PURDUE UNIVERSITY

FACTS FOR FANCY FRUIT

Issue: 22-06
June 10, 2022

A Newsletter for Commercial and Advanced Amateur fruit growers.

In This Issue

Crop Conditions

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

Strawberry – harvest

Black raspberry – in bloom

Apple – fruit developing and towards the end of cell division

Grape – fruit set and early development

Managing Anthracnose in Strawberry

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

Wet weather throughout the Midwest has

resulted in explosive anthracnose outbreaks in Indiana, Illinois, Kentucky and Ohio. Although it is too late to save the fruit crop, actions can be taken to protect daughter-plant establishment and to develop a plan for future disease management.

Anthracnose is one of the most devastating diseases impacting strawberry production in the Midwest and is caused by several species of fungi in the genus *Colletotrichum*. These fungi infect strawberry:

- flowers and peduncles, preventing fruit development.
- fruit, preventing harvest.
- crowns, causing plant death.
- runners, preventing new plants from becoming established in perennial production systems, and
- and even leaves and petioles.

Symptoms

The symptoms and sign of anthracnose can be as obvious as fruit rot with firm, sunken lesions (Fig. 1). Lesions are varying shades of brown, but under warm, wet conditions, lesions may ooze salmon-colored spores (Fig. 2). Crown rot symptoms vary from the dramatic wilting of the entire plant to simple stunting and 'unthriftiness'. Splitting the crown of infected plants reveals a rusty, orange-red- brown discoloration (Fig. 3). Unlike red stele, caused by Phytophthora, the roots of the anthracnose infected plant remain healthy.

Less obvious symptoms of anthracnose infection include blossom infections (Fig. 4), which often precede fruit infection. Infections of petioles, peduncles, stolons, and leaves are often inconspicuous and easily overlooked (Fig. 5). Lesions on these plant parts may girdle peduncles, causing flower or fruit death while infections on stolons cause the death of unrooted daughter plants.

Life Cycle

The fungi that cause anthracnose are commonly introduced into the field on infected, asymptomatic transplants. Under warm, wet conditions, the latent fungal infection begins to invade the infected plant, producing abundant spores (conidia). These spores are spread via wind-driven rain and splash to neighboring plants. Spore production occurs during any period of warm, wet weather. Injured or damage plant material is highly susceptible to infection (Fig. 6).

Colletotrichum fungi overwinter in infected plants, plant debris, and especially mummified fruit. These fungi can persist in soils for approximately nine months in the absence of a host. Some weeds and even nearby fruit and vegetables may serve as hosts for some species of *Colletotrichum,* providing another means of persistence. During warm, rainy, or humid weather, the pathogens become active, producing abundant spores that are readily spread to new hosts. Spores continue to be produced throughout spring and summer, whenever conditions are favorable.

Figure 1. Anthracnose fruit rot (AFR). Photo by Wenjing Guan, SWPAC, Purdue University.

Figure 2. Spores oozing from anthracnose lesion.

A single fruit is capable of producing hundreds of thousands of spores.

Figure 3. Anthracnose crown rot (ACR). Note orange-red stele of the infected plants on the left, compared to the healthy plants on the right. Photo by Raj Singh, LSU.

Figure 4. Damaged blossoms and buds are readily colonized by the anthracnose and botrytis fungi. Photo by Janna Beckerman.

Figure 5. Anthracnose infection of petiole, peduncle and runners are less conspicuous but result in a loss of both fruit and daughter plants. Photo by Steve Koike.

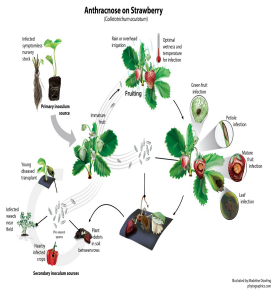


Figure 6. The disease cycle of strawberry anthracnose. Illustrated by Madeline Dowling, Clemson University.

Management

Starting with disease-free plants and/or plugs are essential for successful strawberry production since this disease is introduced to the field by infected plant material. Unfortunately, no greenhouse or nursery can certify that 100% of their plants are free from these pathogens. For this reason, it is important to carefully inspect all plants and plugs, discarding any suspicious looking material. In this instance, not discarding questionable plants can cost far more than what might be saved by not discarding infected plants.

Fungicide dips can be used on transplants before planting in production fields, however, recent research on the role of dips in disease management have shown inconsistent results. The information is available in the Midwest Fruit Pest Management Guide but is not necessarily recommended because of a lack of clear results. Finally, these treatments will not rescue infected plants but will only prevent new infections from occurring while the plant is getting established.

Although not common in Midwest strawberry production, use drip irrigation when needed and avoid overhead irrigation to reduce splashing. Straw mulching further reduces water splash and disease spread in perennial matted row production.

Sanitation is a cornerstone of integrated disease management. Do not work plants when wet, which can injure plants and promote disease spread. Cull infected plants and remove all infected plant material. A single infected berry can produce hundreds of thousands of spores (Fig. 2). To limit pathogen spread, work from clean to infected areas, always picking the infested area last. Never move people or machinery from high disease areas to lower

disease areas.

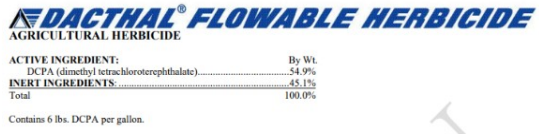
Since weeds serve as alternate hosts, manage weeds in and around the field to improve air flow and drying of strawberries in the field, while reducing another potential source of inoculum and disease spread. Every few years, rotate out of strawberries for at least two (and preferably three) years. In the absence of a susceptible host, including weeds, the inoculum level (spore load) in the field will steadily decline.

Fungicides are available to protect plants when environmental conditions are ideal for infection. To protect against anthracnose fruit rot, begin applications pre-bloom and continue through harvest. Choosing the right fungicide at the right time can be a challenge. This Strawberry Disease Management Guide has an extensive list of options at every stage of strawberry production. This guide will be updated and included in the 2023 Midwest Fruit Pest Management Guide. Remember that fungicides must be applied before infection occurs—not after symptoms are visible.

Although some varieties of strawberry are less susceptible than others, clear answers for Midwest strawberry growers are lacking. Current work to evaluate different strawberry cultivars is being performed by Dr. Wenjing Guan at the Southwest Purdue Agricultural Center.

Future of Dacthal® Herbicide Uncertain

(Stephen Meyers, slmeyers@purdue.edu)


DACTHAL® FLOWABLE HERBICIDE
AGRICULTURAL HERBICIDE
ACTIVE INGREDIENT: By Wt.
DCPA (dimethyl tetrachloroterephthalate) 54.9%
INERT INGREDIENTS 45.1%
Total 100.0%
Contains 6 lbs. DCPA per gallon.

Dacthal® flowable herbicide

Dacthal® flowable herbicide is currently produced by AMVAC Chemical Corporation and registered for use in numerous vegetable crops (Midwest Vegetable Production Guide (mwveguide.org)) and strawberry. It provides pre-emergence control of small-seed broadleaf weeds and grasses. Dacthal herbicide contains the active ingredient DCPA.

On April 28, 2022 the United States Environmental Protection Agency issued a notice of intent to suspend production of technical grade DCPA citing "the registrant's long-standing failure to response to EPA's request for necessary data" needed for EPA to fully evaluate the risks associated with DCPA. The data requested by EPA relate to the potential effects of DCPA on human thyroid development and function. If the active ingredient DCPA cannot be manufactured, the production of the formulated product, Dacthal®, would stop by default. The full notice is available here: EPA Issues Notice of Intent to Suspend the Herbicide DCPA | US EPA.

On May 2, representatives with AMVAC responded with a letter to its customers disputing the EPA's claims and stating that the company is "…committed to vigorously defending the registration of DCPA…" and that it intended to request a hearing to defend its position. In a statement on the AMVAC website May 4 (AMVAC Regulatory Issues Statement Regarding Dacthal/DCPA | AMVAC), the company stated that the required toxicity report would be submitted to EPA in June 2022.

In an effort to improve clarity around the topic, the Weed Science Society of America will host a Zoom webinar on June 15, 2022 from 2 PM to 3:30 PM ET with representatives from the EPA to provide an overview of the pesticide registration process and updates on the DCPA as well as diuron (the active ingredient in Direx®) and fluometuron (the active ingredient in Cotoran®). To register for the webinar, please visit this site: Webinar Registration – Zoom.

Webinar Agenda

2:00 to 2:05 pm: Welcome and Introduction

2:05 to 2:25 pm: Overview of the registration review process

2:25 to 2:30 pm: DCPA registration review update

2:30 to 2:50 pm: Diuron registration review overview and status

2:50to 3:30 pm: Q&A on DCPA, diuron, and fluometuron *

*If you have a question for EPA on DCPA, diuron, or fluometuron that you would like covered during the Q&A session, please send it by email to info@WSSA.net by **4:00pm EST Friday 6/10/22**.

At the time of this article, AMVAC did not anticipate a disruption to the 2022 supply of Dacthal®. Growers who have Dacthal® on-hand should continue to use it according the label. Growers who are unable to secure Dacthal® can consult the Midwest Vegetable Production Guide (Midwest Vegetable Production Guide (mwveguide.org)) or the Midwest Fruit Pest Management Guide (id-465.pdf (purdue.edu)) to view potential alternative products for their specific crop.

Be on the lookout for spotted-wing drosophila as small fruits begin to ripen

(Elizabeth Yim Long, long132@purdue.edu)

Figure 1. Male spotted-wing drosophila on a blueberry. Note males have spots on wings, as pictured here, but females lack spots on wings. Photo credit: T. Martinson

For those growing delicious small fruits, including cherries, raspberries, blackberries, blueberries, and strawberries, on a U-pick farm or even your backyard, now is the time to be on the lookout for spotted-wing drosophila (SWD), especially if your berries are ripe or in the ripening stage.

Most of you are likely familiar with SWD (Figure 1), we wrote a couple of articles in Facts for Fancy Fruit last year; but just as a reminder, SWD is an invasive vinegar fly that looks a bit like the fruit flies you might see hovering around your ripe bananas or apples in the kitchen. However, two key differences are: 1) SWD is attracted to small fruits as they begin to ripen, and 2) female SWD have a specialized egg-laying organ that allows them to cut into healthy fruits and lay eggs. So, these flies have the potential to damage sound berries and make them unmarketable by laying eggs under the skin that hatch into small maggots that will feed on the fruit, reducing berry quality and disgusting customers – unless they are fans of entomophagy (the practice of eating insects as food!).

Figure 2. Commercially available Scentry monitoring trap for Spotted-wing drosophila, available from Great Lakes IPM.

There are several effective and relatively inexpensive monitoring tools for SWD that include a pheromone lure hung inside a red container filled with water or apple cider vinegar solution (Figure 2). The lure in these monitoring traps attracts SWD and when they enter the container, they bump around and eventually fall into the liquid and drown – making them easier for you to detect! By collecting and examining the flies in the drowning solution once a week, you'll know when SWD first appears in your orchard and be able to make an informed decision about when to begin management strategies for this important small fruit pest. We are monitoring SWD in blueberries in three locations in Indiana this summer: Warrick, Tippecanoe, and Starke County and we will share results of trap activity as we have it in real time on the Long Lab website (https://extension.entm.purdue.edu/longlab/extension/#reports). So far, we haven't detected SWD in blueberry crops, but as the berries ripen, temperatures rise, and the season progresses, it is only a matter of time before they appear.

The current recommendation is to begin spray schedules for SWD when a single fly is detected in the trap AND berries are ripening on plants. By using monitoring traps, you might save money by holding back on early sprays targeting SWD before they are present in your small fruit orchard. Finally, it is critically important to evaluate how well your spray program is managing SWD in your small fruit orchards. If you are spraying on a 7-10 day schedule and continue to see berries with maggots or significant reductions in berry quality, this may be a sign that the insecticides you are using are not mixed properly or are not at the correct rate, or that your sprayer equipment needs adjustment or other attention.

You can find more information about SWD management strategies and insecticide options for vulnerable fruit crops in the 2021-2022 Midwest Fruit Pest Management Guide. As always, if you have questions about SWD identification or how to place and use monitoring traps, reach out to your local extension educator or specialist so we can help!

Is it okay to propagate your own strawberry plug plants?

(Wenjing Guan, guan40@purdue.edu)

Strawberry plug plants that have active growing root systems are easier to establish than bare-root plants. Interest in growing strawberries using plug plants and plastic mulch is growing.

Strawberry plug plants are produced from the runner tips of mother plants. In commercial production, mother plants may be grown in climate-controlled greenhouses or open fields in a colder climate. High temperatures and long days favor runner development; thus, runner production is typically in the summer. Plug producers in our region may receive runner tips from runner producers further north. The runner

tips are planted in 50-cell trays with a moist growing medium. The plants require frequent misting, especially in the first few days until roots start to grow.

Farmers have asked me whether it is okay to produce their plug plants by harvesting runner tips from established strawberry fields. Technically, this is doable as long as a misting system is available and farmers have the time and space to produce the plug plants. Farmers may also consider doing that because their favorable cultivars may not be available in plug plant forms, and/or it may allow them to plant earlier than purchasing plug plants. However, two things are crucial for folks who want to propagate their own plants.

Firstly, the patent. Recently released strawberry cultivars are patented. These cultivars cannot be propagated without a license agreement with the patent holder, even for small acreage use. Varieties such as Albion, San Andreas, AC valley Sunset, Galletta, Malwina etc. are still in the patent-protected period. It is illegal to propagate cultivars that are still on patent.

Secondly, disease control. It is almost impossible to ensure disease-free of runners harvested from plants used for fruit production in the field. In commercial runner tip production, mother plants are grown for producing runners not fruit. They are grown either in greenhouses or fields for a shorter period and with strict disease control. Highly destructive strawberry diseases could show on daughter plants from diseases-infected mother plants. Furthermore, the high humidity condition in growing plug plants is prone to disease development. In commercial plug production, fungicide is periodically applied which may not be feasible for a small-scale system.

Because of the aforementioned reasons, folks should be particularly cautious when considering propagating their own plug plants.

Fungus gnat larvae in strawberries

(Laura Ingwell, lingwell@purdue.edu), *(Wenjing Guan, guan40@purdue.edu)* & *(Samantha Anne Wilden, swillden@purdue.edu)*

In the strawberry benchtop system in the greenhouses at Southwest Purdue Ag Center (SWPAC), we have been experiencing infestations in red berries of a small, clear larvae with a black head capsule. The larvae are often found in clusters on a single fruit and were difficult for us to identify. We encountered them in early spring, when there were not a lot of fruits present and the temperatures were still quite cold (that didn't seem to impact the pest). After several attempts to raise them on berries we were successful! The culprit has been identified as larvae of the dark-winged fungus gnat (Family: Sciaridae; Fig. 1).

Figure 1: Dark-winged fungus gnat larvae on ripe strawberry. Photo by John Obermeyer.

They are found only on red berries and only when the berries are in contact with the growing medium. Fungus gnats feed on decaying matter in the soil and plant roots. They are often a problem in greenhouse production systems, mainly a nuisance pest. They thrive in moist soil conditions. The observations at SWPAC are the first that we have seen them attacking healthy, and in this case ripe, fruits. You can manage this

pest by managing soil moisture, allowing pots to dry out. In hydroponic or soil systems incorporating entomopathogenic nematodes (EPN), nematodes that feed on insects, is an effective way to suppress this population. Preventing the developing fruits from contacting the growing media will also prevent their spread onto the fruit. You can monitor for the presence of the adult flies by placing yellow sticky cards perpendicular to the growing media. As the adults emerge from the media they will get stuck on the cards. As always, sanitation is another key step in minimizing this pest. Cull any dying / dead plants and old soil that's sitting around as this can serve as a residue for the pest. If you suspect fungus gnat damage in your crop, please contact Laura Ingwell (lingwell@purdue.edu).

Indiana getting variable precipitation, Indiana State Climate Office

(Beth Hall, hall556@purdue.edu)

Rain continues to be spotty across Indiana with some areas getting the lion's share while others are barely seeing a drop. When considering a recent 7-day period (June 1-7, 2022; Figure 1), central Indiana seemed to have missed out on most of the rain. This translated to central Indiana receiving around 5%-25% of what it normally received during that same period from 1991-2020 (Figure 2). However, if one considers the recent 30-day period (May 9 – June 7, 2022), the whole northern half of Indiana appears to have only received 25%-75% of what has normally fallen (Figure 3). The period of consideration when looking at recent climate is important, and no time frame is necessarily superior to another. It all depends upon the application. For example, being on the dry side over a 7-day period in May could be preferable for agriculture so planting can happen with fewer muddier fields. However, a 30-day dry period could impact deeper soil moisture levels, groundwater supplies, and stream levels.

Abnormally dry conditions were briefly introduced in northwest Indiana last week. However, rain events earlier this week provided 1"-2" of new precipitation to this area, lifting that classification … for now. Climate outlooks for the 8-14-day period is slightly favoring below-normal precipitation across Indiana and increased chances of above-normal temperatures. Soils could dry out quickly under these conditions causing stress to shallow-root vegetation.

Accumulated modified growing degree units are quickly increasing with these warmer temperatures (Figure 4). When considering an accumulation start date of Aril 15th, the southern two-thirds of Indiana is anywhere from 20 to 80 units ahead of the 1991-2020 climatology (Figure 5).

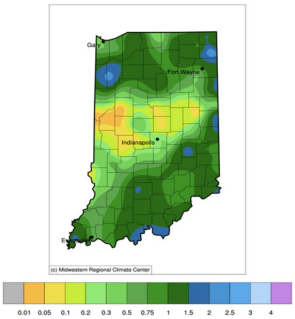


Figure 1. Accumulated precipitation from June 1-7, 2022.

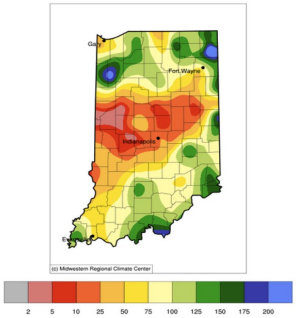


Figure 2. Precipitation for June 1-7, 2022 represented as the percentage of what normally fell during that period from 1991-2020.

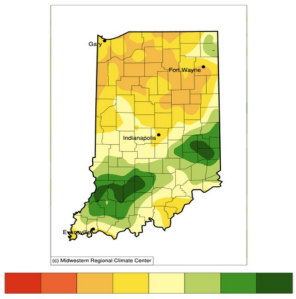


Figure 3. Precipitation for May 9, 2022 through June 7, 2022 represented as the percentage of what normally fell during that period from 1991-2020.

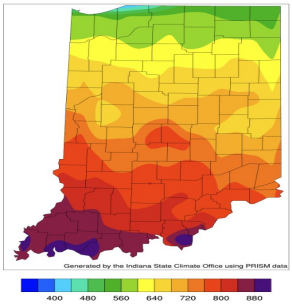


Figure 4. Modified growing degree day (50°F / 86°F) accumulation from April 15-June 7, 2022.

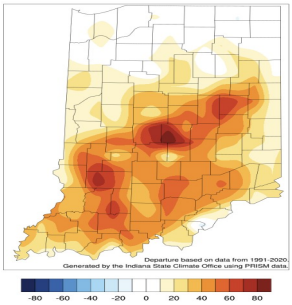


Figure 5. Modified growing degree day (50°F / 86°F) accumulation from April 15-June 7, 2022, represented as the departure from the 1991-2020 climatological average.

Indiana Horticultural Society Summer Meeting

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

Join us for the Indiana Horticultural Society Summer Meeting

Beasley's Orchard, Danville, IN
July 18
All are invited
More details to come.

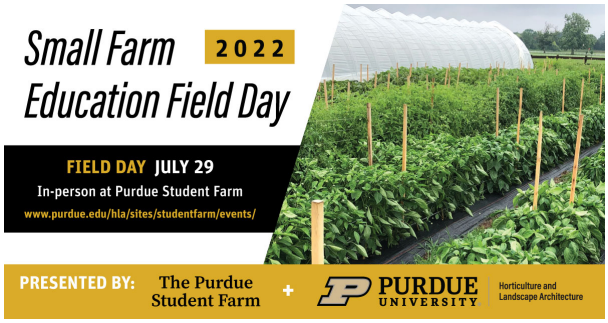
Purdue Fruit, Veg & Hemp Field Day

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

Purdue Fruit, Veg & Hemp Field Day
Meigs Purdue Ag Center
9101 S 100 E, Lafayette, IN 47909
July 21, 2022
More details to come.

Purdue Small Farm Education Field Day

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



Purdue Small Farm Education Field Day
Purdue Student Farm
1491 Cherry Lane,
West Lafayette, IN 47906
July 29, 2022

Facts for Fancy Fruit © Purdue University - fff.hort.purdue.edu
Editor: Peter M Hirst | Department of Horticulture and Landscape Architecture, 625 Agriculture Mall Dr., West Lafayette, IN 47907 | (765) 494-1323