PENNSYLVANIA VEGETABLE MARKETING & RESEARCH PROGRAM

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Pennsylvania Vegetable IPM Weekly Update

July 20, 2022

These are cooperative projects involving Penn State University researchers, Penn State Cooperative Extension educators, growers, the Pennsylvania Department of Agriculture, the Pennsylvania Vegetable Marketing and Research Program and the Pennsylvania Vegetable Growers Association.

Pest Watch Report

Karly Regan, Penn State Extension Educator

Moth Catch Increasing at Some Sites This Week

Corn earworm numbers caught in traps reporting data this week were quite low in most areas but increasing at some sites. Sites in Bedford, Blair, Bucks, Franklin, Indiana, Lancaster, and Montgomery Counties experienced average catch per night of 2-4 moths which means a spray interval of 5-6 days would be suggested for corn that's tasseling or silking. Washington County experienced average catch per night of 9 moths, which means a spray interval of 4-5 days would be suggested. All other sites could reduce spray intervals to every 7 days or so, based on moth catch. As a reminder, corn that is tasseling or silking is very attractive to corn earworm, as eggs are laid on silks, and control must be achieved while larvae are recently hatched before they've entered the ear.

Fig 1. A larval corn earworm that has eaten the silks and is now feeding on the ear tip

If you're monitoring for corn earworm and live in an area where spongy moth (*Lymantria dispar*) occurs, be sure that you are correctly identifying the moths you catch, as spongy moth males have been detected in corn earworm traps in three counties so far and can be mistaken for corn earworm at first glance. The easiest way to differentiate the two species is that corn earworm will have slender antennae whereas spongy moth will have bushy antennae. Spongy moth is typically a forest pest rather than vegetable pest but has been documented to feed on vegetables when populations are very high, as they have been in northern and central PA this year.

Once the spray threshold is reached, you can consider products from the pyrethroid class, diamide class, or spinosyn class for effective control. We tend to see the best efficacy from non-pyrethroid products such as Coragen, Blackhawk, and Radiant, as pyrethroid resistance has increased in migrating corn earworm populations. However, we tend to see more resistance later in the season than now, as moths migrate from further south in the United States up to our region. Diamides and spinosyns do not provide effective control of other pests such as sap beetles, brown marmorated stink bug, Japanese beetles, or adult corn rootworms. If you're seeing these pests as you scout your corn, consider adding a pyrethroid, or the premix Besiege to control those.

We're still not seeing many fall armyworm caught for this season in Pennsylvania, with only two sites catching any this week, each catching 2 over a 7-day period. By managing for corn earworm, fall armyworm should be adequately controlled, as well.

Fig 2. (left) Adult corn earworm moth caught in monitoring trap

Fig 3. Adult male spongy moth, Photo Credit: Tom Butzler

Average weekly catch – 7-day moving average. The average catch per night (total catch, divided by the number of nights trapping), divided by the number of nights where data exist, multiplied by 7. If no data exist for that week, null is reported.

		CEW			FAW		
County	**Site**	**July 5**	**July 11**	**July 18**	**July 5**	**July 11**	**July 18**
Bedford	Curryville	Null	0.2	2	Null	0	0
Blair	Sinking Valley	1	1	2.1	0	0	0
Bucks	Doylestown	Null	0.8	2.1	Null	0	0
Butler	Cabot	Null	1.4	0	Null	0	0
Centre	State College	1.6	6	1.5	0	0	0
Centre	Rock Springs	0.5	1	1	0.6	6	0
Clinton	Loganton	0	0	0	0.1	1.3	0
Franklin	Shippensburg	1.4	1.8	3.9	0.2	0	0
Franklin	Waynesboro	8.4	3.6	1.1	0	0	0
Indiana	Indiana	0.4	0.9	2	0	0	0
Juniata	Happy Breeze	2.4	3.1	1	0	0	0.3
Lancaster	Landisville	0.6	0.7	2.1	0	0	0
Lancaster	New Danville	0	0.5	0.4	0	0	0
Lancaster	Neffsville	0.1	0.7	0.3	0	0	0
Lehigh	Germansville	Null	1.2	1.1	Null	0	0
Lycoming	Linden	Null	2.8	1.7	Null	0	0
Lycoming	Montoursville	0.9	2.1	0.3	Null	0	0.3
Mifflin	Belleville	Null	Null	0.7	Null	0	0
Montgomery	Souderton	Null	Null	3	Null	Null	0
Montour	Washingtonville	1.6	Null	Null	No trap	No trap	No trap
Washington	Venetia	Null	4	8.3	Null	0	0
York	York	0.8	0.3	0.3	0	0	0

THRESHOLDS Reproductive (tassel/silk) and late vegetative corn attract moths. Shorten spray schedules when populations increase.

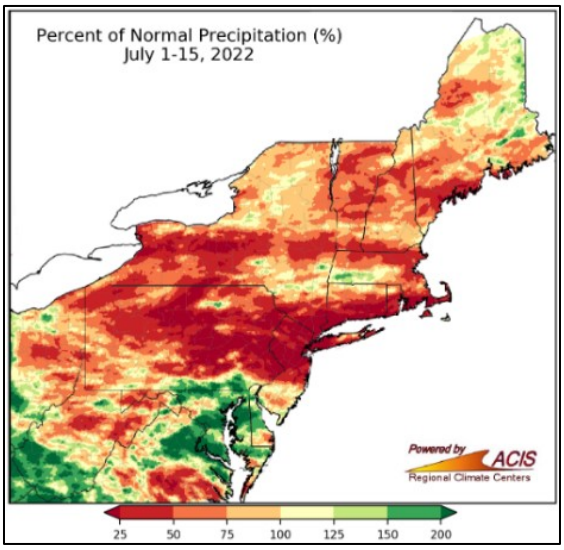
Threshold based on CEW	Catch per week	Spray Frequency
Almost Absent	1-13	7+
Very low	14-35	5-6
Low	36-70	4-5
Moderate	71-349	3-4
High	>350	2-3

PA Vegetable and Berry Current Issues as of July 5

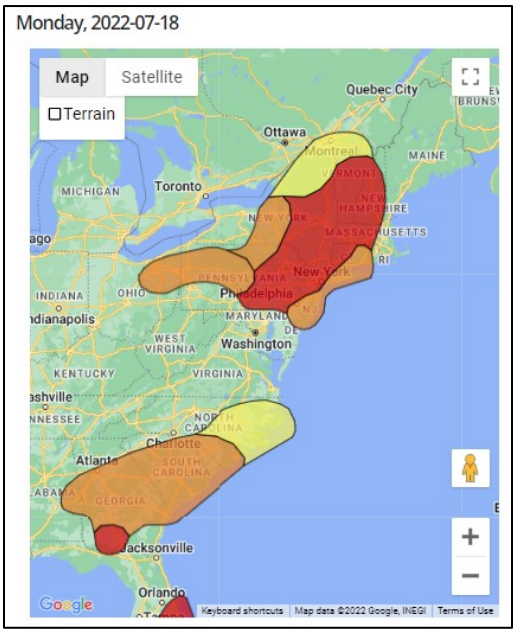
Beth Gugino, Kathy Demchak, and Karly Regan, Penn State Univ. and Extension

General Conditions

Up until a few days ago, much of the Northeast has seen below normal rainfall the first half of July in addition to above average temperatures. Heat and drought stress has taken its toll especially on crops that have had limited access to steady irrigation or that are non-irrigated. Blossom end rot and physiological leaf curl have been reported on tomato. In some regions corn maturity has been delayed and pumpkins are slower growing.



July 2022 average percent of normal precipitation from the [Northeast Regional Climate Center](#).



Cucurbit downy mildew risk map for Monday July 18, 2022. Regions in red, orange, and yellow are at high, moderate, and low risk of pathogen infection and disease development, respectively. (https://cdm.ipmpipe.org).

FIELD PRODUCTION

Reports of **downy mildew on cucumber** have been rapidly expanding over the past week with confirmations in NH, MA, CT, southeastern NY, NJ, OH and most recently in MD, DE, and Ontario, Canada. The increase in sources of inoculum across the region along with the much-needed rains Sunday and Monday placed much of PA at risk for downy mildew on cucumber and cantaloupe especially if the crops are not being protected by effective fungicides. Symptoms resulting from this most recent rain event will become visible within 7 to 10 days. **Powdery mildew** is being reported on early planted cucurbit and squash crops. Bacterial wilt is developing in fields with higher populations of cucumber beetle that transmit the bacterial pathogen.

Onion harvest is well underway. For fields with **bacterial disease** issues, keep in mind that once the neck is dried down the bacteria can no longer move from the leaves into the bulb. So thoroughly field curing and drying the onions down is important to maintain post-harvest marketability. Post-harvest conditions can also affect the development of **black mold**. Black mold is the black soot-like fungal growth on and between the bulb scales. It is caused by the fungal pathogen, *Aspergillus niger*, which is common in the soil and crop residue and affects many vegetable crops. It is favored when bulbs remain hot under high relative humidity (>80% RH) or there are fluctuations in temperature (e.g. coming out of cold storage) that result in the formation of condensation on the bulbs while in the bins followed by exposure to high temperatures. Reducing exposure to high temperatures and storing at low humidity will help manage black mold.

Cercospora leaf spot is being reported on beets. Cercospora causes circular tan lesions that are surrounded by a dark purple boarder that are easily recognizable. The spores are splash-dispersed similar to those of early blight or Septoria leaf spot on tomato. Disease development is favored by warm temperatures and leaf wetness. Weedy hosts including lambsquarters and pigweed can serve as reservoirs of the pathogen. Fungicide resistance to FRAC 11 fungicides has been a documented problem in NY where there is significant acreage of processing beets. Rotating among FRAC codes is recommended for resistance management. Based on trials in NY, organic recommendations for disease management include Cueva tank mixed with Double Nickel LC or LifeGard which have been as effective as conventional fungicide programs.

Characteristic Cercospora leaf spot lesions on a red table beet leaf (Photo: Beth K. Gugino).

INSECT UPDATES

Sweet corn moth pests have decreased since June. Scouting and management efforts can be concentrated on tasseling and silking corn, which is highly attractive to these moths. If doing your own monitoring for corn earworm via pheromone traps, be sure to correctly identify the moths caught in traps. It has been a big year for spongy moth activity in Pennsylvania, which is typically a forest pest, and male spongy moths have found their way into corn earworm traps throughout the central part of the state. Both species can be light in color but the shape of the antennae clearly distinguishes the two. Corn earworm will have slender antennae whereas spongy moths will have bushy antennae. In some parts of the state, sap beetles have moved out of strawberries into sweet corn, which can cause ear damage. If seeing damage from sap beetles and not from caterpillars, opt for a pyrethroid to manage them.

Corn earworm (left, photo K. Regan) and spongy moth (right, photo T. Butzler, Penn State Extension).

Squash bugs are active in pumpkin and squash. Look for egg masses, and young nymphs on the undersides of leaves. The early instars, which range in color, stay clustered on or near the egg mass for a while. Insecticides are most effective prior to canopy closure. Squash bugs are the vector for a pathogen called yellow vine decline. Recent data from Virginia Tech suggests that Sivanto and Beleaf are effective and help conserve a common parasitoid of squash bug. These products can also provide good control of **striped cucumber beetles**, another insect pest that spreads a pathogen, resulting in bacterial wilt. **Squash vine borer** is also active.

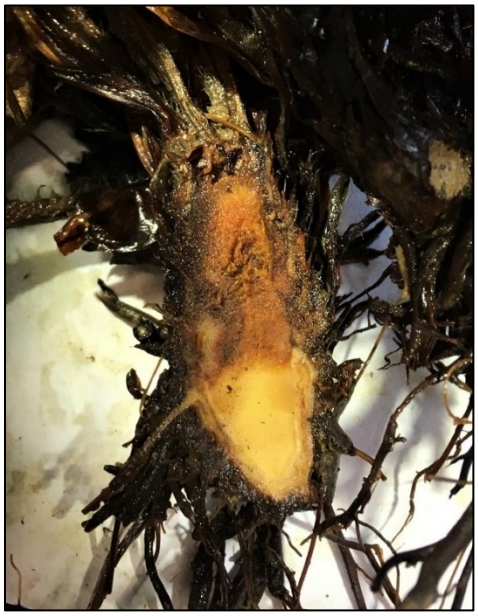
Squash bug egg masses on pumpkin leaf (Photo K. Regan).

BERRY CROPS

Spotted wing drosophila is present in warmer regions of the state but is starting to be detected in cooler areas also. Information on insecticide efficacy, and a table that includes allowable materials for berry crops with pre-harvest and re-entry intervals, is available here: https://extension.psu.edu/spotted-wing-drosophila-a-2021-update-for-berry-growers

We are close to the time of year where blueberries, matted-row strawberries, and raspberries and blackberries can be sampled for **leaf nutrient analysis**. With all berry crops, the correct leaves to sample are the most recently fully expanded ones. Timing for blueberries corresponds to what would be the last week of harvest for a mid-season variety like 'Bluecrop'; other varieties should be sampled at the same time by the calendar even though they may be at a different point in their harvest season. Matted-row strawberries should be sampled after renovation when sufficient

foliage has grown back, and leaves from primocanes of summer-bearing raspberries and blackberries should be sampled between Aug 1 and Aug 20. For more information on how to sample berry crops correctly and in a way that will result in useable results, see this article https://extension.psu.edu/tissue-nutrient-analysis-for-berry-crops-getting-the-most-for-your-money . Sampling at the wrong time of the year or choosing the wrong leaves can lead to incorrect conclusions about the plants' nutritional status.



Phytophthora crown rot symptoms on 'Flavorfest' (Photo: K. Demchak).

Thanks to the work of folks in the Plant Disease Clinics at Penn State and the Univ. of Delaware, we now know that the **crown rots that were affecting 'Flavorfest'** over the past couple of years were caused by several different disease organisms, all of which would be categorized as "water molds" (Pythium, Phytophthora, etc.). As mentioned last week, after harvest and renovation is the time to treat June-bearing strawberries with products such as Ridomil or Orondis Gold if these diseases are known or strongly suspected to be present, such as when strawberries are grown in wet fields.

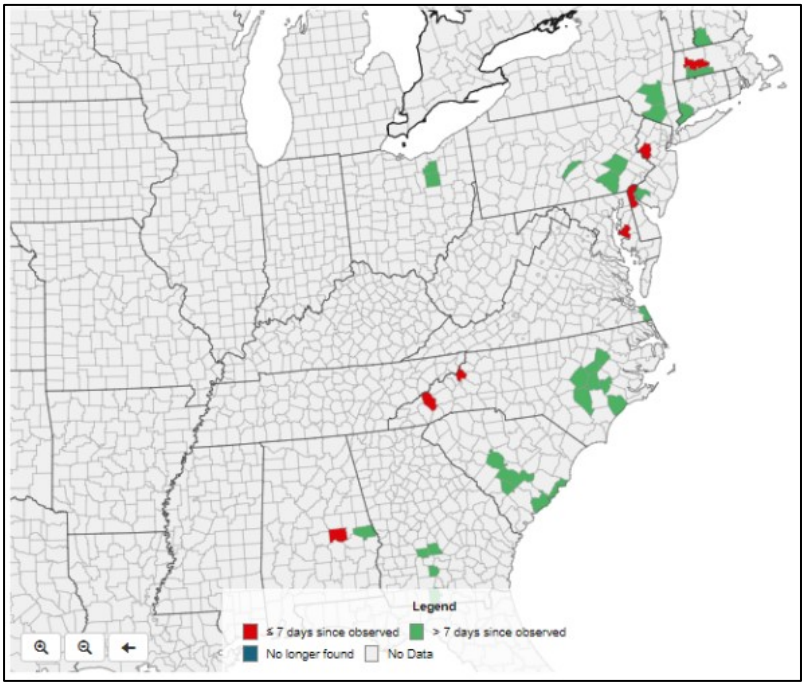
Finally, as you choose fields for **new plantings of plasticulture strawberries** being planted this summer, choose fields that have been out of strawberry production for as long as possible. New ground does best. Most growers who have come back into fields that have had strawberries several times, even when allowing three or more years between plantings, have been disappointed in plant performance, while those who have been able to lengthen rotations report fewer problems overall.

Vegetable Disease Updates

Beth Gugino, Penn State Extension Vegetable Pathologist

GENERAL UPDATES:

- Currently there continue to be **no reports of late blight** on tomato or potato in the region. If you suspect late blight on your farm, please let me know either by email at bkgugino@psu.edu or by phone at 814-865-7328 or contact your local Extension Office.
- Reports of **downy mildew on cucumber** have been rapidly expanding over the past week with confirmations in NH, MA, CT, southeastern NY, NJ, OH and most recently in MD, DE, and Ontario, Canada. The increase in sources of inoculum across the region along with the much-needed rains Sunday and Monday placed much of PA at risk for downy mildew on cucumber and cantaloupe if the crops are not being protected by effective fungicides. Symptoms resulting from this most recent rain event will become visible within 7 to 10 days. The closest reports on butternut squash or winter squash, in general are in Alabama. If you suspect cucurbit downy mildew on your farm, please let me know either by email at bkgugino@psu.edu or by phone at 814-865-7328 or contact your local Extension Office. For the latest reports and forecasts check out https://cdm.ipmpipe.org/.



Cucurbit downy mildew epidemic status map as of 19 July 2022. Reports from South Carolina northward are all on cucumber (https://cdm.ipmpipe.org).

- **Anthracnose is a common disease of watermelon** that affects both the leaves, petioles, and the fruit. It can also be problematic on other cucurbit crops such as cucumber and muskmelon. It is less problematic on squash and pumpkins. On watermelon, foliar lesions are slightly angular and dark in color and not restricted by the leaf veins and often crack. On the fruit circular sunken lesion develop and under humid conditions salmon-pink colored spores develop. The disease is favored by warm (68 to 80°F) and wet conditions. Managing the disease on the leaves can help prevent fruit infection. Protectant fungicides can be effective if applied preventatively and can be rotated with FRAC 11 containing fungicides however, resistance to FRAC 11 fungicides has been reported in some watermelon growing regions in the US.

Foliar and fruit lesions caused by anthracnose on watermelons (Photos: Tim Elkner, Penn State Extension).

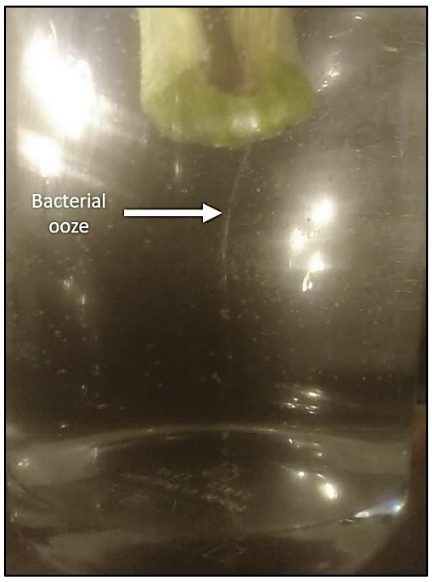
Clinic Corner: Findings from the Penn State Plant Disease Clinic

Jennie Mazzone Penn State Research Technologist and Assistant Diagnostician

The Penn State Plant Disease Clinic received a squash sample in July from a commercial grower in Perry County, PA wondering if they were dealing with bacterial wilt caused by the bacterium *Erwinia tracheiphila*. The grower had both butternut and spaghetti squash plants that were wilting. We looked for signs of bacteria on the sample submitted but none were present. Culture tests for other root and crown pathogens were also negative. Since striped and spotted cucumber beetles were present in the field, it is possible that the symptoms were still due to bacterial wilt (or another pathogen) even though we were not able to detect the pathogen on the sample submitted. We may not be able to detect pathogens in the clinic due to the life cycle (development stage) of the pathogen, condition of the sample, or products applied to the plant. Diagnosing the cause of wilt in cucurbits can be challenging but there are some techniques you can do in the field to check for the common insects, diseases, and abiotic disorders in PA that cause these symptoms:

Bacterial ooze creates a thread-like strand when infected stems are cut and slowly pulled apart on this cantaloupe (Photo credit: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org)

1. **Bacterial Wilt (*Erwinia tracheiphila*)-** This bacterium is vectored by striped and spotted cucumber beetles so scout your fields to see if they are present. There are two quick tests that you can do yourself to check for bacterial wilt. In the field, you can cut affected vines close to the crown of the plant, press the cut ends together, and if bacterial wilt is present, thread-like strands of bacterial ooze will be visible when the two halves are slowly pulled apart again. This method can be difficult to see.



Stream of bacterial ooze from cut squash stem placed in water (Photo credit: Jennie Mazzone).

Another quick method is to cut the vine close to the crown of the plant and stick the cut end in a clear glass of water. If bacteria are present, a thread-like strand of bacterial ooze will appear to stream out of the cut surface into the water. Proper lighting can help visualize this ooze in water. Holding the glass in the sunlight or shining a flashlight to the glass may help visualize the bacterial ooze.

2. **Squash vine borer (*Melittia cucurbitae*)** This clearwing moth can cause entire plants to wilt because its larval stage bores into the lower crown of the plant to feed, hollowing out the stem and causing it to wilt. Diagnosing squash vine borer can be done by scouting for frass and entrance holes in the lower stem/crown. Split the lower stem/crown to look for larva and their feeding damage.
3. **Vascular wilt disease (e.g. Fusarium wilt, Verticillium wilt)** Wilt disease can cause entire plants to wilt. These fungal diseases can also cause discoloration in the vascular tissue of the roots and stems. Shave away the epidermis (outer bark) of the stem/roots to check for this internal.
4. **Root and/or crown rot** (e.g. Phytophthora blight, Pythium root rot**)** Look for symptoms of crown rot and root disease including necrosis, sloughing (separation of outer root sheath from cortex), fewer than normal roots, etc. The Phytophthora blight pathogen can also cause foliar blight and fruit rot.
5. **Abiotic Disorders (e.g. drought, flooding)-** Abiotic disorders are caused by something that is not living, such as environmental stress. Every plant has certain environmental requirements for light, water, temperature, soil conditions, spacing and other factors. When any one of these environmental factors is unfavorable to the plant, it can cause an abiotic disorder. Monitoring environmental changes and site history can help identify abiotic disorders. The most common abiotic disorders associated with plant wilting are drought and flooding. Assess the wetness around the rooting zone. If soil is too dry, plants will wilt, scorch, defoliate, and/or dieback from lack of water. The same symptoms will occur from waterlogged soil conditions that are anaerobic because oxygen is limited, and roots cannot properly function in these environments. Monitor soil moisture and adjust irrigation frequency as needed to provide sufficient water without saturating soil.

Squash vine borer larva and feeding damage on pumpkin (Photo credit: Jim Jasinski, Ohio State University Extension, Bugwood.org).

Discolored vascular tissue in watermelon roots caused by Fusarium wilt (Photo credit: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org)

Pumpkin plants showing crown and root rot with necrotic leaves (Photo credit: Jennie Mazzone).

The Penn State Plant Disease Clinic is here to help you with diagnosing the cause of wilt in cucurbits. We recommend submitting an entire plant showing the wilt symptom. This will allow us to evaluate all possible causes of wilt. Please refer to the 2022-23 Mid-Atlantic Commercial Vegetable Recommendations for cucurbit insect and disease management recommendations.

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