PENNSYLVANIA
VEGETABLE GROWERS
NEWS
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for the commercial vegetable, potato and berry grower

Growers Vote to Continue Vegetable Marketing and Research Program

Nearly 79% of the vegetable growers voting in the review referendum on the Pennsylvania Vegetable Marketing and Research Program voted "Yes" to continue the Program for another five-year period. A total of 309 eligible ballots were received with 243 voting "Yes" to continue the Program and 66 voting "No". Eight ballots were ruled to be ineligible or spoiled. Over 2,000 ballots were mailed to growers. The official results will be announced in a letter to growers from Secretary of Agriculture Russell Redding. The Vegetable Marketing and Research Program Board greatly appreciates this vote of confidence in the work of the Program. PVGA also strongly supported the continuance of the Vegetable Marketing and Research Program and is encouraged by the continued grower support.

A state marketing order for Pennsylvania vegetable growers established under the Pennsylvania Agricultural Commodities Marketing Act, the Vegetable Marketing and Research Program has been consistently supported by growers in previous review referendums. In 2018, 80% of the growers voted in favor of continuing the Program compared to 85% in 2013, 84% in 2008, 78% in 2003, 66% in 1998 and 60% in 1993.

Growers are required to pay an annual assessment to the Program of $25 for the first five units of production plus $1.50 for each additional unit of production. Units of production are acres for field production and 1,000 sq. ft of greenhouse or high tunnel production area. Growers can elect to pay an assessment of 1.25% of their gross sales, but in most all cases the production area method will result in a lower assessment payment.

PVGA petitioned the Department of Agriculture to conduct the initial grower referendum that established the Program in 1988 with the goal of involving all Pennsylvania vegetable growers in the work of promoting Pennsylvania-grown vegetables and funding practical vegetable production research. Since its establishment,

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Growers Vote to Continue Vegetable Marketing and Research Program

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the Program has funded over $755,000 worth of vegetable research by Penn State and other universities and research entities. The Program funded research that helped establish systems to monitor tomato diseases and sweet corn insect pests so growers can time their fungicide and insecticide applications to be more effective. Various weed and root rot control methods for snap beans and other crops have been evaluated by the Program's research efforts. A long-term tomato breeding project plus variety trials for several different crops have been supported as well as herbicide, plasticulture and high tunnel studies. Throughout the history of the Program, PVGA has worked with the Program to fund these vegetable research projects, with PVGA adding another $1 million to the effort, largely from the Association's profits from its Farm Show food booth.

In addition, over $600,000 grower assessment dollars have been supplemented by over $600,000 in state and federal grants to promote Pennsylvania-grown vegetables. The Program has distributed thousands and thousands of price cards, price paddles, stickers, recipe cards, brochures, banners, posters, and signs to growers and markets across the state, enabling them to promote Pennsylvania vegetables with professional looking point-of-purchase materials. In addition, the Program has touted Pennsylvania vegetables to millions of consumers on the radio airwaves, on billboards and in newspapers across the state. The Program has worked with different logos and themes over the years before developing its own PA Produce logo. The annual "August is Pennsylvania Produce Month" promotion supported by the Program's consumer website at www.PAVeggies.org and a robust social media campaign have been the focus of the Program's promotion efforts in recent years. Currently the Program is moving away from the "August is PA Produce Month" to a "Summer Means Local and Local Means Delicious" campaign running from July through September.

The Program is controlled by a Board consisting of the Secretary of Agriculture (or his designee), 12 growers appointed by the Secretary with four growers being appointed from each of the western, central and eastern regions of the Commonwealth, and a representative sales agents. Board members serve without compensation other than travel expenses to attend meetings. PVGA looks forward to continuing to work with the Program's Board to promote PA Veggies and to funding additional research.

FSA Co-Hosts Spring Skill Share Event

USDA Pennsylvania Farm Service Agency co-hosted a two-day growers' event with Sankofa Community Farm on April 18-19, 2023, at Bartram's Garden in Philadelphia. As the oldest surviving botanical garden in North America, Bartram's Garden offers peace, rest, and connection to the public and spans nearly 50 acres in Southwest Philadelphia. More than 200 people and 35 organizations took part in this community led event, which involved several workshops on topics such as beginner level crop planning, spring tonics, mushroom growing and seed keeping.

USDA representatives from Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), Rural Development (RD), and National Agriculture Statistics Service (NASS) were at the event to provide education about

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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.

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Senate Unanimously Confirms Russell Redding as Secretary of Agriculture

The Pennsylvania Senate unanimously confirmed Russell Redding to serve as Pennsylvania's 27th Secretary of Agriculture. A Pennsylvania native and career public servant in the agriculture sector, Secretary Redding led the Pennsylvania Department of Agriculture as Secretary from 2009 – 2011 under Governor Ed Rendell and from 2015 – 2022 under Governor Tom Wolf, as part of his nearly 25 years of service to the Commonwealth.

Under Secretary Redding's leadership in the Shapiro Administration, the Department of Agriculture has led a coordinated response to the Hi-Path Avian Influenza outbreak, invested more than $15 million in partnership with local governments to protect farms from residential and commercial development, secured an $8.8 million boost in federal food assistance funding to administer nutrition programs for low-income seniors, and launched a $1.6 million grant program to expand access to emergency food supplies for Pennsylvania families.

At Secretary Redding's direction, the Department of Agriculture has supported Pennsylvania farmers impacted by the Norfolk Southern train derailment by conducting plant tissue testing in partnership with PennState Extension, and monitoring soil, water, and air testing results in coordination with the Pennsylvania Department of Environmental Protection and the federal Environmental Protection Agency.

Pennsylvania's agriculture industry is a major economic driver for the Commonwealth, contributing $132 billion a year to our state economy and supporting 1 in 10 jobs in Pennsylvania. Governor Shapiro and Secretary Redding are committed to empowering farmers and the entire agricultural industry, ensuring they have access to the resources and support they need to be successful.

Redding has extensive experience as a public servant, having spent more than 30 years serving Pennsylvania in Harrisburg and Washington D.C. He worked on Capitol Hill as Ag Policy Advisor to U.S. Senator Harris Wofford and served for nearly 25 years in the Pennsylvania Department of Agriculture, serving as secretary from 2009-2011 under Governor Ed Rendell, and from 2015-2022 under Governor Tom Wolf. He currently serves on the Agriculture subcommittee of the USDA's Equity Commission. He served as dean of the School of Agriculture and Environmental Sciences at Delaware Valley University from 2011 to 2014.

He earned his B.S. in Agriculture Education and M.S. in Agriculture and Extension Education from Penn State University. In addition, he is a graduate of the Agribusiness Executive program. A native of Pennsylvania, Redding has an innate understanding of food and agriculture, stemming from his youth on his family's dairy farm and his time as a dairy farm operator. He and his wife Nina have two adult sons and own and operate a farm in Gettysburg.

Supreme Court Reaffirms Limits of the Clean Water Rule

On May 25, 2023, in Sackett v. EPA, the United States Supreme Court ruled that the EPA and the Army Corps of Engineers wrongfully claimed oversight on wetlands owned by Chantell and Michael Sackett.

The Court ruled unanimously, 9-0, that the Clean Water Act did not apply to the wetlands on the Sacketts' property, striking down the "significant nexus" test in determining what is considered a Waters of the United States (WOTUS).

Additionally, by a 5-4 vote, the Court adopted a more stringent test for what qualifies as an "adjacent wetland" subject to the Clean Water Act jurisdiction. Writing for the majority, Justice Alito concluded that the Clean Water Act applies to wetlands that are "as a practical matter indistinguishable from waters of the United States" because they have a "continuous surface connection" with a larger body of water.

The decision will have positive, far-reaching consequences for those in the agricultural industry.

Pennsylvania Farm Bureau President Chris Hoffman commented on the U.S. Supreme Court ruling in Sackett v. EPA:

"It's a good day for Pennsylvania agriculture. We thank the Supreme Court for giving farmers clarity about how they manage their land," Hoffman said. "We need a common-sense rule that works for agriculture and helps farmers do their job and protects water quality. We're grateful that the Court acted to rein in the huge overreach of the authority of the EPA and Army Corps of Engineers. The decision in Sackett v. EPA is as a win for our farmers, who protect their soil, air and water every day, as their legacy to the next generation."

American Farm Bureau Federation President Zippy Duvall shared the sentiment.

"AFBF appreciates the Supreme Court justices for their careful consideration of the implications of Sackett v. EPA. The EPA clearly overstepped its authority under the Clean Water Act by restricting private property owners from developing their land despite being far from the nearest navigable water.

"The justices respect private property rights. It's now time for the Biden administration to do the same and rewrite the Waters of the United States rule. Farmers and ranchers share the goal of protecting the resources they're entrusted with, but they deserve a rule that provides clarity and doesn't require a team of attorneys to properly care for their land."

U.S. Congressman and Chairman of the House Committee on Agriculture Glenn "GT" Thompson added the following thoughts on the current WOTUS rule.

"Today's unanimous ruling in Sackett v EPA is a victory for America's farmers, ranchers, and landowners. The decision reaffirms the rights of property owners and provides long-needed clarity to rural America. In light of this decision, the Biden Administration should withdraw its flawed final WOTUS rule. It is time to finally put an end to the regulatory whiplash and create a workable rule that promotes clean water while protecting the rights of rural Americans."

From the Farm Bureau Express, Penna. Farm Bureau, May 26, 2023.

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EPA's Response to Court Decision

"As a public health agency, EPA is committed to ensuring that all people, regardless of race, the money in their pocket, or community they live in, have access to clean, safe water. We will never waver from that responsibility.

I am disappointed by today's Supreme Court decision that erodes longstanding clean water protections. The Biden-Harris Administration has worked to establish a durable definition of 'waters of the United States' that safeguards our nation's waters, strengthens economic opportunity, and protects people's health while providing the clarity and certainty that farmers, ranchers, and landowners deserve. These goals will continue to guide the agency forward as we carefully review the Supreme Court decision and consider next steps.

In 1972, an overwhelming bipartisan majority in Congress passed the Clean Water Act, giving EPA and Army Corp implementation responsibilities. In doing so, our leaders recognized that protecting our nation's waters is vital to ensuring a thriving economy and agricultural sector, to sustaining diverse ecosystems, and to protecting the water our children drink.

Over the past 50 years, we have made transformational progress — rivers that were once on fire have been restored and now sustain vibrant communities in every corner of the country. A common sense and science-based definition of 'waters of the United States' is essential to building on that progress and fulfilling our responsibility to preserve our nation's waters — now and for future generations."

FSA Co-Hosts Spring Skill Share Event *continued from page 2*

agency resources for growers and attendees.

"Creating relationships between USDA Agencies and the growers and community members in Philadelphia and urban areas is important," said Heidi Secord, State Executive Director for FSA in Pennsylvania. "Accessing the resources to grow healthy, culturally preferred food is very empowering. Communities are more resilient when local growing systems provide nutritional food. Supporting these efforts is essential to growth in food sovereignty."

The event also included a powerful panel on Black food sovereignty, in which panelists dove into the intersections of farming, race, culture, faith and community sovereignty. The event closed with the first Rooted Revival in Philadelphia history where attendees cultivated relationships and celebrated the spiritual and cultural connection to the land and food.

"Agriculture in the city is not just about growing food to provide better access to communities that historically and intentionally have been separated from their right to local, nutritious, chemical-free, culturally relevant, affordable produce. It is about the spiritual and cultural connection of people to the land, their food, and their communities,", said Tyler Holmberg, co-director of the Sankofa Community Farm at Bartram's Garden. "Thanks to this event, attendees left filled with inspired energy, new skills, strengthened relationships, and feeling supported by the network of resources from all the organizations present."

To learn more about programs and services for urban agriculture, visit farmers.gov/your-business/urban-growers or contact your local USDA Service Center .

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Farm Bureau Responds to EPA Chesapeake Bay Lawsuit Settlement

On April 20, 2023, it was announced that the U. S. Environmental Protection Agency (EPA) and a group primarily consisting of environmental organizations and downstream Chesapeake Bay jurisdictions had agreed to a draft settlement agreement that would end two separate lawsuits filed against EPA during the Trump administration. One of the suits was from the Chesapeake Bay Foundation and several other groups, including Anne Arundel County, Maryland; the other was filed by the attorneys general of Maryland, Virginia, Delaware, and the District of Columbia. The settlement agreement has been published in the Federal Register for a 30-day public comment period.

The suits accused EPA of failing to enforce provisions of the Clean Water Act by not requiring Pennsylvania to develop a plan to fully meet pollution reduction goals for the Bay set several years earlier in a multi-state compact with the federal government (despite multiple attempts at submitting a satisfactory plan by the Pennsylvania DEP over the past several years). The suits also accused EPA of not using its mechanisms for penalizing states like Pennsylvania that did not meet their pollution reduction goals or for requiring the states to earmark sufficient funding for Bay clean-up (of course, EPA and the Bay states have already all but conceded that the 2025 targets announced back in 2010 for the Bay are not going to be met in any case, and EPA has no direct authority over Pennsylvania budget decisions, regardless).

The settlement requires EPA to focus more attention on agriculture, particularly concentrated animal feeding operations (CAFOs) and smaller animal feeding operations, as well as stormwater runoff (MS4s). For farms not currently required to have federal permits that have proximity to rivers and streams, EPA is to see if there is "significant damage to water quality from manure generation, manure management practices and/or available storage capacity, and compliance history. If EPA determines that a farm is a significant contributor of pollution, the regulators will confer with Pennsylvania officials about designating the farm as a pollution source subject to environmental permitting."

Farm Bureau's public response to date has been that the proposed settlement is under review, and we will comment during the allotted 30-day period, with the further statement that:

"Pennsylvania farmers are the Commonwealth's 'front-line environmentalists' focused on caring for the land, air, and water in their local communities. We are looking forward to augmenting our existing efforts with funding from the new PA Agricultural Conservation Assistance Program, for which Farm Bureau was instrumental in advocating in last year's state budget. We also support the efforts of the joint EPA-USDA task force dedicated to giving farmers credit for previously uncounted agricultural conservation practices, as well as work by Penn State University and others to ensure that farmers get credit for non-cost-shared conservation practices. We are proud to continue our work with many federal, state, and local partners—inside and outside government—to advocate for and utilize tools like ACAP that help farmers protect and improve Pennsylvania's local water quality, which is the key to restoring the Bay."

Farm Bureau will continue to work with state and federal agencies and officials to address this issue.

Rx for SMV Highway Safety: Be Conspicuous

Safely traveling roadways with agricultural equipment requires an extra degree of caution from the equipment operator and from general vehicle drivers sharing the road.

Overview

Most agricultural producers need to move production equipment on public roads for tillage, planting, harvesting, and marketing crops. Livestock may also be moved on public roads by farm equipment. Safely traveling on roadways with agricultural equipment requires an extra degree of caution from the equipment operator and from general vehicle drivers sharing the road. Tractors and agricultural implements typically travel on roadways at speeds of less than 25 mph (40 km/hour). Motor vehicles travel at much faster speeds and drivers often do not understand the braking time needed to avoid a rear-end collision. Incidents involving motor vehicles and farm equipment can be deadly and costly. Greater visibility plays an important role in roadway safety by providing increased sight distance for decision making and stopping. Standards for lighting and marking, which include the SMV, have been developed by the American Society of Agricultural and Biological Engineers (ASABE) for tractors and towed equipment. Domestic manufacturers produce lighting reflectors for tractors and machinery based on these standards.

Slow Moving Vehicle Emblem

The SMV emblem is a highly reflective sign required on the back of all tractors, towed implements, and self-propelled implements used on public roads. The SMV is an equilateral triangle with a minimum height of 14 inches and constructed of reflective materials. The inner part of the triangle is a fluorescent orange material that provides visibility during daytime hours. The orange triangle is outlined by a red retroreflective material that enhances nighttime visibility. The emblem should be seen from a distance of at least 1,000 feet day or night. Emblems that have a metal or

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Rx for SMV Highway Safety: Be Conspicuous *continued from page 5*

plastic backing, as well as decal emblems, are suitable for use. The ASABE standard specifies the quality and durability of the yellow-orange fluorescent triangle that provides daylight identification of slow-moving vehicles. The role of the SMV is to increase the visibility of your farm equipment on public highways through the use of conspicuity material.

Conspicuity material does what it says: it makes the equipment stand out, or be more conspicuous. The reason you want your equipment to stand out when on roads is to give motorists time to notice you and to slow down. Fluorescent material aids daytime visibility and reflective material aids nighttime visibility, but the materials don't last forever. The orange fluorescent center portion of the SMV emblem will fade and turn color over time, changing from orange to yellow, pink or white. This portion is the most vulnerable to light and moisture degradation because fluorescent dyes decompose. Maintaining fresh emblems with maximum fluorescence makes a big difference, especially in early morning or late evening hours. Retroreflective material as found in the outer border of the SMV emblem is intended to reflect the headlights of vehicles approaching from the rear at night. Retroreflective material holds up longer than fluorescent material. The retroreflective border material used in the manufacturing of new SMV emblems is different than older SMVs and can now be detected as far as a mile away compared to only a few hundred feet for the older SMVs.

SMV and Pennsylvania Vehicle Code

The use of the SMV emblem is mandated in Pennsylvania by state law and outlined in the following Pennsylvania Vehicle Code:

#4529. Slow-Moving Vehicle Emblem

General rule--All implements of husbandry, commercial implements of husbandry and special mobile equipment designed to operate at 25 miles per hour or less and all animal-drawn vehicles shall, when traveling on a highway, display on the rear of the vehicle a reflective slow moving vehicle emblem as specified in regulations of the Department. The use of the slow moving vehicle emblem shall be in addition to any other lighting devices or equipment required by this title.

Limitations on use or display--No person shall use or display the slow moving vehicle emblem except as provided in this section nor shall any person display the emblem on a vehicle traveling at a speed in excess of 25 miles per hour.

Towed vehicles--The emblem shall be required to be displayed on a slow moving vehicle which is being towed on a highway unless the towing vehicle displays the emblem in such a manner as to be clearly visible from the rear.

The term "highway" as used in the Code, is officially defined as "the entire width between the boundary lines of every way publicly maintained when any part thereof is open to public use for purposes of vehicular traffic."

Placement and Maintenance of an SMV

The correct placement of the SMV is vital for it to be effective. Use the following guideline when attaching an SMV emblem:

- With the triangle pointing upward, place the SMV emblem at the rear center or left rear of center of the vehicle or implement.
- Center the SMV emblem horizontally on the vehicle.
- The bottom edge of the triangle should be between 2 - 10 feet above the ground.

The purpose of an SMV emblem is to increase visibility of agricultural equipment (implements of husbandry). It is important that the SMV emblem is not used for any other purpose which can decrease its effectiveness as a means of identifying slow moving agricultural equipment. For example, the SMV emblem should not be used to mark a driveway or mailbox.

Agricultural producers are responsible for maintaining SMV emblems and replacing them when necessary. SMV emblems can become covered with dirt or fade over time due to continual sun exposure. To maintain the necessary reflective properties of the SMV, regularly clean the emblem and replace it when it begins to fade.

Speed Indicator Symbol

Tractors and agricultural equipment are classified as slow moving vehicles. However, some newer tractors are capable of traveling over 25 mph. States continue to discuss the use of the SMV symbol on these high speed tractors. In response, ASABE revised the S276 "Slow Moving Vehicle Identification Emblem (SMV) Emblem)" and S279.16 "Lighting and Marking of Agricultural Equipment on Highways" to standardize the use of a speed indicator symbol (SIS) on the rear of higher speed tractors that indicates their maximum speed.

Reflective Tape and Lighting

New federal surface transportation regulations were signed into law in 2012. This legislation included the Agriculture Machinery Illumination Safety Act (AMISA). This new legislation is to be implemented by the U.S. Department of Transportation within two years of its signing. The AMISA is based upon ASABE Standard 297.14 (or successor standards) and is not retroactive to any existing equipment. The latest version of ASABE's Lighting and Marking of Agricultural Equipment on Highways standard is ASABE 279.16. Table One summarizes its recommendations. (Table on next page.)

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Rx for SMV Highway Safety: Be Conspicuous *continued from page 6*

Table 1 - Surface Transportation Legislation for Lighting & Marking of Ag Equipment

Item	ASAE Recommendation - Number	ASAE Recommendation - Color	ASAE Recommendation - Mounting	PA Requirements
Headlights	2	White	On either side of vehicle centerline at same height	Same as ASAE recommendation[1]
Taillights	2	Red	Symmetrically mounted to rear between 1.3' & 10' high and no greater than 5' to left & right of machine center	One mounted at each side on rear[1]
Hazard Flashers	Min of 2	Amber	1.3' to 12' high & symmetrically spaced as widely apart as practicable to be visible from front & rear (60 to 85 flashes/min)	Two if double-faced with amber to front & red to rear. Four if single faced - amber on front corners & red on rear[1]
Turn Indicators	2	Amber or Red	1.3' to 12' high & symmetrically spaced as widely apart as practicable to be visible from front and rear	Not required
SMV Emblem	1	Fluorescent red-orange triangle for daylight with red retroreflective border for nighttime	On rear center or rear left for maximum visibility of 1,000 feet day or night, 2' to 10' above ground	All implements of husbandry designed to operate at 25 mph or less shall display the SMV on rear of vehicle at all times on highways.
Reflectors	2 2	Red on rear of machine. Yellow on front of machine	May be either part of tail lamp lens or conspicuity material. Size to be 2" wide by 4.5" long for machines < 6.7' wide. Size to increase to 2" by 9" for wider machines which is >6.7' wide.	One red reflex reflector or reflective tape at rear on each side & one amber reflex reflector or reflective tape at front on each side with size of reflector to be 3 square inches or more[1]
Rotating Beacons	Not Required			One flashing or revolving yellow light or strobe light.
Conspicuity material to better define size and to increase visibility (machinery or towed equipment)		Red retroreflective & red-orange fluorescent Yellow retroreflective	Visible to rear: Red-orange nonreflective fluorescent material on rear corners within 25" of left and right outer corners of the machine. Distance between materials should not exceed 6'. Visible to front:Yellow retroreflective material.2 Reflective material to be within 16" of outside corners.	SMV only

[1] between sunset and sunrise and during reduced visibility
[2] for trailing equipment > 16.4' behind hitch point, display amber/yellow reflectors spaced < 16.4' apart on sides.
Note: Additional lighting and implement accessories typically require a 7-terminal receptacle.

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Dr. Murphy is the Nationwide Insurance Professor Emeritus at Penn State. *From Penn State Extension, https://extension.psu.edu/rx-for-smv-highway-safety-be-conspicuous, April 3, 2023.*

VEGETABLE PRODUCTION

Cover Crops as a Solution to High Soluble Salt Levels in High Tunnels

Elsa Sánchez and Thomas Ford

Research Funded by PA Growers
PVGA
PA PRODUCE
PA Veg. Growers Assn.
PA Veg. Mktg. & Research Prog.

Farmers across Pennsylvania need solutions for high soluble salts levels in their high tunnel soils. In 2017, with funding from the PVRMB, we worked with 27 farmers across Pennsylvania. We found soluble salts levels averaged 1.48 mmhos/cm, which is well above levels where yields of salt-sensitive vegetables are reduced. Salts accumulate from the use of fertilizers and organic nutrient sources. Interpretation of soluble salt levels is dependent on which testing method is used. Penn State University's Agricultural Analytical Services Laboratory uses the 1:2 (soil:water) method (Gartley, 2011). Soils with soluble salts levels of 1.48 are considered strongly saline, and only salt-tolerant crops, like beets, will grow well (AASL.psu.edu). Most of the 27 farmers told us they were unsatisfied with yields, mostly of tomatoes, from their tunnels, and in some cases, tunnels were taken out of production. While some of them knew about this issue, most did not.

Cover crops with tolerance to high soluble salts levels and that have large above-ground canopies, extensive root systems, and high transpiration rates have the potential to be used to extract salts from the soil. We have suggested this general option to farmers with high soluble salts levels but do not know which specific cover crop types are best for drawing down salt levels.

First Experiment

Study objective: We evaluated cover crops, cut flowers, and tomato cultivars for their ability to extract soluble salts as a solution for high tunnel soils.

How the study was conducted: The experiment was set up in a greenhouse at the Russel E. Larson Agricultural Research Center. Cover crops, cut flowers, and tomato cultivars (Tables 1 and 2) seeds were planted on May 26, 2021, and April 23, 2022, into 3-gallon grow bags filled with soilless potting medium. Seeds were watered with normal strength Hoagland's solution for one week. Plants were watered every other day with 250 mL of 1) normal-strength Hoagland's solution (normal-strength salt solution) or 2) Hoagland's solution + 150 mM NaCl (high-salt solution) beginning on week two. Treatments were arranged in a completely randomized design with three replications. Plant height was recorded weekly for 4 weeks once seedlings had germinated. Height data were converted to percent change in growth between each salt solution treatment in each block and analyzed using the mixed procedure in SAS. Means were separated using pdiff.

Results:

2021

On June 15, all plants receiving the normal-strength salt solu-

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VEGETABLE PRODUCTION

Cover Crops as a Solution to High Soluble Salt Levels in High Tunnels *continued from page 9*

tion were taller than those receiving the high-salt solution. Winter rye and 'Red Russian' kale were significantly taller with high salt solution treatment than 'Oregon Spring' tomato, birdsfoot trefoil, 'New Girl' tomato, 'Wisconsin' tomato, and sugar beets (Table 1). Winter rye was significantly taller when watered with the high salt solution compared to 'Cauralina' tomato. Sorghum, 'Bolder' beet, and 'Royal' sunflower grew taller with the high salt solution compared to 'Oregon Spring' tomato and birdsfoot trefoil. All other plants were not different from each other.

By June 22, most crops did not significantly differ from each other in the percent change in height. However, birdsfoot trefoil, sorghum, buckwheat, and winter rye grew taller with the high salt solution than the normal-strength salt solution. Winter rye grew taller than all other crops receiving the high-salt solution, and sorghum and buckwheat grew taller than most other crops.

On the last date height was recorded, June 29, most crops receiving the normal-strength salt solution were taller than those receiving the high-salt solution. Rye remained the top performer compared to all other crops except sorghum. Sorghum outperformed most other crops.

2022

On May 14, sunflowers growing with the high salt nutrient solution were taller than those receiving the normal-strength nutrient solution and 'Roadster' tomatoes and malibar spinach were taller when receiving the normal-strength nutrient solution. The percent change in high between these crops was significant. All other crops were not significantly different from each other, or the sunflowers, 'Roadster' tomatoes, or malibar spinach for the percent change in height.

On May 22, sorghum, 'Red' beets, sunflowers, and winter rye growing with the high-salt nutrient solution were taller than those receiving the normal-strength nutrient solution, while 'Roadster' tomatoes and malibar spinach were taller when receiving the normal-strength nutrient solution. The percent change between these crops was also significant.

By May 29th, winter rye and sugar beets growing with the high-salt nutrient solution were taller than those receiving the normal-strength solution, while 'Roadster' tomatoes, malibar spinaches, 'Red Snapper' tomatoes, 'Thunderbird' tomatoes, 'Red Duce' tomatoes, and ornamental kale were taller when receiving the normal-strength solution. Additionally, the percent change in height between these crops was significant.

What the results mean: Some crops grew taller than others with the high-salt nutrient solution compared to the normal-strength salt solution and have the potential to be used to accumulate excess soluble salts in high tunnel soils. Winter rye, sugar beets, berseem clover, and sorghum may be options for cover crops when high soluble salts levels are observed in high tunnels. The key to using cover crops to remove excess soluble salts is to remove them from the high tunnel when they are terminated. Incorporating them back into the soil will add the excess salts back into the soil. Tomatoes did not respond well to the high-salt nutrient solution (Photo 1). By the first or second date height was recorded, plants were stunted compared to plants receiving a normal-strength nutrient solution. At the last date data were recorded, tomatoes receiving the high-salt solution were about 30 to 70% shorter than plants receiving normal-strength nutrient solution. The difficulty in visually identifying the issue with high soluble salts levels in high tunnel soils is that the salts are uniformly found throughout tunnels. This means that all the plants in the tunnel will be stunted because of high soluble salts levels, which masks the problem. If even one plant were not affected, it would be taller, and the stunting of plants throughout the tunnel would be evident. The solution to this issue is to determine the soluble salts levels in high tunnel soil with regular testing. This study provides evidence that certain cover crops can be used to remove excess soluble salts in soils from high tunnels.

How to read Tables 1 and 2: Each value is the mean of how each crop grew with the high-salt solution compared to the normal-strength salt solution. Values near zero indicate that plants grown with the normal-strength and high-salt solution were close

Table 1. Percent change in high between plants receiving a normal-strength salt solution and plants receiving a high-salt solution at three dates in 2021. Crops in the bold text were used in the second experiment described below.

Crop	Mean change in plant height (%)		
	June 15, 2021	June 22, 2021	June 29, 2021
'Oregon Spring' tomato	0.63 a	0.62 a	0.59 a
Birdsfoot trefoil	0.60 a	-111E-18 a-b	0 ab
'New Girl' tomato	0.51 ab	0.51 a	0.32 a
'Cauralina' tomato	0.50 abc	0.53 ab	0.60 a
'Wisconsin' tomato	0.47 ab	0.50 a	0.68 a
Sugar beets	0.46 ab	<1 a-b	-222E-18 ab
Ornamental kale	0.40 a-d	0.58 a	0.55 a
'Balady 1' Berseem clover	0.26 a-d	0.36 a-c	0.08 ab
'CDC Copeland' barley	0.26 a-d	0.10 a-b	.28 a
'Boro' beet	0.25 a-d	0.38 a	.46 a
Buckwheat	0.22 a-d	-2.02 c	-
'Purple Majesty' millet	0.22 a-d	0.35 a	.22 a
WGF sorghum	0.19 b-d	-1.67 bc	-2.3 bc
'Bolder' beet	0.17 b-d	0.25 ab	.43 a
'Royal' sunflower	0.12 b-d	0.73 a	.78 a
'Red Russian' kale	0.04 cd	0.48 a	.54 a
Winter rye	0.03 d	-4.83 d	-4.7 c

Table 2. Percent change in high between plants receiving a normal-strength salt solution and plants receiving a high-salt solution at three dates in 2022.

Crop	Mean change in plant height (%)		
	June 15, 2021	June 22, 2021	June 29, 2021
'Roadster' tomato	0.42 a	0.56 a	0.61 a
Malibar spinach	0.35 a	0.51 ab	0.52 ab
'Red Snapper' tomato	0.29 ab	0.41 abc	0.45 abc
Birdsfoot trefoil	0.26 ab	0.14 abc	0.29 abcde
'Thunderbird' tomato	0.25 ab	0.38 abc	0.38 abcd
'Red Duce' tomato	0.25 ab	0.36 abc	0.37 abcd
'Purple Majesty' millet	0.23 ab	0.08 abc	0.04 abcdef
'Patsy' tomato	0.16 ab	0.31 abc	0.33 abcde
'CDC Copeland' barley	0.11 ab	0.27 abc	-0.03 cdef
'Bolder' beet	0.07 ab	0.22 abc	-0.01 bcdef
WGF sorghum	0.05 ab	-0.01 c	-0.09 def
'Balady 1' berseem clover	0.04 ab	0.03 bc	-0.14 def
'Red Russian' kale	0.02 ab	0.14 abc	-0.01 bcdef
Sugar beets	0.02 ab	0.09 abc	-0.19 ef
Buckwheat	-0.01 ab	0.12 abc	0.27 abcde
Ornamental kale	-0.03 ab	0.34 abc	0.34 abcd
Winter rye	-0.09 ab	-0.54 d	-0.37 f
'Red' beet	-0.09 ab	-0.10 cd	-0.05 cdef
'Royal' sunflower	-0.26 b	-0.13 cd	0.26 abcde

continued on page 11

Cover Crops as a Solution to High Soluble Salt Levels in High Tunnels *continued from page 10*

in height. Positive values mean the plants grew taller with the normal-strength salt solution compared to the high-salt solution. Negative values mean the plants growing with the high-salt solution grew taller than those watered with the normal-strength salt solution. For example, using Table 1, on June 15, 'Oregon Spring' tomatoes growing with the high-salt solution were 63% shorter than plants growing with the normal-strength salt solution.

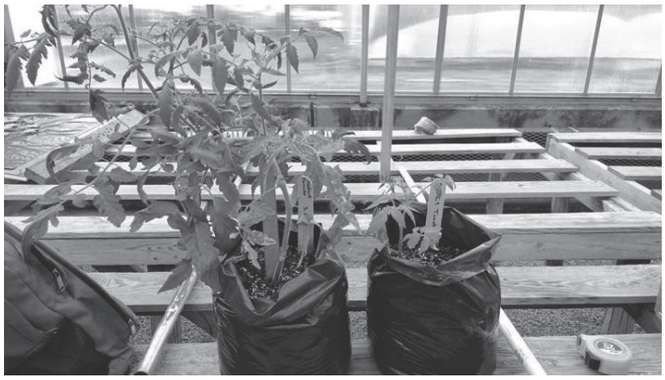


***Photo 1**. The tomato plant on the left received the normal-strength salt solution. The one on the right received the high salt solution.*

Second Experiment

Study objective: We further evaluated a subset of crops from the first experiment for their ability to extract soluble salts from soils.

How the study was conducted: The first run of this experiment was set up in a greenhouse at the Russel E. Larson Agricultural Research Center in Rock Springs, PA, and the second in a greenhouse at Pennsylvania State University in University Park, PA. Crops (Tables 1 above) were seeded on August 2, 2022, and October 16, 2022, into 3-gallon grow bags filled with soilless potting medium. Seeds were watered with tap water for one week. Beginning on week two, they were watered every other day with 250 mL of 1) normal-strength Hoagland's solution (normal-strength salt solution), 2) Hoagland's solution + 75 mM NaCl (medium-salt solution), or 3) Hoagland's solution + 150 mM NaCl (high-salt solution). Treatments were arranged in a completely randomized design with three replications. On September 11, 2022, and November 28, 2022, above-ground tissues were sent to Pennsylvania State University's Agricultural Analytical Services Laboratory for analysis. A statistics student analyzed data for a capstone project.

Results and Discussion:

Two-way ANOVA with replications revealed no interaction between the crops and nutrient treatments (Table 3 below).

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
crop	5	585851871.1	117170374.2	2.51	0.0291 *
soln	2	359882265.1	179941132.6	3.85	0.0217 *
crop*soln	10	194774238.9	19477423.9	0.42	0.9388

Table 3: Analysis of variance of the full model

The normality assumption was violated even after data were log-transformed; therefore, non-parametric analysis with the Kruskal-Wallis Test was used (Tables 4 and 5 below). No significant differences between crops or nutrients were observed.

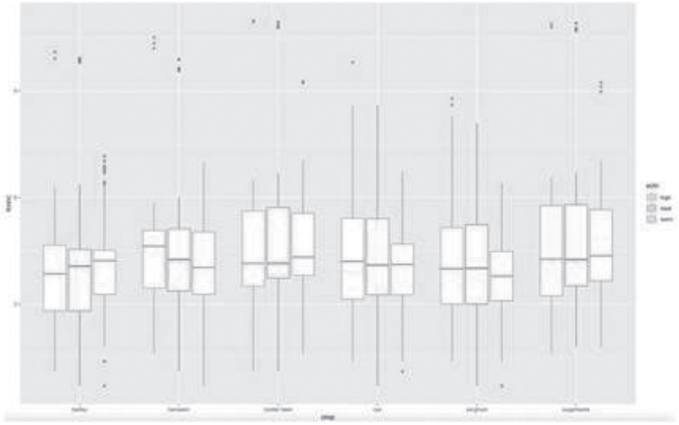
Kruskal-Wallis Test		
Chi-Square	DF	Pr > ChiSq
7.2740	5	0.2011

Table 4: The Kruskal-Wallis Test for types of cover crop

Kruskal-Wallis Test		
Chi-Square	DF	Pr > ChiSq
0.1083	2	0.9473

Table 5: The Kruskal-Wallis Test for types of solution

Figure 1 (below) shows box plots of the concentration of nutrients in each crop evaluated. Notice the nutrient concentrations of berseem clover, winter rye, and sorghum are slightly higher for plants receiving the medium- and high-salt treatments compared to the normal-strength nutrient treatment. These crops have the potential to bioaccumulate excess nutrients and will be further evaluated in 2023 with funding from the USDA.



Figurel Box plot of concentration by cover crops and solutions after transformation

Acknowledgments: Chris Sánchez and Austin Kirt of the PSU Hort Farm Crew, Alan Bauman and Emily Betler, undergraduate students, and Ji Seon Kwan, a graduate student in statistics, helped make this project successful.

Dr. Sánchez is with the Penn State Dept. of Plant Science and Mr. Ford is with Penn State Extension in Cambria Co. *This research was supported by PVGA and the Pennsylvania Vegetable Marketing and Research Program.*

VEGETABLE PRODUCTION

Poor Stands and Plant Vigor in Fresh Market Sweet Corn

Gordon Johnson

Growers are reporting issues with stands and vigor in sweet corn fields in 2023, especially in early planted fields. There can be many causes for stand loss and weak seedlings: surface compaction and crusting, birds, soil insects, slugs, cold soils that delay emergence, soil diseases affecting seeds or seedlings, wet soils, fertilizer injury, deep planting, and herbicide injury are just a few examples.

Seedcorn maggot damage to sweet corn in 2023 has been significant. David Owens, UD Extension Entomologist recorded a YouTube video discussing seedcorn maggot which can be accessed here: https://www.youtube.com/watch?v=nDhj8QTz8hw.

When checking sweet corn fields with vigor and stand problems, it is important to dig up seeds and affected plants and examine the seed remnants, roots, and mesocotyl (stem that pushes the seed leaf to emerge above the ground). Corn seedling survival and early vigor is directly tied to a healthy seed kernel and mesocotyl from planting through the six-leaf stage. Any damage to the seed or mesocotyl during this period can lead to stunted or weak seedlings, and in severe cases, seedling death. This is because the corn seedling depends on the seed for food to grow for several weeks after emergence until sufficient leaf area has been produced and nodal roots have become established. The seed kernel provides the means for early roots to grow and these food reserves are also mobilized and transported through the mesocotyl to grow the first stalk and leaf tissue. The mesocotyl also serves to transport water and mineral nutrients from the seedling roots.

Sweet corn is more susceptible to stand loss and poor vigor problems than field corn because the seed has less food reserves. Shrunken types (supersweet, sugary enhanced, augmented shrunken, synergistic varieties) have even less stored food than “normal” types and therefore are more susceptible to stand problems.

I have looked at sweet corn fields with stand loss and vigor problems (uneven growth) over the years. Often, when digging up the seedlings and examining the seed remnants and mesocotyls, the kernels will be disintegrated and there will be darkening at the mesocotyl attachment. This means that the seeds deteriorated prematurely and the full content of the food reserves in the seed were not available for seedling development, leading to the stand and vigor issues. Premature seed deterioration and/or poor vigor seedlings can be due to diseases that cause seed rots, seedling blights and/or root rots. Soil insects can cause seed deterioration by feeding on seed contents or creating entrance wounds for disease organisms. In addition, certain soil insects and slugs can feed on the mesocotyl causing seedlings to collapse. Sweet corn that takes more than 10 days to emerge is at great risk of injury due to insects and diseases as seed treatments dissipate.

Cold stress and cold soils are common stress factors leading to poor stands. Often growers are pushing the limits and are planting sweet corn very early. While field corn will start to germinate at 50°F, many types of sweet corn need much warmer soils. This is especially true of supersweet varieties and other shrunken types, which perform best at higher soil temperatures (above 60°F). When soil temperatures are below 55°F, germination is greatly extended. Food nutrients are mobilized in the seed but are not being utilized rapidly by the plant. The seed then becomes a perfect food source for many soil microorganisms. On a positive note, many of the newer sweet corn varieties have much more cold tolerance and emerge more rapidly in cold soils.

Stand issues are often related to the inherent poor vigor of sweet corn. Work with seed suppliers to obtain their best lots with the largest seed sizes. Obtain varieties that perform better under cold stress. When possible, obtain reports from sweet corn trials to assess which varieties are the most cold tolerant. Request seed treatment information and select treatments with the best protection potential. There are in-furrow fungicide options; however, research is limited with sweet corn in our region.

Growers often face the decision on whether to keep plantings with poor stands. This is most often a marketing decision based on the need for and value of early sweet corn for that farm. An estimate of potential marketable ears will be based on stand counts of full vigor plants from 20-40 sites throughout the field. This stand count information then can be used to estimate the value of the field as is versus the value of a later planted full stand crop.

Dr. Johnson is Extension Vegetable & Fruit Specialist at the Univ. of Delaware. From the ***Weekly Crop Update****, Univ. of Delaware, Vol. 31, Issue 6, May 5, 2023..*

VEGETABLE PRODUCTION

When is Black Plastic Mulch Too Hot for Vegetables?

Gordon Johnson and Emmalea Ernest

High temperatures (90°F or higher) coupled with clear skies can lead to heat buildup on the surface of black plastic mulched soils. We have found temperatures of over 140°F at the surface of black plastic mulch. This can cause losses with transplants because stems near the mulch are damaged by the high heat. In crops seeded through the black mulch, germination is often reduced, and if plants do emerge, they can be killed by the excess heat. Another problem is high soil temperatures under black mulch which can lead to fruit quality issues in tomatoes and peppers. In onions, black mulch can cause damage to bulbs due to excess heat.

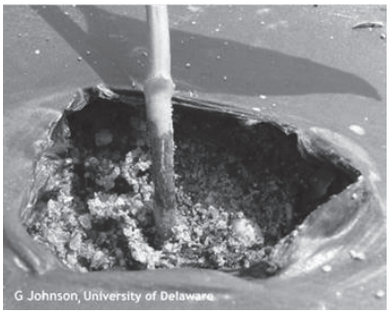


Figure 1. *Pepper transplant with stem girdling from heat necrosis*

Late spring planted peppers are very susceptible to stem heat necrosis on black plastic mulch (Fig. 1). This is where the high temperatures at the mulch surface causes damage to the stem, often causing plants to collapse. When daytime temperatures are in the high 90s, the surface of black plastic mulch can be as high as 140°F, which will kill plant cells.

There are several strategies that can be used to reduce stem heat necrosis. Larger transplants with thicker stem diameters are less susceptible to damage. Make a larger hole when transplanting and make sure the plastic mulch does not touch the stem of the transplant. White particle films (clay or lime based) sprayed at the base of plants over the mulch can also reduce plant losses to heat necrosis. Putting a small mound of clean sand around the plant stem will also eliminate this problem.

Shade cloth is another potential strategy for reducing stem necrosis. In a 2022 trial conducted by the UD Extension Vegetable Program, 30% black shade cloth was very effective in preventing pepper transplant loss. The shade cloth was applied on June 1, the same day as transplanting. In the shaded plots there was 97% stand 49 days after transplanting; however, in unshaded plots only 64% of the transplants survived. The shaded treatment also had larger plants (Fig. 2) which eventually produced significantly higher marketable yields.

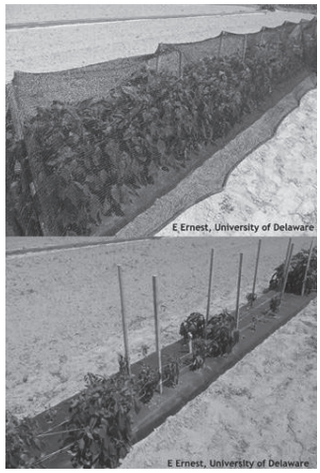


Figure 2. *Pepper plants that were shaded immediately after transplanting (top) had higher stand establishment and greater plant vigor than unshaded plants (bottom).*

Switching to white plastic mulch for later spring plantings can reduce losses significantly (white plastic will be 10-20 °F cooler than black plastic mulch). White mulches can lower bed temperature by up to 20°F. Use

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VEGETABLE PRODUCTION

When is Black Plastic Mulch Too Hot for Vegetables?

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of white mulch increases transplant survival and increases germination and survival of seeded crops. The cooler soil can also increase root function and reduce fruit disorders such as white tissue, blotchy ripening and yellow shoulders in tomatoes and blossom end rot in tomatoes and peppers.

In onions, cutting the black mulch in mid-June as bulbs are increasing size has been shown reduce to reduce bulb damage.

In the past, a rule of thumb has been to switch to white mulch in the middle of June when days are longer and air temperatures are higher for longer periods of time. White mulch should also be used for crops planted in July and the first half of August.

The most common mulch used is white on black. The black side reduces weed germination, and the white top reflects solar radiation thus cooling the surface and the soil beneath.

Is there an advantage to switching earlier? Up to the middle of May, black plastic (or other soil heating colors) should be the preferred mulch to get warm season vegetable plants off to a good start when soil temperatures can be variable and bed heating improves crop performance. The second half of May can see some very hot weather as can the beginning of June, but this varies from season to season. Past research has shown no benefits to using white mulch in this period and often reduced crop performance in warm season crops such as watermelons. If long range forecasts are for warmer than normal temperatures, laying white or reflective plastic earlier in June may be advised for sensitive crops.

White mulches have also shown benefits in spring and summer planted cool season crops such as broccoli, lettuce, onions, and day neutral strawberries planted in April.

*Dr. Johnson is the Vegetable and Fruit Extension Specialist and Dr. Ernest is a Scientist in Vegetables and Fruits at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 8, May 19, 2023.*

Pest Scouting

Lisa McKeag

What is scouting and why is it useful? Scouting is the process of routinely checking crops for pests and disease to inform management decisions. The way to do this is to regularly check a random sample of plants across a field to get a sense of what pests are present and in what quantities, how widespread the problem is, and to identify any patterns in distribution, so that you can decide whether or not it's time to implement a control strategy. It's often a good idea to get into the field and see for yourself what's happening when a pest has been detected on or near your farm, or when monitoring data or environmental conditions indicate that a particular pest may be emerging. Successfully implementing IPM requires that you are aware of the conditions on and around your farm each year and over time. Furthermore, establishing a scouting program can help you keep track of what you see and allow you to detect pest problems early and prevent and manage issues before they cause economic losses. Regular scouting will also help you determine whether your spray program and other control strategies are effective, as you can see pest numbers going up or down over time. The UMass Vegetable Program has developed a series of crop-specific scouting sheets, linked on the next page, to help you keep track of your scouting and make decisions about what you find.

Some things to consider before you go into the field:

Field history. What crop or crop family was planted here last year and what pest issues occurred? Consider insect pests, but also diseases that might persist in soil or on crop residues, and weeds. Also note locations of field edges, as pests may emerge from windrows, woods, or adjacent fields. Note shaded areas or places with poor drainage where diseases may begin to develop.

Pest identification. Know what you're looking for! It's important to be able to identify some of the key insects that may be feeding on your crop and to be able to tell the good bugs from the bad. You should also be able to recognize some of the signs and symptoms of insect feeding, and common diseases and physiological disorders. There are lots of great ID guides out there, including the Northeast Vegetable & Strawberry Pest Identification Guide—a collaborative effort of the New England Extensions (see https://ag.umass.edu/vegetable/publications/guides/northeast-vegetable-strawberry-pest-identification-guide). It can be very tricky to identify problems in the field, though, so if you find something suspect, you can contact us for help or consider having it diagnosed at the Penn State Plant Disease Clinic (https://plantpath.psu.edu/about/facilities/plant-disease-clinic), or testing soil or plant tissues for nutrients at the Penn State Agricultural Analytical Services Laboratory (https://agsci.psu.edu/aasl).

Pest life cycles. Consider when certain pests are active and if they overwinter or persist in the environment, or if they have to travel from warmer locations on storm fronts. Pheromone traps, sticky cards, keeping track of growing degree days (GDDs), and using web-based monitoring tools can all help with knowing when to keep an eye out for particular insects and/or diseases. It's also important to know what the different life stages of insect pests look like, where you might find them, and which stage(s) will harm your crop.

Economic threshold and economic injury level (Fig. 1). The economic threshold is the pest population size or the level of damage that a crop can tolerate without economic impact. When the threshold is reached, some control should be implemented. The economic injury level is that point above which crop yield will be affected by pest damage, and the benefit of controlling the pest outweighs the cost. Often, thresholds have been established through scientific research. You may develop your own thresholds based on your scouting records and trends on your own farm, as well as what your markets may tolerate. Shareholders of a CSA may be more tolerant of some insect feeding than a high-end restaurant, for instance.

Management options. What pesticide options and other control strategies do you have available and how effective are they? Your economic threshold may be lower than those published if you are using organic materials, since economic thresholds are designed with conventional pesticides in mind and many organic materials are less effective than conventional materials. Or you may not have an effective control option for a current pest problem, but scouting and keeping records will help you prevent problems in the future by using crop rotations, row covers, or materials applied at-planting. Have some sense of what you will do

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Pest Scouting *continued from page 14*

with the information you collect.

Now to scouting! The idea here is to assess a random sample of plants that is representative of what is happening in the whole field or crop, or to identify hot spots or problem areas in the field or among different crops or varieties. Don't make spray decisions based on what you see on the first couple of plants in your sampling! You might panic because the first plant is covered in beetles, but then realize that the problem is localized and that the crop as a whole is well below threshold (Figs. 2 and 3).

First, take a look at the field as a whole and note if anything looks abnormal. Then, decide how you will divide the field into units. If you plan to look at 25 plants, decide about how frequently you would have to stop to get a sampling of the entire field.

We have scouting sheets for the following crops (see example of the sweet corn sheet below):

Allium (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/allium_scouting_form_2.pdf)

Brassica (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/brassica_2.pdf)

Cucurbit (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/cucurbit_scouting_form.pdf)

Eggplant (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/eggplant_scouting_form.pdf)

Pepper (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/pepper_scouting_form.pdf)

Potato (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/potato_scouting_form.pdf)

Strawberry (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/strawberry_scouting_form.pdf)

Tomato (https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/tomato_scouting_form.pdf)

Each sheet has a list of common pests, thresholds if available, along with some sampling instructions. Thresholds or control options may vary depending on the stage of the crop, so there is a place to note that as well.

UMass Extension — **Potato Scouting Form**

Farm/Grower:_____ Scout:_____

Field Name:_____ Date:_____

Crop/Cultivar(s):_____ Block:_____

Crop Stage (circle): foliage — open row / filled row / closed canopy — collapse — senesce — bloom — none — bud — bloom — postbloom

Sample unit used (circle one): plant stalk — tuber size:_____ (Record average tuber size at 2-3 hills)

Procedure: Walk the field in a V- shaped pattern & select **10 sites** (randomize using paces).
Select **3 plants** (when plants emerge until 12"-18" tall) thereafter select **3 stalks** at each site.

Potato leafhopper (PLH) *Start scouting in June.*
PLHA: Before scouting CPB, shake plant/stalk to count adults flying up (estimate). **Threshold:** 1/plant
PLHN: Inspect underside of 3 leaves (low, mid, upper) per plant or stalk, record total number. **Threshold:** 1 per 3 leaves

Aphid (APH) *Start scouting in mid June.*
APH = Scout 3 leaves (same as PLHN) count aphids on top, middle and bottom leaf. Record total number.
APH. ID: GPA=green peach aphid, PA=potato aphid, MA=melon aphid **Threshold:** 15/3 lvs; if <2 weeks before vine kill, 30/3 lvs

Colorado potato beetle (CPB) *Start scouting late May to early June*
EM = egg mass **SL** = small larva (< half grown; 1st + 2nd instars) **LL** = large larva (> half grown; 3rd + 4th instars)
A = adult **Threshold** (per plant or stalk): 0.5 Adult, 4 SL, or 1.5 LL

Defoliation/Damage Rating (DMG): combined damage from CPB, hopperburn, disease. Note predominant cause of damage in "Other" column.
Rate percent of foliage damaged on a scale of 0-100%

Other Pests/Beneficials/Diseases/Weeds: Make note of any of these seen on a plant being scouted. Identify if possible.
Disease: note presence of Early Blight, Late Blight, Scab or other. Include in % total plant damage. Note tuber damage separately.
Note if sample taken for ID

Plant or Stalk	CPB counts				PLH and APH number/3 leaves				DMG	Other Pests/Beneficials/ Diseases/Weeds/Cause of Damage
	EM	SL	LL	A	PLHA	PLHN	APH	APH ID	rating	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
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22										
23										
24										
25										
26										
27										
28										
29										
30										
Total										
Avg.										

Notes: Map:

For example, in potato you should scout 3 plants per site when the crop is small or 3 individual stalks once the plants are hilled. Note the unit you are using and what the threshold is.

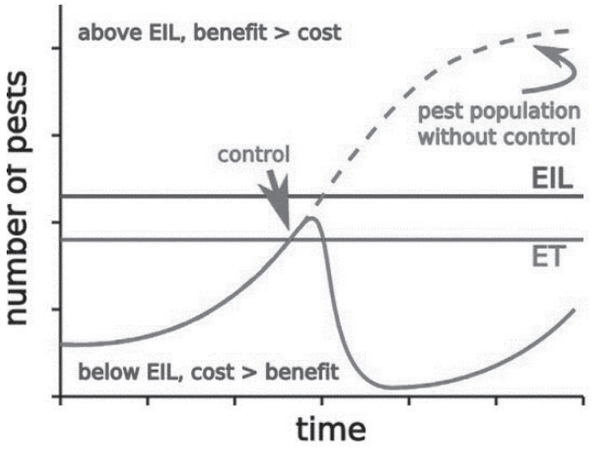

Figure 1. Relationship between economic threshold (ET) and the economic injury level (EIL)

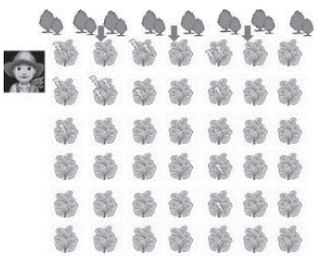

Figure 2. A farmer sees heavy pest pressure on the edge of a field near the tree line.
Image: S. Scheufele

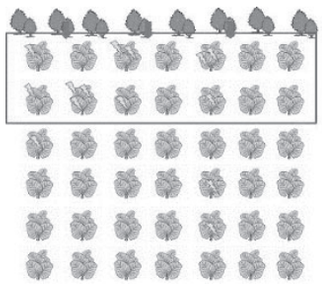

Figure 3. After surveying the whole field, the farmer finds that only the plants near the treeline have heavy pest pressure, while the whole field is under threshold and no treatment is necessary.
Image: S. Scheufele

Using the appropriate scouting sheet for the crop you are inspecting, move through the field, stopping at random spots—moving in a V or W pattern works best—and look at whatever plant(s) happen to be wherever you stop. It helps to count about the same number of paces between samples, so that you avoid getting a biased sample by inadvertently stopping at plants that are obviously affected or infested. Look at and around the plant, then inspect more closely—pests and symptoms can often be found on the undersides of leaves or on stems. It's good to have a hand lens with you for looking at small insects or mysterious lesions. Record what you see in the appropriate line on the scouting sheet, along with any notes you think are important. There is a spot on the sheets labeled 'scouting map' so you can record your path. This may reveal that there is higher pressure on one area of the field, which can indicate where a pest is entering, or a preference for a certain variety.

When you have finished sampling, count your results. Take the average for whatever unit you are considering for your threshold—it may be insects per leaf, or damage per plant—and compare that number to your threshold. If you are above threshold, apply your control strategy. If you are below, wait to treat and scout again at some regular interval (e.g. the following week). If

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VEGETABLE PRODUCTION

Pest Scouting *continued from page 15*

you implement a control, scout again afterward to determine if the treatment worked and when/if you should make another application. If you found natural enemies when scouting, consider them when deciding which material to use or whether a pesticide application is warranted.

Using these scouting sheets throughout the season and over multiple years can help you to identify trends and understand your pest levels and cycles and the effectiveness of your management strategies over time. If you do use the UMass scouting sheets, we'd love your feedback! Let us know if they help you manage your scouting program, and if you have suggestions for how they can be improved. Contact us at 413-577-3976 or umassveg@umass.edu.

We also have more detailed scouting guides for sweet corn and cucurbits:

Sweet Corn IPM Guide –
https://ag.umass.edu/vegetable/publications/guides/sweet-corn-ipm-scouting-guide-record-keeping-book

Cucurbit Disease Scouting and Management Guide
https://ag.umass.edu/vegetable/publications/guides/cucurbit-disease-scouting-management-guide

Be sure to check out all of our Scouting Resources online at https://ag.umass.edu/vegetable/resources/scouting-resources including our Pest Scouting Calendar (available in both English and Spanish!).

Ms. McKeag is with the Univ. of Massachusetts Vegetable Program. From the ***Vegetable Notes for Vegetable Farmers in Massachusetts****, Univ. of Mass. Extension, Vol. 35, No. 6, May 18, 2023.*

Bolting in Spring Planted Vegetables

Gordon Johnson

Bolting is the term used for flower stalk formation in vegetables. Bolting response may be related to temperature, daylength, or a combination.

Bolting in spinach, lettuce, and some radishes (oriental types) will occur naturally as days get longer (daylength effect). High temperatures will accelerate bolting in spinach and lettuce. Lettuce may also be induced to bold just by high temperature stress.

Bolted spinach plant. This variety is not well adapted to spring planting.

Seedlings exposed to low temperatures early in the season may also be induced to bolt. This is called vernalization. Many mustard family plants need a cold period (vernalization of seedlings) along with lengthening days to flower. The amount of cold needed depends on the species and variety. Mustards are very prone to cold initiated spring bolting; turnips, Chinese cabbage, and salad radishes require a greater amount of cold to initiate the

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VEGETABLE PRODUCTION

Bolting in Spring Planted Vegetables *continued from page 16*

bolting response.

Overwintered Brassica crops such as mustards, turnips, kale, and collards will be fully vernalized and will bolt in the spring. They should be harvested before bolting occurs.

In the cole crop group, cabbage planted very early in cold springs may bolt. Premature flowering in broccoli, cauliflower, kale, and collards also occurs when planted too early, or if the spring is abnormally cold. However, cole crop transplants must be of a certain physiological age to be susceptible to this cold-initiated bolting.

Other biennial vegetables such as beets, carrots, and onions also can be induced to bolt but only once plants have reached a certain size (they are past the juvenile growth stage). This is uncommon in our region.

Controlling bolting starts with planting during the recommended planting window. Early planting will contribute to bolting in some crops (such as cabbage), late planting in others (such as lettuce).

Use of transplants can also reduce bolting in Brassica crops. Transplants are produced from non-vernalized seed in greenhouse conditions and are less susceptible to bolting.

Select varieties that are adapted to the spring planting season (an example would be Savannah mustard). Choose slow bolting varieties of spinach and lettuce. Choose spring adapted varieties of oriental radishes and Chinese cabbage.

One issue that complicates this, is the use of high tunnels for early production. High tunnels allow for earlier planting but cold snaps still may drop temperatures enough to cause the cold induced flowering response in many of these crops.

*Dr. Johnson is the Extension Vegetable & Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 8, May 19, 2023.*

Viruses Turning Up in High Tunnel Tomatoes

Jerry Brust

In the last week or so high tunnel tomato plants have been reported that look a bit squirrely. I thought it was possibly herbicide or virus or nutrient problems. After eliminating the first and third possibilities we had the plants tested for a battery of viruses. There were 3 viruses found. The most unusual one was the Pepino mosaic virus, which belongs to the Potexviruses. This virus is very easily transmitted mechanically and has a low seed transmission rate. Seed transmission occurs at rates of less than one in a thousand when seed is not properly cleaned. The virus is external, contaminating the seed coat and not the embryo or endosperm. Symptoms vary greatly with fruit marbling being the most typical and economically devastating symptom. You can also have fruit discoloration, open fruit, leaf blistering or bubbling, leaf chlorosis and yellow angular leaf spots. The severity of the Pepino mosaic virus symptoms is dependent on environmental conditions. As the infected plants mature the foliar symptoms usually disappear, but not the fruit problems. Prevention of infection is through stringent hygiene measures as the virus is spread primarily by mechanical methods. The Pepino mosaic virus is a newer one but is appearing more often in tomato production areas.

The other two viruses found were more common: Tobacco mosaic virus and tomato mosaic virus. Tobacco mosaic virus (TMV) is one of the most highly persistent tomato diseases because it can remain viable without a host for many years and it is able to withstand high temperatures. Both viruses are spread primarily by mechanical methods. Workers and their equipment can become contaminated when they touch infected plants. Symptoms are rather general and appear as yellow-green mottling on leaves with flowers and leaflets being curled, distorted, and smaller than normal in size. Generally, the fruit from TMV infected plants do not show mosaic symptoms but may be reduced in size and number and may develop an internal browning that most often appears in fruits of the first cluster. Severe strains of TMV and tomato mosaic virus can cause the lower leaves to turn downward at the petiole and become rough and crinkled. Some tomato varieties when infected with TMV or tomato mosaic virus can develop dead areas on leaves, stems and roots. As with the Pepino mosaic virus the best control for these two viruses is strict hygiene and not using contaminated seed.

*Dr. Brust is the IPM Vegetable Specialist at the Univ. of Maryland. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 6, May 5, 2023.*

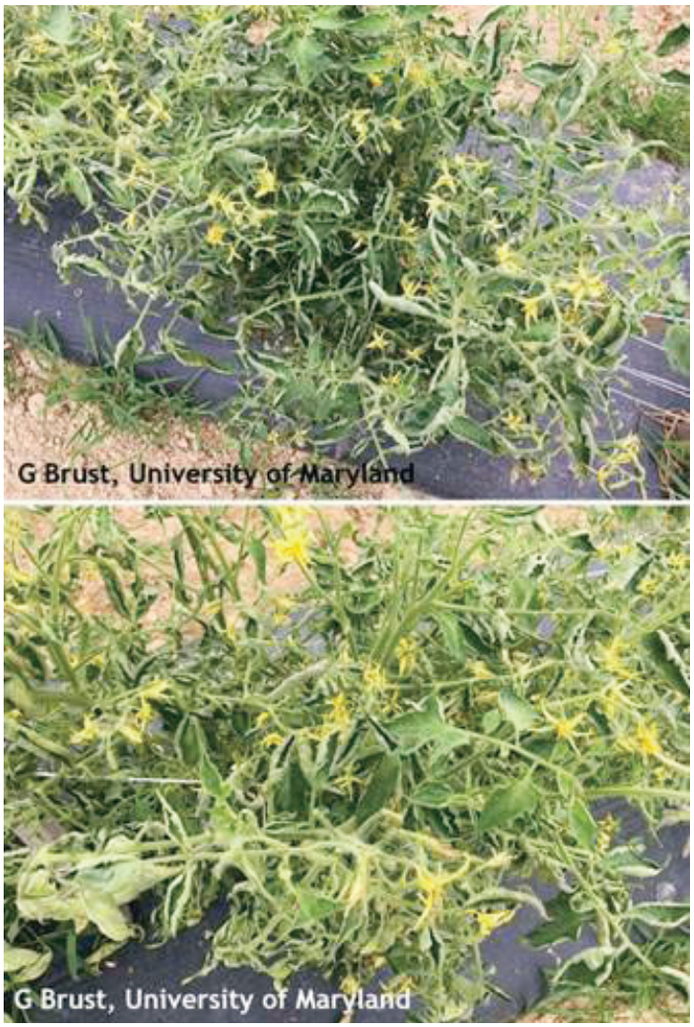


Figure 1. Tomato plants infected with three different mosaic viruses

VEGETABLE PRODUCTION

Using Lady Beetles to Manage Aphids on Winter Greens

Lori Koenick

Aphids, these pesky pear-shaped pests can be a problem year-round in vegetable production. If growing in high tunnels and aphids were a challenge in the summer, they could continue to be a nuisance in the winter as well. In a protected setting such as a high tunnel, aphids are not killed by subfreezing temperatures. They will overwinter in the soil and can enjoy snacking on weeds and what you plant next.

Despite their small size and soft bodies, aphids can be a problem as they have a wide host range and can reproduce quickly without mating. They suck out plant juices when feeding, reducing plant vigor and yields. In addition, aphids excrete a sweet substance, honeydew, that can attract unsightly black sooty mold to grow. A few types of aphids can also transmit viruses.

Fortunately, ladybeetles can be an effective aphid management tool in winter. Previous Cornell Vegetable Program (CVP) research has shown ladybeetles are hardy enough to survive the cold temperatures and shorter daylengths in Western New York (check out this CVP Winter Aphid Management Fact Sheet at https://rvpadmin.cce.cornell.edu/uploads/doc_197.pdf to learn more).

We have been working with a cooperating Erie County high tunnel to manage aphids in winter greens production. Last summer, we noted high aphid populations on tomatoes in the high tunnel. Infested crops were removed in early fall, but the aphids remained most likely surviving on weeds and in the soil.

We released two pints of ladybeetles (18000 adults) under row cover in plantings of winter greens and herbs on January 27. By February 22, lady beetles were still alive and reduced the aphid population by 98.2% (Figure 1). On our final check on March 10, we did not see any aphids in the high tunnel.

Note on our release rate: This rate is very high for the 1800 sq ft that we were treating. We hope to see similar results with lower rates, which would be more cost effective. Our scouting program used an action threshold of one aphid per leaf. Lady beetles can be purchased from biological control suppliers. We sourced the lady beetles from IPM Labs (315-497-2063 or see their ad in this newsletter), a partner in this project.

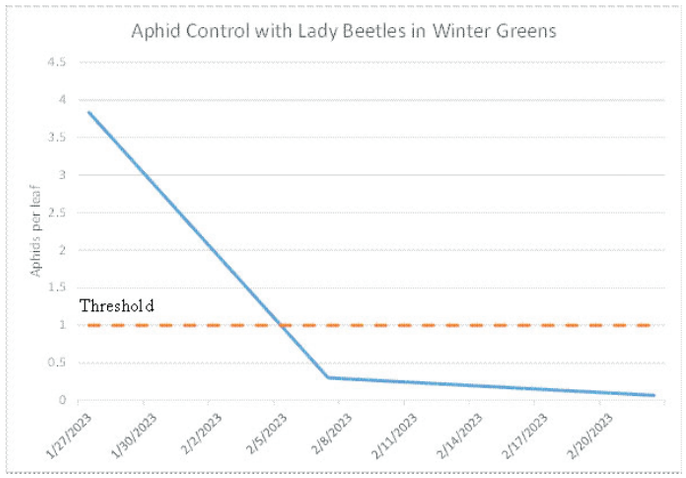
Tips for aphid management on winter greens:

- Practice prevention throughout the year by regular scouting to get ahead of any outbreaks
- Manage weeds to eliminate places for aphids to live in between crop plantings
- When using lady beetles, wait to release them until infested plants have been removed and the winter crop has been established
- Release lady beetles under row cover to keep them close to the crop and aphid food source

Interested in learning more? Contact Lori Koenick (lbk75@cornell.edu, 301-802-3289) or Judson Reid (jer11@cornell.edu, 585-313-8912). This work was supported by NESARE.

*Ms. Koenick is with Cornell Cooperative Extension, Cornell Vegetable Program. From the **VEGEdge**, Cornell Vegetable Program, Vol. 19, Issue 4, April 5, 2023.*

Figure 1. Tracking aphid populations in Erie County high tunnel on winter greens.



Aphids feeding on underside of celery leaf on January 27.

Lady beetles on the prowl for an aphid snack on February 22.

VEGETABLE PRODUCTION

Are Pillbugs Pests? How Can They be Managed?

Samantha Willden and Laura Ingwell

Background

Pillbugs, roly-polys, and potato bugs are the dominant common names for the isopod genus Armadillidium spp. As the scientific name suggests, these little critters resemble mini armadillos but are, in fact, crustaceans that live on land (Figure 1). Therefore, they are more closely related to lobsters, crabs, and shrimp than insects. Pillbugs are important recyclers on farms, as they help to break down decaying organic matter to speed up the decomposition process. However, pillbugs can secondarily feed on fruits, vegetables, young shoots or roots, or lower leaves at the soil level, sometimes causing damage.

Figure 1. Image of individual pillbug (Photo by Wikimedia Commons).

Examples of damage

Several growers this spring have reported pillbugs feeding on plant shoots and fruits (Figure 2). Feeding damage by pillbugs can resemble nibbling from mice, caterpillars (on leaves), or slugs. Most of this damage occurs at night and is concentrated at the soil level. They are also most common during springtime when the weather is cool and damp. It is currently unclear whether and to what extent pillbugs feed on roots below the soil surface. There are also suspicions that pillbugs climb plants at night, when they are most active, to feed on above-ground plant tissue.

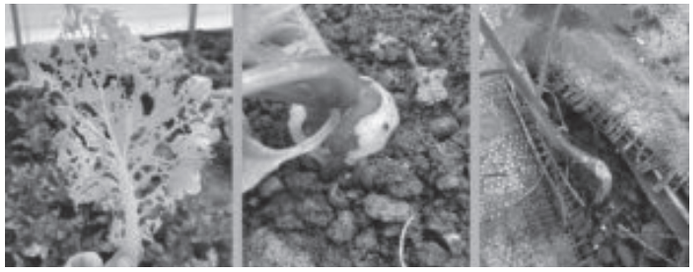


Figure 2. Examples of pillbug feeding damage. Far left: Large irregular holes on lower lettuce leaf. Center: Radish tuber with damage and surrounded by pillbugs. Far right: suspected pillbug damage on tomato transplants (Photos by Samantha Willden).

Scouting

Because pillbug feeding damage can be misidentified, scouting plants at night or early in the morning is recommended to confirm pillbug presence. Area-wide scouting and monitoring of pillbugs can be done by placing wooden boards throughout a planting. Pillbugs will congregate under these covers during the day and can be counted to monitor pressure (Figure 3).

Figure 3. The underside of a 2 x 4" wooden board placed between rows of leafy greens. A congregation of pillbugs, and several slugs, can be seen in this image (Photo by Samantha Willden).

Management

There are currently no economic thresholds of injury levels for pillbugs. They are likely to be most problematic in damp, undisturbed soil with high organic matter levels. If they are identified as pests using the scouting methods above, preventative and cultural control practices are the best lines of defense. First, reduce the amount of organic material and hiding spots on the soil surface by removing dead or decaying plants, unnecessary plants or mulch, debris, and weeds within and around the planting. Increasing plant spacing will also help to reduce canopy cover and hiding spots for pillbugs during the day (Figure 4). Second, minimize soil surface wetness by irrigating crops only as needed. Lastly, placing wooden boards in the planting as described above will help to consolidate pillbugs that can be relocated by tapping the wooden boards to dislodge pillbugs in a new area. Consider moving pillbugs to compost piles away from vulnerable crops. Infested wooden boards can be soaked in soapy water to kill the pillbugs if a suitable relocation area is unavailable.

Figure 4. A cluster of pillbugs hiding below a dense plant canopy during the day (Photo by Samantha Willden).

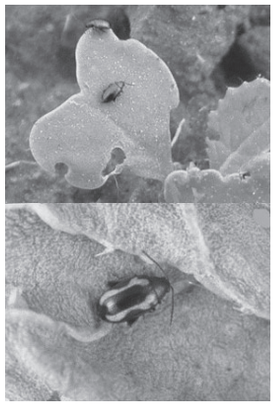
Unfortunately, there is little information on spray recommendations for additional management of pillbugs. One resource from Texas A&M suggests pyrethroid insecticides, namely permethrin, for managing pillbugs. However, cultural control options of reducing suitable habitat and excess soil moisture are the most effective long-term solutions for pillbug management.

Mr. Ford is with Penn State Extension in Cambria Co. From Penn State Extension, https://extension.psu.edu/rhizoctonia-solani-prevention-and-management-on-vegetable-transplants?, April 4, 2023.

VEGETABLE PRODUCTION

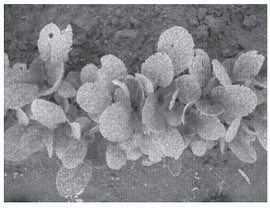
Flea Beetle Management

Flea beetles have emerged from their overwintering homes in the shrubby or wooded areas surrounding fields and are feeding now on spring brassica plantings. Controlling flea beetles can seem like a losing battle, but we have seen real success on farms that have taken an integrated approach to management. The most important steps to reducing the population size and damage caused by flea beetles seem to be breaking the cycle (rotating spring crops as far as possible from overwintering sites near last year's fall crop), and controlling early season outbreaks using something like a trap crop or a "push-pull" approach to prevent the problem from spiraling out of control within the season or from building up to unmanageable levels over the years.



Top: Crucifer flea beetle feeding damage on a cotelydon. Bottom: Striped flea beetle

Life Cycle. There are two species of flea beetle that feed on brassica crops. The crucifer flea beetle (*Phyllotreta cruciferae*) is uniformly black and shiny, while the striped flea beetle (*Phyllotreta striolata*) has two yellow stripes on its back. Both are about 2 mm in length and hop away when disturbed. These flea beetles only feed on brassica crops; those found on corn or solanaceous crops are different species. Though they prefer the tender leaves of *Brassica rapa* and *B. juncea* crops such as arugula, tatsoi, mizuna, bok choi, and mustard, they will also feed on the more waxy *B. oleracea* crops such as broccoli, cabbage, kale, and collards. Their feeding damage—small, round holes on leaves or leaf margins, which can coalesce or expand to form large holes as leaves mature—can kill seedlings outright, delay maturity, and re-duce yield and marketability of older plants. The adults that are active now will mate and lay eggs in the soil, and larvae will hatch in 11-13 days. Larvae will feed on the root hairs of brassica crops but do not cause noticeable damage. After about 2 weeks, the larvae will pupate, and emerge after another week as the next generation of adults in mid-June. This cycle repeats itself and a second summer generation emerges in late July to feed on fall brassica crops before moving outside of the field to forested areas for the winter. Flea beetle generations usually overlap over the course of the growing season, meaning there is rarely a lull in flea beetle activity.



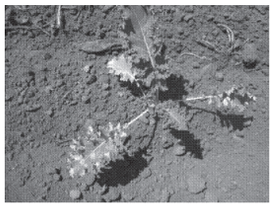
Severe flea beetle feeding damage on brassica greens

Management:

Break the cycle. Plant spring crops far from fields where fall brassicas were grown, and where flea beetles will over-winter. When overwintering beetles emerge, if they can't find a host plant they will not survive and reproduce and you will reduce the population of flea beetles on your farm. You can also starve the overwintering beetles by delaying planting until June. This may not easily fit your markets, but it does work. With no food or place to lay eggs, the overwintered adults leave the area, instead of reproducing and emerging in time for midsummer dining. It may take 2-3 years to bring populations down. Be careful to control brassica weeds at the same time. It is also important to separate your fall crop from the spring crop, since second generation flea beetles will emerge at the same time that fall brassica crops will be at their most vulnerable. These second generation adults are also the beetles that overwinter, so next spring, plan to use a field distant from previous late-season brassica fields.

Row covers. Floating row cover or insect netting provide the most effective protection from flea beetles, especially in spring and early summer. It is expensive in both materials and time, but it works. Insect netting, such as Proteknet, Biothrips, and Filbio, are available in a range of mesh sizes and can be used to protect against a variety of pests, including flea beetles. These trap in less heat and allow for greater air circulation than spunbonded row covers, though for early spring crops, the additional warming benefit of traditional row covers of various weights may be preferred. Whatever cover you choose, it is critical to seal the edges immediately after planting to make sure you exclude the beetles. Flea beetles can fit through small openings—not to mention the large holes and tears that often develop in row cover over time. Fortunately, hoops are not needed on brassica crops, but management is still time-consuming because the cover has to be removed for cultivation. Replace it as soon as possible to avoid letting beetles in.

Chemical control. Maturing plants should be scouted frequently. When plants are young, an average of 1 beetle per plant or 10% average leaf damage is a reasonable threshold for chemical intervention. Several synthetic pyrethroids (Group 3A), carbamates (Group 1A), neonicotinoids (Group 4A, either as foliar or soil drench), and diamides (Group 28) are labeled for flea beetle in brassicas. Avoid repeated use of one type of chemistry over multiple generations or using both soil and foliar applications of the same group. Systemic insecticides can provide longer-term control against damage, although beetles may still be seen when scouting. Diamide products (Exirel and Harvanta for foliar applications, Verimark for soil), are systemic and provide control against flea beetles as well as other brassica pests like caterpillars, cabbage aphid, and, if applied to the soil pre-plant, cabbage root maggot. Be aware that systemic insecticides may have longer days-to-harvest intervals.



Kale treated with Surround is protected from damage while untreated bok choi used as a trap crop could draw flea beetles, where they can be sprayed. Photo: S. Scheufele

For organic **farmers,** the choice of effective chemistries is limited to spinosad (Entrust), kaolin clay (Surround), and pyrethrin (Pyganic). Entrust provides the best control; it works primarily by ingestion and remains active on the leaf surface for some time after application. Pyganic is a contact insecticide and is deactivated by sunlight and so does not provide any residual control but can provide short-term knockdown effects by killing any flea beetles hit directly by the spray. Surround is kaolin clay that coats the foliage, which flea beetles find unappealing. It must be reapplied as the plants grow or after rain. Growers often hesitate to use Surround because of difficulty mixing and spraying—some growers have found that using a masonry or sheet-rock drill to mix up the material in a 5-gallon bucket before adding to a backpack sprayer works to get the clay into suspension. If you want to apply Surround using a tractor-mounted sprayer you must have mechanical agitation or the material will not go into suspension and it will clog up your nozzles. It is probably worth figuring out how to do this if you struggle with getting your early season transplants to survive the onslaught of flea beetles, and it can also be useful in protecting cucurbit transplants from striped cucumber beetles, which vector bacterial wilt.

Control brassica weeds. Brassica weeds also harbor flea beetles (both adults and larvae) and reduce the efficacy of your crop rotation schemes that aim to break the pest cycle by changing crop families. Yellow rocket, wild mustard, and shepherd's purse are familiar weeds that are widespread in fields and roadsides. The list of weed hosts probably also includes garlic mustard (*Alliaria petiolata*), a serious invasive weed in the brassica family. It is a bi-

continued on page 22

BERRY PRODUCTION

Food Safety in Strawberry Season

Carol Allen

For the farmer, produce safety for this enjoyable crop includes all the 4 W's – workers, water, wildlife and waste. And the bonus – proper cleaning and sanitation of food contact surfaces.

Since strawberries are often eaten raw, worker training on basic health and hygiene helps to ensure reducing the risk of human pathogen transfer during growing, picking, and packing. Strawberries can often go through several layers of handling from field to consumer. Workers need to be trained on washing hands, recognizing clean bins, and keeping food contact surfaces cleaned and sanitized.

Strawberry growers may need to use overhead irrigation for frost protection as well as to keep later ripening berries cool when the unpredictable Maryland weather brings in summer temperatures early. Sometimes surface water is the only high-volume source for these overhead irrigation events. Farmers should stay on top of water testing and plan their sampling during strawberry time. Perhaps producers should consider mitigation strategies should water quality be poor.

People are not the only critters who love strawberries. More frequent monitoring of fields for animal intrusion may be needed as the berries ripen. Be sure to cordon off areas of animal damage or presence of scat to avoid accidental harvesting of these contaminated fruits. Remove and dispose of contaminated material either by burying, deep composting, or other safe method. Observe proper cleaning and sanitizing of tools, boots, and gloves after this work and before going back to picking or handling the fruits.

How farmers deliver the necessary nutrients to the berries requires some advanced planning. If composts containing either post-consumer waste or manures are used and there is any doubt as to the validity of the composting process, the National Organic Standard 90/120-day rule should be observed. The use of chemical fertilizers may be safer in a lowered risk of human pathogen contamination, but workers will need to be trained in safe handling practices.

Finally, cleaning and sanitizing of all food contact surfaces should be strictly observed from the picking baskets to sorting tables and in the farm market. Remember, sanitizing cannot be effective without cleaning the surface first!

Now go have some strawberry shortcake and enjoy the season!

Do you have any questions about Good Agricultural Practices or the Produce Safety Rule? Contact Carol Allen, callen12@umd.edu, 240-994-5043

From the Food Safety Newsletter for Maryland Farmers, Univ. of Maryland, May 15, 2023.

Photo credit, Guy Moore

Cane Blight of Brambles

Kim Leonberger and Nicole Gauthier

Cane blight occasionally impacts homegrown and commercial raspberries and blackberries in Kentucky. The disease causes lesions to develop on both primocanes (current-year canes) and floricanes (second-year or fruiting canes) and can result in reduced yield and cane death. Fungicides are available; however, sanitation is a critical step in prevention and management.

Cane Blight Facts

- Symptoms include brown to purple cankers (Figure 1) that expand to girdle canes throughout the season. Wilting and dieback are observed in areas above the canker. During periods of high moisture, black fruiting bodies (pycnidia) may be visible.
- Hosts include red raspberry, black raspberry, and blackberry.
- Primary infection occurs in spring when spores, moved by wind or water, enter through pruning cuts, insect damage, broken fruit stems, bark cracks, or wounds.
- Caused by the fungus Leptosphaeria coniothyrium.
- Overwinters in dead or diseased canes.

Figure 1: Cane blight symptoms include brown to purple cankers. (Photo: Michael Ellis, The Ohio State University)

Management Options

- Prune to improve air circulation and rapid drying.
- Remove weed hosts.
- Maintain plant health with proper nutrition and irrigation practices.
- Remove wild brambles from the area.
- Prune and burn or bury all old canes and diseased or dead plant tissue.
- Protect plants from winter damage.
- Manage insect pests.
- Homeowners may apply fungicides containing lime sulfur during dormancy; however, availability of these products may be limited. Products containing copper or captan can be used beginning at vegetative growth and continuing through bloom.
- Commercial growers should refer to Midwest Fruit Pest Management Guide (ID-232) for up-to-date fungicide recommendations.

Additional Information

- Backyard Berry Disease Management Using Cultural Practices (with Low Spray, No Spray & Organic Options) (PPFS-FR-S-25)
- Commercial Midwest Fruit Pest Management Guide (ID-232)
- Fruit, Orchard, and Vineyard Sanitation (PPFS-GEN-05)
- Cane Blight of Raspberries (The Ohio State University Extension, PLPATH-FRU-10)

Ms. Leonberger is Plant Pathology Extension Associate and Dr. Gauthier is Plant Pathology Extension Specialist at the Univ. of Kentucky. From the Kentucky Pest News, Univ. of Kentucky Extension, https://kentuckypestnews.wordpress.com/2023/05/09/cane-blight-of-brambles/

BERRY PRODUCTION

Orange Rust on Brambles

Kathleen Demchak

Orange rust on raspberries. Photo: Kathleen Demchak, Penn State.

Orange rust on black raspberries and blackberries is quite common this year. Infected plants should have been removed by now, but if they were not, cover and bag the canes and try to clip them carefully to avoid spreading spores. Remove them from the field, and then dig the remaining parts of the plant out. Apply a fungicide in category 3 or 11 to help protect remaining plants. See this article for more information:

https://extension.psu.edu/bramble-disease-managing-orange-rust.

Ms. Demchak is with the Plant Science Dept. at Penn State Univ. From Penn State Extension, https://extension.psu.edu/2023-pa-vegetable-and-berry-current-issues-for-june-8, June 8, 2023.

Flea Beetle Management *continued from page 20*

ennial with white blooms in spring (mid-May). It thrives in roadsides and field edges as well as shady woodlands, and has rapidly spread throughout Massachusetts.

Trap cropping. Take advantage of the flea beetles' preferences for particular brassicas by using the preferred species or varieties as a draw. Their numbers will build up in the more attractive plants, and can be killed there with an insecticide application, protecting the main crop and reducing spray area and time. A border or even a middle row planted to *Brassica rapa* or *B. juncea* crops such as komatsuna, tatsoi, mizuna, bok choi, or mustard has been shown to reduce numbers and feeding damage on less preferred *B. oleracea* crops such as broccoli, cabbage, or traditional kale (e.g. 'Winterbor' types). Red Russian kale (*B. napus*) and lacinato kale (*B. oleracea*) seem to be of intermediate attractiveness. To make it work, here are some tips:

- Make sure the trap crop is established before the main crop (the one you are trying to protect) or is at least as mature (e.g. transplanted same day). Direct-seeded crops can be used around transplants if seeded 7-14 days earlier.
- Use a fast-growing, vigorous cultivar for the trap crop.
- Use a border crop to prevent beetles from moving farther into the field. Traps at ends of rows help make a complete perimeter, which stops beetles coming from all directions. Interior trap crops also can act as a 'sink' within the field.
- Spray only the trap crop to kill the accumulated beetles, and to avoid having to spray the main crop. You also want to keep the trap crop healthy enough to do its work, and potentially be harvestable as well—you may need to fertilize, re-seed, or otherwise maintain this trap crop because if it gets too ragged, the beetles will not enjoy feeding on it and will move back into your main crop. Use a longer-residual product, if possible.
- Combine with a repellent on the main crop, e.g., coat the main crop with Surround WP and use a trap crop as part of a "push-pull" system.

*From **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Mass. Extension, Vol. 35, No. 6, May 18, 2023.*

GREENHOUSE PRODUCTION

Cleaning and Sanitizing Commercial Greenhouse Surfaces

Carol Allen

Sanitizing surfaces is a critical step for greenhouse and nursery sanitation. This is particularly important for sites where disease was a problem in previous crops. Pathogens that cause plant disease can survive in debris, in soil, or on surfaces. Cleaning and sanitizing greenhouses, benches, containers, and tools are important steps in eliminating microscopic propagules that can cause disease in subsequent crops.

Greenhouses and nursery pads should be fallowed (emptied) after each crop cycle or at least once per year for cleaning and sanitizing. Begin by removing weeds, carryover crops, and other potential reservoir hosts. Next, clean and sanitize all surfaces (greenhouse sidewalls, floors, and benches; containers; tools; equipment; irrigation lines) in order to inactivate any remaining propagules.

Cleaning Steps

Steps to cleaning containers, equipment, and surfaces include the following:

1. Sweep or brush floors and surfaces to eliminate dry debris and soil particles.
2. Wash surfaces. Use a brush and heavy stream of water to dislodge large particles. Follow up with soap or detergent. Tools, containers, benches, and equipment should be brushed or rubbed to clean surfaces. Note: Organic regulations indicate that soaps cannot come into contact with food products.
3. Rinse away detergent and debris. Repeat steps 1 to 3 until all surfaces are clean.
4. Sanitize surfaces, especially if disease was a problem for previous crops. The key to effective disinfection is the length of time the product contacts surfaces; slow-drying increases contact time and optimizes effectiveness. Commercial products are formulated and tested for stability, residual activity, safety, and sensitivity. Refer to label for specific instructions.
5. Flush irrigation lines with disinfectant to remove propagules that may have moved into water lines and emitters.

Sanitizers and Disinfectants

Commercial products are recommended for efficacy. The following is a summary, only; refer to product labels for detailed instructions. Mention of trade names is solely for the purpose of providing examples and does not imply endorsement.

- Hydrogen dioxide (ZeroTol® 2.0, Oxidate® 2.0) – effective against algae, bacteria, and fungi; contact time 1 to 10 minutes; use on containers, greenhouse walls and floors, foot baths, tools; use with a foaming agent for vertical surfaces (OMRI listed).
- Hydrogen peroxide & peroxyacetic acid (Sanidate 5.0®) – effective against algae, bacteria, and fungi; contact time 1 to 10 minutes; use on containers, greenhouse walls and floors, foot baths, tools; use with a foaming agent for vertical surfaces (OMRI listed).
- Quaternary ammonium compounds (Green-Shield®, Physan 20®, and KleenGrow™) -effective against algae, bacterial, fungi, viruses; contact time 10 to 15 minutes; residual activity several hours; use on containers, cooling pads, greenhouse walls and floors, foot baths, irrigation lines, tools; foaming formulation (OMRI allowed if measures are taken to assure that residues do not come into contact with the fruit or harvestable tissues).
- Chlorine bleach (10% to 20% dilution) – extremely effective against algae, bacteria, fungi, and viruses; contact time less than 1 minute to 15 minutes; most effective product for use on porous surfaces such as wood, especially at higher concentrations; highly corrosive to metals; damaging to soft plastics and rubbers; dangerous to human health; never mix bleach with products containing ammonia or acidic products; half-life 2 hours (OMRI allowed in certain circumstances).

Alternative sanitizers and disinfectants; efficacy data not available and limited information is available for commercial applications.

- Alcohol (70%) – practical for use on tools; contact time 10 to 15 minutes; flammable (OMRI allowed for disinfestation of tools).
- Trisodium phosphate, TSP (10% solution) – corrosive to metals; harmful to human health (not allowed by OMRI).
- Lysol® Disinfectant, concentrate – practical for containers, tools, equipment, and for hand-washing smaller surfaces (not allowed by OMRI).

Additional Resources

Greenhouse Sanitation (PPFS-GH-04 - http://plantpathology.ca.uky.edu/files/ppfs-gh-04.pdf)

OMRI Regulations (https://www.ecfr.gov/current/title-7/subtitle-B/chapter-I/subchapter-M/part-205/subpart-G)

*Dr. Gauthier is the Plant Pathology Extension Specialist at the University of Kentucky. From the **Kentucky Pest News**, Univ. of Kentucky Extension, https://kentuckypestnews.wordpress.com/2023/05/09/cleaning-and-sanitizing-commercial-greenhouse-surfaces/*

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Equipment

FOR SALE – Automatic Potato Weigher and Bagger - Paper and poly. Call 610-996-1403 for more info

Employment

POSITION AVAILABLE - Twin Springs Fruit Farm (TSFF) is looking to hire a new **Commercial Greenhouse/Field Vegetable/ Small Fruits Production Manager, or Manager Trainee.** Some experience in greenhouse production preferred. Job responsibilities include day-to-day greenhouse operations, pest management, including IPM beneficial's, nutrient monitoring, ordering of numerous products. TSFF is a family owned farm located 8 miles west of Gettysburg in the small town of Orrtanna . We are a very diverse Farm, whose main focus is on direct marketing. We presently have over 3/4 of an acre of hot houses that we grow in year-round. We also grow about 40 acres of outdoor vegetables and 10 acres of small fruits.

Contact Jesse King at 575-779-0215 and email resume to: kingdagcfs@yahoo.com

Classified Ads and Sale Notices are free for PVGA members for non-commercial sales.

Call us at 717-694-3596
or email us at pvga@pvga.org.

Pennsylvania Vegetable Growers Association

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