

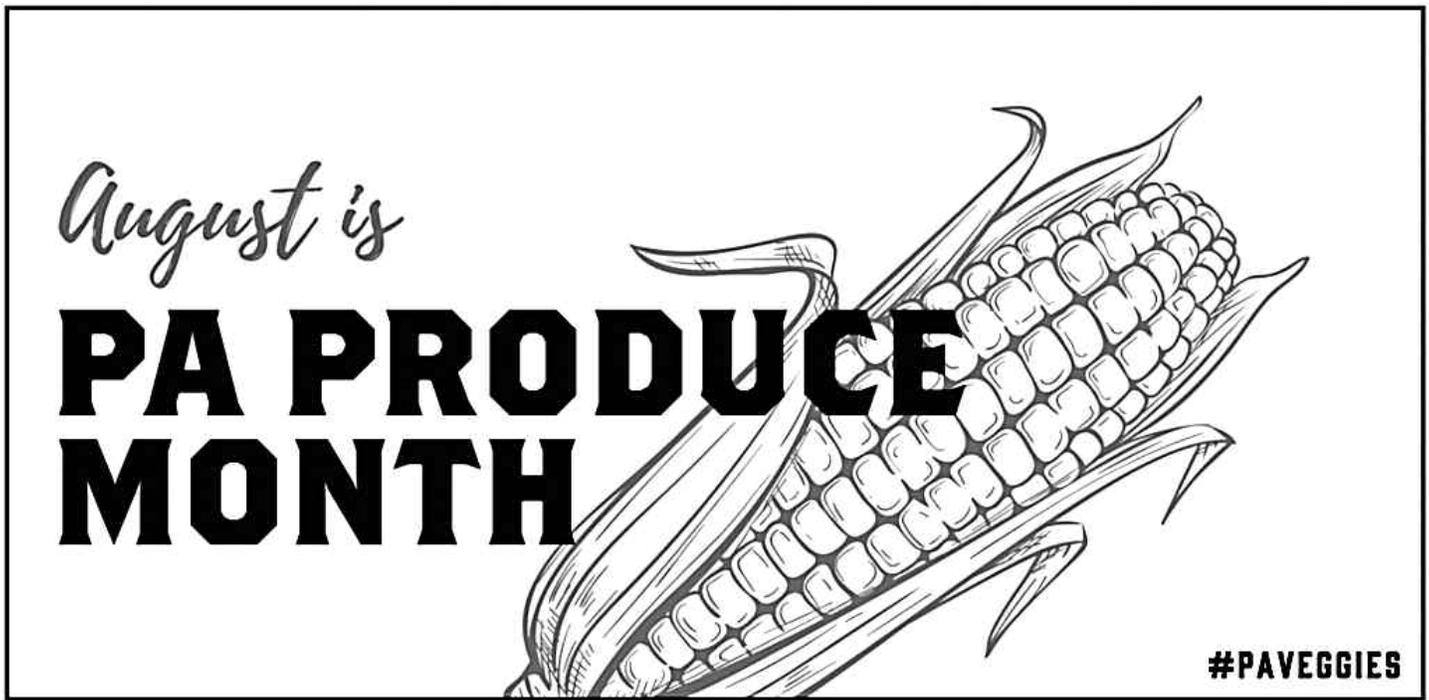
PENNSYLVANIA
VEGETABLE GROWERS

NEWS

for the commercial vegetable, potato and berry grower

July 2018 / Volume 41 Number 7

August is PA Produce Month



The Pennsylvania Vegetable Marketing and Research Program is again celebrating August as Pennsylvania Produce Month. While the Program recognizes that the Pennsylvania

vegetable season begins before August and lasts until the fall, August is the peak of the season for many crops all across the

(continued on page 2)

PDA Offers Growers Free Readiness Reviews Ahead of New FSMA Standards

Food safety inspectors with the Pennsylvania Department of Agriculture are offering free on-farm readiness reviews to assess whether produce growers are ready to meet new preventative food safety standards under the federal Food Safety Modernization Act (FSMA). The new standards took effect for fruit and vegetable producers this season.

"Our goal is for those who buy their fruits and vegetables from Pennsylvania producers to be confident that what they buy is safe," Agriculture Russell Redding said. "Prevention is the best way to eliminate food safety risks, and FSMA's increased safety standards have been a positive shift from response to prevention. Our state food safety team stands ready to support Pennsylvania producers in adjusting to the changes."

State food safety inspectors will visit farms on request, and do a mock inspection to determine whether the grower is meeting new protocols for safe harvesting, handling, storage, and

transport of the specific produce grown on their farm. A review takes approximately four hours, depending on the size of the operation, and will help ensure that the farm is ready to pass an FDA inspection.

FSMA was signed into law in 2016, setting new Food and Drug Administration requirements for businesses that grow, process and transport food. Requirements have been phased in, affecting more Pennsylvania businesses this growing season.

Producers may call 717.787.4315 to arrange a review. Those who participate in a review may also receive promotional items encouraging customers to "Buy Local," courtesy of the PA Preferred state branding program.

Learn more about food safety in Pennsylvania at agriculture.pa.gov.

NEWS



**Pennsylvania
Vegetable Growers
Association**

*An association of
commercial vegetable,
potato and berry growers.*

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State College

Christopher Powell '20

Strasburg

John Shenk '20

Lititz

Robert Shenot '19

Wexford

Jeffrey Stoltzfus '20

Atglen

Mark Troyer '21

Waterford

Timothy Weiser '19

York Springs

Executive Secretary

William Troxell

Richfield

August is PA... (continued from page 1)

state. It is also a time when sales sometimes start to slump and could be hopefully helped with some extra promotion.

The Program has just launched its new website at www.paveggies.org that features recipe videos offering consumers tips on vegetable preparation; farm videos interviewing farmers on their farms; blogs providing an abundance of information about vegetables; directories listing on-farm markets, community farmers' markets, CSAs, wholesale growers and produce auctions – all for consumers and buyers. For growers, the website includes an abundance of tips on how they participate in the PA Produce Month promotion and make the most of the statewide promotion effort at their market or markets. In also includes the reports from the research projects funded by the Program, copies of the Program's newsletters, information on the point-of-purchase items available from the Program and the annual assessment.

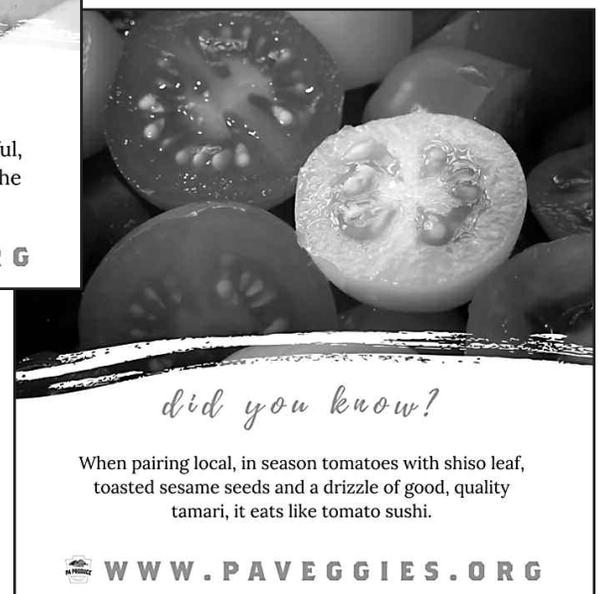
An extensive social media campaign on Facebook and Instagram at #PAVeggies is also being waged with frequent posts about how consumers can find and prepare fresh Pennsylvania vegetables.

The Program offered growers promotional kits containing posters and price cards designed specifically for the August promotion. These kits are also available for sale at a nominal price at many of the state's produce auctions. In addition, Produce Month materials were provided to over 235 supermarkets across the state to highlight their offerings of local produce.

Growers who operate a retail market are urged to visit the www.paveggies.org website or call 717-694-3596 to check out how they participate in PA Produce Month.



*More examples of graphics available
to growers from the
www.paveggies.org website.*



The Pennsylvania Vegetable Growers News is the official monthly publication of the Pennsylvania Vegetable Growers Association, Inc., 815 Middle Road, Richfield, PA 17086-9205 phone and fax - 717-694-3596, email - pvga@pvga.org website - www.pvga.org

Our Mission:

The Pennsylvania Vegetable Growers Association serves Pennsylvania's commercial vegetable, potato and berry growers through education, research, advocacy and promotion.

Our Vision:

The Pennsylvania Vegetable Growers Association will be the driving force in ensuring the future viability of the commercial vegetable, potato and berry industries in Pennsylvania.

Inquiries about membership, this publication or advertising rates should be directed to William Troxell, Executive Secretary, at the above addresses.

Association Directors Meet

The Association's Board of Directors met at the State Capitol on March 13 for their "spring" meeting. After meetings with ten legislators or their staff members, the Board held their business session. While they were one Director short of a quorum, they discussed the issues on the agenda and presented motions for approval by the absent Directors after the meeting.

The Board voted to renew the contract with Troxell Administrative Services as an independent contractor for the general administration of the Association. The contract includes the services of Executive Secretary William Troxell plus his wife Cheryl and additional clerical staff. As an independent contractor they are responsible for all FICA taxes and receive no benefits from the Association. Along with their services, they also provide to the Association office and storage space and the use of office equipment such as computers, printers and copiers. The contract was renewed for an annual fee of \$70,000 – an increase of 8.5%.

The Directors also elected Arthur King as a Director of the Association chosen by the Board pursuant to the constitutional amendment and motion passed at the 2018 Annual Meeting that charges the Board with electing one Director each year.

Second Vice President Rita Resick was named as a signatory on the Association's bank accounts to replace former Past President Robert Shenot. Secretary-Treasurer William Reynolds and Executive Secretary William Troxell are also signatories on the accounts which require two signatures on all checks and withdrawals. Former President Kenneth Martin who lives near Mr. Troxell has been retained as signatory in case there is not sufficient time to mail documents to one of the other signatories.

Brian Campbell and Mr. Reynolds who have been assisting with the management of the Farm Show Food Booth over the past several years reported on their review of the Farm Show financial and sales records. They presented several suggestions designed to streamline the operation of the booth and recommended that detailed management decisions for the booth be delegated to a smaller committee rather than coming before the full Board. This recommendation was approved with Mr. Campbell, Mr. Reynolds, Mr. Shenot, Jonathan Strite and Mr. Troxell being appointed to the Committee.

Robert Amsterdam, chairman of the Capacity Development Committee, reported that the Committee was working on preparing the forms for filing for 501(c)3 charitable non-profit status for the Association as well as developing a succession

plan for the Executive Secretary. The Committee also is developing a plan to add additional staff to the Association, possibly sharing staff with another entity. They also suggested that the Board consider making the Executive Secretary the Executive Director. The Committee will be developing suggested job descriptions for the Directors and reviewing the Crisis Management Plan. The Board voted to appoint the Committee members (Mr. Amsterdam, Mr. King, Mr. Martin, Ms. Resick and Mr. Troxell) to two-year terms and budget \$10,000 for the Committee's expenses.

On July 24 the Board held their summer meeting by telephone conference call. Mr. Troxell reported that the rent for the Farm Show Food Booth will continue to be based on a per square foot basis with the rate for 2019 being increased slightly to \$7 per square foot. Although several possible plans for revisions to the rental rates had been considered, including moving to a percentage of the booth's sales, the Farm Show decided not to pursue those plans. They will, however, begin charging the Food Court vendors for the parking passes at half the rate paid by the public (which is the current policy for other commercial exhibitors). This will be an additional expense of about \$3,000 to the Association since previously Food Court vendors received the passes given to the volunteers for free.

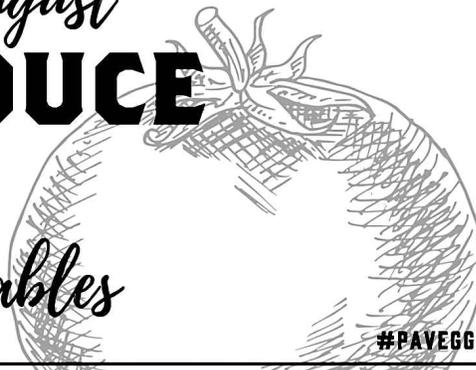
The Board tabled any changes to the scholarship criteria after noting that no applications had been received for the three scholarships available for 2018. The scholarships will be rolled over until the next year and the Association will seek to advertise their availability at Penn State and Delaware Valley Universities. The scholarships are available to students pursuing careers in production agriculture who are children or grandchildren of PVGA members.

The Capacity Development Committee recommended that Board apply to amend the Association's Articles of Incorporation with language that will allow it to file for the 501(c)3 charitable non-profit status with the Internal Revenue Service. They also presented a suggested Conflict of Interest policy that will also be required for the 501(c)3 filing. The Board approved both of these recommended documents.

The next meeting of the Board of Directors will be on Tuesday, December 11, in State College. Meetings of the Association's various committees will be held the day before on December 10.

celebrate this August
**PA PRODUCE
 MONTH**

buy local vegetables



#PAVEGGIES

One of the many graphics available to growers to use in their advertising, Facebook pages or websites to highlight both Produce Month and Pennsylvania Vegetable in general.

NEWS

State News Briefs

State Budget a Win for Agriculture

Pennsylvania's recently adopted 2018-2019 state budget increases funding for several key programs important to agriculture and makes investments aimed at combatting several challenges faced by Pennsylvania farmers, including the spread of the invasive spotted lanternfly and the struggling dairy economy.

The spending plan increases funding for the Pennsylvania Department of Agriculture's general operations by \$1 million, gives a \$500,000 boost to the department's agriculture research programs, and restores funding for Agricultural Excellence programs, Food Marketing and Research, and Agricultural Promotion, Education and Exports. The budget also increases funding for Penn State Cooperative Extension by \$1.5 million and funding for University of Pennsylvania's School of Veterinary Medicine by \$900,000.

The Pennsylvania Agricultural Surplus System, which helps food banks access surplus agricultural goods produced by Pennsylvania farms and processors, will also get a \$500,000 funding increase. The budget includes a new \$3 million investment aimed at controlling the spread of the spotted lanternfly and \$5 million in grants for dairy farmers and processors to create value-added products or conduct market studies.

Pennsylvania Farm Bureau thanks the General Assembly and Gov. Tom Wolf for delivering an on-time budget that recognizes the needs of Pennsylvania agriculture.

"We are pleased that adequate funding to support programs and people, who work on behalf of Pennsylvania farmers and the state's agriculture industry, is in place for the new fiscal year," PFB President Rick Ebert said.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna Farm Bureau, July 2018.*

New Law Adds Checks and Balances in Taking Preserved Farms Through Eminent Domain

A bid to add more scrutiny of local governments seeking to take preserved farmland through eminent domain is now law. Gov. Tom Wolf recently signed House Bill 2468.

The bill, sponsored by Rep. Warren Kampf of Chester County, would require local government agencies, such as municipalities and school districts, to make their case in Orphans' Court before taking preserved land for building projects. That means that governments would have to prove in court that they have no viable alternative to taking preserved land. The requirement would not apply to state agencies, public utilities or projects governed by federal laws.

The legislation came in response to the recent cases of two school districts, Cumberland Valley School District in Cumberland County and Lower Merion School District in Montgomery County, seeking to take preserved land for building projects. The law was made retroactive to apply to both cases, meaning the districts will now have to gain Orphans' Court approval before taking the land.

Pennsylvania Farm Bureau supports farmland preservation and the role it plays in keeping land available for agricultural uses. PFB believes the new law provides important checks and balances to protect the wishes of farmers and other landowners who made the choice to preserve their land.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna Farm Bureau, July 2018.*

Private Dam Financial Assistance Program Established

House Bill 1929 (Marsico-R-Dauphin) enacted as Act 42 of 2018 established the Private Dam Financial Assurance

Program. This is a state-run insurance plan for owners of private dams. In addition, there is a revolving loan program for costs connected with maintenance, repair or permanent breach of a private dam. Funds will come from private dam owners through a premium and an initial \$1,000 registration fee.

*From the **AG-ONE Newsletter**, Penna. State Council of Farm Organization, Issue 2018.11, July 24, 2018*

House Takes No Action on Reducing the General Assembly

An effort to reduce the size of the General Assembly appears unlikely to move forward this year. Lawmakers left Harrisburg for summer recess without taking the action needed to put the measure to a public referendum this year, a necessary step because cutting legislative seats would require amending the state Constitution.

House Bill 153, which calls for cutting the number of seats in the state House to 151 from the current 203, cleared the Senate last week. The House approved an earlier version of the bill but, because changes were made by the Senate, must vote again before Aug. 6 to put the measure to a public vote this November's election. It's unlikely that the House will return to session before that deadline.

If no action is taken this year, the process would reset and the earliest a referendum on reducing the General Assembly could occur would be 2021 because lawmakers would have to approve the measure in back-to-back sessions first.

Pennsylvania Farm Bureau opposes reducing the number of seats in the General Assembly and believes doing so would weaken rural Pennsylvanians' representation in state government. With fewer seats, districts would likely be concentrated in suburban and urban areas, diluting the voice of rural Pennsylvania.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna Farm Bureau, July 2018*

Pennsylvania Farmers Can Apply for Prestigious Conservation Award

A prestigious award that celebrates voluntary conservation by farmland owners is coming to Pennsylvania.

This year Pennsylvania will become the 14th state to present the Leopold Conservation Award in partnership with the Pennsylvania Farm Bureau and Heinz Endowments. The Wisconsin-based Sand County Foundation, the nation's leading voice for private land conservation, presents the award to farmers, ranchers and foresters for extraordinary achievement in voluntary conservation on private working lands.

The inaugural award will be presented at the Pennsylvania Farm Show in January. The recipient receives \$10,000 and a crystal award.

"Pennsylvania Farm Bureau welcomes this opportunity to promote the inaugural Leopold Conservation Award in the state as another occasion to recognize and reward farmers, who are going above and beyond in adopting Best Management Practices on their farms to protect the environment, while maintaining the future economic viability of their farming operations," PFB President Rick Ebert said.

Nominations for the award will be accepted through Aug. 15. Nominations may be submitted on behalf of a landowner, or landowners may nominate themselves. The application is available at <http://bit.ly/LeopoldAwardPA>. For more information, visit www.leopoldconservationaward.org.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna Farm Bureau, July 2018*



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and Apples**

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diseases: early blight,
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NEWS

National News Briefs

Congress Moves Forward on Farm Bill

The 2018 Farm Bill is leaps closer to becoming law.

The U.S. Senate overwhelmingly passed its version of the critical agriculture legislation recently. The vote came after the House narrowly advanced its version of the bill the week before. Now that both chambers have passed versions of the farm bill, legislative leaders can meet in conference to develop a combined version that will need to be approved by both the House and Senate.

Having a new farm bill in place before the current law expires at the end of September is critical to continuing key agriculture programs that help farmers manage their risk to stay viable in an unpredictable business and give certainty during a struggling farm economy. While hurdles remain—chiefly reconciling differences between the House's and Senate's approaches to the nutrition title—the recent votes move the process forward and enable leaders to start drafting the final version.

American Farm Bureau President Zippy Duvall said after the Senate vote that it couldn't have come at a better time as farmers face a difficult farm economy, volatile markets and labor shortages.

"Of course, no bill is ever perfect, but this bipartisan effort gives us a solid framework for progress," Duvall said. "We do have concerns about some of the provisions that were added to the bill that make it harder for farmers to manage risk, but we are confident that those issues can be satisfactorily addressed by the House/Senate conference committee. We look forward to working with conferees from both houses to get the best possible farm bill done for rural America."

Pennsylvania Farm Bureau thanks the Pennsylvania lawmakers who voted for the legislation: Sen. Bob Casey and Reps. Lou Barletta, Ryan Costello, Mike Kelly, Tom Marino, Bill Shuster, Lloyd Smucker, and Glenn "G.T." Thompson.

From the Pennsylvania Agricultural Alliance Issues Update, Penna Farm Bureau, July 2018

More Retaliatory Tariffs on U.S. Agricultural Goods Take Effect

Pennsylvania agriculture could be hit hard as retaliatory tariffs take effect on a bevy of U.S. agricultural goods.

China, Mexico, Canada and the European Union have each implemented tariffs on a wide-ranging list of U.S. imports in the response to a move by President Donald Trump's administration to tax steel and aluminum imports.

The dispute with China also relates to the administration's move to implement tariffs on a variety of Chinese imports. China's 25-percent tariffs on U.S. imports take effect July 6 and apply to numerous items including pork, soybeans, corn, beef, cotton, wheat, sorghum, tobacco, orange juice and cranberries. China is the second-largest recipient of U.S. agricultural goods, accounting for 15 percent of U.S. agricultural exports. And the levies on pork and soybeans would be especially damaging to Pennsylvania, which exports about \$413 million in agricultural products a year to China.

Meanwhile, trade with Canada and Mexico accounts for 60 percent of Pennsylvania agricultural exports. Canada imposed a 25-percent tax beginning July 1 on many U.S. imports including yogurt, maple syrup, prepared meats, chocolates, pizza, orange juice, whiskies and more. Mexico's 20-percent tariffs take effect July 5 and apply to U.S. pork legs and shoulders, sausages, potatoes, apples, cheeses and more. The European Union's 20-percent tariffs took effect in June and apply to U.S. rice, cranberries, orange juice, kidney beans, tobacco products, bourbon whiskey and more.

From the Pennsylvania Agricultural Alliance Issues Update, Penna Farm Bureau, July 2018

Agricultural Labor Reform Effort Falls Short in U.S. House

A push to expand farms' access to year-round agricultural labor fell short in the U.S. House recently amid a spat between lawmakers over other issues related to immigration policy.

Farm Bureau supports measures that would address an agricultural labor shortage by creating a new visa program to expand access to agricultural guest workers and enable year-round operations, such as dairy and mushroom farms, to use it. Those provisions were incorporated into a broader immigration bill that was considered by the U.S. House but ultimately voted down in June. Farm Bureau had supported the bill based on the inclusion of the agricultural labor provisions but did not take a position on other aspects of the legislation.

The agriculture provisions were expected to be included in a second broad immigration bill that was ultimately voted down in the House the following week but were pulled from the legislation prior to the vote.

"It has been over 20 years since any meaningful reform of agricultural guest worker programs have been moved in Congress, yet the can is once more getting kicked even further down the road," American Farm Bureau Federation President Zippy Duvall wrote in a letter to lawmakers, "a road that leads to more imported food, less food security for Americans and fewer U.S. farms and ranches."

From the Pennsylvania Agricultural Alliance Issues Update, Penna Farm Bureau, July 2018

Bills Would Lead to Clearer Product Labels

A pair of bills in Congress aim to reduce the burden and confusion caused by arbitrary or misleading product-labeling rules.

The Accurate Labels Act, introduced in the Senate by Sen. Jerry Moran (R-Kan.) and in the House by Reps. Adam Kinzinger (R-Ill.) and Kurt Schrader (D-Ore.), would establish science-based criteria for state and local labeling requirements, allow state-mandated product information to be provided through smartphone-enabled "smart labels" and online, and ensure that warning labels focus on legitimate risks.

The move comes as some states and localities have enacted restrictive or misleading labeling rules. Examples include warnings on drinks containing sugar and California law that requires products (from coffee to french fries) with even trace amounts of 900 different substances to be labeled as cancer causing.

"To fulfill their purpose of helping consumers make informed choices based on facts, food labels must be science-based," American Farm Bureau Federation President Zippy Duvall said. "Congress should ensure that food labels are consistent, clear and credible. We support new legislation to make 'smart labels' the standard, uniform vehicle to accomplish that."

From the Pennsylvania Agricultural Alliance Issues Update, Penna Farm Bureau, July 2018

USDA Notes

USDA's National Agricultural Statistics Service (NASS) reminds potato growers to respond to the annual Potato Processing Survey which will include data such as potato quantity for chips, frozen French fries, dehydrated potatoes, etc. Results will be published September 3, 2018. Details: King Whetstone, 800-498-1518

Eligible farmers have until August 17 to sign up for the Conservation Reserve Program (CRP). Details: Local Farm Service Agency office or www.fsa.usda.gov/crp

From the AG-ONE Newsletter, Penna. State Council of Farm Organization, Issue 2018.11, July 24, 2018.



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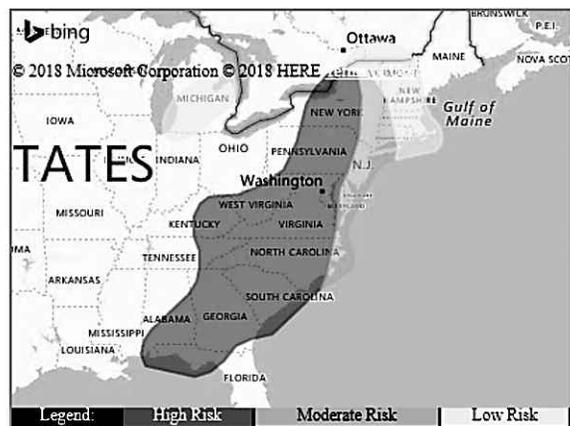
For other regions, contact US
1-844-4BIO360 (1-844-424-6360)



VEGETABLE PRODUCTION

High Risk Alert for Downy Mildew on All Cucurbit Crops Across the Region

Risk prediction map for Day 3: Thursday, August 2



HIGH Risk in the FL panhandle, southeast AL, GA, SC, eastern TN and KY, all but far eastern sections of NC / VA / MD, WV, central and eastern PA, and central NY. Moderate Risk to cucurbits in the far eastern eastern sections of NC / VA / MD, DE, NJ, eastern NY, Long Island, and western CT and MA. Low Risk to cucurbits in VT, NH, central and eastern MA, eastern CT, RI, southern VT, and southern lower MI. Minimal Risk to cucurbits otherwise.

Downy mildew risk map for Thursday August 2, 2018 (cdm.ipmPIPE.org).

The unrelenting wet weather has created ideal conditions for the spread and development of downy mildew on all cucurbit crops including cucumber, cantaloupe, summer squashes, winter squashes and pumpkin not only across most of PA but all along the east coast. Yesterday, downy mildew was confirmed on jack-o-lantern pumpkin in NJ and last week on butternut squash in NJ. It is advised that all cucurbits fungicide programs include products that are specific for downy mildew and be maintained on a tight spray schedule as long as the wet weather persists. It is also recommended that for crops with successive plantings, once harvest is complete disk-under, rogue or spray the planting with an herbicide to kill the plant tissue. If infected with downy mildew, once the plant tissue is dead, the pathogen is dead. If not infected with downy mildew, then you are removing potential plant tissue that could potentially become infected and serve as an inoculum source for your later plantings.

Fungicides are an important tool for effective. At this time, if not already being used, protectant fungicides are recommended for growers in the central and western parts of PA. Conventional growers closer to the sources may want to consider including a downy mildew specific fungicide in their spray program. Organic management of downy mildew is more challenging. Copper-based products are still the primary tool but can also cause phytotoxicity on some cucurbit crops. Other organic options include the microbial biopesticides Actinovate, Double Nickel 55, Serenade and Sonata as well as the biochemical biopesticides MilStop, Organocide, Oxidate, Regalia, Sporotec and Trilogy. Zonix is an OMRI-approved rhamnolipid surfactant which has shown some efficacy when included in a regular spray program. It is recommended that all organic cucumber crops be under some type of protectant spray program at this time.

There are more product options for non-organic production including Orondis Ultra (U15 + 40), Orondis Opti (U15 + M5) and Ranman 400SC (21) which can be rotated with Previcur Flex 6F (28), Zampro 525SC (40 + 45), Zing! 4.9SC (M5+ 22). See the 2018 Mid-Atlantic Commercial Vegetable Production Recommendations for a more complete list of recommended products. For resistance management, rotate between FRAC

code groups and tank mix with protectant fungicide. The latest resistance management recommendations can be found here electronically. In fall 2017, Valent received a federal registration for Elumin (ethaboxam, FRAC 22) which is labelled for oomycete diseases on cucurbits, ginseng, pepper/eggplant and tuberos and corm vegetables.

Since downy mildew disease forecasting is an important tool utilized by growers, extension educators, crop consultants and other industry stakeholders, confirming reports especially early in the season and on different cucurbit crops is important at both a local and regional level. 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. Check the CDM ipmPIPE website for the latest information about confirmed reports.

Dr. Gugino is with the Dept. of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, July 4 and August 1, 2018.

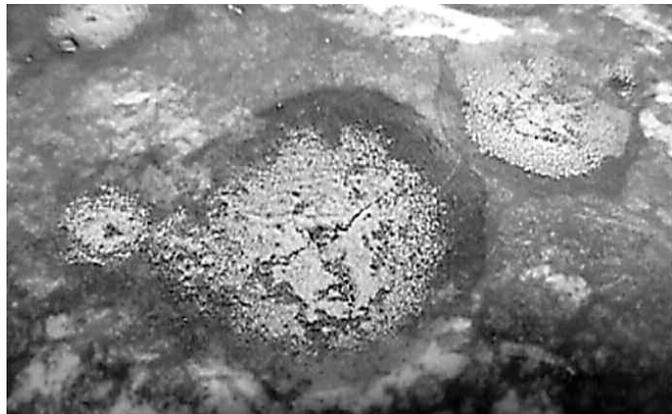


Angular lesions caused by downy mildew on the upper surface of a cucumber leaf (top) and purple spores of the pathogen on the lower leaf surface (bottom). (Photo credit: Beth Gugino).

Watch Out for Fungal Diseases on Melons

Carla Burkle

Your melon crops should be well on their way by now, and with the rain we've had, fungal diseases may be too.



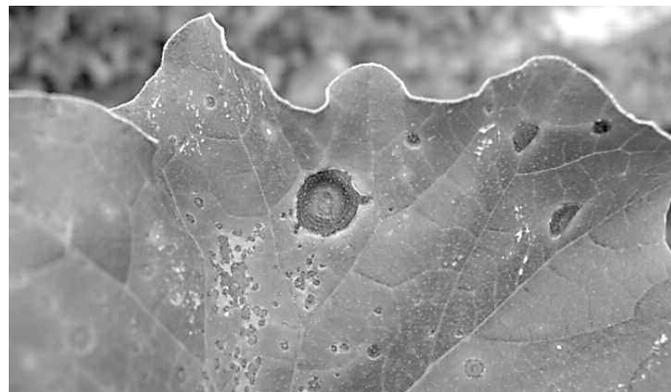
Anthrachnose (Colletotrichum orbiculare) on watermelon. Photo: Jason Brock, University of Georgia (bugwood.org)

I've seen alternaria and anthracnose on melons so far this season, and have also had some calls with a concern about gummy stem blight. Here's what to look for to tell the different diseases apart.

Alternaria Leaf Spot

Alternaria leaf spot is a common fungal disease of many fruit and vegetable crops, and melons are no exception. Cantaloupes are most often affected, but other cucurbits may

be affected as well. Defoliation may occur as the disease progresses, causing reduced yield, sunscald of fruit, and premature ripening. Lesions begin as small, brown spots and enlarge quickly. Enlarged spots may be water-soaked in appearance with a yellow margin. They may have light/dark brown concentric rings, giving them a target-like appearance. Conidia are widely present in the environment and easily spread by wind, so protectant sprays of chlorothalonil or mancozeb are recommended when vines start to run.



Alternaria leaf blight (Alternaria cucumerina) on cantaloupe. Foliar lesion with concentric circles. Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo (bugwood.org)

(continued on page 10)

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VEGETABLE PRODUCTION

Watch Out for... (continued from page 9)**Anthracnose**

Anthracnose is another common fungal disease that affects several cucurbit crops, including melons. At this time in the season, you're likely to see lesions on leaves and stems. Look for water-soaked yellowing spots on leaves that rapidly expand to brown or black spots. The centers may tear giving leaves a ragged appearance. Lesions may coalesce, and entire leaves may die. Stem lesions are elongate and sunken and may crack along the center as they age. Young fruit with infected pedicels may die. Older fruit may develop sunken, circular lesions that progress to black as the lesions age. You may see a salmon-colored slime on lesions in wet weather, which is caused by fungal sporulation. Resistant cucurbit varieties are available, and their use is strongly encouraged. There are many fungicides available for anthracnose management, but alternating chlorothalonil with a tank mix of thiophanate-methyl and chlorothalonil or mancozeb is encouraged when disease pressure is low.



Anthracnose (*Colletotrichum orbiculare*) on watermelon. Note the cracking of necrotic tissue, irregular lesion margins, and shot-hole effect. Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo (bugwood.org)

Gummy Stem Blight

When a grower calls me concerned about a disease issue on a cucurbit crop, this is the disease they most often think they're dealing with. In all likelihood, it isn't gummy stem blight, as this disease is much more common further south. That doesn't mean we don't get it in Pennsylvania though. On seedlings, look for circular brown water-soaked lesions on the stem and cotyledons. Stems may develop water-soaked brown lesions that split and exude brown to black "gummy" droplets. As these lesions dry, they may turn brown and split further. Fruit lesions start out circular, with a greasy green-brown appearance. Lesions may coalesce and turn black with a sunken appearance, and gummy exudate is possible. If you look closely, you may see very small black dots, called pycnidia, on lesions. The stem lesions, in particular, may appear similar to anthracnose lesions, and the appearance of pycnidia can help tell them apart. Chlorothalonil sprays are advised under low disease pressure; there are other fungicides recommended as a tank mix with chlorothalonil under higher pressure. Resistance is a problem with gummy stem blight, so making solo applications of fungicides in the FRAC Code 11 (Cabrio, Quadris, Flint) isn't recommended.

Ms. Burkle is with Penn State Extension in Cumberland Co. From Penn State Extension, <https://extension.psu.edu/watch-out-for-fungal-diseases-on-melons>, July 23, 2018.



Gummy stem blight (vine decline) (*Stagonosporopsis cucurbitacearum*) on watermelon. Stems show dark, water-soaked lesions often containing black, "pimple-like" fruiting structures. Photo: David B. Langston, University of Georgia (bugwood.org)

Controlling Cucurbit Downy Mildew

Kate Everts

Please read labels carefully as some of the fungicides mentioned in this article are not labelled on all cucurbits.

In planning your spray programs for powdery mildew on cucurbits, remember that many products that are labeled for this disease, are not effective because of the existence of fungicide resistance. The powdery mildew pathogen *Podosphaera xanthii*, is highly prone to the development of resistance and has lost sensitivity (become resistant) to some recently registered fungicides. To manage powdery mildew, begin with good cultural practices – especially the use of resistant cultivars. In a spray program, alternate targeted fungicides in different FRAC groups, apply fungicides at manufacturer's recommended rate (don't cut the rate), tank-mix with a fungicide with different mode-of-action (or use combination product), and don't apply at-risk fungicides if powdery mildew sporulation covers more than 20% of the leaf surfaces.

Currently the following targeted fungicides are NOT effective for managing powdery mildew (resistance in pathogen population is high): Topsin M (FRAC 1, Benzimidazole), and Cabrio, Quadris, and others (FRAC 11, QoI fungicides).

Resistance exists, but the following fungicides may be used judiciously, to a limited extent, in a rotational program: Rally, Procure, Folicur, (FRAC 3, DMI fungicides); Pristine (FRAC 7 + 11), Fontelis, Xemium, Aprovia (FRAC 7, SDHI fungicides). Luna is also a FRAC 7 fungicide, however it isn't cross resistant with the other FRAC 7 group.

Fungicides that still have good efficacy in our area in the past two years are: Quintec (FRAC 13) and Vivando (FRAC U8). Luna Experience and Quintec alternated with Procure are alternations that I have tested and performed well. Unfortunately, resistance to Torino (FRAC U6) has now been documented in the eastern U.S. and it hasn't performed well in my trials.

Dr. Everts is the Vegetable Pathologist at the Univ. of Delaware and the Univ. of Maryland. From the **Weekly Crop Update**, Univ. of Delaware Extension, Issue 26:12, June 15, 2018.

Powdery Mildew Management in Cucurbits for 2018

Beth Gugino

Powdery mildew continues to be an annual concern in cucurbit production.



Late season powdery mildew on pumpkin may severely weaken the handles and reduce marketability. Photo: Beth Gugino, Penn State

Since the pathogen (primarily *Podosphaera xanthii*) does not overwinter in the Northeast and mid-Atlantic regions, the pathogens move into our production fields from other nearby sources; typically moving from the southeast up along the east coast.

When it comes to cucurbit diseases, powdery mildew is unusual because disease development can be initiated at a lower relative humidity (~50% RH) and leaf dryness (over leaf wetness) favors colonization, sporulation, and dispersal of pathogen spores. Temperatures between 68 and 80°F are most favorable for disease development.

The first signs of powdery mildew are small white powdery spots most commonly seen on the underside of the leaves or within the plant canopy. When scouting, it is important to thoroughly look over the entire plant. Also, scout by cultivar to account for differences in host resistance; usually scouting the most susceptible cultivars first around the time of fruiting. If protectant fungicides are being used, sometimes the spots on the upper leaf surface are yellow or chlorotic with white powdery lesions on the corresponding underside of the leaf. Accurate diagnosis is critical because targeted conventional fungicides applied for managing powdery mildew are different than those used for downy mildew.

Although at this point in the season it is too late, host resistance is an important tool for disease management. There is a wide array of cucurbits that have been conventionally bred with resistance. Genetic resistance can often both delay the onset of powdery mildew and reduce overall disease severity. As a result, it is important to scout for powdery mildew by cultivar.

When powdery mildew occurs early in the season and is left unmanaged, it can severely reduce the photosynthetic area of the leaves needed to produce high-quality marketable fruit. On pumpkin later in the season, it can also severely damage the handles leaving them weak further reducing marketability. Fungicides are an important tool for managing powdery mildew in-season. However, resistance management is a concern. It is recommended that the most effective products are applied when symptoms are first observed (one powdery mildew spot on 45 to 50 leaves) and then later in the season when switch-

ing to a protectant spray program rather than the reverse. In the long-run, this will reduce the selection pressure for powdery mildew spores that are resistant to the fungicide because fewer spores are exposed to the active ingredient when disease severity is low.

Annually since 2009, pumpkin powdery mildew fungicide trials have been conducted on a susceptible pumpkin cultivar such as Sorcerer and Howden at the Russell E. Larson Research and Education Center in Centre Co., PA. Products that continue to be the most effective include Torino 0.85SC (FRAC code U6), Vivando 2.5SC (U8), Luna Experience 3.34SC (3 + 7) and Quintec 2.08SC (13). These are best used

(continued on page 12)

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Powdery Mildew... (continued from page 11)

when alternated with products like Fontelis 1.67SC (7), Procure 480SC (3), tebuconazole (3), Inspire Super 2.8F (3 + 9), Pristine 40WSP (11 + 7), Aprovia Top 1.62EC (3 + 11) and Rally 40WSP (3) or with micronized wettable sulfur 80W (M2). Each application should be applied tank mixed with a broad spectrum protectant fungicide to manage for fungicide resistance and always rotate between FRAC codes with each application.

The latest resistance management recommendations and efficacy ratings: Fungicide Resistance Management Guidelines for Cucurbit Downy and Powdery Mildew Control in the Mid-Atlantic and Northeast Regions of the United States in 2018

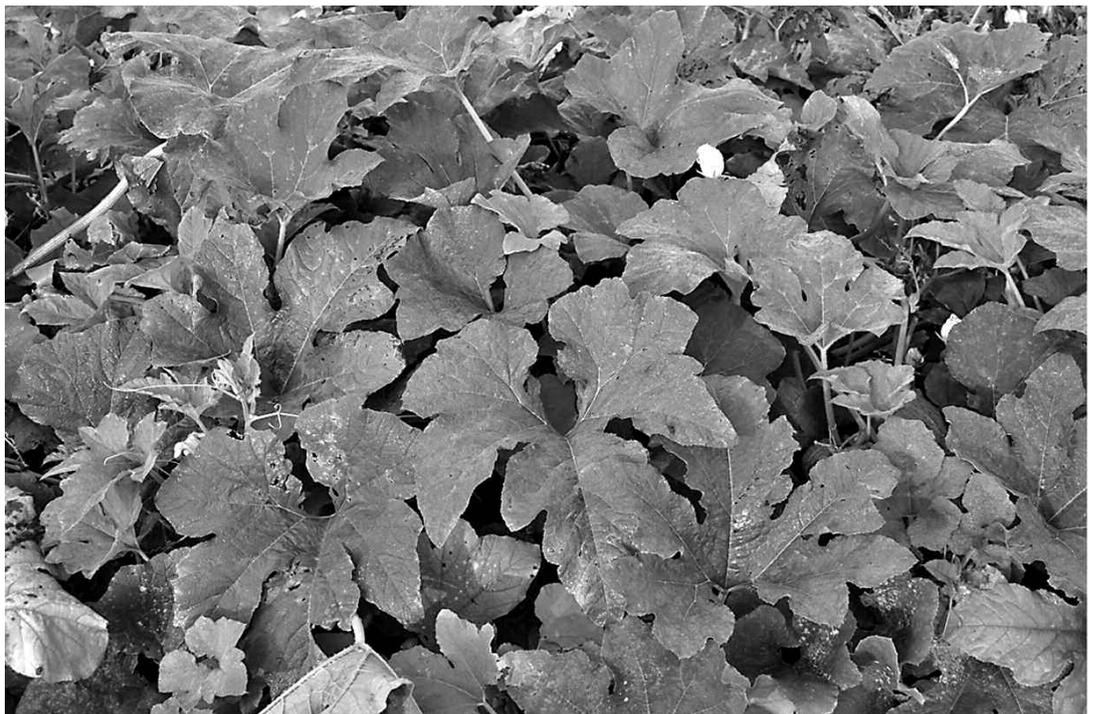
Due to increasing concerns about pollinator health and their exposure to fungicides such as chlorothalonil when possible, time fungicide applications when fewer pollinators are foraging and visiting flowers and flowers are closed. In trials conducted over the past couple of years to identify alternatives to tank mixing with chlorothalonil, both Tritek (mineral oil) and Microthiol Disperss (sulfur) were determined to be equally effective tank-mix partners and pose less of a risk to bee health.

Fortunately, cucurbit powdery mildew is one of the easier diseases to manage organically and there are a number of options including copper, sulfur, oil-based products like Eco E-rase (jojoba oil), JMS Stylet oil (paraffinic oil), Trilogy (neem oil), and Organocide (sesame oil), as well as potassium bicarbonate-based products such as Kaligreen and MilStop to name a few. With these products, spray coverage is essential since they are only effective at the site of application. So apply them in a large enough volume of water at a higher pressure to move the spray and penetrate the plant canopy.

Dr. Gugino is with the Department of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, <https://extension.psu.edu/powdery-mildew-management-in-cucurbits-for-2018>, July 9, 2018.



Severe powdery mildew on a susceptible pumpkin cv. Howden at the end of August 2017. No fungicides applied. Photo: Beth Gugino, Penn State



A weekly rotation of Fontelis, Torino, and Vivando, each tank mixed with Bravo WeatherStik, 5 total applications. Photo: Beth Gugino, Penn State

Wild Bees for Pennsylvania Cucurbits

Shelby Fleisher

In addition to honey bees, which are managed, various unmanaged species that exist as wild populations play key roles in providing pollination of cucurbit crops.



Pollination services in the Cucumis genus (cucumbers and melons), appears to be more sensitive to the need to achieve pollination by honey bees. Studies show a mix of both honey and wild bees in the pollination of these crops, but researchers found more than 28 species of wild bees visiting cucumber flowers in addition to honey bees in central Indiana, and we have seen similar variation in Pennsylvania.

In eastern PA and parts of NJ, researchers observed 44 species visiting watermelon flowers planted in small, diversified farms. The team developed individual-based models to simulate pollination services from data on visitation rates, along with number of pollen grains deposited per visit. Results showed that wild bees provided full pollination in ~90% of these farms, even though honey bees were also present. Honey bees alone provided pollination in ~70 to 80% of the farms. The presence of both honey bees and wild bees helped ensure resiliency in pollination services.

The degree to which different species of bees provide pollination services varies among cucurbit crops. It also changes as the season changes, and can even vary at different times of the day.

In the Cucurbita genus, the squash and pumpkin crops, wild bees may well be the dominant floral visitor, regardless of whether the field is stocked with honey bees. This has been seen in NY, MA, VA and in diversified farming operations in PA. In larger 'Gladiator' pumpkin fields in 2013 in Columbia and Lancaster Counties destined for wholesale markets, measures of 4,853 bee visits showed that 67% came from bumble bees, and 25% from squash bees. Thus, wild bees provided 92% of the visits to flowers (honey bees added an additional 6%) in that year.

Among the several bumble bee

species in Pennsylvania, the common eastern Bumble Bee, *Bombus impatiens*, plays the key role. Overwintered solitary queens are establishing nests in late March, April, and May. During this very sensitive time in their life cycle, queens are finding and building nests, laying eggs, keeping the brood warm with her body heat, provisioning brood with pollen sometimes mixed with nectar, and rearing the first generation of brood. She needs plentiful, diverse, and high quality floral resources in close proximity to her nest. We are experimenting with a cover cropping system, planted in September of the previous year, to provide floral resources during this time. Along with providing the spring floral resources, this mix is designed to stop flowering (or be killed) by the time that the pumpkin crop needs to be pollinated (mid July through mid August). You may have other ideas that would achieve this same purpose.

(continued on page 14)

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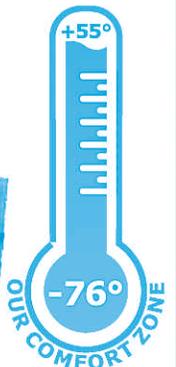
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VEGETABLE PRODUCTION

Wild Bees... (continued from page 13)

Trial Seed Mix, with a mid September Planting Date, to provide floral resources for the overwintered queen of the Common Eastern Bumble Bee (Bombus impatiens) during the time she establishes a nest and provisions the first brood in spring of the following year.

| Crop Species | Seeding rate (lbs/ac) |
|---------------------|-----------------------|
| Oats | 30 (nurse crop) |
| Canola | 5 |
| Crimson Clover | 20 |
| Vetch | 30 |
| Austrian Winter Pea | 60-70 |

During the mid-summer, do you want to provide additional floral resources? Some would argue this would help support bumble bee, honey bee, and other “generalist” bee species (species that visit flowers from multiple plants). Others argue that these flowers would compete with the pumpkin flowers for visitation by bees. In our current experiments, we are not adding a floral resource during the July to late August time frame, and we see good numbers of bumble bees working pumpkin fields. This is also the time frame when *Bombus impatiens* colonies should be at their strongest, because they should have multiple broods of workers helping support the colony.

As summer comes to a close, *Bombus impatiens* enters a second sensitive time. Instead of developing as workers, female offspring become reproductive, and males are produced. These new females will mate, and attempt to overwinter - they are called ‘gynes’. Gynes need to acquire substantial resources if they are to successfully overwinter. Thus, we are trialing seed mixes designed to flower during the time that gynes are acquiring resources for overwintering. Again, you may have additional ideas.

Trial Seed Mix, with a July 7 Planting Date, to provide floral resources for the new queens of the Common Eastern Bumble Bee (Bombus impatiens) during the time they are foraging prior to overwintering.

| Crop | Time to flower | Initial flower | Seeding rate (lbs/ac) |
|--------------------|----------------|-------------------------|-----------------------|
| Buckwheat | 6 weeks | August 19 | 20 |
| Phacelia | 6 weeks | August 19 | 7 |
| 'Caliente' Mustard | 6-8 weeks | August 26 - September 1 | 5 |
| Cowpeas | 8 weeks | September 1 | 15 |
| Sunn Hemp | 10 weeks | September 14 | 8 |
| Sunflower | 12 weeks | September 25 | ?? |

You might consider trialing seed mixes to see what works on your farm. What seeding rates work? What plant species mixes result in flowering at what time, and are you seeing bumble bee visitations to those flowers? When can you fit this into your cropping system?

Using cover-crop types of plant species is one option that could fit well within farming systems based around annual crops. You might also consider installing some perennial species, which have different advantages and logistical issues to consider. There are a wide range of perennial species that are visited by bumble bees, and food for thought in another article.

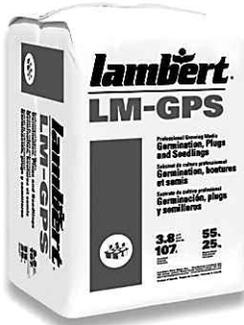
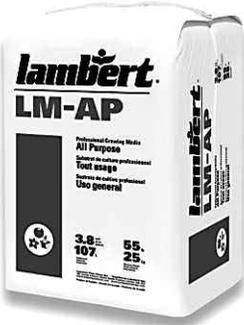
A listing of references used in preparing this article is available upon request from the author.

Dr. Fleischer is with the Department of Entomology at Penn State Univ. From Penn State Extension, <https://extension.psu.edu/wild-bees-for-pennsylvania-cucurbits>.





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High Tunnel Soil Nutrient Levels

Elsa Sanchez and Thomas Ford



High tunnel tomatoes. Photo credit: Thomas Ford, Penn State.

Over the last year (2017), we have been working with 27 Pennsylvania farmers to better understand soils in high tunnels. Farmers sent soil samples from their high tunnels to Penn State's Agricultural Analytical Services Laboratory (hereafter "the Lab") for analysis. In this article, we are taking a look at phosphate, potash, magnesium, and calcium levels.

Fertility baselines for high tunnel crops have not yet been determined for Pennsylvania. In the interim, we are using field data for commercial vegetable crops as the baseline for all nutrient management decisions coupled with regular plant analysis (tissue testing.)

Soil test values reported for commercial vegetables from the Lab fall into the categories "deficient," "optimum," or "exceeds crop needs." Crops normally produce best when nutrient levels fall in the "optimum" category. When nutrients are in the "deficient" category, adding those nutrients should increase yield. When nutrient levels are in the "exceeds crop needs" category, more than enough of a nutrient is present in the soil. Having nutrients in the "exceeds crop needs" category can be as bad as being in the "deficient" category. High soil nutrient levels might not only represent an economic loss, but may also result in crop, animal, or environmental problems.

Phosphate values higher than about 321 lb/acre fall in the "exceeds crop needs" category. The range for the high tunnels surveyed was 289 lb/acre to 5038 lb/acre, and 26 of the 27 (96 percent) fell into the "exceeds crop needs" category. The average phosphate value was 1580 lb/acre. The Lab tracks the average nutrient value for commercial vegetable soil samples. These samples include soil from fields and high tunnels. The average phosphate level for the 1359 commercial vegetable samples analyzed in 2016-17 was about 751 lb/acre. This value also falls in the "exceeds crop needs" category and is about 52% lower than the average of the 27 high tunnels.

Potash values higher than about 336 lb/acre fall in the "exceeds crop needs" category. The range for the high tunnels was 228 lb/acre to 8215 lb/acre, and 23 of the 27 (85 percent) fell into the "exceeds crop needs" category. The average potash value in the high tunnels was 1282 lb/acre. The average phos-

(continued on page 16)

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VEGETABLE PRODUCTION

High Tunnel... (continued from page 15)

| SOIL NUTRIENT LEVELS | | | | Deficient | Optimum | Exceeds Crop Needs |
|----------------------|----------------------------------|------|------|-----------|---------|--------------------|
| Soil pH | | 7.6 | | | | |
| Phosphate | (P ₂ O ₅) | 779 | lb/A | | | |
| Potash | (K ₂ O) | 451 | lb/A | | | |
| Magnesium | (MgO) | 2616 | lb/A | | | |
| Calcium | (CaO) | 8589 | lb/A | | | |

Example from a soil test report showing the categories Deficient, Optimum, and Exceeds Crop Needs.

phate value for commercial vegetable samples sent to the Lab in 2016-17 was about 550 lb/acre. This value also falls in the “exceeds crop needs” category and is about 57% lower than the average of the 27 high tunnels.

Magnesium (as magnesium oxide) values higher than about 398 lb/acre fall in the “exceeds crop needs” category. The range for the high tunnels was 515 lb/acre to 4977 lb/acre, and all (100 percent) of the samples were in the “exceeds crop needs” category. The average magnesium value in the high tunnels was 1619 lb/acre. The average magnesium value for commercial vegetable samples sent to the Lab in 2016-17 was about 717 lb/acre. This value also falls in the “exceeds crop needs” category and is about 56% lower than the average of the 27 high tunnels.

Calcium (as calcium oxide) levels are a bit more complicated because recommendations are based on the calcium level, pH goal, and exchangeable acidity. The range for the high tunnels was 3472 lb/acre to 21,040 lb/acre, and 23 of the 27 (85 percent) of the samples were in the “exceeds crop needs” category. The average calcium value in the high tunnels was 9290 lb/acre. The average value for commercial vegetable samples sent to the Lab in 2016-17 was about 5516 lb/acre. This value also falls in the “exceeds crop needs” category and is about 40% lower than the average of the 27 high tunnels.

Nutrient levels in these high tunnels largely exceeded crop needs. Averages for these nutrients in all commercial vegetable samples also exceeded crop needs, but not to the same extent as in the high tunnels. Phosphate, potash, and magnesium levels from high tunnels were over twice the values seen in all

crop needs” levels when using compost, inorganic fertilizers, or other organic nutrient sources.

If nutrient levels in your high tunnels exceed crop needs, avoid adding more of these nutrients to the tunnels to start to correct the situation. Use other nitrogen sources, including granular and liquid forms, to meet crop needs. Look for sources with grades containing very low or no phosphorus or potash, for example, dried blood, feather meal, or urea.

For nitrogen, another option is using cover crops – typically legumes. For example, planting a red clover can provide 100 to 110 lbs of nitrogen per acre. Tables exist that can help to determine how much nitrogen can be added by various legume cover crops. You can find one on page B16 of the Mid-Atlantic Commercial Vegetable Production Recommendations available to purchase as a hard copy. It is also available as a free pdf.

When using compost, be aware that most composts do not contain nutrients in balanced amounts as needed by plants. They can have an excess of phosphorus and potassium relative to plant demand for nitrogen. These nutrients can accumulate to levels exceeding crop needs with repeated applications or even a single large application.

This is not to say that you should not use compost, just that it is better used along with other nutrient sources. We have a publication for free download called Using Organic Nutrient Sources, which helps interpret soil test reports for using organic nutrient sources. It includes a formula (on page 11) for calculating how much compost to apply.

Over time, with the production of your crops the phosphate, potash, magnesium, and calcium levels should decrease. You

can speed up the process by growing cover crops. The key with this method is to remove the cover crops from the tunnel versus turning them into the soil.

Dr. Sanchez is with the Plant Science Dept. at Penn State Univ. and Mr. Ford is with Penn State Extension in Cambria Co. From Penn State Extension at <https://extension.psu.edu/high-tunnel-soil-test-report-soil-nutrient-levels>. July 20, 2018.

| SOIL NUTRIENT LEVELS | | | | Deficient | Optimum | Exceeds Crop Needs |
|----------------------|----------------------------------|------|------|-----------|---------|--------------------|
| Soil pH | | 6.7 | | | | |
| Phosphate | (P ₂ O ₅) | 586 | lb/A | | | |
| Potash | (K ₂ O) | 626 | lb/A | | | |
| Magnesium | (MgO) | 704 | lb/A | | | |
| Calcium | (CaO) | 6279 | lb/A | | | |

Recommendations For: LEAF LETTUCE

Limestone and Magnesium:

Calcitic Limestone (calcium carbonate equivalent): NONE Magnesium (Mg): NONE

Plant Nutrient Needs:

Nitrogen (N): 75 lb/A Phosphate (P₂O₅): NONE Potash (K₂O): NONE

Nitrogen needs still need to be met, when phosphate, potash, magnesium, and calcium levels are in the “exceeds crop needs” category.

Corn Earworm Management

Katie Campbell-Nelson

Corn earworm (*Heliothis zea*) moths migrate annually into the Northeast, traveling north on storm fronts, and may arrive anytime from late June through September. They arrived late this year because the Gulf stream pushed storms northward without much help from the Jet stream to push them eastward. However, with the last few storms, the corn earworm population has grown, and one farm on the south coast of Massachusetts captured 251 moths in their trap this week! Populations usually don't peak until August when trap captures may exceed 90 moths per week. Heaviest numbers are found in coastal areas and up the major river valleys. The severity of infestations varies from year to year and may change suddenly during the season. For example, in 2014, we did not get a lot of Atlantic coastal storms, and corn earworm populations were low.

Identification

Known as the tomato fruitworm, cotton bollworm, or corn earworm, this lepidopteran noctuid (night-flying) pest feeds on corn, tomato, cotton, green beans, clover, vetch, lettuce, peppers, soybean, and sorghum. Sweet corn, especially when silking, is a preferred host in New England, and losses may reach 50% if populations are not managed. Adult moths are light tan with a distinctive dark spot on each forewing, with a dark band near the margin of the hind wing, and a wingspan of 1.2 to 1.5 inches. Live moths have bright green eyes. Rounded, ribbed eggs less than 1/16th of an inch in diameter are laid directly on fresh silk. Eggs develop a red ring encircling them 24 hours after being laid, and the black head capsule is visible just before they hatch. Corn earworm larvae may be brown, tan, green, or pink, with light and dark longitudinal stripes. Corn earworm can be distinguished from fall armyworm and European corn borer by the plain, golden brown head capsule and small bumps and spines that give the body a rough texture. The larvae reach 1.5 to 2 inches when full-grown.

Life Cycle

Adults arrive in Massachusetts ready to lay eggs. Egg laying takes place mostly in the evening as this is a noctuid moth, and each female is capable of laying 500 to 2000 eggs during her two-week life span. Even though many eggs may be laid in each ear, usually only one larva is found per ear because they are cannibalistic. Eggs hatch in 2.5 to 6 days, or within 48 hours when temperatures get into the 90s. Caterpillars crawl down the silk channel within one hour of hatching and feed on the kernels at the tip, leaving unsightly frass. In the tip they are protected from insecticide sprays. Control measures must be timed to prevent larvae from entering the ear. Larvae feed for 3 to 4 weeks as they go through 5 growth stages before chewing out through the corn husk and burrowing in the soil to pupate. Another generation of adults may emerge from these pupae, as more adults are simultaneously carried North on storms. Therefore, later in the season, infestations may not correlate to storms bringing in new adults.

Monitoring

When corn earworm captures in pheromone traps are above two per week, we know that a damaging population is present. Monitoring moth flight with pheromone traps is key to season-long control, both to respond quickly to changes in flight

Corn earworm eggs
(Photo: Bill Hutchinson),
larvae, and adult.



and to avoid unnecessary sprays. Non-target moths can often end up in traps and accurate identification is important for decision making. Reports of moth trap captures at selected locations are provided in most New England states. The most accurate and timely flight information will be obtained by monitoring your own fields. *Heliothis zea* pheromone lures are commercially available and widely used in the region. Spray thresholds (see Table 1) are based on trap counts. Use two traps on

(continued on page 18)



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Corn Earworm... (continued from page 17)

each farm. Place traps in blocks with fresh silk and move one trap into fresh silk each week. Blocks with fresh silk will give you the highest and most accurate counts. Counting moths twice weekly is the most accurate way to monitor and will help you avoid missing a sudden jump in the CEW population on your farm. Calculate the average nightly catch (divide total count by the number of nights since the last count). Replace lures every two weeks. Use 2 traps on each farm and move one each week into fresh silk.

Control

Control depends upon maintaining insecticide coverage on the silks, unless you are using transgenic hybrids which express the *Bacillus thuringiensis* (Bt) toxin in leaves, silks, and kernels. Bt transgenic corn has been commercially available since 1996. In 2015, 81% of corn and 84% of cotton grown in the U.S. were Bt transgenic crops. Research published in 2016 indicates that there is field resistance among corn earworm to transgenic corn. This has likely developed as a result of rapid adoption of Bt field corn and cotton production, lower 'refuge' compliance, and high tolerance of corn earworm to Bt toxins.

Table 1: Spray Intervals for corn earworm based on moth captures in Heliiothis net traps.

| Moths/Night | Moths/Week | Spray Interval |
|-------------|------------|----------------|
| 0 - 0.2 | 0 - 1.4 | no spray |
| 0.2 - 0.5 | 1.4 - 3.5 | 6 days |
| 0.5 - 1 | 3.5 - 7 | 5 days |
| 1 - 13 | 7 - 91 | 4 days |
| Over 13 | Over 91 | 3 days |

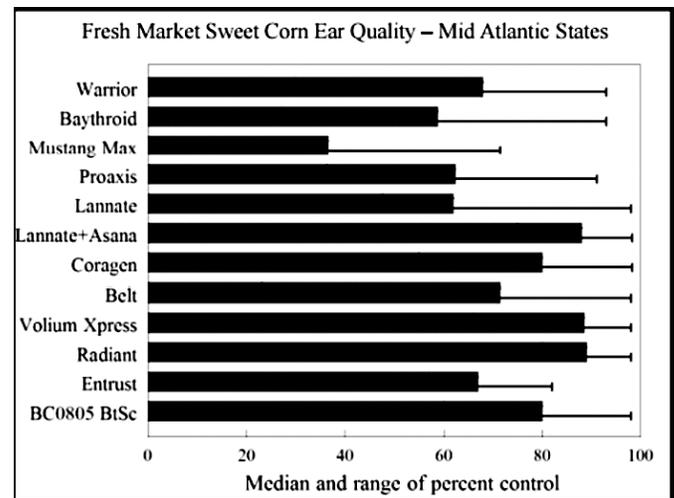
Directed sprays to the ear zone provide the best coverage. Repeat applications to silk every three to six days depending on trap captures according to the chart to the right. The spray intervals assume use of synthetic pyrethroid or carbamate products. Some newer products in the diamide class (Coragen, Belt, or mixtures such as Voliam Xpress and Besiege) have a longer residual that should allow the spray interval to be extended by one or two days. If maximum daily temperature is below 85°F for two to three days, spray intervals may be extended by one day. Continue treatments until five to seven days before final harvest or until silk is completely dry and brown. Use selective materials instead of broad spectrum insecticides to conserve natural enemies of aphids and other pests.

The newer, selective products for corn earworm, fall armyworm, and European corn borer provide good control while being easier on beneficial insects that are present in the field and safer for applicators to handle. These provide good alternatives to the synthetic pyrethroids (e.g. Warrior) and carbamates (e.g. Lannate) that were the mainstay of corn earworm control for many years. As with other products, control is better when application equipment is set up for good coverage of the ear zone. Based on review of published trials, the following products have provided good control:

- Radiant (spinetoram): consistently equivalent efficacy with Warrior in trials - highly effective.
- Belt (flubendiamide): equivalent efficacy to Warrior in some trials, slightly less in others.
- Coragen (chlorantraniliprole): slightly less effective on corn earworm than Warrior but easier on beneficials and people.
 - A rotation of Coragen, Belt, and Radiant is recommended to avoid resistance development. Growers we have

spoken with who have been trying these products have also reported effective control. The products mentioned above can be mixed with broad spectrum pyrethroids. However, given that there are many beneficial insects in corn, it's good to have more selective products available.

- **Besiege** (a mixture of Coragen and Warrior active ingredients, each at lower rates): highly effective, often better than Warrior.
- **Entrust** (spinosad): In organic fields, this material has been observed to give good control of corn earworm. Foliar sprays of Entrust will be effective for control of European corn borer in the tassel, as well as for control of light to moderate populations of corn earworm. High populations (over 30 per week) may not be fully controlled by this product.



Results of trials conducted by Ben Beale and Galen Dively (University of Maryland) and Joanne Whalen (University of Delaware).

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Ms. Campbell-Nelson is with the Univ. of Massachusetts Extension. From **Vegetable Notes for Vegetable Farmers in Mass.**, Univ. of Mass. Ext., Vol. 30, No. 17, August 2, 2018.

Sap Beetles in Sweet Corn

Ruth Hazzard and Susan Scheufele

Sap beetles have generally been thought of as secondary pests of sweet corn, usually associated with damage caused by caterpillars, but on some farms they are a regular and troublesome pest in early sweet corn plantings – even where caterpillars have been non-existent! Early sweet corn varieties tend to have poor tip cover, allowing sap beetle adults to lay small cavities in cucumber fruit. In a more severe form hollowness and cavities can render the fruits unmarketable or reduce processing (pickling) quality. Progression from marketable to unmarketable pickle fruits that are crooked, waist pinched, tip pinched or tip pinched with crook. 6 eggs near the tip, where tiny larvae burrow into the kernels, and make the ears unmarketable (see photo). Sap beetle adults have already been observed in early corn plantings in MA, so now is the time to be scouting if this pest has been a problem on your farm in past years. Sap beetles can also be pests of strawberry and other fruits, so they tend to be more of a problem on farms that grow both fruit and corn. The beetles are attracted to decaying plant material, particularly fruit. Growers with sweet corn plantings that are close to peach or apple orchards, where over-ripe dropped fruit can attract adult beetles, are vulnerable to invasions into corn, and should pay particular attention for this pest when scouting. Sap beetle infestations tend to be worse in hot, dry years.

Life Cycle and Damage. Sap beetles overwinter as adults, often in the woods near previous feeding sites. Early sweet corn silk is an attractive early-season feeding and egg-laying site, especially when fruits and other hosts are rare. There are several generations per year. The most common sap beetles in corn are the dusky sap beetle (*Carpophilus lugubris*), which is black and plain (3.5-4.5 mm long), and the four-spotted sap beetle (also known as picnic beetle, *Glischrochilus quadrisignatus*) which is black with four irregular yellow spots (5-6 mm long). The most common species in strawberries is the strawberry sap beetle (*Stelidota geminata*).



Sap beetle larvae and damage. Photo: E. E. Nelson.

Adults are first noticeable about the time that tassels and silk appear. They may also move in closer to harvest, when kernels fill and silks are dried or decaying. They may invade corn borer tunnels or areas with other insect or bird damage, but are also found in corn that is free of caterpillar damage. They lay eggs in silks and the tip of ears. Eggs are milky white and resemble tiny grains of rice. The larvae are small, pinkish white or creamy colored grubs about 1/4 inch long. They may hollow out kernels of the upper half of the ear, making ears unmarketable. Adults may also hide between the layers of the husk.

The problem can easily be overlooked until harvest, when adults show up in harvest bins, and larvae are found in the ears.

Monitoring and sprays. Scout for sap beetles when silks begin to wilt, and scout regularly until harvest. Inspect the silk area at the tip and



Four-spotted sap beetle adult. Photo: A. Hazelrigg

the husks of 50-100 ears across the field, and determine the percent of ears infested with adults, eggs, or larvae. Sprays for other ear pests usually control sap beetles, but if other pests are absent and more than 10% of ears are infested with sap beetles, treat for sap beetles. Sprays in the final 7-10 days before harvest may be needed if sap beetles are present at that time – timing is important. Pyrethroids used to control European corn borer (ECB) and corn earworm (CEW) infestations will reduce sap beetle, but if populations are high, a combination of pyrethroid and methomyl (Lannate) may provide additional control. Bt

(continued on page 20)

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VEGETABLE PRODUCTION

Late Blight Confirmed in South Central Pennsylvania

Beth Gugino

In late June late blight was confirmed in a 3 acre conventionally managed commercial tomato field in York Co. and in a small $\frac{3}{4}$ A potato field and adjacent tomato field in southern Lancaster Co. Both growers are working to actively manage the disease. Samples collected from York Co. have been determined to be caused by *Phytophthora infestans* genotype US23. This is the same genotype or strain that had been predominant on both tomato and potato across the region for over the past four years. Samples from Lancaster Co. have been submitted for genotyping.

Similar to cucurbit downy mildew, there are a number of conventional fungicides that are very effective for managing late blight if managed preventatively. On tomato, chlorothalonil can even be effective if applied on a weekly schedule preventatively and good coverage is obtained. Protectant fungicides are recommended at the very least and in York and Lancaster Co., it is recommended that late blight specific fungicide be incorporated into fungicide spray programs especially as the temperatures cool off later in the week. Late blight will not progress when temperatures reach above 90°F however, keep in mind that the high temperature will not kill the pathogen, so the disease will continue to progress when the temperature drops in the evening and the leaves are wet as a result of dew.

Late blight specific fungicides would include products such as but not limited to, Previcur Flex (FRAC 28), Ranman (21), Zampro (45+40) or Orondis Opti (U15+M5). See the Mid-Atlantic Vegetable Production Recommendations for additional recommendations. These products should be tank mixed with a protectant for fungicide resistance management and alternated/rotated between different FRAC codes. For organic growers,

Sap Beetles... (continued from page 19)

hybrids that produce Bt toxin at the cellular level do not protect against sap beetles, so you may need to spray even in the absence of ECB and CEW in those plantings.

Spray trials conducted by Gaylon Dively of UMD indicated that sprays on the 3rd and 6th days of silk were most effective, and additional, later sprays did not improve control. Efficacy trials have shown that carbaryl (Sevin), lambda-cyhalothrin (Warrior II), bifenthrin (Bifenture), and methomyl (Lannate) are more effective than most other insecticides. However, carbaryl cannot be used during the early silk period while corn is shedding pollen and does not allow for hand harvesting after use. When spraying for sap beetle please consult the labels and try to spray in such a way as to protect bees.

Cultural practices. Ears with exposed tips, especially super sweet and Bt varieties, are especially susceptible to infestation. To prevent or reduce damage, select varieties that have good tip cover, use clean cultivation, and control ear-infesting caterpillars. Sanitation is important to prevent successful overwintering and reproduction during the season. Bury corn residue, especially decomposing ears; remove or bury alternate hosts such as rotting tree fruit or discarded vegetables on a regular basis but especially in the fall to reduce the size of the overwintering population. Burial should be deeper than 10 cm.

*Ms. Hazzard is retired from the Univ. of Massachusetts Extension and Ms. Scheufele is with the Univ. of Mass. Ext. From **Vegetable Notes for Vegetable Farmers in Mass.**, Univ. of Mass. Ext., Vol. 30, No. 15, July 19, 2018.*



Characteristic irregular brown lesions caused by late blight on the upper tomato leaf surface (top) and the white sporulation on the lower leaf surface (bottom). (Photo credit: Cathy Thomas, PDA).

copper-based programs tend to be most effective. Another possible option would be to alternate between Regalia and Actinovate both tank mixed with a copper-based fungicide. These products are most effective when applied preventatively and regularly when conditions favor disease. Good spray coverage is essential.

If you suspect late blight on your farm, please contact your local Penn State Extension Office or let Beth Gugino know via email at bkgugino@psu.edu or by phone at 814-865-7328. We are interested in collecting samples so we can better understand how the pathogen population is changing both within and across growing seasons. Also for the information regarding where the latest confirmed outbreaks have been reported and to receive email or text alerts about when late blight has been confirmed with a personally defined radius from your location visit <http://usablight.org>.

Dr. Gugino is with the Dept. of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, July 4, 2018.

Be On the Lookout for Vegetable Bacterial Diseases

Beth Gugino



Angular leaf spot on the upper surface of a cucumber leaf (Photo credit: Beth Gugino).

Copper phytotoxicity on cantaloupe (top) and bacterial leaf spot of pepper (bottom) (Photo credits: Beth Gugino).



The continued unsettled weather pattern which has resulted in the recent frequent and unrelenting rains will likely exacerbate foliar bacterial diseases on many crops ranging from angular leaf spot on cucumber to bacterial spot and speck on tomato. Bacterial pathogens that are associated with the leaf surface are easily splash dispersed during rain events and the long durations of leaf wetness allow ample time for the

bacteria to enter into the leaves through stomata (open pores that enable the leaf to "breathe") and small microscope wounds. Once the bacteria are inside the plant tissue, the application of copper-based or other microbial-based products are ineffective. These products are active on the surface of the leaves and on internal plant tissues and thus need to be used preventatively and as a protectant. The latter is further hindered by the excessively wet field conditions making it difficult to get equipment into the field to spray. Products such as Actigard, Regalia and LifeGuard that function to boost the plant's defense response are most effective when applied earlier in the season. Each may take several days to upregulate defense responses in the plant so waiting until symptoms are visible will limit their efficacy. These products are also used most effectively when coupled with copper-based products regularly during the growing season. Keep in mind that some crops like cantaloupe or muskmelon are sensitive to copper and can result in marginal yellowing of the leaves.

As much as possible, avoid working the plants when they are wet. This can be challenging when harvesting in the morning for afternoon markets. Since diseases are more likely to spread from older to newer plantings avoid working in both on the same day or divide up your labor so those harvesting for market are not working tying younger plantings in the same day.

(continued on page 22)



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Have You Seen Any Viral Diseases in Tomato?

Beth Gugino

There have been several reports of viruses or virus-like symptoms in tomato and more specifically high tunnel tomato. Symptoms of viruses range from bronzing, mottling (light/dark green areas), and necrosis of the leaves to severe leaf distortion (e.g. shoestring) and stunting of the plant. Often it is difficult to identify viruses simply based on symptoms and submitting samples for further diagnostics is often recommended. The



Bronzing caused by tomato spotted wilt virus (TSWV) on tomato (Photo credit: Tim Elkner).

Be On the Lookout... (continued from page 21)

Having an accurate diagnosis is important. Pennsylvania residents can submit samples to the Penn State Plant Disease Clinic. However, the diagnosis can only be as good as the sample be sure to read the sample submission instructions prior to submitting your sample. Diseases such as angular leaf spot and downy mildew can look very similar on cucurbit crops especially cucumber. Keep records of the specific crops, cultivars and bacterial diseases that are affecting your crops. In some cases host resistance is available (e.g. bacterial spot of pepper) or you may want to consider selecting a different cultivar or seed source if you are experiencing problems over multiple seasons. Since most bacterial disease management strategies are preventative and focus on sanitation, when outbreaks occur, it is important to review your notes from the season and reflect where you could make improvements in sanitation for next season.

Dr. Gugino is with the Dept. of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, July 25, 2018.



Shoestring leaf distortion caused by cucumber mosaic virus (CMV) on tomato (Photo credit: Elizabeth Bush, Virginia Tech, Bugwood.org).



Subtle mottling caused by tobacco/tomato mosaic virus (ToMV/TMV) on tomato (Photo credit: Beth Gugino).

Penn State Plant Disease Clinic can routinely check for tomato spotted wilt virus (TSWV), impatiens necrotic spot virus (INSV), cucumber mosaic virus (CMV) and tomato/tobacco mosaic virus

(continued on page 23)

Common Mid-Summer Tomato Diseases: Early Blight and Septoria Leaf Spot

Beth Gugino



(top) Small round lesions a darker margin and tan center characteristic of Septoria leaf spot on tomato. Small dark pycnidia can be seen in the center of the lesions when the image is enlarged.
(bottom) Early blight lesion with concentric rings and characteristic yellowing (Photo credits: Beth Gugino).

Early blight and Septoria leaf spot are two fungal diseases commonly seen in tomato fields as the plants start to fruit. Both start on the lower leaves when spores are splash dispersed during rain events and work their way up the plant leading to defoliation. Early blight lesions are initially small, brown to black in color and may be surrounded by a yellow halo. As the disease progresses, larger lesions will develop a characteristic concentric ring pattern. Lesions with concentric ring patterns can also develop on the fruit and stems. Septoria lesions are circular with a tan center surrounded by a darker margin/border. With the aid of a hand lens, small black pycnidia (spore producing structures) can be seen in the center of the lesions. The lesions primarily develop on the leaves and not the fruit or stems. Both pathogens survive on crop residue so shorter rotations lead to increased problems. Although early blight is favored by slightly warmer temperatures (75 to 85°F) and Septoria cooler temperatures (68 to 77°F) it is not uncommon to see both at the same time. In recent years however growers and other stakeholders have commented on the increasing predominance of Septoria leaf spot in tomato fields.

During the season, maximizing air flow by suckering, staking and tying the plants as well as minimizing working the field when it is wet will help minimize spread. Mulching around plants to reduce soil splash may also help. Protectant fungicides like chlorothalonil, mancozeb and Gavel will also help reduce spread but good coverage is important. These are best rotated with products in FRAC codes 3, 7 or 11 including Quadris Top

(FRAC 3 + 11), Revus Top (FRAC 3 + 40), Endura and Fontelis (FRAC 7), Priaxor (FRAC 7 + 11), etc. See the 2018 Mid-Atlantic Commercial Vegetable Production Recommendations for a more complete list of recommendations. For organic production, copper-based products (e.g. Champ, Nordox, Badge X2) could be used in a program with plant defense activator products (e.g. Regalia) and microbial biopesticides (e.g. Double Nickel, Serenade, etc.). As with most product, these are best used preventatively. This funding support from the Pennsylvania Vegetable Growers Association and PA Marketing and Research Board this summer the vegetable pathology program at Penn State is evaluating the integration of biopesticides into conventional programs coupled with host resistance for the management of early blight and Septoria leaf spot on tomato.

Dr. Gugino is with the Dept. of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, July 11, 2018.

Have You Seen... (continued from page 22)

(ToMV/TMV). Typically once symptoms are observed there is not much that can be done in terms of management aside from potentially roguing the symptomatic plants to prevent further spread. However, identifying the causal virus can help inform management strategies next season. Keep in mind, that herbicide injury can also cause symptoms similar to those of viruses and that there are over 20 viruses that affect tomato so submitting a sample to a diagnostic lab such as Agdia may be necessary.

Many viruses are vectored by insects so management needs to be focused on the insect rather than the virus. Thrips, more specifically the western flower thrips and tobacco thrips are the primary vectors of TSWV. This virus is characterized by bronzing on the leaf surface, possible stunting of the plants and chlorotic/yellowish rings on fruit if infected later in the season. Another example is CMV which is vectored by more than 75 different aphid species. The most distinct symptom is the "shoe-string" strapping of the leaves. That being said, there are also viruses that are transmitted (or moved around) mechanically on people's hands, clothing or tools. An example of a mechanically transmitted virus would be ToMV/TMV. Washing hands frequently with soap and water and consider disinfecting tools regularly with 20% nonfat dry milk solution to denature the virus particles.

In general, many of these mentioned viruses have a wide host range that includes many weedy plant species which commonly serve as a reservoir of virus upon which the vectors can feed on. So weed management in addition to a three-year rotation to allow crop residue to thoroughly decompose is important. Host resistance is also an option for a number of viruses. See the 2018 Mid-Atlantic Commercial Vegetable Production Recommendations for a more complete list of recommended cultivars and their disease resistance.

Dr. Gugino is with the Dept. of Plant Pathology and Environmental Microbiology at Penn State Univ. From Penn State Extension, July 18, 2018.

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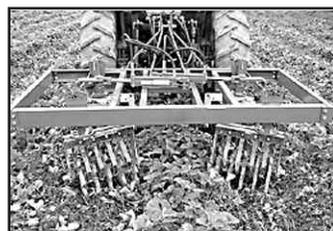
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