



PENNSYLVANIA VEGETABLE MARKETING & RESEARCH PROGRAM

2301 N. Cameron St., Harrisburg, PA 17110 | 717-694-3596 | pvmp@embarqmail.com | PAVeggies.org

Pennsylvania Vegetable IPM Weekly Update

August 18, 2021

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.

Current Vegetable and Berry Issues

Beth Gugino, Shelby Fleischer and Kathy Demchak, Penn State University

General Conditions as of August 17:

Across Pennsylvania, August is produce month and needless to say production is in full swing and fall crops are in the ground. The drier and slightly warmer than average first half of August is now being followed with the potential for significant rainfall from tropical storm Fred over the next couple of days. Be on the lookout for physiological damage that comes from fluctuating water conditions such as rain checking on field tomatoes. There will also likely be an increase in fruit rots caused by *Phytophthora* blight in fields with poor drainage and retain standing water. Asymptomatic (visibly healthy) fruit at harvest could still develop symptoms post-harvest. It usually takes several days for visible symptoms to develop. If a bin is rejected, avoid disposing of rotting fruit in production fields.



*Post-harvest watermelon fruit rot caused by *Phytophthora* blight. Fruit were infected in the field but symptoms did not develop until several days later (Photo: Jeff Stoltzfus, Penn State Extension).*

FIELD PRODUCTION

The typical later summer-time diseases are being observed in both field and high tunnel production. There continue to be additional reports of **downy mildew on cucumber and cantaloupe** across the region with the most recent reports in western Pennsylvania in Butler and Erie Counties. The closest report on jack-o-lantern pumpkin, acorn and summer squash is in Kentucky however, the predicted trajectory of Tropical Storm Fred could place our jack-o-lantern pumpkin, butternut squash and summer squash crops at risk. Protectant fungicides being applied for the management of *Alternaria* leaf spot, powdery mildew or other diseases will help protect from downy mildew. Vigilant scouting after the storms pass is highly recommended. Inclusion of a downy mildew specific fungicide in a fungicide program should be considered for crops that are not close to harvest and still require



*Anthrachnose caused by the fungal pathogen *Colletotrichum orbiculare* on leaves and fruit of watermelon (Photo: Tim Elkner, Penn State Extension).*

maintenance of a healthy crop canopy to produce marketable fruit. **Powdery mildew** is present on all different types of cucurbit crops and **Alternaria leaf spot** continues to be reported along with **anthracnose** and **gummy stem blight**. Both fungal diseases are favored by warm, rainy weather.



Mottling and leaf deformation associated with virus infection in pumpkin leaves (Photo: Beth K. Gugino).

Cucurbit virus issues continue to be reported in several different cucurbit crops. Symptoms can easily be confused with herbicide injury and diagnostic tests can be used to help confirm the presence of a virus(es). Symptomatic plants cannot be cured and can serve as a reservoir of the virus(es) which are most often transmitted by aphids passing through the field. If only a few plants, roguing them from the field can help reduce inoculum. Some growers have salvaged symptomatic pumpkins that are warty and misshapen by marketing them as “spooky” pumpkins for the fall holiday market. To manage aphid-transmitted viruses, it helps to understand how aphids feed. These are with ‘stylet-borne’ viruses. Stylet refers to the needle-like feeding tubes of aphids. When a winged aphid –the life stage that

immigrates into a field – alights onto a plant, it first ‘tastes’ the plant. The tasting probe is short (30 seconds or less, maybe a minute), and shallow. If the ‘taste’ is good, the aphid may ‘decide’

to stay and feed –send the stylets down to the phloem, with mouthparts that are longer than the aphid body, and deposit live offspring, which leads to the wingless forms. But if the taste results in rejection, the winged aphid moves to another plant.

That early, tasting, probes can move stylet-borne viruses quickly. Think of the taste as a two-step process. First, the aphid pushes fluid out – imagine a drop of saliva getting pushed out of a straw. The ejected saliva mixes with the plant sap and gets pulled in. Stylet-borne viruses adhere to proteins in the stylet. If an aphid feeds on an infected plant, the virus gets pulled in, adheres to the stylet. If the aphid then moves to another plant, during that tasting probe the ejected saliva carries the virus with it. There is a limit, because after a few tasting probes on clean plants, the viruses are cleared from the stylets. There is also an interaction going on: aphids may be attracted more to plants with virus symptoms, which helps the virus get acquired.

Bacterial canker is being reported on tomato as well as **early blight** and **Septoria leaf spot**. Due to the persistent high relative humidity, **leaf mold** is being observed both in field and high tunnel tomato production. So far there is no reported late blight in the region. The closest reports are on potato and tomato in northern Georgia. As the night temperatures start to drop and we experience longer dew periods, the risk for late blight will increase if there is inoculum nearby.



Corn earworm comes in many color morphs (left, photo Purdue Extension) while the fall armyworm is much darker in color (right, photo R. Bessin, Univ. Kentucky).

Night flying moths that infest sweet corn, tomatoes, and many other vegetables were captured in pheromone traps at high levels. **Corn earworm** trap captures spiked in multiple



counties and neighboring states. In some locations, there was a 10, 20, and even 100 fold increase from the previous week. This may be due to immigration on weather fronts, emergence of a locally-produced generation, or a combination of both. CEW overwinters wherever the soil does not freeze to a depth of about 3-5 inches: we now have overwintering in the DelMarVA, parts of NJ, and possibly

Corn earworm (left) has a light-colored head capsule. Fall armyworm (right) has a prominent upside-down ‘Y’ on the head capsule, due to the light band on the edges of chitinous plates. (Photos: G. Dively, Univ. of MD).

pockets in PA. Concurrently, we continue to see very high **fall armyworm (FAW)** counts. FAW does not undergo diapause, so overwintering is limited to very far south (southern FL, southern TX, perhaps the Gulf Coast). Genetic signatures distinguish populations arriving from TX or FL., after the three or five generations that occur as they move poleward. Historically, our FAW populations originated from TX, moving up the continental interior and easterly along nighttime wind currents. FL populations can also arrive, but they are also blown easterly, so few reach PA. That why our FAW populations are mostly in the western side of the state, and almost always the highest in Erie.

CEW eggs are laid individually on silks, and young larvae move into the ear tip within 2 to 5 days, depending on temperature. CEW are cannibalistic, so you usually only get one per ear, often with a lot of frass. FAW lay eggs in a mass on vegetative tissue (including the flag leaf). Although FAW larvae feed on vegetative corn, when tasseling or silking the larvae chew their way rapidly into the ear, from the base, side or tip. CEW come in many color morphs but are usually lighter in color than FAW. You can distinguish CEW from FAW by looking closely at the chitinous plates that make up the head capsule. CEW will be light greenish or yellow/tan in color, with no strong band along the edge of the plates. FAW have a strong color band on the edge of the plates, resulting in a upside-down 'Y' pattern on their head.

Both CEW and FAW exhibit resistance to pyrethroids. Other options include spinosyns (IRAC group 5: Blackhawk, Radiant) and diamides (IRAC group 28: Coragen, Vantacor). Diamides have low bee toxicity. These also control ECB, but not sap beetles, silk-clipping beetles (adult Western corn rootworm), or stink bugs – pyrethroids are often used for these. Premixes that include pyrethroids and diamides (Beseige, Elevest) are options.

We are also seeing increases in **cucumber beetles**, **flea beetles** in eggplant, **two-spotted spider mites**, **stink bug** damage in tomatoes, and **worms** in cabbage.

BERRY CROPS

Overall, growers are reporting satisfactory growth on renovated matted-row strawberry plantings. However, this is the time of year when feeding damage from **strawberry rootworm** adults is most severe. The adults are small brown beetles that feed on the leaves at night and hide in soil crevices during the day. Their feeding causes many small circular or oval-shaped holes in the leaves, and plant vigor can be negatively affected if leaves are riddled with holes. Many of the broad-spectrum insecticides applied for spotted wing drosophila will control this pest, but sprays should be made at night when the beetles will soon be exposed to the spray material. Holes caused by other larger insects present this time of year such as **grasshoppers** and **Japanese beetles** vary more in shape and are often larger.

Some growers of day-neutrals are reporting **reduced sweetness** of the berries; this is common when warm nighttime temperatures cause the plants to use up the sugars that they produced during the day. Berries will become sweeter again when nighttime temperatures are cooler.

When planting plug plants in strawberry plasticulture, be sure to watch for signs of disease on the plug plants. Remove any leaves that have brown blotches on them or dark sunken lesions on petioles. Collect and dispose of this material. Do not plant plug plants are wilted even when the cells are wet, or plug plants that appear very weak, as this may be a sign of a crown-rotting disease, such as **Phytophthora crown rot**, to which

Flavorfest appears to be especially susceptible, or **anthracnose crown rot**.



Grasshopper feeding causes irregular shaped holes in strawberry leaves. (Photos: K. Demchak).



Aggressive strains of Neopestaloptopsis can rapidly colonize large portions of a strawberry leaf (Photos: K. Demchak).

Watch for **Neopestalotiopsis**, a newer disease that may be present on plug plants. It causes large brown leaf lesions and rapidly colonizes large areas of the leaves. It can also invade the crown area causing plant loss. Thiram and Switch help with this disease, but do not control it completely.

Vegetable Disease Updates

Beth Gugino, Extension Vegetable Pathologist, Penn State University

GENERAL UPDATES:



Characteristic irregular brown lesion caused by late blight on the upper surface of a tomato leaf. Photo credit: Beth Gugino.

- There continue to be **no reports of late blight** on tomato or potato in the mid-Atlantic region but this week there was a confirmed report on tomato in Haldimand-Norfolk Ontario Canada along Lake Erie as well as in western North Carolina. The previous reports on potato in Maine and Wisconsin and tomato in northern Georgia have been determined to be caused by the US-23 genotype. This has been the predominant genotype on both tomato and potato over the past 10 years. Late blight is favored by temperatures between 65 and 70°F and high relative humidity or leaf wetness. 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. Additional information about late blight can be found on the USABlight website (<https://usablight.org>).



Angular yellow and tan lesions on the upper leaf surface and purplish-gray sporulation on the lower leaf surface of pumpkin caused by downy mildew. Photo credit: Beth Gugino.

- Reports of **downy mildew on cucumber and cantaloupe** continue to increase across the region. In Pennsylvania, it has been confirmed in Centre, Huntingdon, Mifflin, Juniata, Luzerne, Lehigh, Bucks, Lancaster, Chester, and Lackawanna Counties and this week also in Erie and Butler Counties. Downy mildew was recently confirmed on jack-o-lantern pumpkin in central western Ohio as well as in two counties in Kentucky. The closest report on butternut squash is in eastern North Carolina. Tropical storm Fred has created very favorable conditions for the spread of downy mildew and the predicted trajectory could place our jack-o-lantern pumpkin, butternut squash and summer squash crops at risk. Protectant fungicides being applied for the management of Alternaria leaf spot, powdery mildew or other diseases will help protect from downy mildew. Vigilant scouting after the storms pass is highly recommended. Inclusion of a downy mildew specific fungicide in a fungicide program should be considered for crops that are not close to harvest and still require maintenance of a healthy crop canopy to produce marketable fruit. It is important to maintain a regular fungicide program on cucumbers and cantaloupes. As you finish with a planting, burning down the crop will reduce spread other succession plantings. Once the plant tissue is dead, the pathogen is dead. If you suspect 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. Knowing where the disease is an important component for area-wide management. See <https://cdm.ipmpipe.org> for the latest reports and disease risk forecasts.



- Due to the persistently high relative humidity, **leaf mold on tomato is being reported in high tunnel as well as field production**. Leaf mold is a disease caused by the fungal pathogen *Fulvia fulva*. It general only affects the foliage first starting on the older leaves. The initial symptoms are pale green or yellowish spots first noticeable on

Yellow spots on the upper leaf surface and dark gray sporulation on the lower leaf surface characteristic of leaf mold on tomato under very humid conditions. Photo credit: Beth Gugino.

- the upper leaf surface which eventually turn a more distinct yellow with undefined margins. The fungal sporulation that develops on the underside of the leaf is olive green in color and tends to be more dense and darker in color towards the center of the lesion. The pathogen does not affect the fruit but reduces overall photosynthesis and can lead to defoliation reducing fruit quality and quantity. In a high tunnel maximizing air circulation is critical and selection of less susceptible cultivars will help manage the disease because the use of fungicides is limited to those that are labeled for greenhouse use. For recommendations see Table E-11 in the 2020-21 Mid-Atlantic Commercial Vegetable Production Recommendations.

ANTHRACNOSE ON CUCURBITS



Foliar symptoms of anthracnose caused by the fungal pathogen Colletotrichum orbiculare on leaves of watermelon and cucumber as well as watermelon fruit (Photos: top - Tim Elkner, Penn State Extension, and left Beth K. Gugino).

Anthracnose is a fungal disease caused by *Colletotrichum orbiculare*. While it can cause disease on all types of cucurbits, watermelon, cucumber, and melons are more susceptible than squash and pumpkin. On watermelon, the lesions are dark brown to black and can occur near the leaf veins. On cucumber the spots are more circular and tanner in color. The centers of the lesions may crack and drop out leaving a shot-hole appearance. Stem and petiole lesions are elongated and sunken. On the fruit, the lesions are initially water soaked, sunken, and under wet, humid conditions will develop masses of pinkish- or salmon-colored spores. The disease is favored by rain, warm temperatures (74 to 78°F) and high humidity and is spread by rain splash, field equipment and working the plants when they are wet. Cucumber beetles can also pick up and passively carry the spores between plants and fields. Post-harvest fruit rots can occur if the fruit are wounded during harvest and spores enter through wash water. Host resistance is available for cucumber and watermelon for select pathogen races. See the 2020-21 Mid-Atlantic Commercial Vegetable Production Recommendations for regional recommendations. In-season management with fungicides should when symptoms are first observed. Protectant fungicides being applied for the management of other diseases will also help with anthracnose. In general disease pressure will planted cucumber and watermelon crops and good coverage is

be higher on later

necessary. A minimum three-year crop rotation is recommended to facilitate complete decomposition of crop debris.

Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Extension is implied.

Sweet Corn Insect Pest Monitoring

Shelby Fleisher, Extension Vegetable Entomologist, Penn State University

Corn earworm (CEW) catch started spiking, and the increase was not subtle. Often, we see a transition for one spray threshold to the next, but this past week CEW counts jumped at multiple sites, and across thresholds. Counts exceed thresholds in 16 of 22 sites. Eight of these were at 5-6, or 4-5, day spray intervals, 7 were at 3-4-day spray intervals, and one site reached a 2-3-day spray interval, which we have rarely seen in PA. The earlier lull in captures that we saw all the way to early August is over.

Fall armyworm (FAW) is spiking. Within the last 3 weeks, high to very high counts came from Bedford, Erie, Indiana, Lancaster, Lycoming, Mifflin, Northampton, Susquehanna, and York counties. Extremely high counts came from Erie. Most increases occurred within the last week. We really don't have good thresholds for FAW. During vegetative corn, perhaps we could use higher thresholds because there would be more feeding just on the leaves, but at this time of year larvae bore rapidly into the ear, from the base, side or tip. I suggest using the same thresholds as CEW, so I color coded the counts using the CEW thresholds.

See additional comments on resistance and pictures under the Field Conditions section of the Current Vegetable and Berry Crop Issues.

Average weekly catch –moving average for the last 7 days.

County	Trap Name	CEW			ECB			FAW		
		3-Aug	10-Aug	17-Aug	3-Aug	10-Aug	17-Aug	3-Aug	10-Aug	17-Aug
Blair	Tyrone	8	6		6	4		4	4	
Bedford	Martinsburg	6	10		4	0		96	10	
Bucks	Bedminster	27	47	118	0	0	0	0	0	0
Centre	State College		6			2			0	
Centre	Rock Springs		0			0			5	
Clinton	Loganton	5		0	0		2			
Erie	Fairview	7	3	400				6	1	292
Erie	Lake City	23	2	294				79	94	785
Indiana	Brush Valley	2	5	76				0	2	175
Indiana	Creekside	1	5	31				0	2	45
Juniata	Port Royal		12	24				0	0	1
Juniata	Greenbar	3	12							
Lancaster	Landisville	5	7	54	1	1	0	1		29
Lancaster	Neffsville	2	8	30	0	0	1	4	0	8
Lancaster	New Danville	8	3	42	0	0	0	0	0	12
Lehigh	Germansville	7	2	30	0	0	5	6	2	7
Luzerne	Drums			10			0			0
Lycoming	Linden	1		0				5		2
Lycoming	Montoursville	12		10				46		4
Lycoming	Muncy	0	4	7				1	0	0
Mifflin	Belleville	15		15	42		0	48		7
Montour	Washingtonville	7	6	75	3	0	0			
Northampton	Nazareth	4	2	92	0	0	0	0	0	21
schuylkill	Tower City	2			0					
Susquehanna	Montrose	3	1	2	2	5	6	2	4	26
Union	Winfield		3	60		3	3			
Washington	Venetia	17	16	246						
York	York	4		70	0		0	9		42

THRESHOLDS: Reproductive (tassel/silk) and late vegetative corn attracts moths. Shorten spray schedules when populations increase. If CEW is not a problem, then consider ECB.

	CEW		ECB	
	Catch/Week	Spray Frequency (days)	Catch/Week	Spray Frequency (days)
Almost Absent	≤13	7 or more	<15	7 or more
Very low	14-35	5-6	15-35	6
Low	36-70	4-5	36-70	5
Moderate	71-349	3-4	>70	4
High	>350	2-3		