PENNSYLVANIA
VEGETABLE GROWERS

NEWS

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for the commercial vegetable, potato and berry grower

Promoting PA Vegetables and PVGA at Ag Progress Days

Penn State's Ag Progress Days attracted thousands of rural Pennsylvania families to the Russell Larson Agricultural Research Center at Rock Springs on August 9th to the 11th. While the first day was plenty hot (it was August after all) generally the weather allowed the visitors the opportunity to see the latest, best and largest new farm equipment available. Like it has the past several years, PVGA set up a display in the ECM Building partnering with the PA Vegetable Marketing and Research Program to celebrate August as PA Produce Month and promote Pennsylvania-grown vegetables to show attendees. About 1,175 copies of a special brochure with vegetable recipes were distributed to adults and over 1,075 "Fun and Healthy Facts" vegetable activity cards were given to children. That is about 40% more than were distributed last year – presumably reflecting more attendees at this year's show.

While the Ag Progress Days attendees are primarily from an agricultural or rural background, most seemed interested in the vegetable recipes pulled from the PAVeggies.org website. Zucchini recipes were especially in demand! The booth also offered the Vegetable Marketing and Research Program's series of 15 "How to Use" cards that contain information on how to use some less common (and some more common) vegetables along with a recipe. A display of fresh vegetables is always the focal point that attracts people's attention to the booth.

Besides promoting vegetables to the consumers attending the show, the Association also had sample newsletters and PVGA membership brochures on hand to give to any vegetable, potato or small fruit growers attending the event who were not members. The booth also gives Association staff the opportunity to connect with any PVGA members who are attending the show.

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Secretary Redding Highlights PA Produce Month

Agriculture Secretary Russell Redding joined the PA Vegetable Growers Association August 25 at Harvest Valley Farms, a fourth-generation vegetable farm and PA Preferred® on-farm market, to highlight investments strengthening fruit and vegetable production and to encourage Pennsylvanians to shop locally this harvest season.

Art King (left) and Dave King (right) show Secretary of Agriculture Russell Redding some Fairytale eggplants.

"As we celebrate Pennsylvania Produce Month this August, we are reminded of fruit and vegetable growers – like Harvest Valley Farms – who go the extra mile for the communities they serve," said Redding. "It is demonstrated through charitable food donation, conservation work, and the connections made by bringing food from field to table. This harvest season, join me in supporting Pennsylvania farmers by shopping locally and buying PA Preferred®. It is a great way to say, 'thank you' to all those who help bring food to our tables."

According to the 2021 Pennsylvania agriculture economic impact update, Pennsylvania fruit and vegetable production supports more than 7,200 family farms, 31,000 jobs, and contributes more than $6.1 billion to the state economy annually.

To grow on-farm opportunities and ensure fresh foods remain available, accessible, and affordable, Governor Wolf developed the Pennsylvania Farm Bill. Since 2019, this historic package of legislation has invested more than $76 million in Pennsylvania agriculture, including dollars to support PA Preferred and grow the commonwealth's specialty crop industry.

Many on-farm markets like and farmers market vendors are members of the PA Preferred program or carry PA Preferred products. PA Preferred is the statewide branding program for agricultural products grown, produced, and processed in Pennsylvania. When purchasing items with the PA Preferred checkmark, consumers are supporting locally grown and processed Pennsylvania agricultural products and directly supporting Pennsylvania farmers.

Secretary Redding presented a PA Produce Month proclamation from the Governor to the King family members at Harvest Valley Farms. From left to right: PVGA Executive Director Bill Troxell, Anna Steinmiller, Dave King, Secretary Redding, Larry King, Art King, and Norma McAfee.

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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 Director, at the above address.

NEWS

What is the (Food and) Farm Bill and Why Does It Matter?

Shelby Myers

Going back almost 100 years, the history of the farm bill largely tracks the history of food production in the United States as the legislation evolves to meet the needs of its modern-day constituents – farmers and consumers. Agriculture's role in providing food security, and in turn national security, to the United States is more important than ever. And now, work on the next farm bill has started during a period of volatility on every front – political, economic and beyond. So why is this food and farm bill so impactful and influential?

A background and brief history of the farm bill is provided here, as well as a title-by-title description, including the programs encompassed in each title. This article is the first of a series of Market Intel articles that will dive deeper into farm bill programs.

Background

For starters, the farm bill holds a lot of statutory power, but it also has a little something for everybody. From farm program payments and food policy to conservation initiatives and rural development, the farm bill provides mandatory and discretionary funding for many everyday programs and functions whose impact and influence carries across all social demographics and regions.

Farm bill passage and implementation has a unique timeline with serious consequences if lawmakers fail to adhere to it. Its five-year lifespan provides lawmakers the opportunity to update the programs so they are relevant to current market and economic conditions. There have been 18 farm bills since the 1930s. If the farm bill were to expire without a new bill in place or if programs were not granted an extension by Congress, all of the programs would return to the 1949 bill, meaning reverting to support price programs for the limited number of commodities covered by the 73-year-old law. Adjusted for inflation, these support prices would be far above even the current elevated market. This helps drive the urgency farmers and ranchers – and Congress – feel about passing this legislation in a timely manner.

What is the Farm Bill?

The farm bill refers to an authorization of mandatory and discretionary spending bills appropriated to provide assistance related to food and farms. It is a multi-year law that is primarily executed by the United States Department of Agriculture (USDA) and it governs a wide variety of agricultural and food programs. First created to help struggling farmers in the 1930s, the farm bill has expanded to be a resource to help the industry grow and thrive in an ever-evolving world. The current farm bill, the Agriculture Improvement Act of 2018, is set to expire on Sept. 30, 2023. To prepare for the 2023 farm bill, discussions about how best to address the issues of agriculture have already begun. These will be especially important given what the agriculture sector has been up against over the past few years and the various unknowns farmers and ranchers face.

The farm bill provides an important consistent opportunity for policymakers to address agricultural and food issues comprehensively. It has grown over the decades to serve food and agriculture, but its roots are in farm commodity program support. These traditional support commodities include corn, cotton, wheat, soybeans, rice, dairy, peanuts, and sugar. The farm bill has expanded and broadened to include nutrition assistance, conservation, research, specialty crops and bioenergy programs. Because of this, the farm bill brings together some of the most unlikely partners to advocate for a legislative package composed of provisions that would likely not survive the legislative bureaucracy as stand-alone measures.

The farm bill continues to be entangled in political debates and ideological policy conversations. Over time, programs have been adjusted to respond to the market and economic pressures of agriculture, the U.S. and the world. As ideas are collected for future farm bills, even in today's debate, the question remains the same: how can the farm bill best serve its constituents?

Titles of 2018 Farm Bill

Title I: Commodities and Disaster

The commodity title has provided certainty and predictability to eligible producers by reauthorizing and improving commodity, marketing loan, sugar, dairy and disaster programs.

Title II: Conservation

The conservation title provides voluntary conservation programs that farmers and ranchers use to improve their productivity and address natural resource and, increasingly, environmental concerns.

Title III: Trade

Post-World War II and post-Korean War conditions in agriculture created a need to focus on trade and trade development programs.

Title IV: Nutrition

First created with the Food Stamp Act of 1964, the nutrition title is a pillar in farm bill discussions, of particular interest to urban voters and their representatives.

Title V: Credit

The credit title of the farm bill provides lending opportunities that private commercial entities cannot offer.

Title VI: Rural Development

The rural development title has held a spot in the farm bill since 1973 with the purpose to create and support new competitive advantages in rural areas.

Title VII: Research

When the United States Department of Agriculture was created in 1862 it was primarily charged to support agricultural research. Serving, technically, as the oldest title of the farm bill, stemming from the Morrill Land Grant Act of 1862, the purpose was to establish and fund research in land grant institutions in each state.

Title VIII: Forestry

First created in the 2002 farm bill, the forestry title provides authority for the United States Forest Service, which is the principal federal forest management agency.

Title IX: Energy

Renewable energy, primarily ethanol and biodiesel production, was spurred through the Renewable Fuel Standard, which is not included in the farm bill. However, it created interest in the development of farm bill programs regarding energy.

Title X: Horticulture

The horticulture title is designated to specifically support specialty crops and certified organic and local foods.

Title XI: Crop Insurance

The crop insurance title provides new and continued insurance products for producers to purchase in a public-private partnership. The insurance helps protect producers against losses resulting from price and yield risks on over 445 million acres, in addition to a growing assortment of policies for animal agriculture.

Title XII: Miscellaneous

The miscellaneous title holds a variety of programs. In most cases, these programs either do not have a "home title" or are individual programs to address specific problems. In the 2018 farm bill, the miscellaneous title primarily focused on livestock programs, agriculture and food defense, historically underserved producers, limited-resource producers and other miscellaneous provisions.

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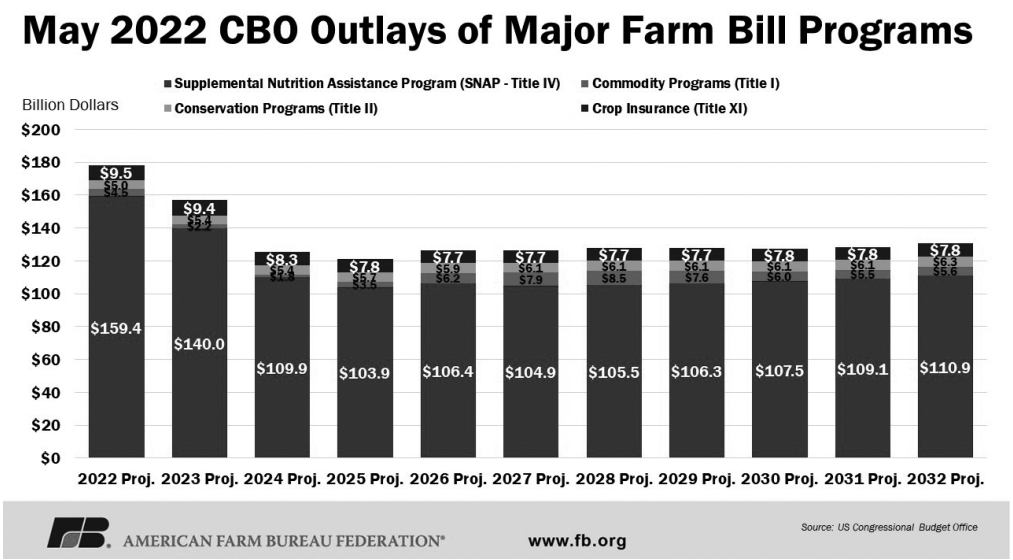

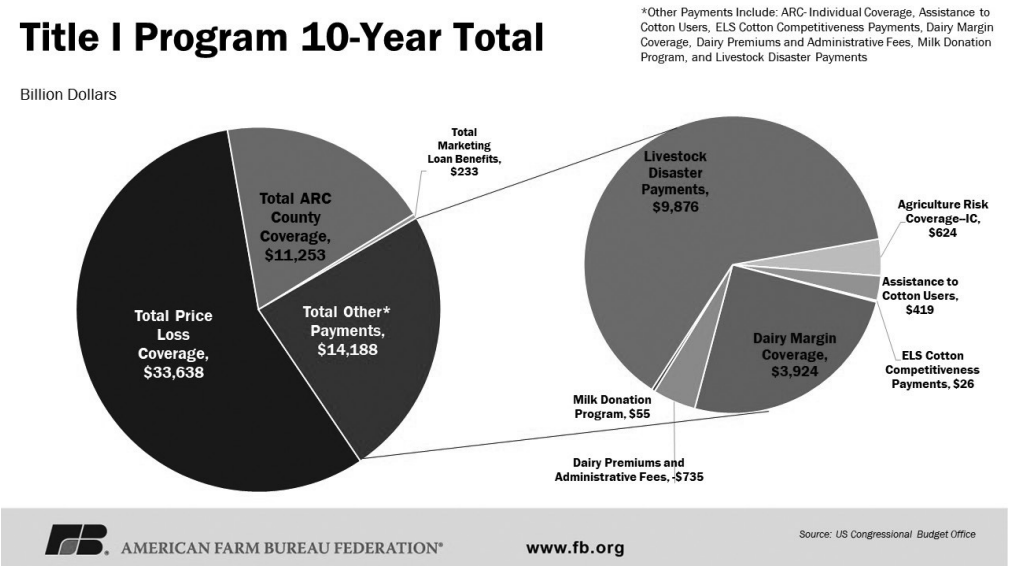

The Nutrition Title

Another question that pops up every five years or so: is it a farm bill or a food bill or both? The nutrition title is the most expensive title in the farm bill, dominating almost 80% of the bill's spending. It governs programs utilized by people who cannot afford to buy food in times of difficulty. As part of the federal welfare program portfolio, there is criticism from some quarters about the title's spending levels. This has made the nutrition title a political bone of contention through decades of farm bill debate, but critical to building a coalition of support.

Farm Bill Politics

The farm bill has historically been a bipartisan effort. Some legislators' concentrate on the nutrition portion of the farm bill given the constituent interest in their state and/or district, while other legislators concentrate on the commodity programs due to their constituents' interests. More often, geography is a factor. The "Traditional Farm Coalition" includes corn in the Midwest, cotton in the South, and wheat in the Great Plains. The "Expanded Traditional Farm Coalition" includes soybeans with corn in the Midwest, peanuts with cotton in the South, and rice in the Mississippi Delta region. What pits the farm coalition against itself? Historic ideology regarding farm policy.

Given the dwindling farm and ranch population, there lies significant uncertainty for the farm coalition to get enough "yay" votes, thus the coalition of support for the farm bill has broadened tremendously, growing the bill to secure enough votes to pass it.

A more recent farm bill evolution is the expectation that farmers protect the environment, prompting environmental groups to lay claim to the legislation too. Similarly, the rural/urban coalition has worked to educate about nutrition programs' benefits beyond high-density populations and shown value to their inclusion in the farm bill. Moreover, since its inception, the farm bill has brought more and more stakeholders to the discussion, including national farm groups, commodity associations, state organizations, nutrition and public health officials, and a variety of advocacy groups for conservation, recreation, rural development, local food systems, and certified organic production.

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National News Briefs

International Fresh Produce Association Urges Ag Workforce Legislation

For years, the fresh produce industry and our agriculture sector partners have made an overwhelming case for legislation to reform our broken immigration system and help build a legal and reliable workforce. With passage [last year] of the bipartisan 2021 Farm Workforce Modernization Act (H.R.1603) in the House of Representatives, we are one step closer to getting the reforms the fresh produce industry has needed for decades.

This legislation marks an important first step in that process and it includes the basic principles of immigration reform that we have long advocated for. In particular, the bill provides legal status for the current workforce, reforms the current federal agriculture guest worker program known as H-2A and ensures that we will have future access to a skilled, dedicated workforce. The bill also includes provisions to ensure the proper enforcement of our nation's immigration laws.

A Senate bill is still needed, and we encourage the industry contact their Senators about the need for that. While bipartisan negotiations began early this year, more support is needed to see this long-standing issue addressed.

Apart from legislation, we will work with the Biden Administration to seek greater modernization of the H-2A program. This includes building continued support in the Biden Administration for reforms that were made under the Trump Administration. These include a revised calculation of the Adverse Effect Wage Rate (AEWR) as well as the relaxation of burdensome administrative requirements to ensure access to a viable workforce.

Our Legislative Positions Support:

- A program that will provide earned legal status for current farmworkers who are undocumented
- Reforms to the H-2A visa program that will enable participation for year round operations like indoor growing operations. We also support reforms to the cost structure for growers who employ these workers
- Mandatory E-Verify if the aforementioned reforms are made to the policies overseeing the current and future workforce needs are addressed

The American Farm Bureau and PVGA have not supported the House version of the Farm Workforce Modernization Act due to several concerns. Key reforms that were needed included ensuring a fair and competitive wage rate, setting limitations on the use of federal courts to solve workforce grievances, and ensuring all of agriculture including year round workers have access to H-2A visas. Hopefully these concerns will be addressed in a Senate version that is currently being negotiated.

From the International Fresh Produce Association website at freshproduce.com.

USDA to Invest Up to $300 Million in New Organic Transition Initiative

Agriculture Secretary Tom Vilsack announced details of the U.S. Department of Agriculture's (USDA) $300 million investment, including with American Rescue Plan funds, in a new Organic Transition Initiative to provide comprehensive support for farmers transitioning to organic production. This initiative will deliver wrap-around technical assistance, including farmer-to-farmer mentoring; provide direct support through conservation financial assistance and additional crop insurance assistance, and support market development projects in targeted markets.

This initiative is part of USDA's food system transformation effort to support local and regional food systems, expand access to markets to more producers and increase affordable food supply for more Americans, while promoting climate-smart agriculture and ensuring equity for all producers.

"Farmers face challenging technical, cultural, and market shifts while transitioning to organic production, and even during the first years after successful organic certification," said Vilsack. "Through this multi-phased, multi-agency initiative, we are expanding USDA's support of organic farmers to help them with every step of their transition as they work to become certified and secure markets for their products."

USDA's Agricultural Marketing Service (AMS), Risk Management Agency (RMA) and Natural Resources Conservation Service (NRCS) are the primary agencies supporting the Initiative, which will focus on three areas.

- Transition to Organic Partnership Program: AMS will build partnership networks in six regions across the United States with trusted organizations serving direct farmer training, education, and outreach activities. USDA will provide up to $100 million for this program.
- Direct Farmer Assistance: NRCS will develop a new Organic Management conservation practice standard and offer financial and technical assistance to producers who implement the practice. USDA will provide $75 million for this effort.
- USDA will provide $25 million to RMA for the new Transitional and Organic Grower Assistance Program (TOGA) which will support transitioning and certain certified organic producers' participation in crop insurance, including coverage of a portion of their insurance premium.
- Organic Pinpointed Market Development Support: This AMS initiative will focus on key organic markets where the need for domestic supply is high, or where additional processing and distribution capacity is needed for more robust organic supply chains. USDA will invest up to $100 million to help improve organic supply chains in pinpointed markets.

State News Briefs

CREP Program Opportunity

Most Pennsylvania farmers have at least a few acres that are hard to farm: Too steep, too rocky, too shady, etc. And if that land is prone to flood, you risk losing all your work — and your profit — on those lands in any given year.

If you are working twice as hard to earn half as much on some of your land, then maybe it's time to investigate the Conservation Reserve Enhancement Program (CREP). In a nutshell, the Conservation Reserve Enhancement Program (CREP) pays farmers to retire and restore land that erodes easily or floods often. CREP is 100% voluntary for farmers. CREP is administered by the U.S. Department of Agriculture Farm Services Agency, and many Conservation Districts in Pennsylvania can help farmers get enrolled.

CREP helps landowners with projects like these in two ways. First, the CREP program reimburses much or all of landowners' costs to restore the land. Then, CREP pays a guaranteed annual rent for up to 15 years. This can allow a farmer to focus their efforts on their own best land. Many farmers use their rental payments to help lease more productive land to make up for the acres taken out of production.

If projects like these pique your interest, check out www.CREPPA.org. This website provides a user-friendly introduction to the program, with case studies, payment scenarios, and other information that can help you decide if CREP is a good fit for your farm. And you can schedule a consultation with a nearby CREP planner in just a few clicks.

From Farm Bureau Express, Penna. Farm Bureau, August 19, 2022.

Cleaning and Sanitizing

Carol Allen

Good Agricultural Practices (GAP) teaches us that foodborne illness is best prevented by reducing the risk of fecal contamination to food contact surfaces. Many of our crops are grown in close proximity to the soil, and the soil can harbor pathogens and/or be contaminated with animal manures. The cleaning and sanitizing of food contact surfaces allows a clean break in produce handling practices and minimizes the build up of debris, soil, and biofilms.

What is cleaning and sanitizing and how does this recommended procedure help minimize cross contamination?

Cleaning is the removal of dirt and debris. **Cleaning comes first.** The dirt could be a combination of organic debris, plant proteins, oils, and field soil. Those materials can build up in corners, on rough weld joints, rollers and brushes on grading machines, and in the surface cracks of picking bins. Power washing is not going to do a good job and has the potential to spread debris and pathogens into other areas. (See video on power washing here: https://youtu.be/_mV9vcolycY)

Those areas described above are perfect places for colonies of bacteria to create biofilms. Biofilms consist of long chain sugars (polysaccharides) in the form of a film that the bacteria produce as protection against harsh environmental conditions. It takes an appropriate detergent and scrubbing to break up and remove biofilms.

Photo credit, Carol Allen

The correct procedure is as follows: First, loose debris is removed either through brushing or hosing off the surface. Next, an appropriate detergent is applied, and the surface is thoroughly scrubbed with an abrasive tool. After the detergent and dissolved organic debris are rinsed away, a sanitizer can then be applied. Care should be taken while rinsing to avoid contaminating other surfaces with the debris. Check the sanitizer label for proper concentration and to make sure there is adequate surface contact time for the sanitizer to work. The surface can be used when it has been rinsed, if required, and has dried.

Be sure to mix the sanitizer of choice to the correct dilution according to the label directions. Sanitizers are microbial pesticides, and the axiom "the label is the law" does apply. Most dilute sanitizers will lose effectiveness over time. Check and make sure sanitizer solutions are mixed fresh before use and are not left over from a previous day's work.

Make sure the detergent is appropriate for the surfaces on which it will be used and for the soil it is formulated to remove. Make sure it is safe for food contact surfaces.

Taking a fresh look at all SOPs is part of the annual review of the farm's food safety plan. Be sure yours is complete and up to date. Next, confirm workers are trained on cleaning and sanitizing SOPs, and they are being implemented.

*Ms. Allen is with the Univ. of Maryland Extension. From the **Food Safety Newsletter for Maryland Farmers**, Univ. of Maryland Plant Science Food Safety Group, August 29, 2022.*

GENERAL

Algae in Irrigation Water Sources

The conditions of this summer—hot and dry—are especially conducive to the build-up of excessive algae in surface waters. While algae is normal and even beneficial (it contributes oxygen to the atmosphere), too much algae in farm ponds or reservoirs used for irrigation can clog irrigation equipment and contrib¬ute to the accumulation of muck that can trap plant and human pathogens. Algae are aquatic plants that need the same nutrients that crop plants do, so when nutrients—especially nitrogen and phosphorus, often from fertilizer applications or manure runoff—accumulate in the water, algae proliferate. The best ways to pre¬vent problems from algae are to 1) prevent excessive growth by reducing the nutrients that run-off into the water from field ap-plications, 2) create vegetative buffers around ponds to filter out nutrients, 3) avoid addition of leaves or grass clippings to water, and 4) aerate the water to increase oxygen levels and increase the levels of anaerobic bacteria that feed on organic matter and help reduce nutrients. There are also a variety of materials that can be added to ponds to prevent algae build-up, including pond dyes that block sunlight and reduce algae's ability to photo¬synthesize, and beneficial bacteria that compete with algae for food. Addition of barley straw to the water has been shown to be somewhat effective as well. Chemical algaecides are available for reducing algae levels once they've built up, but unless condi¬tions change, populations will rebound. See this Purdue Extension fact sheet at https://www.canr.msu.edu/uploads/resources/pdfs/ho-247-w.pdf for more on managing algae in irrigation ponds.

Another important reason to pay attention to algae is that some species produce substances that can be toxic to humans and animals. Toxic algae may become dominant in stagnant water, especially during periods of drought and high tempera¬tures. These Harmful Algal Blooms (HABs) made up of cyanobacteria (sometimes called blue-green algae) can make peo¬ple and animals sick when they ingest or inhale affected water. Typically, cyanobacteria will look like a blue or green mat or scum on the surface of the water. If you see these concerning signs in your irrigation water sources, avoid contacting the water, don't allow pets or livestock to drink from it, and don't allow the water to directly contact the edible portions of food crops. Avoid using algaecides since the toxins are contained within algal cells and are released when cells die. The Massachusetts Department of Public Health provides more information on their Algae Blooms webpage about identifying harmful blooms, along with a list of waterbodies for which advisories have been issued. Here's a fact sheet on blue-green algae and irrigation water from Australia that has some general and applicable information for growers.

The grower that manages this irrigation pond uses blue pond dye and beneficial bacteria to reduce algal growth. Photo: L. McKeag

What is the (Food and) Farm Bill and Why Does It Matter?

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Why Does the Farm Bill Matter?

The farm bill ensures a safe and abundant food supply, helps feed the hungry, invigorates rural communities and helps farmers take care of the environment as they continue to provide food, feed, fuel and fiber to the United States and the world.

On the farm side, those utilizing farm bill programs value risk management tools that offer certainty and predictability. Tools like crop insurance products, marketing loans and commodity programs help producers manage through tough times in order to be able to pass the family farm on to the next generation. Families are able to put dinner on the table thanks to nutrition assistance programs. Voluntary, market-based incentives in conservation programs help provide producers with the tools and assistance needed to implement soil and water improvements. Rural communities have access to tools like broadband grants and new business loans authorized by the farm bill to help enhance economic development and attract growth.

Just as agriculture changes and adapts to meet the needs of the time, the farm bill is called upon to do the same to serve the needs of its constituents. Every five years or so, Congress passes a new farm bill to meet the challenges of an ever-changing world and ensure that critical programs continue to work for farmers and ranchers, families on a budget, and rural communities working to stay competitive.

Summary

The farm bill – or as it could be called, the food and farm bill – has supported U.S. agriculture for almost 100 years, providing safe and affordable food, feed, fuel and fiber for the country and the world. It provides mandatory and discretionary funding to a number of everyday programs and functions to support food security, and in turn national security, for the U.S. Hearings on the 2023 farm bill have already started in Congress.

The American Farm Bureau Federation has reconvened its Farm Bill Working Group with representation from all 50 states and Puerto Rico so that priorities fully backed by the entire AFBF organization can be set. The working group's analysis will help Farm Bureau members across the country at the county, state and national levels discuss and adopt Farm Bureau policy, which serves as a roadmap for us to engage with Congress. While assessing the 2018 farm bill, Farm Bureau members need to consider: what is working and what is not and how the legislative package could be made better? When looking toward the 2023 farm bill, how have economic conditions changed in the past few years and what forecasted conditions do farmers and ranchers need to be prepared for? The answers to these questions will shape food and agriculture for the next five years and beyond.

Ms. Myers is an economist with the American Farm Bureau Federation. From the American Farm Bureau Federation, www.fb.org, July 20, 2022.

Fungal Diseases of Tomatoes

Bess Dicklow and Susan B. Scheufele

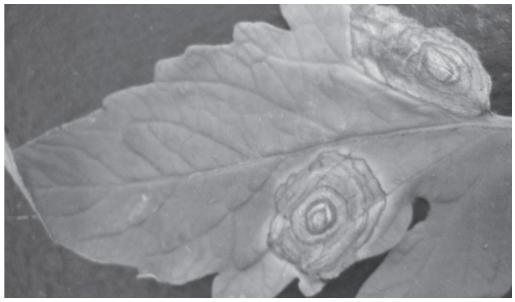
Under the incredibly dry conditions this year, it is especially discouraging to see tomato plantings still going down to foliar diseases. While most of the fungal foliar diseases of tomatoes thrive and spread mostly quickly in rainy weather, they can infect and spread using just the moisture on leaves formed by overnight dew. During the recent heat wave, humidity was high, and dew formed on leaves early in the evening and remained late into the morning, giving these foliar diseases a leg up. At this point in the season, field tomatoes have been being harvested for almost a month, and it's likely too late to control severe infections of these foliar diseases. Take some time to identify what diseases you have in your field and high tunnel tomato crops this year, though, so that you can make a plan for control for next year.

Most of the diseases caused by these pathogens can occur in both field and high tunnel tomatoes, but Botrytis, leaf mold, and powdery mildew are most commonly seen in high tunnels and Septoria and early blight are most commonly seen in the field. Late blight, which we haven't seen in Massachusetts since 2017, is often perceived as the scariest tomato disease because of its ability to rapidly wipe out a crop; however, the diseases outlined below, which we see every year without fail, routinely have significant effects on fruit quality and yield. Even though we don't expect to see late blight in Massachusetts this year, some key characteristics of late blight are listed below in order to help you distinguish them from symptoms of the other diseases included in this article.

Late blight lesion on tomato

- Leaf lesions are dark-green to gray, and appear water-soaked or greasy.
- No leaf yellowing occurs.
- Stem lesions are brown and can occur anywhere on stems or petioles.
- White sporulation may be seen within or on the edges of lesions on leaves or stems.
- Lesions can occur anywhere on the leaf and anywhere on the plant, meaning that they don't necessarily start at leaf margins or at the base of the plant but are distributed throughout the canopy.

The common fungal foliar diseases of tomato are similar in that they all thrive in hot, humid weather and once established, are spread by wind, splashing water, insects, workers, and equipment. Most also survive in infested crop residue or in the soil. It's common to see multiple of these diseases on a single plant. Management practices are similar for all of these diseases, but it is still helpful to know what diseases you are seeing in your crop so you know where it is coming from and how to stop its spread. It's especially important to identify what diseases you have if you plan to control them using resistant varieties. For help with tomato disease identification, you can [contact the Penn State Plant Disease Clinic (see https://plantpath.psu.edu/about/facilities/plant-disease-clinic or 814-865-2204.]



Botrytis in tomato. Clockwise from top left: Characteristic concentric rings of leaf spots (Photo: S. B. Scheufele). Fuzzy gray sporulation (Photo: G. Higgins). Ghost spot on fruit (Photo: G. Higgins).

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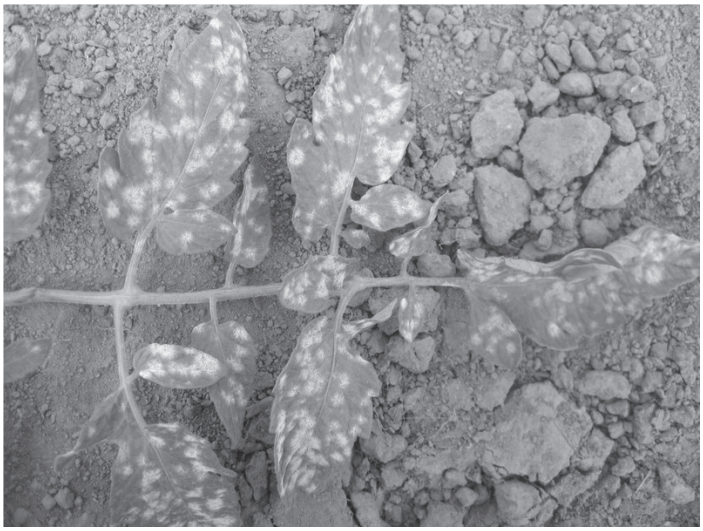
VEGETABLE PRODUCTION

Fungal Diseases of Tomatoes *continued from page 9*

Botrytis gray mold & ghost spot (*Botrytis cinerea*): Botrytis cinerea causes leaf spots, stem cankers, fruit rot, and ghost spot on fruit. The pathogen thrives in humid greenhouse conditions, but it has been observed in field tomatoes when humidity is very high. Leaf lesions are dark gray and have no yellow halo, and therefore are often mistaken for late blight lesions. Under conditions of alternating heat and humidity, like in a high tunnel, the pathogen grows in such a way as to form concentric rings, and for this reason can also be confused with early blight. The way to distinguish Botrytis from early blight is by its characteristic fuzzy, brownish-gray sporulation. If you hold the leaf up and look across the lesion horizontally, you will see fine mycelia sticking up with little tuftlets on the ends that resemble grape clusters. *B. cinerea* primarily feeds on dead tissue and is only weakly pathogenic, therefore, you will likely see this sporulation on senescing tissue including flowers, pruning scars, or leaf tips and margins where nutritional disorders have caused tip dieback. Spores that land on fruit cause ghost spot, which appears as pale white haloes or ring spots on the green fruit. On ripe fruit, the ringspots may be yellow. Ghost spot develops when the fungus initiates infection, but disease progress is stopped by dry environmental conditions. This spotting may adversely affect market quality. Under more humid conditions, ghost spot may lead to fruit rot. *B. cinerea* has a wide host range and can survive on dead plant tissue for long periods of time. It overwinters as mycelium in crop residues and sometimes as sclerotia in the soil.

Leaf mold: Yellow spots appear on the tops of leaves (left) and produce fuzzy olive green sporulation on undersides of leaves (right). Photos: Cornell Coop. Extension

Leaf mold (*Passalora fulva*, previously *Fulvia fulva*): This disease is quite common in tunnels and greenhouses, in both soilless and hydroponic systems. Leaf mold infections begin on older leaves and cause pale-green to yellow spots visible on the upper leaf surface, with olive-green to grayish-brown fuzzy sporulation on the underside of the leaf. Heavily infected leaves turn yellow, then brown, and may wither and drop. Occasionally petioles, stems, and fruit may be affected. Infected flowers wither without setting fruit and infected fruit has leathery, black, irregularly shaped lesions. The fungus overwinters in soil on crop residue and as sclerotia (hard, black, long-lived resting structures) and may be introduced on infested seed. The fungus can survive and reproduce between 50-95°F, with optimal infection and growth between 71-75°F.



Powdery mildew. Photo: S.B. Scheufele

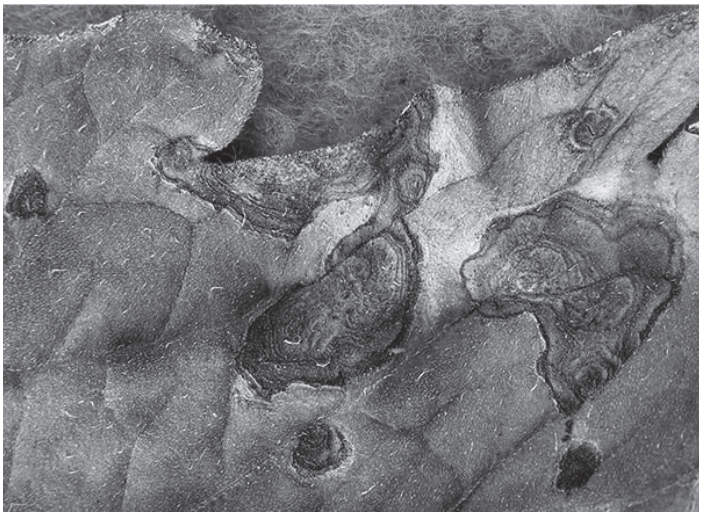
Powdery mildew (*Oidium neolycopersici*) of tomato is primarily a concern in high tunnels. (Note: this is a different pathogen than the one that causes powdery mildew on cucurbits.) Infections begin as small, white, powdery, circular lesions on the upper and lower leaf surfaces that can expand and coalesce until they cover entire leaves. Unlike other powdery mildews, affected leaves may rapidly wither and die, but remain attached to the stem. There are no symptoms on fruit or stems, but loss of foliage may result in sunscald. Unlike the other pathogens in this article, *O. neolycopersici* does not require leaf wetness to germinate and cause disease, but it does thrive under humid conditions and a range of temperatures (50-86°F). This pathogen can be very aggressive and lead to reduced yield and poor fruit flavor if untreated.

Botrytis, Leaf Mold, and Powdery Mildew Management:

- Reduce humidity within the canopy, improve air circulation, and reduce leaf wetness by controlling weeds, using wider plant spacing, removing suckers, pruning lower leaves, and watering early in the day or using drip irrigation. In high tunnels, improve horizontal airflow with fans, and reduce humidity by a combination of heating and venting in the evening, particularly when warm days are followed by cool nights.
- Provide sufficient nutrients to avoid tip burn from nutrient deficiencies and avoid excessive nitrogen fertilization. High tunnel tomato fertility recommendations were updated in the 2020-21 edition of the New England Vegetable Management Guide, based on New England state Extension research—see https://nevegetable.org/crops/tomato-greenhouse-and-high-tunnel

- Remove and destroy all diseased plant residue; disinfest the entire greenhouse after pruning and harvest. See our Cleaning & Disinfecting the Greenhouse article for more information (https://ag.umass.edu/sites/ag.umass.edu/files/newsletters/october_15_2020_vegetable_notes.pdf).
- Choose resistant varieties. This is especially effective for leaf mold management. You can find a list of resistant tomato varieties here: https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vege-table-varieties/
- Chemical control: Start chemical control before or as soon as symptoms first develop. See the Greenhouse and High Tunnel Tomato section of the New England Vegetable Management Guide (https://nevegetable.org/crops/tomato-greenhouse-and-high-tunnel) [or the Mid-Atlantic Commercial Vegetable Production Recommendations] for current chemical control recommendations. Always alternate fungicide applications between materials with different modes of action to prevent resistance development. Check labels to ensure using indoors (in tunnels and greenhouses) is not prohibited. If a label does not explicitly prohibit indoor use, a product may be applied in tunnels and greenhouses. Michigan State University has a spreadsheet that compiles indoor use allowances of pesticides (see https://www.canr.msu.edu/news/vegetable_pesticide_series_can_i_use_it_in_the_greenhouse); but you should always check the label yourself as well!

Septoria leaf spot (*Septoria lycopersici*) usually occurs in the field and is one of the most destructive diseases of tomato foliage, resulting in considerable leaf drop that can cause sunscald, failure of fruit to mature properly, and reduced yields. Once infections begin, the disease can spread rapidly from lower leaves to the upper canopy. Symptoms consist of small, circular, tan-to-grey lesions with dark brown margins that appear on lower leaves first, after the first fruit set. Lesions usually have yellow halos and as the lesions coalesce, significant leaf yellowing can occur. S. lycopersici forms pycnidia (structures that produce asexual spores) in the center of expanding lesions, which can be seen with a 10X hand lens as tiny black dots. The presence of pycnidia, plus the generally smaller size of the lesions and the absence of target-like circular bands within the lesion, distinguish this disease from early blight. The pathogen overwinters on infected tomato debris or infected solanaceous weed hosts (jimsonweed, horsenettle, ground-cherry, and black nightshade), and can also survive on stakes and other equipment. The pathogen can also be seed-borne.



Early blight lesions, showing characteristic yellow haloes and concentric rings. Photo: M. T. McGrath

Early blight (*Alternaria solani*) occurs on the foliage, stem, and fruit of tomato, as well as on potato foliage and tubers. In tomato, the disease first appears as small brown to black lesions with yellow haloes on older foliage. Under conducive conditions, numerous lesions may occur on each leaf causing entire leaves to turn yellow. As the lesions enlarge, they often develop concentric rings giving them a bull's eye or target-spot appearance. As the disease progresses, plants can become defoliated, reducing both fruit quantity and quality. Fruit can become infected either in the green or ripe stage. Infections usually occur through the stem attachment. Fruit lesions appear leathery and may have the same characteristic concentric rings as the foliage. Fruit lesions can become quite large, encompassing the whole fruit. The fungus overwinters on infected crop debris in the soil and can survive there for several years.

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VEGETABLE PRODUCTION

Fungal Diseases of Tomatoes *continued from page 11*

Stemphylium leaf spot. Photo: S. Menasha

Early blight lesions, showing characteristic yellow haloes and concentric rings. Photo: M. T. McGrath

Stemphylium or gray leaf spot can be caused by several different species of the genus *Stemphylium*. This is a new disease of tomato in the Northeast—we first saw it in Massachusetts in 2020 – but is common in southern states. Over the last few years, it's been reported in both field and high tunnel tomatoes throughout the region. Stemphylium leaf spots are tan to gray and irregularly shaped, with *no* yellow halo. Sparse gray sporulation is sometimes visible at the center of the spots with a 10X hand lens. Lesions occur on upper and lower leaves simultaneously, distinguishing this disease from early blight and Septoria that often start on lower leaves and move upwards as the diseases progress. Similarly to early blight and Septoria, Stemphylium spores are dispersed by wind and splashing water, and the fungus can survive on crop residue in the soil as well as on seeds.

Septoria, Early Blight, and Stemphylium Management:

Some tomato and potato varieties with early blight resistance or tolerance are available. Stemphylium-resistant tomato varieties are also available. However, most tomato cultivars are susceptible to Septoria leaf spot. You can find a list of resistant tomato varieties here: https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/

Adequate nitrogen fertility throughout the season can help delay onset of early blight; lower leaves become more sus¬ceptible as the nitrogen demand increases with fruit production and nitrogen is pulled from older leaves. See the field tomato and high tunnel tomato sections of the [Mid-Atlantic Commercial Vegetable Recommendations] for nutrient recommendations.

Protectant fungicide sprays, beginning before symptoms begin to develop and applied at regular intervals (depending on weather conditions and disease pressure) will delay the onset of disease.

Reduce overwintering inoculum by rotating fields out of tomato crops for at least two years, controlling solanaceous weeds, and incorporating crop debris promptly after harvest to encourage decomposition.

Reduce the length of time that tomato foliage is wet by using drip irrigation, using wider plant spacing, and staking. Keep workers and equipment out of wet fields where possible.

Many fungicides are registered and effective against both early blight and Septoria. Please see the [Mid-Atlantic Commercial Vegetable Production Recommendations] for recommendations.

Stemphylium leaf spot is not currently included in the [Mid-Atlantic Commercial Vegetable Production Recommendations], and fewer fungicides are labeled specifically for this disease than for early blight and Septoria. In [Pennsylvania], fungicides can legally be used if the target crop and use pattern (e.g. foliar sprays) are both on the label—fungicides that are effective against early blight and Septoria should also be effective against Stemphylium. Chlorothalonil, mancozeb, Aprovia Top, Inspire Super, Luna Tranquility, ManKocide, Gavel, Revus Top, Mettle, Flint are labeled specifically for Stemphylium/gray leaf spot.

Ms. Dicklow is retired as an Univ. of Massachusetts Extension Plant Diagnostician, and Ms. Scheufele is with the Univ. of Mass. Extension Vegetable Program. From the Vegetable Notes for Vegetable Farmers in Massachusetts, Univ. of Mass. Extension, Vol. 34, No. 18, August 18, 2022.

VEGETABLE PRODUCTION

Tomato Disease and Fruit Quality Problems

Jerry Brust

[The last week of August] a great number of problems pop-up in tomato fields throughout our area. The first problem is that bacterial and fungal diseases are spreading. The fungal pathogens usually can be contained with timely (as difficult as that might be) fungicide applications. Bacterial spot or speck on the other hand can be much more difficult to control once they get started and the weather remains wet and warm. Using Actigard along with a protactant fungicide (mancozeb) and a copper product will usually reduce the severity of the disease (Fig. 1).

Several other fields had similar symptoms as seen in Figure 2, where the bottom half of the foliage has been decimated but the top of the plant's foliage looked okay. If fungicide sprays are applied as needed the top foliage should do well enough. The problem arises with the green fruit being exposed by the missing foliage. These fruits are in danger of sunburn or sunscald (Fig. 2) and rain check (the many, tiny concentric cracks that form on the shoulder of fruit and can expand over time (Fig. 3). This is when using shade cloth (20-30% shade-inducing) would greatly reduce the chances of sunscald and rain check.

Figure 1. Row on the right had fungicides and Cu applied, row on left same fungicides and Cu plus Actigard.

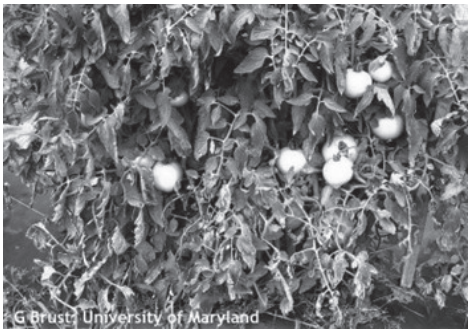


Figure 2. Bottom half of plants have lost a great deal of foliage and expose fruit to sunscald

Figure 3. Exposed side of tomato fruit with rain check.

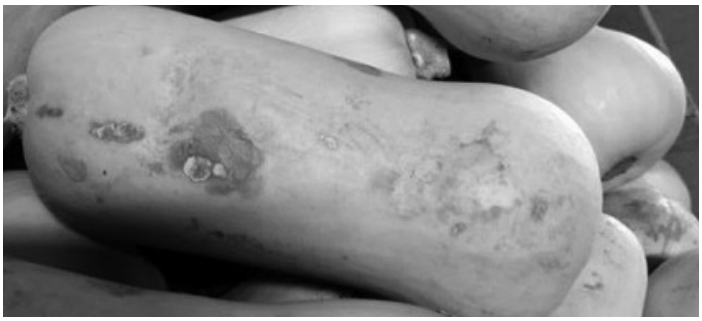
Dr. Brust is the IPM Vegetable Specialist, at the Univ. of Maryland. From the ***Weekly Crop Update****, Univ. of Delaware Extension, Vol. 30, Issue 23, August 26, 2022.*

VEGETABLE PRODUCTION

Prevent Rot of Winter Squash in Storage

Leah Fronk

In August and September, everything is popping in the produce fields. One crop that is sizing up and one of the latest to mature is winter squash.



Butternut squash in storage. Photo: Leah Fronk, Penn State

Many growers produce winter squash for their roadside stands or local auctions. Still, an increasing number of acres are planted for regional farmer's cooperatives that sell to larger markets in Pennsylvania and beyond. A storage crop is a perfect way to maintain sales throughout winter.

Winter squash requires a long growing season and proper care to get a good quality fruit that holds up well in storage. Depending on the variety, winter squash can last for 1–6 months if harvested, cured, and stored carefully. Other times, improper handling during and after harvest can shorten shelf life. Sometimes undetected or mismanaged disease in the field can lead to post-harvest rots in winter squash. Alternaria, anthracnose, bacterial soft rot, and phytophthora are examples of plant pathogens that may cause squash to deteriorate in storage. In this article, I will discuss how to prevent post-harvest rot, which is rotting after your harvest.

Is It Ready to Harvest?

If you are new to growing winter squash for storage, you'll want to look for a few cues to know when the crop is mature.

Check the rind for hardness. Pressing your fingernail into the rind should be difficult whenever the fruit is mature.

Color—as squash matures and its true color develops, the glossiness will fade into a dull appearance. In some varieties, you will notice a ground spot (where the fruit is touching the ground) that is a different color than the rest of the fruit.

The stem or handle of the squash will begin to dry out and become corky closer to maturity.

Preventing Rot in the Field

A good rule of thumb when thinking about winter squash storage is "harvest early, store carefully." If your vines and fruit are in good health, the fruit will likely hold fine out in the field for a couple of weeks. To protect the leaves and handles/stems, using a protectant fungicide such as chlorothalonil or mancozeb to protect against disease is a good practice, especially if rainy weather is forecasted. Good leaf cover is critical to protect the fruit from sunscald. If your vines have been taken over by powdery mildew or another disease, harvesting fruit as soon as possible is essential. When harvesting squash—easy does it. Although their skin appears tough, it can be easily damaged during harvesting. Any wound allows a fungal or bacterial pathogen to enter the rind and begin to grow a rotten spot.

Curing

Curing helps to harden the skin of winter squash and can even aid in healing minor wounds. Proper curing will improve the shelf life of winter squash too. If the weather conditions are right, you may cure your squash in the field for 7–10 days after cutting off the vine. Look for dry, warm days at 70–80°F. If outdoor conditions are not suitable, bring fruit to a warm building such as a barn or greenhouse. Space out the fruit, and do not pile it while curing. After fruits are cured, move them to the storage shed.

Preventing Rot in the Storage Shed

Before placing fruit in the storage shed, remove clumps of soil and plant debris with a dry cloth. There are a number of food-safe sanitizers available, and it may be worthwhile trying out a couple of bins to see if it makes a difference. The storage shed should be dry and well-ventilated. See the table below for recommended conditions for specific types of squash. Prevent chilling injury by ensuring your storage shed stays above 50°F. If squash is subjected to temperatures below 50°F, you will see pitting on the skin and more decay once it's removed from storage.

Keep #2 (second quality) squash separate from first-quality fruits and sell as soon as possible. Do not attempt to hold #2 crops for long winter storage. To decrease condensation and sweating, keep fruits in low piles. Cardboard bins are often used to store squash. Place the bins on pallets to keep them off the ground and move the pallets with them. Using forks to move cardboard bins may wound the fruit inside. Consider also ethylene gas released naturally from produce such as apples, pears, and tomatoes. Ethylene gas can speed up the ripening process in fruits and reduce storage life in winter squash. Keep your squash in a separate room from these crops.

Looking Ahead

If you planted winter squash this year and are experiencing above-average amounts of rot, there are some things to consider for the following year.

Rotate the field out of cucurbit crops, including cucumbers, melons, and zucchini. Do not plant the same plant family in the same field year after year. A 3 to 4-year rotation is best to prevent the build-up of disease.

Buy seed from a reputable seed company. Do not save your seed from fields that have experienced disease pressure. Some diseases can be seed-borne.

Using a natural or plastic film mulch will protect fruits from contact with the soil.

Encourage good leaf cover throughout the growing season by keeping insects in check and irrigating when necessary. Have the insecticide on hand for the next year and be ready for them. Look in the Mid-Atlantic Vegetable Production Guide to get insecticide recommendations for cucurbit insects that are troublesome on your farm.

If the following year's squash field is in a high sun-exposure area, look in the seed catalog for bush or semi-bush varieties that provide better leaf cover than vine types.

The recommended storage conditions for different culinary types and their storage life expectancy are as follows in the chart below.

Culinary Type	Temp (F)	Percent Relative Humidity	Storage Life Expectancy
Pumpkins, general	50–55	50–70	8–12 weeks
Squash, general	50	50–70	Varies with variety
Acorn	60–70	60	4 weeks
Acorn	50–60	60	4–7 weeks
Buttercup	50	50–70	13 weeks
Butternut	50–60	60–	7 weeks
Butternut	50	60–	8–11 weeks*
Hubbard	50–60	60–70	27 weeks
Turban	50	50–70	13 weeks

**Storage for four months or more is possible if all production, curing, and storage recommendations are followed.*
From http://vegetablemdonline.ppath.cornell.edu/index.html

Ms. Fronk is with Penn State Extension in Juniata Co. From Penn State Extension, https://extension.psu.edu/prevent-rot-of-winter-squash-in-storage?, August 24, 2022.

Cucurbit Viruses and Transmission

Bess M. Dicklow and Susan B. Scheufele

We have seen a few cases of potyviruses in cucurbit crops in the last few weeks. Cucurbits are susceptible to more than 32 viruses, which can cause a wide variety of symptoms, including color breaking or mottling of fruit, mosaic or mottled pat¬terns on leaves, and darkening, distortion, and/or blistering of leaf tissue. Most cucurbit viruses are part of the Potyvirus family (which includes potato virus y, though this virus does not affect cucurbits), and are vectored by aphids. Species of aphids that prefer potatoes are moving on to alternate host crops such as cucurbits now that potato vines are being mowed or desiccated. Please submit suspicious samples to the [Penn State Plant Disease Clinic (see https://plantpath.psu.edu/about/facilities/plant-disease-clinic or 814-865-2204.]

Transmission

Viruses that are transmitted by insect vectors are classified as non-persistent, semi-persistent, or persistent, depending on the length of time the insect vector can retain infectious virus particles. Non-persistent viruses stay within the insect vector for only minutes to hours, compared to semi-persistent viruses, which can remain in the vector for days. Persistent viruses remain in the vector for the insect's lifetime and, in some cases, can even be passed from an infected vector to its progeny. Most of the viruses we encounter in cucurbit fields in the Northeast are non-persistently transmitted by aphids (except for squash mosaic virus, which is transmitted semi-persistently by cucumber beetles). Because non-persistent viruses only remain in the insect vector for up to a few hours, any movement of the virus from plant to plant has to occur quickly. Aphids probe plants briefly with their mouthparts as they move from plant to plant, in order to determine if they are on a preferred host plant or not. Even this quick probing activity can be enough to transmit a virus to a plant, even if the plant is not a preferred host of that aphid! Aphids can pick up the virus particles anywhere along their path and are very efficient at spreading them, often causing 100% of the crop to be affected. Insecticides can cause increased muscle twitching and probing in aphids, and so are generally not effective at preventing non-persistent virus transmis¬sion. The exceptions are insecticidal soaps and horticultural oils, which do not have this effect. Once a virus is present in a plant, it is there to stay, though fruit may not be affected if the virus was acquired after pollination occurred. Mechanical transmission of viruses from plant to plant may also occur via movement of plant sap by equipment or workers (e.g., during pruning or harvesting). Some viruses can be seed-borne and other may overwinter on weed hosts.

Prevention

Once a virus becomes visible in your crop there is no cure or chemical treatment, so prevention is essen¬tial. Furthermore, the severity of disease caused by viruses is usually determined by the timing of infection—the earlier infection occurs, the greater the impact on plant growth, fruit symptoms, and fruit set. Delaying the onset of infection by several weeks can have a dramatic effect on the amount of damage.

Cultural Practices

- Start with certified virus-free seed, as some viruses can be seed-borne in particular crop species.
- Where possible, do not grow ornamental plants and vegetable transplants in the same greenhouse, as viruses often have large host ranges including vegetables, ornamentals, and woody plants and may be introduced on infected plugs.
- Plant resistant cultivars. Many resistant varieties are available in a variety of crops including cucumber, summer squash, and melons. Resistance is derived from traditional breeding as well as through genetic engineering, while some species are naturally resistant to certain viruses.
- Cover crops with floating row covers in the spring to prevent the early influx of virus-carrying aphids. Be careful with this tactic, as aphid populations can develop quickly under row cover if present when the crop is covered, and row covers will exclude beneficial insects that might otherwise help control aphid populations. Make sure plants are not already infested before you apply row covers. Remove covers when flowering begins to allow for pollination.
- Reflective mulches may repel aphids. Though slightly more expensive, they may be cost-effective if viruses are a chronic problem.
- Eliminate weed host reservoirs such as shepherds purse, dandelion, field bindweed, purple dead nettle, and Canadian goldenrod.
- Prunus species (peaches, cherries, etc.) are attractive to green peach aphids. Removing wild cherry trees from around fields can make the area less attractive to green peach aphids. The green peach aphid is not the only aphid that transmits viruses, but it is important because it is a vector of many different viruses that affect cucurbit crops.
- Handle plants as little as possible, clean tools frequently, and work in clean fields first and affected fields last to minimize mechanical transmission by workers and equipment.
- Remove and destroy affected plants to prevent a source of virus for further infections.

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VEGETABLE PRODUCTION

Cucurbit Viruses and Transmission

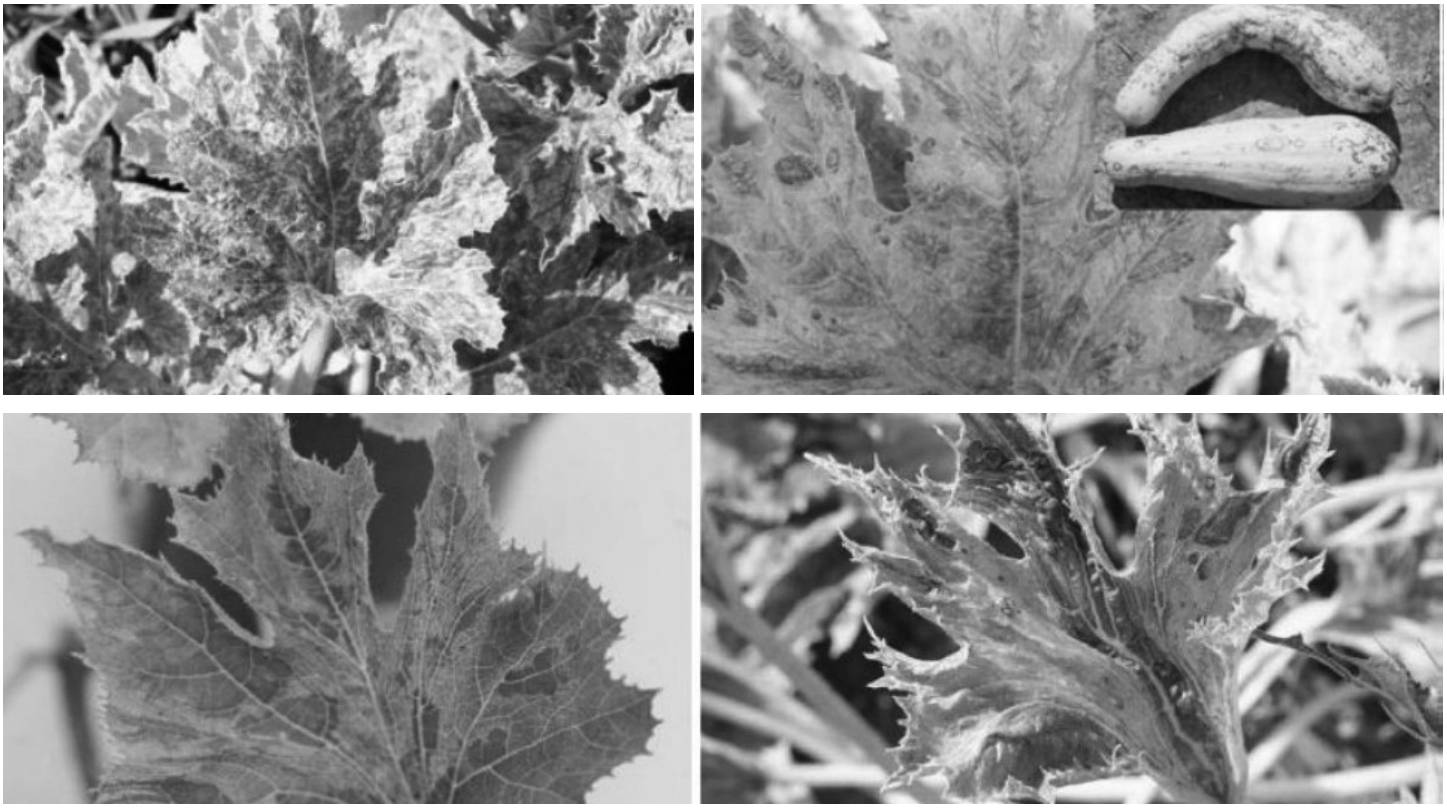
continued from page 15

Insecticides

Because most cucurbit viruses are transmitted non-persistently and thus very rapidly, insecticides DO NOT act quickly enough to prevent infection or control disease spread. (Put another way, by the time an insecticide has killed a virus-carrying aphid, the aphid has already spread the virus throughout many plants by probing). Systemic materials are generally the most effective insecticides available for aphid control because they are taken into the plant tissue and ingested by aphids when feeding. However, when probing a leaf, an aphid is not feeding and does not ingest plant sap or insecticide. In fact, the presence of an insecticide may actually stimulate aphids to probe more quickly, and to move from plant to plant rapidly, in an effort to find a suitable feeding site. This can increase the spread of non-persistently trans¬mitted viruses in cucurbit crops. Mineral oil sprays have been used to deter aphids from feeding, but this method can be costly and unreliable. Conversely, controlling spotted and striped cucumber beetles can effectively reduce the spread of squash mosaic virus through a field because those insects transmit SqMV semi-persistently—the beetles must feed for 5 minutes in order to acquire the virus.

Important Viruses

Listed below are the six viruses you are most likely to encounter in New England cucurbit fields. Of these, cucumber mosaic virus and watermelon mosaic virus occur every year and papaya ringspot virus occurs most years in the Northeast. Squash mosaic virus is mostly introduced via contaminated seed. Zucchini yellow mosaic virus has not been seen in the Northeast for many years. A note on the naming of viruses: Viruses are named for the first host that they are identified on, and for the first symptoms identified on that host. For example, cucumber mosaic virus was first described causing a mosaic pattern on the foliage of cucumber. Many viruses have wide host ranges and cause wide ranges of symptoms - they are not limited to the host crop nor the symptoms that they are named. It is difficult to diagnose viruses in cucurbits from symptoms alone, as most of the common viruses can produce similar symptoms – diagnosticians usually rely on lab tests (similar to a COVID rapid test!) to diagnose plants with viral symptoms.



Virus symptoms in squash. Clockwise from top left: Cucumber mosaic virus; Papaya ringspot virus; Watermelon mosaic virus; Zucchini yellow mosaic virus. Photos: M. Babadoost

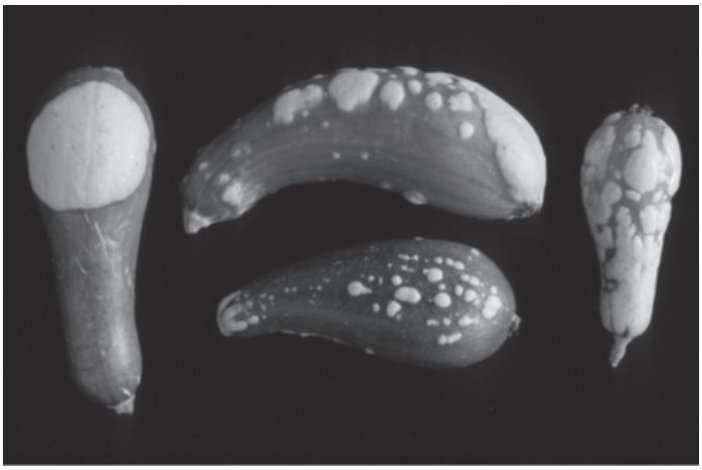
Cucumber mosaic virus (CMV) causes severe plant stunting, prominent foliar mosaic, malformation, and downward cupping and reduced size of leaves. Flowers may be malformed or have greenish petals. Fruits may be distorted, discolored, and small and may not produce many seeds. Summer squash, some melons, and some pumpkins are most severely affected, while cucumbers, watermelons, and winter squashes are less severely affected. The host range of CMV includes at least 1200 plant species including many vegetables, ornamentals, and woody tree species. CMV is non-persistently transmitted by over 60 species of aphid, including green peach, potato, and foxglove aphids. CMV may be seed-borne in some cucurbit crops and weeds including chickweed (*Stellaria media*). Most varieties of cucumber are bred to have good CMV-resistance. Some summer squash varieties carry a “precocious yellow gene” which masks the color-breaking effect caused by CMV infection, some have intermediate resistance, and others carry high transgenic resistance to CMV. Melons may carry intermediate resistance to CMV, though no commercial muskmelon varieties are resistant. Most watermelon varieties are naturally resistant to the most prevalent strains of CMV.

Papaya ringspot virus type W (PRSV-W) causes prominent foliar symptoms including a green mosaic and leaf malformation, puckering, distortion, and narrowing. Affected fruit is malformed, knobby, and exhibits color-breaking. PRSV-W is non-persistently

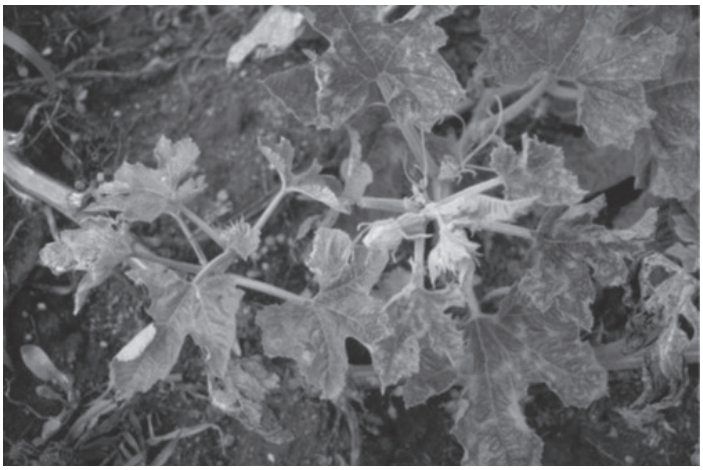
vectored by over 20 species of aphid, including cowpea, melon, foxglove, potato, and green peach aphids, but is not seed-borne like CMV. PRSV-W can be effectively prevented by host resistance in cucumber, melon, winter and summer squash, but no watermelon varieties are resistant.

Squash mosaic virus (SqMV) affects squash and melons and some species in the family Chenopodiaceae. Foliar symptoms include green vein-banding, mottling, a dark green mosaic, blistering and hardening of leaves, ringspots, and protruding of veins at leaf margins. Infected fruits are mottled and infected melons lack netting. SqMV can be seed-borne, and this is the primary source of inoculum for outbreaks. Once introduced, SqMV is transmitted by spotted and striped cucumber beetles. Beetles acquire the virus after feeding on an infected plant for 5 minutes and can retain the virus for 4 to 20 days. because the beetles must feed for so long to acquire the virus, controlling cucumber beetle populations will help reduce spread of SqMV.

Watermelon mosaic virus (WMV) causes green mosaic, rough wrinkled leaves, darkening of leaf veins, chlorotic rings and malformation. While foliar symptoms can be severe, especially in winter and summer squash, fruit is generally not affected. Yellow colored summer squash fruit may develop green spots. The host range of WMV includes most of the plants in the Cucurbitaceae family and the virus overwinters primarily in wild legumes (*Trifolium* spp., e.g., clovers), as well as members of the Chenopodiaceae and Malvaceae families. WMV is non-persistently vectored by over 20 species of aphid, including foxglove aphid, potato aphid, and cowpea aphid. WMV is not seed-borne in cucurbits or legumes. Resistant varieties of cucumber are available.



Butternut squash in storage. Photo: Leah Fronk, Penn State



Butternut squash in storage. Photo: Leah Fronk, Penn State

Zucchini yellow mosaic virus (ZYMV) causes a yellow leaf mosaic, severe malformation and blistering, reduced leaf size, and plant stunting. Squash and pumpkin fruit are reduced in size and greatly deformed and knobby. Muskmelon and watermelon fruit are also reduced in size and deformed, and develop deep cracks. Of the cucurbits, pumpkin, summer squash, muskmelon and watermelon are especially affected. ZYMV is also non-persistently transmitted by aphids, including melon and green peach aphids. New varieties of squash, melon, and cucumber have been developed with high, transgenic resistance.

Tobacco ring spot virus (TRSV) is rare in MA but has been observed in PA. Initial symptoms on cucurbits are pin-point necrotic leaf spots with bright yellow haloes that develop into a bright yellow mosaic on young leaves. The initial onset of symptoms is followed by a slow recovery. Older leaves remain dark green but are reduced in size and plants are not very productive. Fruits of infected watermelon plants may develop elevated pimples and ringspots. This disease is primarily vectored by dagger nematodes, but can be mechanically transmitted by equipment or workers, and can be seed-borne.

Ms. Dicklow is retired as a Univ. of Massachusetts Plant Diagnostician and Ms. Scheufele, Univ. of Mass. Extension Vegetable Program.
*From the **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Mass. Extension, Vol. 34, No. 17, August 11, 2022.*

VEGETABLE PRODUCTION

Avoid Creating New Weed Problems with Harvest and Cultivation Equipment

Lynn Sosnoski

Bindweed caught in cultivating equipment. Photo: L. Sosnoskie

Weeds can interfere with crop growth and development both directly, via competition for water, nutrients, and light, and indirectly, by physically interfering with farming tasks. Weeds that escape in-season control often produce significant quantities of seed, which are threats to future yields. While most seed will be deposited in the same field in which it was produced, some may be transported between sites on farm equipment. In some parts of the US, university personnel have found that harvesters are a significant source of seed dispersal for important weed species, such as herbicide resistant biotypes of Palmer amaranth (*Amaranthus palmeri*) and waterhemp (*Amaranthus tuberculatus*). In New York State, herbicide-resistant waterhemp seeds were recovered from a combine that was recently acquired from an out-of-state grower. Ultimately, the careful examination of this harvester may have prevented the establishment of a difficult-to-control weed with a novel resistance profile.

While it may not always be feasible to thoroughly clean equipment between every field, removing as much plant debris as possible before transferring farm equipment between sites is a valuable strategy for controlling weed spread. Here are some other tips for reducing the movement of unwanted seeds:

- Newly purchased, previously owned equipment should be inspected to prevent new weed species or weedy biotypes from being introduced.
- Avoid harvesting overly dense patches of weeds, especially if you suspect herbicide resistance
- Arrange harvest operations to ensure that the weediest fields are harvested last, when possible.
- While it may not be feasible to thoroughly clean equipment between every field, removing as much plant debris as possible before moving harvesters between sites can be a valuable strategy for controlling weed spread.
- Remember that unwanted seed can also be picked up and spread on tires and on tillage and planting equipment. Remove clumped soil from implements and tractors to avoid spreading weed seeds (as well as devastating soil-borne pathogens).
- Be strategic with site selection when conducting end-of-season equipment clean-outs; choose a location where dislodged or removed seed cannot be easily blown, picked up, washed away, or otherwise transported back to fields. The removal of debris may have additional economic benefits if it prevents unnecessary wear-and-tear and helps to preserve equipment functionality over time.

For more information, see the following links:

- End-of-Season Combine Clean-Out Fact Sheet – North Dakota State University https://www.ag.ndsu.edu/palmeramaranth/documents/end-of-season-combine-clean-out-fact-sheet.pdf
- Weed Seed Movement via Combines – University of Wisconsin-Madison Extension https://www.wiscweeds.info/img/2020%20combine/Weed%20Seed%20Movement%20via%20Combines.pdf
- Weed Seed Management at Crop Harvest – University of Wisconsin-Madison Extension https://www.wiscweeds.info/img/2020%20combine/Weed%20Seed%20Management%20at%20Crop%20Harvest.pdf

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These weed seed seedlings, predominantly common lambsquarters, are germinating from soil that was collected off of disc harrows at the Cornell AgriTech farm in Geneva. Photo: L. Sosnoskie

VEGETABLE PRODUCTION

Snap Bean Pod Flecking Complex

Julie Kikkert

Recently, an Extension Educator from out of our Western NY program region sent me some photos of snap bean pods with blemishes. I immediately thought "russeting", but it prompted me to look up information that Dr. Helene Dillard and colleagues worked on in the early 2000's. The name given to these rusty looking spots and flecks on pods is "Pod Flecking Complex" or PFC for short. It is a sporadic problem in New York. Symptoms include tan, orange, or black discoloration in the suture and/or small dark superficial specks, flecks, or spots (sometimes sunken) on the pod surfaces.

In 2006, the lab of Helene Dillard at Cornell was alerted to various blemishes on snap bean pods that resulted in considerable losses to some fields in New York and Pennsylvania. Late in the growing season, losses were common at 8-9% and occasionally reached as high as 20%. The lab group collected snap bean plant and pod samples from 20 fields in Western and Central NY. They also received additional samples of bean pods with "russet" symptoms sent in from producers and processors in NY and PA. Affected varieties included Titan, Hystyle, Bronco, and Diplomat. The researchers isolated several potential pathogens from the pod samples. In testing the samples, they were able to reproduce the russet symptoms in greenhouse and mist chamber tests with two fungal species, *Alternaria alternata* and *Plectosporium tabacinum*. The problem in 2006 was most prevalent in mid- to late August following periods of prolonged rainfall or rainfall of high intensity. Symptoms also became more apparent as bean pods increased in size and maturity.

Pod flecking caused by *Alternaria alternata* (Fig. 1) appears initially as small, irregular, water-soaked flecks and occurs on leaves, petioles, and pods, and the lesions tend to darken with age. The infected tissues remain only a few cells deep. The flecks may coalesce to produce long streaks. Spots may be sunken or raised (Dillard and Cobb, 2007a).

The laboratory of Dr. Dillard identified *Plectosporium tabacinum* as a causal agent of "russet" on snap beans (Dillard, et al. 2005). According to Dillard and Cobb (2007b), "P. tabacinum has recently become more visible in the United States as a new or emerging pathogen on yellow summer squash pumpkin, and zucchini. The organism appears to opportunistically parasitize plants under conducive wet conditions. Russet symptoms observed in commercial fields of the cultivars Brio, Gold Mine, Hystyle, and Hercules were evident only on the pods and consisted of diffuse, superficial, light brown necrotic areas or flecks on the pods with undefined borders (Fig. 2). Symptoms were often severe in the sutures of the pods and the lesions varied in size and shape.

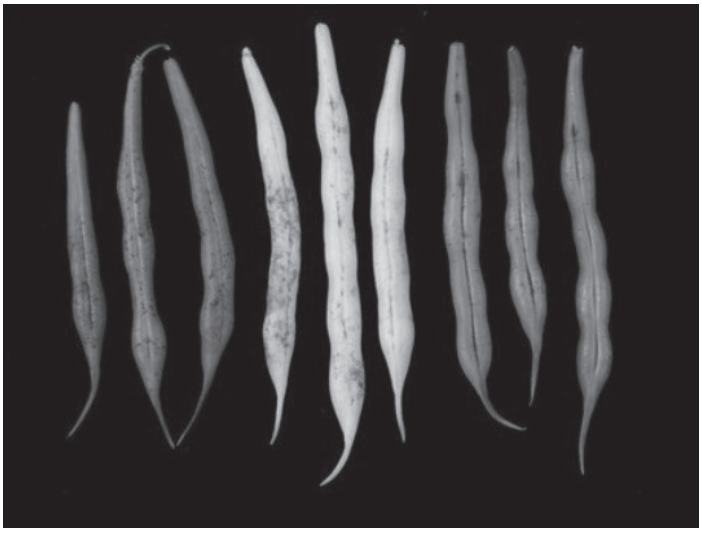

Figure 1. Pod flecking caused by Alternaria alternata *on snap bean pods. Varieties, left to right: Diplomat, Goldmine, and Hystyle. Photo: Helene Dillard, Cornell.*

Figure 2. Symptoms caused by Plectosporium tabacinum *on snap bean pods. Varieties are Goldmine (left) and Diplomat (right). Photo: Helene Dillard, Cornell.*

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VEGETABLE PRODUCTION

Snap Bean Pod Flecking Complex

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In mist chamber tests, severity of russet on bean pods generally increased with pod size at the time of inoculation with *Plectosporium*. Wounding the pods before inoculation had no effect on the amount of russet developing on the pods."

Dillard and Cobb (2008) tested eight cultivars (Bronco, Caprice, Diplomat, Gold Mine, Hystyle, Titan, Secretariat, Summit) for susceptibility to A. Alternaria and P. tabacinum isolates. All cultivars were susceptible. Titan consistently developed high levels of disease when inoculated with either pathogen.

Fungicide trials were conducted during the winter of 2007 in a mist chamber, using greenhouse produced potted plants of var. Titan. The plants were inoculated with spores of either *A. alternaria* or *P. tabacinum*. If the percent disease control criterion is set at greater than 43% control, Headline, Bravo WS, Quadris, and Champion provided control of both fungi. Endura, Switch, and Rovral provided control of Alternaria, but did not control *Plectosporium*. Topsin M controlled *Plectosporium*, but not *Alternaria*. Ronilan (no longer registered) did not control either fungus. In 2008, several products were tested in field trials and all significantly controlled PFC except for Topsin M and Bravo + Topsin M, but the disease incidence was very low (Dillard, et al. 2009).

Pod Flecking Complex is not sufficiently widespread to warrant planned sprays for disease control. The information presented above provides insight as to which materials have the potential for disease control under field conditions. Additional tests are needed to quantify efficacy in the field and determine application strategies in compliance with days to harvest label requirements. Currently, there are no recommended fungicides for PFC in snap beans (2022 Cornell Integrated Crop and Pest Management Guidelines for Commercial Vegetable Production).

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Dillard, H.R., A. Cobb, and D. Shah. 2009. 2008 – Weather Driven White Mold and Pod Flecking, Proceedings of the 2009 Empire State Fruit & Vegetable Expo, February 11-12, 2009, Syracuse, NY, pages 98-100.

Ms. Kikkert is with Cornell Cooperative Extension, Cornell Vegetable Program. From the From VegEdge, Cornell Cooperative Extension Vegetable Program, Vol. 18, Issue 19, August 17, 2022.

Understanding Protectant Fungicides (FRAC groups M01 – M12) in 2022

Andrew Wyenandt

Protectant (contact) fungicides, such as the inorganics (copper, FRAC group M01) and sulfur (FRAC code M02); the dithiocarbamates (mancozeb, M03), phthalimides (Captan, M04), and chloronitriles (chlorothalonil, M05) are fungicides which have a low chance for fungicide resistance to develop. Protectant fungicides typically offer broad spectrum control for many different pathogens.

Why wouldn't fungi develop resistance to protectant fungicides? Protectant fungicides are used all the time, often in a weekly manner throughout much of the growing season. The answer is in their modes-of-action. Protectant fungicides have modes-of-action that prevent fungal development in different manners. In inorganic compounds, sulfur (M02) prevents fungal growth (i.e., spore germination) by disrupting electron transport in the mitochondria. Coppers (M01), on the other hand, cause non-specific denaturation of proteins. Importantly, the overuse of copper on certain diseases on can lead to copper resistance development (e.g., copper use and bacterial leaf spot in tomato and pepper). Chlorothalonil (M05) inactivates amino acids, proteins, and enzymes by combining with thiol (sulfur) groups. In all cases, a protectant fungicide's chemistry disrupts fungal growth and development either non-specifically or in multiple manners. Because of this, there is a much lower chance for fungi to develop resistance to them.

Protectant fungicides are contact fungicides, meaning they must be present on the leaf surface prior to the arrival of the fungus and must then come into direct contact with the fungus. Protectant fungicides can be redistributed on the leaf surface with rainfall or overhead irrigation, but can also be washed off by too much of either. Remember, that with protectant fungicides, any new growth is unprotected until the next protectant fungicide is applied, in other words, protectant fungicides are not systemic and do not have translaminar activity like some of the newer fungicide chemistries. For some diseases its difficult to get protectant fungicides where they are needed the most – on the undersides of leaves. Thus, tank mixing protectant fungicides with systemic fungicides or fungicides with translaminar activity is important when disease pressure is high.

Protectant fungicides should be tank-mixed with fungicides with high risks for resistance development. Protectant fungicides used in this manner will help slow (or reduce the chances for) fungicide resistance development on your farm. In any case, it's best to always follow the label and tank mix protectants with high risk fungicides when suggested or required to do so.

Dr. Wyenandt is the vegetable pathologist with Rutgers Cooperative Extension. From ***Plant and Pest Advisory****, Rutgers Cooperative Extension, https://plant-pest-advisory.rutgers.edu/growers-guide-to-understanding-the-protectant-fungicides-frac-groups-m1-m11-2-3-2/, April 21, 2022.*

Vine Killing Options for Potatoes

Margie Lund

Vines are laying down in potatoes which means it is time to consider options for vine killing. Chemical vine kill 10-14 days prior to harvest helps thicken skins of tubers, leading to less bruising and skinning during harvest and handling. It can also help control tuber size in fields where tubers have grown large during the season, and decreases disease incidence including hollow heart, late blight, and infection by bacterial diseases. Vine kill should mimic natural plant decay, and too rapid of plant death can lead to vascular decay or sunken tubers. To avoid rapid kill when applying chemicals, use low rates on hot, dry days, and higher rates on cooler days. Vines can also be killed mechanically via flail mowing or rolling. If using mechanical methods, mow or roll 14-21 days before harvest to provide tubers time to mature. Be careful to not overly disturb the soil because exposed tubers may become sunburned or damaged. Rolling can also be used in combination with chemical methods to increase rate of natural desiccation. There are several different chemical options for vine kill available to use in New York (read and follow all pesticide label instructions before using any listed chemicals):

[Note: The following are New York recommendations. The Mid-Atlantic Commercial Vegetable Production Recommendations ONLY recommends glufosinate and diquat. The others listed below are labeled for the mid-Atlantic but either limited local data is available and/or they are not recommended for the mid-Atlantic due to potential crop injury concerns.]

Carfentrazone-ethyl (Group 14)
Trade name: Aim EC
Rate/A: 3.2-5.8 fl. oz. (alone) or 2-5.8 fl. oz. (tank mix); PHI 7 days; REI 12 hrs

Apply in later stages of senescence. Adequate desiccation will occur within 14 days after initial treatment. Will also desiccate late season susceptible broadleaf weeds. Two applications may be required if potatoes are in active vegetative growth when first application is applied.

Diquat dibromide (Group 22)
Trade name: Reglone 2L
Rate/A: 1-2 pts.; PHI 7 days; REI 24 hrs.

Two applications may be needed if potatoes are in active vegetative growth when first is application is applied. A second application can be made 5 days after the first if vine growth is dense. Do not exceed a total of 4 pt/A. Drought at the time of application will decrease desiccation effectiveness.

Pyraflufen-ethyl (Group 14)
Trade name: Vida
Rate/A: 5.5 fl. oz. (alone) or 2.75-5.5 fl. oz. (tank mix); PHI 7 days; REI 12 hrs.

Make 1-2 applications with a minimum interval of 7 days. Do not exceed 2 applications or 11 fl. oz/A per crop season. Apply with either a non-ionic surfactant or crop oil concentrate in 20-50 gallons of water/A. Use an approved buffering agent if the pH is greater than 7.5.

Glufosinate (Group 10)
Trade name: Rely 280
Rate/A: 21 oz.; PHI 9 days; REI 12 hrs.

Not for use in Nassau and Suffolk Counties. Make one application at 21 oz/A. Do not split. Potato varieties wit heavy or dense vines may require and application of another desiccation product to complete vine desiccation. Thorough coverage of the potato vines to be desiccated is essential. Use a sufficient volume of water (20 to 100 gpa) to obtain a thorough coverage of the potato vines. Vary the gallons of water per acre and the spray pressure as indicated by the density of the potato vines to assure thorough spray coverage. Increase the spray volume to at least 30 gallons of water per acre when the potato vine canopy is dense or under cool and dry conditions. Apply Rely 280 with the spry boom as low as possible to achieve thorough coverage of the potato vines for best control and to minimize drift potential. See label about rotation restrictions.

Paraquate dicholoride (Group 22)
Trade name: Firestorm and Parazone 3SL
Rate/A: 0.7-1.3 pts.; PHI 3; REI 12 hrs.

For use in f**resh market potatoes only**. Should only be used on fresh market potatoes that will be processed or consumed immediately, and not on tubers that will be stored, as it may result in tuber decomposition in storage. A second application can be made a minimum of 5 days after the first if vine growth is dense. Do not exceed 2.6 pts./A per season. Will also desiccate susceptible grass weeds. Apply with either a non-ionic surfactant or crop oil concentrate. Do not apply to drought stressed potato vines.

*Ms. Lund is with the Cornell Cooperative Extension Cornell Vegetable Program. From **VegEdge**, Cornell Cooperative Extension Vegetable Program, Vol. 18, Issue 19, August 17, 2022*

BERRY PRODUCTION

Bird Control in Fruit Crops

Gordon Johnson

Bird netting in grapes.

Cherries, blueberries and some grape varieties are susceptible to bird damage. Cherry season is over for this year; however, blueberry harvest is under way and grapes will be harvested later this summer. Netting is effective, particularly in grapes where it can be mechanically applied. However it can be expensive in dwarf cherries and blueberries where structures will be needed to support the nets.

The following are some other methods to consider in managing birds in fruit crops:

Methyl Anthranilate

Methyl anthranilate is chemically similar to the major flavor component of Concord grapes and is manufactured in large quantities by food processors. Birds are repelled by its taste, and it is regarded as safe for human consumption. There are many bird repellent products available containing this chemical. It needs to be applied multiple times during the season.

Sugar

Applications of sucrose sugar syrup have been shown to repel birds from blueberry plantings. Many bird species cannot digest disaccharides. The sugar is applied when the fruits begin to turn blue, and reapplied after episodes of rain.

Audio Scare Devices

Devices such as “Bird-Gard” with digitized, species specific bird distress calls can be effective. There are several types available with different species recorded such as crows, robins and starlings that sound every minute during daylight hours. Other types use calls of birds of prey such as hawks or owls.

Visual Scare Devices

Reflective tapes, balloons, waving air man devices, predatory bird models, and other visual devices can help to scare birds but may not work as stand-alone methods for long periods.

Netting

Vineyard managers should take care to control birds in mid-late summer when sugar contents are peaking in grapes, making them a highly desirable food source. Netting is probably the most effective control method, followed by scaring devices.

It is possible to completely exclude birds from the grapes by netting the vines. The initial expense of the netting is quite high, but when amortized over the life of the netting (5-10 years) it becomes much more affordable. Applying and removing the netting are labor-intensive tasks. However, a number of bird netting implements have been designed that dramatically reduce the time and labor required to making bird netting more feasible. If the netting is just draped over the grapevines, birds have a knack for finding ways to get under the netting to feed. Therefore, it may be necessary to pin the ends of the netting together under the vines

Multiple layers of hay bale net wrap has been used as an alternative to the expensive bird netting. It is inexpensive and can be replaced each season.

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Applying multiple layers of hay bale wrap as bird netting in grapes.

VEGETABLE PRODUCTION

Don't Rely on Disinfestants for Disease Control

Andrew Wyenandt

The hot, then windy, then wet weather these past few weeks [in late June] have brought with it prolonged windy days and rain to many areas. In general, this type of weather is ideal for the development and spread of many vegetable diseases.

By now most growers are on weekly protectant fungicide programs to help prevent disease development. It's important to remember at this point in the season when disease pressure is high that growers stick with their standard fungicide programs.

Growers should not replace fungicides with disinfestant-type products in their weekly fungicide programs.

Remember, disinfestants only kill what they come into direct and immediate contact with and do not offer any residual activity like fungicides do. Disinfestants should be used in conjunction with weekly fungicide programs and be applied based on specific weather events such as following rainfall or overhead irrigation or after certain cultural practices such as tying or pruning where plant injury or wounding may occur.

Dr. Wyenandt is with Rutgers Cooperative Extension. From the Plant and Pest Advisory, Rutgers Cooperative Extension, https://plant-pest-advisory.rutgers.edu/dont-rely-on-disinfestants-for-disease-control-2/, June 28, 2022.

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