the plants have flowered and set seed.
- "palmeri" is a reference to English botanist Edward Palmer, who collected plants in North America in the late 1800s.

Family: *Amaranthaceae* – the pigweed family

Life cycle

Palmer amaranth is a summer annual weed. Although it can germinate in soils as cool as 63° F, it germinates best between 86 and 99° F and can germinate all summer long. Later emerging plants may pose less of a risk to crop yield but are still capable of producing viable seeds before a killing fall frost/freeze.

Identification

- **Seedlings:** Palmer amaranth has two long and narrow seed leaves ("cotyledons") (Figure 1). The first true leaves are "egg-shaped"- wider at the base and narrower at the tip. The leaf tips of young seedlings are notched (Figure 2). Seedling leaves are hairless.


Figure 1. A Palmer amaranth seedling with linear seed leaves and elliptic-shaped true leaves (Photo by: A. Mueth)


Figure 2. Palmer amaranth leaves with a notch at the tip (Photo by A. Mueth).

- **Mature plants** can reach 6 feet tall or more (Figure 3) and can grow several inches in a day under ideal growing conditions. The form of a mature Palmer amaranth plant can vary. At lower densities, Palmer amaranth plants will have many branches and grow wider (Figure 4). We have recorded Palmer amaranth plants nearly 5 feet wide! However, at higher densities, plants tend to be narrower and taller. Leaves are alternately attached to the stem, but when viewed from above, they appear whorled, like a poinsettia (Figure 5). Petioles ("leaf stalks") of Palmer amaranth plants are at least as long as the leaf blade and often longer (Figure 6). Leaf blades of mature plants are egg- or diamond-shaped and may have a whitish chevron-shaped watermark on the upper leaf surface. Mature plants have a thick taproot with an extensive secondary fibrous root system.

Figure 3. The second author stands next to a Palmer amaranth plant in North Carolina, circa 2007 (Photo by K.M. Jennings).

Figure 4. A Palmer amaranth plant growing in a sweet potato field (Photo S.L. Meyers).

Figure 5. Above view of alternate leaves looking like whorled (Photo by A. Mueth).

Figure 6. Palmer amaranth petioles are longer than their leaf blades (Photo by A. Mueth).

- **Reproduction:** Palmer amaranth plants are dioecious, meaning that male and female flowers appear on separate plants. The entire flowering structure (inflorescence) of female plants is prickly. However, male inflorescences are soft to the touch. Individual flowers are small and inconspicuous and are densely arranged in upright, slender, branched spikes (0.5 to 1.5 ft long) that appear at the ends of shoots (Figures 7 and 8). A single female Palmer amaranth plant can produce hundreds of thousands of glossy, reddish-brown to black, 1 mm seeds.

Figure 7. Individual flowers are arranged in upright, slender, branched terminal spikes (Photo by A. Mueth).

Figure 8. Palmer amaranth can grow to more than 6 ft tall and produce over 100,00 seeds (Photo by A. Mueth).

Integrated weed management strategy

Cultural and mechanical control

Scout and rogue*:* Although Palmer amaranth is present in Indiana, it is not uniformly distributed. In fields with no history of Palmer amaranth, scouting for them and removing them before they set seeds will be helpful to delay infestation.

Sanitation and exclusion*:* Remove soil from equipment and implements that have come from a field or location with Palmer amaranth before using them in a field or location with no history of Palmer amaranth. Consider harvesting infested fields last to limit their spread and decrease machinery cleaning time.

Inversion tillage*:* Because Palmer amaranth seeds are so small, only seeds near the soil surface can germinate and emerge. Plowing several inches deep can invert the soil and bury small weed seeds. Note, however, that yearly plowing will return buried weed seeds to the soil surface. So, it is best to limit this method to no more than once every 5 years or so.

Cultivation*:* Cultivation can be highly effective but must target small seedlings. Because Palmer amaranth can emerge all growing season, repeated cultivation is necessary if this is your chosen method of control. Ensure that implements such as rolling cultivators are operated in a manner that provides weed control as close to the crop as possible (Figure 9).

Figure 9. A rolling cultivator used between rows of sweet potato did not control emerged Palmer amaranth seedlings in the planted row (Photo by S.L. Meyers).

Crop rotation: Consider rotating to crops that are more competitive or have more registered effective herbicides, including row crops.

Cover crops: Cereal rye planted in the fall and terminated by roller-crimping the following spring can provide suppression of Palmer amaranth but usually not complete control. Fields not currently in production can be planted with cover crops to limit Palmer amaranth's ability to grow and reproduce. Summer annual cover crops include buckwheat and sorghum-sudangrass. The Midwest Cover Crops Council (MWCCC) maintains a cover crop

selection tool that can help you select the best option: MWCCC (midwestcovercrops.org)

Hand-weeding: Hand-weeding escaped Palmer amaranth plants is common. Make sure to hand-weed before the plant makes viable seeds then properly dispose of the weeds by composting or burning them. If kept on the soil, they will re-root along their stem and continue to grow and produce viable seeds.

Herbicides

Burndown*:* Consider using a burndown herbicide to kill all Palmer amaranth before planting your crop. Since most populations are glyphosate-resistant, consider using a tank mix of glyphosate and a Group 4 (dicamba or 2,4-D) herbicide (be aware of the planting restrictions of burndown herbicides).

Pre-emergence: Use preemergence (AKA soil-applied or residual herbicides) at full rates for your cropping system and soil type as close to planting as the label allows. This will help to reduce the selection pressure of the few post-emergence herbicide options available later in the season. These herbicides must be activated by either overhead irrigation or rainfall to move them into the soil where Palmer amaranth seeds are germinating. Most preemergence herbicides will only provide control for a month or so. When possible, consider "overlapping residuals" by making a second application of a registered pre-emergence herbicide before the first application has worn off. For a list of effective herbicides, visit the *Midwest Vegetable Production Guide's* Weed Management Chapter by clicking this link (18-Herbicide-Tables_2023-12-20-141131_wjyh.pdf (mwveguide.org)) or scanning this QR code and looking in the "Pigweed/Amaranth" column:

Midwest Vegetable Production guide QR code

Post-emergence: Most vegetable crops will have few registered, effective, postemergence herbicide options for Palmer amaranth. For those that do, timely postemergence applications are essential. Applications should target Palmer that are less than three inches in height. Late-emerging weeds might not impact yields but could increase the seed bank. For this reason, adding a residual herbicide to the postemergence application can help control later-emerging Palmer amaranth.

Rotate chemistries: Palmer amaranth populations have documented resistance to numerous herbicide modes of action. Learn which herbicides are effective against the population you have, but rotate among effective herbicides to delay the onset of more resistance.

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Warm Temperatures and Rain Continues

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Allergy season is in full swing. At least, it is for me. Runny nose, itchy eyes, and consistent drainage that I have to clear in the shower every morning. We love spring, right?? That's enough complaining for now. Indiana's April 2024 average temperature was 55.1°F (3°F above normal), which was good enough for the 14th warmest on record since 1895. April ended with the 5th most precipitation on record for April, dating back to 1895, with 6.63 inches of precipitation. This was 2.24 inches above normal or 151 percent of normal. The wettest Indiana April on record occurred in 2011 when the state observed 9.61 inches of precipitation. This April's rain helped chew away at precipitation deficits but led to limited planting windows across the state.

Shifting attention to the last 30 days (April 16-May 14), temperatures have run 2-6°F above the 1991-2020 climatological normal. In fact, Indiana's statewide average temperature was 61.1°F, 4.4°F above normal for this period (Figure 1). The Evansville Regional Airport observed the highest average temperature in the state (66.4°F), which was 4.3°F above normal for the period. As a result of the above-normal temperatures, growing degree days (GDDs) continued to run ahead of schedule (Figure 2). Statewide, GDDs have accumulated between 240 and 640 units, which was 50 to 150 GDDs above normal.

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

Indiana
4/16/2024 to 5/14/2024

	Temperature			Precipitation			
cd	temp	norm	dev	prcp	norm	dev	percent
1	58.4	55.1	3.3	4.76	3.35	1.42	142
2	58.2	54.6	3.6	4.35	3.16	1.19	137
3	57.9	54.2	3.8	4.32	2.98	1.34	145
4	61.0	56.9	4.1	3.81	3.78	0.03	101
5	60.8	56.2	4.6	3.29	3.79	-0.50	87
6	60.3	55.3	5.0	2.84	3.60	-0.76	79
7	64.9	59.7	5.2	5.18	4.62	0.55	112
8	64.4	59.0	5.4	4.70	4.53	0.17	104
9	62.9	58.0	4.9	4.32	4.25	0.07	102
State	61.1	56.6	4.4	4.20	3.81	0.39	110

Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at:
Wed May 15 10:46:24 EDT 2024

Figure 1. Temperature and precipitation data for April 16 to May 14, 2024 for Indiana and representative climate divisions (cd). Temperatures are represented as average mean temperature (temp), 1991-2020 normal mean temperature, and mean temperature deviation from normal (dev). Precipitation is represented as the average observed total, 1991-2020

normal precipitation, precipitation deviation from normal, and precipitation represented as the percent of the 1991-2020 climatological normal.

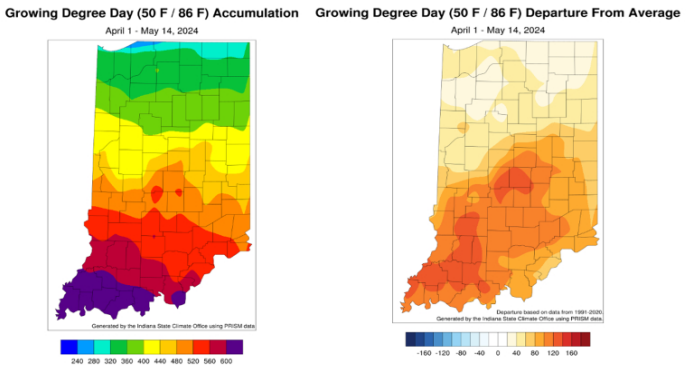

Figure 2. (Left) GDD accumulations from April 1-May 14, 2024. (Right) GDD accumulations from April 1 to May 14, 2024, represented as the departure from the climatological average.

Precipitation totals over this period ranged from 1.82 inches in New Castle (Henry County) to 10.18 inches at the Evansville Regional Airport (Vanderburgh County). From April 16 to May 14, the Evansville Regional Airport recorded at least a trace of precipitation on 16 days and averaged roughly 0.35 inches per day. The April 14th precipitation observation yielded 3.42" of rain. Despite the limited planting windows, corn and soybeans planted progress tracked with the five-year average. As of April 12, 36 percent of corn and 34 percent of soybeans have been planted. Today's equipment and technology allow farmers to plant crops faster than ever!

Through May 22, the heaviest rain totals (up to 2.5") are expected in southern Indiana, whereas northern Indiana could see up to an inch of rain (Figure 3). The Climate Prediction Center expects above-normal temperatures and precipitation from May 20-24, with near-normal temperatures returning toward the end of the month. Elevated chances of above-normal temperatures continue through the end of the month.

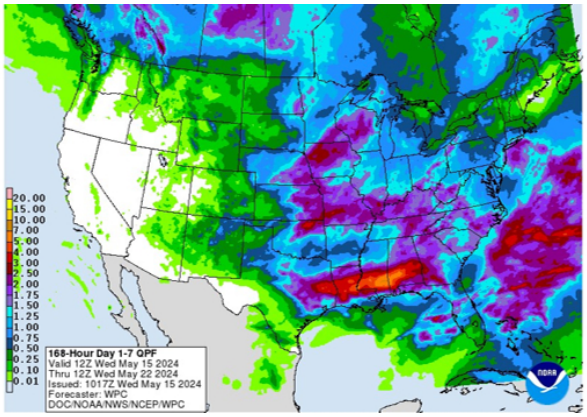

Figure 3. Weather Prediction Center's Day 1-7 Quantitative Precipitation Forecast valid from May 15 to May 22, 2024.

Clearspring Produce Auction Price Update

(Jeff Burbrink, jburbrink@purdue.edu)

The Clearspring Produce Auction is located just 2 miles south of US 20 in Clearspring Township in the Heart of the LaGrange-Elkhart Amish Settlement. It is within easy driving distance of the towns of Shipshewana, Topeka, Emma, and LaGrange.

Produce is sold 3 days a week throughout most of the growing season (Tuesday, Thursday, Friday), with a hay sale on Saturdays. Office hours are Monday and Wednesday, 1 to 4 pm, and Tuesday, Thursday, and Friday, 8 am to 4 pm. An auction report can be heard by calling (260) 463-4131. Besides the produce and hay auctions, Clearspring has an equipment and supply business operating onsite for growers.

Are you curious about vegetable pricing?

In an effort to communicate more market information, we are publishing Clearspring Produce Auction volumes and prices. You will be able to view volumes and pricing below:

May 10, 2024

May 15, 2024

Purdue Fruit and Vegetable Field Day on July 18, 2024

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

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.

Registration is now open! Register here: Purdue Fruit and Vegetable Field Day

More information about the upcoming field day will be available by mid-May 2024.

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

Purdue Small Farm Education Field Day on July 25, 2024

(Petrus Langenhoven, plangenh@purdue.edu, (765) 496-7955)

We are happy to announce that Purdue Extension is presenting its annual Small Farm Education Field Day on July 25, 2024, at the Purdue Student Farm, West Lafayette, IN.

Registration is now open! Register here: Purdue Small Farm Education Field Day

Educational topics for the 2024 field day will be available soon. 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.

Market Report for

Clearspring Produce Auction
2050 S 300 W
LaGrange, IN 46761
* Phone (260) 463-4131
* Fax (260) 463-4362
* Market Report (260) 463-4131

Order Buyers:
David Schrock & Richard Yoder

Date of Report:	10-May	2024

Description of Product		Unit	Units Sold	Price Average	Price High
Asparagus		lb.	21	$ 2.43	$ 2.50
Black Raspberry starts			30	$ 4.50	
Ferns		pots	10	$ 20.00	$ 20.00
Flower Flats			12	$ 11.67	$ 17.00
Flowers, 4 inch pots			2182	$ 1.12	$ 3.00
Flowers, 6-8 inch pots			1206	$ 2.72	$ 15.00
Hanging Baskets, 10 inch			1601	$ 7.36	$ 18.00
Hanging Baskets, 12 inch			351	$ 8.45	$ 20.00
Herbs, misc			166	$ 0.91	$ 3.50
Lettuce		head	397	$ 0.40	$ 0.75
Onions, green		bunch	50	$ 2.00	$ 2.00
Rhubarb		lb.	256	$ 2.01	$ 2.25
Rhubarb Starts			11	$ 9.00	$ 9.00
Roses		12 inch	68	$ 13.54	$ 35.00
Strawberries		qt	24	$ 5.00	$ 5.00
Succulents			236	$ 2.86	$ 13.00
Tomatoes		10#	17	$ 18.97	$ 22.50
Urns/Specialty Baskets			126	$ 17.54	$ 40.00
Vegetable Flats			68	$ 4.40	$ 14.00
Vegetable pots, 4 inch			129	$ 1.04	$ 3.00

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Clearspring Produce Auction
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* Phone (260) 463-4131
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* Market Report (260) 463-4131

Order Buyers:
David Schrock & Richard Yoder

Date of Report:	14-May	2024

Description of Product		Unit	Units Sold	Price Average	Price High
Asparagus		lb.	20	$ 2.31	$ 3.25
Beans, Green		lb	36	$ 2.50	
Black Raspberry starts			75	$ 0.65	$ 1.25
Cucumber		peck	3	$ 14.00	
Flower Flats			32	$ 9.88	$ 14.00
Flowers, 4 inch pots			3767	$ 0.87	$ 3.50
Flowers, 6-8 inch pots			1258	$ 3.58	$ 16.00
Hanging Baskets, 10 inch			1295	$ 12.18	$ 27.00
Hanging Baskets, 12 inch			297	$ 15.11	$ 32.50
Herbs, misc			420	$ 0.87	$ 6.00
Kolrabi		ct	58	$ 1.60	
Lettuce		head	90	$ 0.70	$ 0.75
Onions, green		bunch	125	$ 1.00	
Perennials		pots	84	$ 7.15	$ 29.00
Petunia		pouches	8	$ 7.00	
Radishes		bunch	26	$ 0.50	
Rhubarb		lb.	555	$ 0.56	$ 1.25
Strawberries		qt	232	$ 4.60	$ 4.75
Succulents			308	$ 0.81	$ 6.50
Tomatoes		10#	22	$ 18.27	$ 27.00
Urns/Specialty Baskets			55	$ 25.82	$ 34.00
Vegetable Flats			61	$ 7.92	$ 15.00
Vegetable pots, 4 inch			25	$ 0.76	$ 1.10