

2023 Summer Grower Educational Opportunities

The usual focus of our special summer newsletter is to publicize the summer educational events available to growers. This year PVGA will be organizing a series of on-farm twilight meetings to provide growers with the opportunity to visit a fellow growers farm operation and/or market.

The upcoming twilight meeting schedule is as follows:

Tuesday, August 15, 2023 – Hess Farms/Bridgeside Farms, Waynesboro (Franklin County) – 6:00 p.m.

Tuesday, August 22, 2023 – Burger's Farm, Drums (Columbia County) – 6:00 p.m.

Thursday, September 21, 2023 – Strite's Orchard, Harrisburg (Dauphin County) – 5:30 p.m.

Tuesday, August 15, 2023 – Hess Farms/Bridgeside Farms
8620 Helman Road, Waynesboro (Franklin County)
6:00 to 8:00 p.m.

Galen Hess and his family grow about 200 acres of various vegetables, berries and fruit crops that they pack and sell wholesale from their farm in Waynesboro. Their vegetable crops include zucchini, cucumbers, peppers, pumpkins, fall squash, sweet corn and tomatoes. Their fruit and berry crops include apples, peaches, strawberries, blueberries and raspberries. Join us for a tour of their production fields and their packing facilities. There will be light refreshments. While no pre-registration is required and walk-ins are encouraged, if you do know ahead of time that you plan to attend, please contact PVGA at pvga@pvga.org or 717-694-3596.



Tuesday, August 22, 2023 - Burger's Farm
371 Saint Johns Road, Drums (Columbia County)
6:00 to 8:00 p.m.

Burger's Farm Market is a family owned and operated farm established in 1889. Five generations have farmed the land with the 6th generation on its way! The Burgers grow 75 acres of fresh market vegetables to supply their on-farm seasonal farm market and local farmers' market. Besides the usual vegetable crops, the farm has also found a niche market for specialty peppers favored by Eastern European ethnic groups who come from as far away as the New York City area for these peppers, many of which are sold pick-your-own. Besides these specialty peppers, they also

grow horticultural beans and over-mature sweet corn favored by the Hispanic population in nearby Hazleton. Besides a wide selection of vegetables in their farm market (sweet corn, carrots, potatoes, zucchini, beets, onions, garlic, tomatoes, peppers and beans), they offer pick-your-own blueberries, tomatoes, peppers and eggplant.

Burgers host no cost educational tours to local school districts and daycare centers as well as no cost entry to their pumpkin patch, hayride, and pumpkin field. They have a small petting zoo in their fall season which includes baby calves and baby chicks. They also have food and ice cream vendors on the weekends during October.

Join fellow PVGA growers for a tour of Burgers' production fields and their market. While no pre-registration is required and walk-ins are encouraged, if you do know ahead of time that you plan to attend, please contact PVGA at pvga@pvga.org or 717-694-3596.



Thursday, September 21, 2023 – Strite's Orchard
1000 Strite's Road, Harrisburg (Dauphin County)
5:30 to 8:00 p.m.

The Strite family has been farming in the Harrisburg area since 1843. The first fruit trees and vegetables were planted by Joseph C. Strite in 1914. His son Earl would eventually join him in the business and over time expand the farm to over 250 acres. Earl sold his produce at markets in the city of Harrisburg and door to door in nearby Hummelstown. In 1950 the original market was

NEWS



*Pennsylvania
Vegetable Growers
Association*

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

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Why is PVGA Important?

We all have our “communities” of our extended families, our neighborhoods, our churches and other organizations, and our towns or townships, as well as our state and nation. And there is the group of people we interact with daily in the course of our work as well – our employees/employers, our fellow workers, our customers, and our suppliers. For many growers, the local produce auction with the group of growers and buyers that make the auction run is a “community” that provides an opportunity for personal interaction where we can exchange ideas and experiences as well as offer encouragement and be encouraged.

PVGA is the “community” that brings together vegetable, potato and berry growers and others involved in those industries or just interested in those industries. PVGA provides the opportunity to stay informed about what is happening in the statewide grower community. We do that through this monthly newsletter, the Pennsylvania Vegetable Growers News and through our weekly email, the PVGA Update. The newsletter provides not only news about the Association, current events, and legislation/regulations that affect growers, but also practical production information from Penn State Extension and from other extension services. The email update includes links to articles of interest to growers from various online sources – enabling vegetable, potato and berry growers to see a variety of articles pertaining to their industry all in one place. PVGA also maintains a website at www.pvga.org with various information about the Association like its policy resolutions and legislative priorities as well as past issues of the newsletter along with an index of the articles in the newsletter since 2009. A complete restructuring of the website was completed last year with a membership directory and videos of some past Convention sessions and farm visits. We have also added “Resource” pages for vegetable, potato and berry growers that contain links to various educational materials.

PVGA also helps sponsor the Mid-Atlantic Fruit and Vegetable Convention, one of the premier grower meetings in the eastern United States. Plans are being made for 2024 Convention on January 30 to February 1 at the Hershey Lodge. While the virtual version of the Convention held in February 2021 was very successful in providing educational sessions for those able to access the internet, attendees really missed the person-to-person interaction – the “community” aspect – of the “normal” in-person event that is missing in a virtual event. Both attendees and exhibitors appreciated being able to be able to talk to each other face-to-face, taste the samples, and kick the tires in the trade show in 2022. The Mid-Atlantic Convention is perhaps one of the best examples of how PVGA fosters a sense of community among growers – bringing them together physically from all across the state (and actually from many surrounding states as well). While growers greatly value the educational sessions featuring expert speakers from Penn State and numerous other universities, many also comment that they learn as much from their conversations with fellow growers in the hallways.

Another “community” aspect of PVGA is the Association’s food booth at the Pennsylvania Farm Show. Over 200 members and friends of the Association staff the food booth each year to earn funds to support research. Over the past 35 years, PVGA as a grower “community” has contributed \$1.4 million to vegetable and berry research. (Another part of the grower “community”, the PA Vegetable Marketing and Research Program has contributed another \$755,000 to vegetable research.) This has been possible primarily with profits from the Farm Show food booth (as well as profits from the Mid-Atlantic Convention). Like the Convention, the Farm Show food booth allows growers to work together and share conversation with their fellow growers.

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The **Pennsylvania Vegetable Growers News** is the official monthly publication of the

Pennsylvania Vegetable Growers Association, Inc.,

815 Middle Road, Richfield, PA 17086-9205

Phone and fax: 717-694-3596 • Email: pvga@pvga.org • Website: www.pvga.org

Our Mission:

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

Our Vision:

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

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

2023 Summer Grower Educational Opportunities

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opened on the farm. Earl's sons Joe and Tom joined their father on the farm and expanded vegetable plantings and added greenhouse operations. All three received the honor of being named Master Farmers over the course of their careers. In 1994 a new farm market and bakery were built and the farm was expanded to 300 acres. Strites sell 95% of their produce through their on-site farm market plus their CSA which was added in 2011. They also offer customers the opportunity for pick-your-own in selected crops. The family also operates several greenhouses where they grow bedding plants as well as all of the vegetable transplants that they use throughout the year. They also have added a high tunnel for early season tomato production. Current family members actively involved on the farm are brothers Joe and Tom, wives Sharon and Sheryl, and children Jon, and Matt.

This twilight meeting is being planned by the PVGA Berry Committee so one of the focuses of the twilight meeting will be Strite's strawberry, bramble and blueberry plantings. Light refreshments will be served. While no pre-registration is required and walk-ins are encouraged, if you do know ahead of time that you plan to attend, please contact PVGA at pvga@pvga.org or 717-694-3596.

Other Opportunities

"Are You Crazy?" Farm Market Tour – October 3 & 4, 2023

This popular farm market tour is returning in 2023 and will be visiting several farm markets in the state of Delaware. Farm market stops are being confirmed now. If you are interested in further details about the tour, contact Brian Moyer at bfm3@psu.edu or 610-391-9840.

PVGA Berry Growers Info Exchange

PVGA is continuing to host a periodic get-together for berry growers. These virtual meetings are the second Monday of the month at 8:00 p.m. (in the winter months they start at 7:00 p.m.). Growers can participate online via Zoom or call in by phone. Meetings are designed to give growers a chance to get time-sensitive updates on current issues from state and regional extension personnel, exchange info with other growers, get answers to their questions, or just listen in or bounce thoughts off of others. Kathy Demchak is the host.

Calls are open to PVGA members and non-members to maximize information exchange, so spread the word and invite your friends and neighbors to join.

The Zoom link is <https://us02web.zoom.us/j/83077021881>

The call-in numbers are (be aware that this is not a toll-free call):

+1 929 436 2866 US (New York)

+1 301 715 8592 US (Washington DC).

The meeting ID is 830 7702 1881

If you have questions, contact us at pvga@pvga.org or 717-694-3596.

PVGA Weekly Update

Members of the Pennsylvania Vegetable Growers Association (PVGA) who have email receive the PVGA Weekly Update – a compilation of articles and other information available on the internet of interest to growers. The Update is normally sent out each Saturday evening. If you are not a PVGA member (that is you do not receive this newsletter every month) you can join the Association for the rest of 2023 for only \$37.50 – half the regular dues rate of \$75. OR if you pay the full \$75 dues, your membership will be run until the end of 2024! Simply send a check with your name, mailing address and email address to PVGA at 815 Middle Rd., Richfield, PA 17086, or you can join online at www.pvga.org/joinpvगतoday/. We will be glad to add the email addresses of employees or other family members of PVGA members to the distribution list for the PVGA Update. In particular we would like

to include the email addresses of young growers (whether family members or key employees) to this list.

Pennsylvania Vegetable Growers News

PVGA also publishes its own monthly newsletter – this is complimentary sample copy if you are not a member (again, members receive this newsletter every month). Besides current news that pertains to vegetable, potato and berry growers that may not be readily available elsewhere, the newsletter also contains timely articles on vegetable, potato and berry production from Penn State Extension and other sources as well. Again, if you are not a PVGA member you can join the Association for the rest of 2023 for only \$37.50 – half the regular dues rate of \$75. OR if you pay the full \$75 dues, your membership will be run until the end of 2024! Simply send a check with your name, mailing address and email address to PVGA at 815 Middle Rd., Richfield, PA 17086, or you can join online at www.pvga.org/joinpvगतoday/.

Pennsylvania Vegetable IPM Weekly Update

The PA Vegetable Marketing and Research Program offers growers the PA Vegetable IPM Weekly Update available by email, fax or regular mail. These Updates contain current sweet corn, tomato, cucurbit, berry and general integrated pest management (IPM) information from Penn State Extension specialists throughout the season until early September. To request these Updates, email the Program at pvmrp@embarqmail.com or call 717-694-3596 as soon as possible to get on the list for the weekly mailings, faxes or emails. Please note that faxes will normally be sent during the nighttime hours. These Updates are also posted on the PAVeggies.org website at <https://www.paveggies.org/farmers/ipm-weekly-updates/>.

Why is PVGA Important?

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PVGA is organizing local grower meetings this season and helping to sponsor the "Are You Crazy?" farm market tour in the near future – more events that help create "community" among growers. And PVGA continues to communicate the concerns of the growers to government officials on issues that affect growers – another "community" function of the Association.

But the bottom line is that to benefit from any of these initiatives, YOU have to belong and YOU have to attend. **If you are not currently a PVGA member (that is you do not receive this newsletter each month) we invite you to join PVGA for the rest of 2023 for the half year rate of \$37.50. OR if you pay the full \$75 dues, your membership will be run until the end of 2024! You can do so online at www.pvga.org or simply sent a check with your name, address, email and phone to:**

PVGA

815 Middle Road

Richfield, PA 17086

Note: If you were a PVGA member in 2022, we ask that you pay the full \$75 rate for the rest of 2023 – the half-year and BOGO offers above are for persons who were not previously members.

PVGA members receive this newsletter every month and, if you give us an email address, our weekly email "PVGA Update". Plus, you become a contributing member of the grower community. We urge you to plan now to attend the 2024 Mid-Atlantic Convention – and we would greatly appreciate your help at the 2024 Farm Show food booth.

NEWS

Penn State Extension Expands 800-PENN-IPM Hotline

A Penn State Extension toll-free hotline that provides quick updates on the latest disease and pest management issues for Pennsylvania vegetable, fruit and greenhouse growers has expanded to include new topics for the 2023 growing season.

While the hotline is designed primarily for growers who do not use computer technology to make timely crop management decisions, anyone can call 800-PENN-IPM (800-736-6476) to access pest and disease updates.

As experts in agriculture and horticulture, Penn State Extension faculty specialists and county-based educators record 90-second messages about critical concerns they see on produce farms and greenhouses across the state. The team meets regularly to discuss the latest production issues related to insects, diseases and plant nutrition. Messages typically are updated weekly or more frequently if needed.

These updates are distributed widely through newsletters, email and educational kiosks. Anyone with phone service can access the hotline, providing a way for Extension to reach the Plain community and other growers with important crop management information, noted Beth Gugino, professor of vegetable pathology in Penn State's College of Agricultural Sciences.

The hotline was upgraded and expanded for 2023 to feature dedicated lines for the cut flower industry, for agronomic crops and industry updates, and for weather conditions and forecasts.

The hotline also features:

- Dedicated Spanish-language lines for vegetable, small fruit and tree-fruit updates.
- Dedicated lines for vegetable crops, such as onions and other Allium species, tomatoes and potatoes, sweet corn, and vine crops.
- Dedicated lines for small-fruit production, greenhouse integrated pest management, coronavirus management and Pennsylvania Department of Agriculture pesticide applicator license updates.
- Separate lines for tree-fruit production and updates on disease, insect, horticulture and general industry issues.
- A directory of tree-fruit specialists and educators.

Each message line offers 90-seconds-worth of content for every subject. Previously, a more limited set of options addressed all these areas. Growers with diversified operations now can access specific information about a variety of horticultural crops.

Instructions for navigating the hotline are available on the Penn State Extension website at <https://extension.psu.edu/the-1-800-penn-ipm-hotline>. Extension educators noted that sometimes callers hang the instructions on the wall near the phone or on the refrigerator. Listeners can contact a county office of Penn State Extension to receive a printed copy of these instructions by mail.

Gugino said callers can reach out to their local extension educators to suggest topics that should be addressed or crops that should receive a dedicated message box on the hotline.

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Pasa's Diversified Vegetable Apprenticeship pairs beginning farmers with established growers to provide a guided pathway toward managing or starting a vegetable farm.

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Diversified Vegetable Apprenticeship is administered in Pennsylvania and the surrounding region.



Long-Term Leasing on Farmland Booklet

Case Studies, Legal Considerations, & Lease Agreement Examples

Funded by the USDA's Specialty Crop Block Program, PA Farm Link has compiled a comprehensive long-term leasing booklet that contains case studies of farmers actively farming with a lease agreement and lease agreement examples.

CONTACT US TODAY:

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Project funding provided by USDA Specialty Crop Grant AM200100XXXXG065.



NEWS

In Memory

Timothy C. Brown



PVGA member Timothy Clutz Brown, 74, Littlestown, passed away February 13, at home. His wife, Marcia, preceded him in death in May 2021. They had been married for 44 years

The son of the late Wade H. and S. Elizabeth Brown, he was a 1967 graduate of Littlestown High School, and a 1969 graduate of Williamsport Area Community College, now Penn State College of Technology, where he studied machine technology.

He is survived by his brother, Ronald and his wife Glenda of Mount Wolf; his sister, Sally Bair and her husband Alan of Lancaster; brother-in-law, Richard Mummert of New Freedom; and sister-in-law, Linda Becker of Gettysburg. He was predeceased by his brother, Ed Brown and his wife Barbara, and sister Barbara Mummert. He has many surviving nieces and nephews.

Tim farmed with his father and then his bother Ed, with Brown-valley Holsteins, and eventually moved to a farm on Hickory Road where he and Marcia raised small fruits and Tend-R-Lean beef. Tim and Marcia were committed to learning and applying new farm-

ing techniques and sharing what they learned with others, hosting many open houses over the years – for dairy producers, fruit growers, school groups and others.

He joined 4-H when he was 11 and was grateful for the many opportunities he had through 4-H, traveling to Iowa, Maine and Tennessee on 4-H exchange trips, attending Camp Nawakwa and Citizenship Days in Harrisburg and Washington. In addition to raising sweet corn and strawberries, he enjoyed participating in 4-H Round-Up, showing his dairy cows. He continued contributing to 4-H as a leader of the Dairy Club and coach of the 4-H dairy judging team, one of which placed second in the state.

Passionate about preserving Adams County’s rich farmland, he was a founding member of the Adams County Farmland Preservation Board, and served for 30 years as a member.

He served as state president of the Pennsylvania Young Farmers and was on Southern States Board of Directors for six years and Adams County DHIA for 20 years, also serving on the state board for six years. He was a member of Kingsdale Fire Company, the Pennsylvania Holstein Association and Atlantic Dairy Cooperative, served on Adams Electric Advisory Committee, Littlestown FFA Advisory Board, Farm Service Agency County Board and South Mountain Fair Board. He was a longtime PVGA member and regular Farm Show food booth volunteer.

He was recognized many times for his outstanding community service, including the Local Hero Award from the American Farmland Trust and the Pennsylvania Farmland Preservation Association, Country Folks Farmer of the Year Award, and was named an Outstanding Young Farmer over 30 by Pennsylvania Young Farmers Association. He also received the Community Service Award from PYFA.

He was a member of St. Mary’s United Church of Christ, Silver Run, Maryland, where he served as a deacon for three years.

Memorial contributions may be made to 4-H Clubs of Adams County Inc., 670 Old Harrisburg Road, Suite 204, Gettysburg, PA 17340; or St. Mary’s UCC, 1441 E. Mayberry Road, Westminster, MD 21158; or County of Adams Ag Preservation Program Fund, 670 Old Harrisburg Road, Suite 100, Gettysburg, PA 17325, Attn: Ellen Dayhoff.

From the Gettysburg Times, February 15, 2023.



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NEWS

Grading Services, Market Inspections, and GAP/GHP Audits

The Pennsylvania Department of Agriculture has terminated its Cooperative Agreement with USDA AMS. Effective April 14th, 2023, PDA will no longer conduct inspections, gradings, audits, and certification of specialty crops. The Department has determined that in the best interests of Commonwealth consumers and food industry, the Bureau of Food Safety & Laboratory Services must focus its financial and personnel resources on those food safety regulatory activities for which the Department has a statutory mandate and responsibility to protect the public health.

After April 14th, 2023, please contact the USDA AMS directly for these services.

All Audit Service requests after April 14 should be directed to scaudits@usda.gov ow.

All shipping point inspection requests should be directed to the SCI Area office located in Hunt Valley, MD.

Phone: 410-527-0400

FAX: 410-527-0402

Michael Stevenson, Officer-in-Charge, michael.stevenson2@usda.gov

Phone: 410-568-6911

Jarrett Dunagan, Asst. Officer-in-Charge, jarrett.dunagan@usda.gov

Phone: 410-568-6913

All requests for Market Inspections or Continuous Processing Grading Services should be directed to the USDA Specialty Crops Program, Specialty Crops Inspection Division.

Philadelphia:

Phone: 215-336-0845 and 0846 or 800-237-6401

Fax: 215-336-2051

Pittsburgh

Phone: 412-321-2565 and 2563

Fax: 412-321-2532

Free Ag Mentorship Program

Free Ag Mentorship Program – In 2022, Pennsylvania's agriculture industry received anew resource to help farmers. The PA Agriculture Mentor Program Pilot included five mentors with extensive agricultural backgrounds to assist beginning farmers, agribusiness entrepreneurs and farmers in troubleshooting new strategies and ideas for their farm businesses.

The program pilot proved to be a valuable asset to PA farmers, resulting in 124 sessions and over 127 hours of service. In the first quarter of 2023 alone, 34 clients received atotal of 48.25 hours of free mentoring already. Spearheaded by a group of Pennsylvania agricultural organizations with an interest in the future of agriculture, the program leverages SCORE, a 501(c)(3) nonprofit organization and resource partner of the U.S. Small Business Development Center. The mentoring is free and confidential.

Mentor highlight: Winifred McGee of Elizabethtown, PA, has a passion for helping farm and food businesses get started and works part-time for University of Scranton Small Business Development Center (SBDC). She was formerly with Penn State Extension and spent more than 30 years teaching topics such as business planning, financial analysis and business feasibility.

The PA Ag Mentorship Program focuses on training all farmer types. This includes next generation farmers, farmers entering new specialties, organic farming, vegetable apprenticeships, and more. With the backing of the national SCORE program, the PA Ag Mentorship Program is able to provide business mentoring with experts in the industry.

To request a mentoring session, please visit score.org/find-mentor, email us at farmland@pafarmlink.org, or visit our website, pafarmlink.org/mentor/. The following organizations supported the development and launch of the PA Agriculture Mentor Program: Pennsylvania Department of Agriculture Horizon Farm Credit, Center for Dairy Excellence, Farm Progress, Pasa, PA Farm Link, Penn State Extension, and SCORE. For further information contact Darlene Livingston at 717-705-2121 or daliving@pafarmlink.org.

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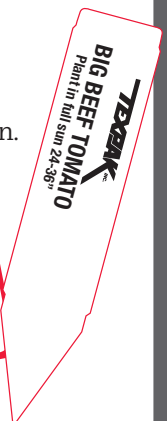
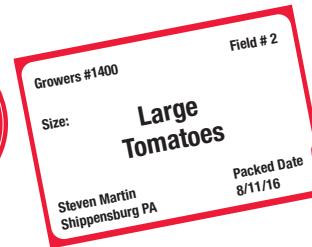
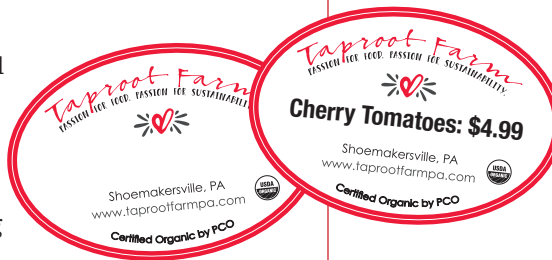
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Color labels enhance your brand and instill confidence in your customers. For over three decades Texpak has been making both fully pre-printed and partially pre-printed labels for our customers, helping them add branding to their products and differentiate themselves from the competition.

In addition to labels, Texpak offers a large variety of pot stakes and other horticulture labeling supplies, all of which can be run through an inexpensive thermal transfer printer. These supplies can be used for everything from FSMA labels to product/species identification.

Our most common label solution is the partially pre-printed label. For this type of label, we will pre-print your logo and any other branding information on part of the label, leaving a section blank for you to run through our printer. This allows you to have only one label that can be used on all your products.



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VEGETABLE PRODUCTION

What is Cleaning and What is Sanitizing?

Carol Allen

We recently attended a day-long symposium on cleaning and sanitizing. Famers and producers nationwide seem to have the most confusion about this aspect of produce safety.

As we visit farms, we find a wide interpretation of just what is cleaned and sanitized. At some operations we find picking bins, truck beds, and tractor tires simply power washed with water. Perhaps an application of sanitizer might be made after that.

Other farms spray surfaces with sanitizer and call it done. Sometimes the packing table is hosed down after it is sprayed with dilute detergent.

In each of the above cases, effective cleaning and sanitizing was not performed.

Cleaning is the removal of dirt and grime. Cleaning comes first. The dirt could be a combination of organic debris, plant proteins, oils, and field soil. Those materials can build up in corners, rough weld joints, rollers and brushes on grading machines, and in the surface cracks of picking bins.

Power washing is not going to do a good enough job and has the potential to spread debris and pathogens into other areas. (Watch this video, https://www.youtube.com/watch?v=_mV9vc0lycY)

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

As you think about the machinery in your operation that come

in contact with covered produce, just how easily can it be cleaned? Chris Callahan of the University of Vermont and Betsy Bihn of Cornell University created an on-farm hygienic design checklist for farm machinery (<https://blog.uvm.edu/cwcallah/files/2020/02/CHECKLIST-Excel-Sheet-Checklist-On-Farm-Hygienic-Design-Review-Checklist-v2.0.pdf>). This checklist can help the farmer take a good look at the worst of the machinery cleaning challenges. It is also invaluable for looking at the machinery being considered for purchase.

The correct procedure is as follows: First, loose debris is removed either through brushing or hosing off the surface. Next, an appropriate detergent is applied, and the surface is thoroughly scrubbed with an abrasive tool.



Photo credit, Angela Ferelli

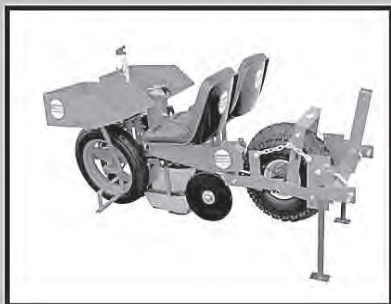
Make sure the detergent is appropriate for the surfaces on which it will be used and for the soil it is formulated to remove. Make sure it is safe for food contact surfaces.

Cleaning and sanitizing procedures are best when demonstrated as a part of worker training. Back the demonstration up with a written SOP (Standard Operating Procedure) and signage.

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

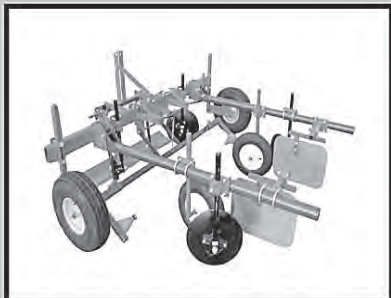
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VEGETABLE PRODUCTION

What is Cleaning and What is Sanitizing? *continued from page 10*

The take-away message is that a surface must be cleaned before it can be effectively sanitized.

To review the process of preparing a work surface for produce contact:

- Remove any gross debris by brushing or rinsing as the surface may have bits of leaves, field soil or other organic debris clinging to it.
- Apply the detergent of your choice. Generally, any detergent that is safe for kitchen use will be safe in this application. Also make sure it is appropriate for the type of soil and the type of surface being cleaned.
- Using a dedicated brush, scrub the surface creating a foaming lather. Be sure to get into all crevices, around lumpy welds, and any other part of the area that is porous or textured, and might harbor dirt and pathogens. Rollers and brushes may require special tools to fully remove debris and be thoroughly cleaned.
- Rinse completely. Make sure the rinsed debris will not contaminate any other nearby food contact surface.



Lumpy welding joints can be areas of harborage. Photo credit, Audra Bissett

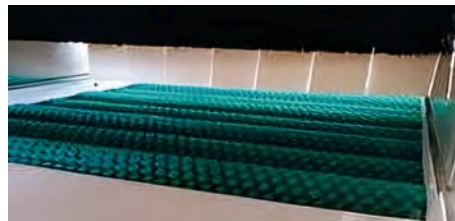
- Now the sanitizer of choice can be applied.
- Allow the full contact time for the sanitizer to work.
- Allow the surface to dry before using.
- Record your successful cleaning and sanitizing event!

But, which sanitizer to use? The Produce Safety Alliance provides an excellent factsheet (<https://resources.producesafetyalliance.cornell.edu/>

documents/Sanitizer-Factsheet.pdf) and an interactive spreadsheet (Note, this is an interactive Excel spreadsheet. The link will download to your task bar. When opened, it is full of really good information on a wide variety of sanitizers).

Be sure to mix the sanitizer of choice to the correct dilution according to the label directions. The label is the law! This activity would benefit from a written SOP as well as a worker training demonstration.

Most dilute sanitizers will lose effectiveness over time. Check and make sure sanitizer solutions are mixed fresh before use and are not left over from a previous day's work.



Lumpy welding joints can be areas of harborage. Photo credit, Audra Bissett

Make sure all of your SOPs and worker training events for cleaning and sanitizing are complete and up to date. Observe

workers to make sure the SOPs are being implemented.

Also mentioned above was the concept of on-farm hygienic design for farm machinery. The University of Vermont has provided an excellent factsheet to guide the farmer through the purpose of hygienic design and the impacts it can have on produce safety. <https://blog.uvm.edu/cwcallah/files/2020/02/FACTSHEET-UVM-Ext-Hygienic-Design-for-Produce-Farms-Fact-Sheet-v2.0-only-fact-sheet.pdf>

Ms. Allen is with the Univ. of Maryland Plant Science Dept. From the *Food Safety Newsletter for Maryland Farmers*, Univ. of Maryland Ext., June 12 and 19, 2023.

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VEGETABLE PRODUCTION

Phytophthora and Pythium Control During Wet Weather

Most of New Jersey [and some of Pennsylvania] has finally gotten some significant rain after many weeks of dry weather making current conditions ideal for pathogens such as Phytophthora and Pythium. Unfortunately, Pythium and Phytophthora blight can be found on most farms in the southern part of the state. Poor crop rotations with susceptible hosts only make matters worse. The Phytophthora pathogen has an increasing host range that now includes snap and lima beans; and all crops, other than a few resistant bell pepper cultivars, lack any resistance to the pathogen.

Control of Phytophthora blight and Pythium are extremely difficult (even with the use of fungicides) in the wet weather conditions. In the past few years a number of new fungicides, with new active ingredients, have become commercially-available for use on multiple crops. Mefenoxam or metalaxyl, both once widely-used to effectively control Phytophthora blight has been hit by resistance issues around much of Southern New Jersey the past decade. Growers with a known history of mefenoxam-insensitivity on their farm should use Presidio, Previcur Flex, or Ranman plus a Phosphite fungicide in rotation in their drip application programs. Importantly, if mefenoxam has not been used in particular fields on any crop for a number of years (more than 5+) the fungus may revert back to being mefenoxam-sensitive and control with these products may return. Mefenoxam, metalaxyl, Previcur Flex, and the phosphites are the most systemic of the group and should readily be taken up by the plant via application through the drip. Presidio has locally systemic and has translaminar activity and should offer some protection of the root system via drip. Ranman has protectant activity and thus will offer some root protection where it comes into contact with. Orondis Gold (oxathiapiprolin + mefenoxam, 49 +4) is the newest fungicide available with a new active ingredient in a new FRAC group. Additionally, in past research trials, mefenoxam, Orondis Gold, Presidio, Previcur Flex, Ranman, Revus and the phosphites in rotation and/or tank mixes have offered very good control of the fruit rot phase of phytophthora blight.

Recommendations

mefenoxam—1.0 pt Ridomil Gold 4SL/A or 1.0 qt Ultra Flourish 2E/A or metalaxyl (MetaStar)—4.0-8.0 pt 2E/A at transplanting via drip and 30 days later.

Orondis Gold (oxathiapiprolin + mefenoxam, 49 +4) at 4.8 to 9.6 fl oz/A 1.67S at transplanting and 30 days after. If applied as drip application it can not be applied as a foliar.

Presidio (fluopicolide, 43) at 3.0-4.0 fl. oz 4SC/A at transplanting via drip and in rotation.

Ranman (cyazofamid, 21) at 2.75 fl oz 400SC at transplanting via drip and in rotation. (Ranman can be added to transplant water, see label for specific crop uses)

Previcur Flex (propamocarb HCL, 28) at 1.2 pt/A 6F at transplanting via drip or directed spray at base of plant. (Previcur Flex can be added to transplant water, see label for specific crop uses). Use in rotation.

Phosphite materials (FRAC code 33) such as Rampart, ProPhyt, or K-Khite may also be tank mixed with one of the above to help suppress Phytophthora blight.

If mefenoxam-insensitivity is present, only use Presidio, Previcur Flex, Ranman, Revus, and/or phosphite fungicides. For more information on these fungicides and specific crop use please see the 2022/2023 Mid-Atlantic Commercial Vegetable Production Recommendations Guide.

Recommendations for Organic Growers

Applications of Double Nickel (*Bacillus amyloliquefaciens*) or Regalia (Extract of *Reynoutria sachalinensis*) as drenches or via the drip system prior to the onset of disease may help suppress phytophthora and pythium development. Other biopesticides, such as those containing *Trichoderma* spp. or *Streptomyces* spp.

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Fertilize strawberries and brambles after the last harvest with Berry Mix 4-2-4 one time between July-September before you mulch the plants. The fertilizer will be more readily available to the plant roots if allowed to be absorbed directly into the soil while protected by the mulch. For strawberries, after harvest apply 8-10 lbs per 100 row ft. For brambles, apply 6 lbs per 100 row ft.

Holly Care 4-6-4

For blueberries especially, between July-September we recommend a one time application of Holly Care 4-6-4 to provide a high phosphorus fertilizer with sulfur to give plenty of time for the roots to absorb them. Apply 10 lbs. per 100 row foot. Can also be used on hollies, dogwoods, gardenias, marigolds, rhododendrons, azaleas, ferns, hydrangeas and all other acid loving plants.

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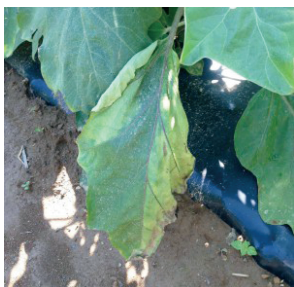
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VEGETABLE PRODUCTION

Diagnosing Verticillium Wilt in Eggplant

Andrew Wyenandt

Verticillium wilt has been reported in eggplant this summer. It is a common soil-borne fungal pathogen that once it has infested soil can remain for a very long time. Verticillium wilt is caused by either *Verticillium albo-atrum* or *Verticillium dahlia* and has a wide host range (over 200 plant species). Both pathogens can survive (overwinter) as microsclerotia in the soil. Verticillium wilt prefers cooler weather and drier soils and can be more severe in neutral to alkaline soils. Solanaceous weeds such as Nightshade may harbor the pathogen.



Diagnostic symptoms of Verticillium wilt in eggplant
Photo by Kris Holmstrom

Symptoms can vary between hosts, but on eggplant the leaves of infected plants will typically become lopsided where one side of the leaf will wilt and stop expanding while the other side continues to develop. Vascular tissue near the soil line will become discolored. Eventually the entire plant will collapse as the vascular tissue becomes more infected (clogged) and water movement up the plant stops.

There is no resistance to verticillium wilt in eggplant and no effective fungicide control options so long crop rotations with non-susceptible crops are critically important. Some cultivars, such as 'Classic' and 'Epic' may maintain yield in infested fields.

Dr. Wyenandt is Extension Specialist in Vegetable Pathology at Rutgers Univ. From **Plant and Pest Advisory**, Rutgers Coop. Extension, <https://plant-pest-advisory.rutgers.edu/verticillium-wilt-in-eggplant-2-2-2/>, August 3, 2023

Phytophthora and Pythium Control During Wet Weather

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can also be used to help suppress these pathogens.

Losses Become High?

If Phytophthora losses become high because of the heavy rains, pre-emptive cultural practices need be taken immediately. Roguing out, disking under, or hitting areas with gramoxone to burn infected plants down will help slow down and reduce the spread of potential inoculum to healthier areas of the block or farm. If beds are chronically wet, plastic can be cut or completely removed to help soils dry out.

Dr. Wyenandt is Extension Specialist in Vegetable Pathology at Rutgers Univ. From **Plant and Pest Advisory**, Rutgers Coop. Extension, <https://plant-pest-advisory.rutgers.edu/phytophthora-control-during-wet-weather-3-3-2/>, July 5, 2023.

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Potassium and Vegetable Crops

Gordon Johnson

Currently, potassium fertilizer prices are about one third of the 2022 peak price. However, expect prices to rise in the future. This is because potassium deposits that are mined (largely in Canada and Russia/Belarus) are a finite resource. US deposits are much smaller and are diminishing and most of our potash comes from Canada. Even with high prices, vegetable growers should not limit potassium fertilization because of the effects on vegetable quality.

For vegetable growers, potassium (K) is a nutrient that is essential for quality, especially in fruiting vegetables. Research by Jerry Brust at the University of Maryland has shown the critical role that potassium plays in tomato fruit ripening and quality (see <https://sites.udel.edu/weepotassiumlycropupdate/?p=13902> for more information). My research has shown that potassium plays an important role in sugar levels in watermelons.

Potassium influences fruit quality through its effects on sugar accumu-

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VEGETABLE PRODUCTION

Potassium and Vegetable Crops *continued from page 17*

lation (soluble solid levels), acidity, size, appearance, and color. Fruiting vegetables such as cantaloupes, watermelons, and tomatoes have high potassium requirements as do fruit crops such as grapes, peaches, and strawberries. Potassium is critical for improving quality of fruits by maintaining desirable sugar to acid ratio and ripening of fruit and is the most important nutrient regulating the quality of fruits. Potassium is also required for high levels of production in legume vegetables such as beans, peas, and edamame.

Unlike nitrogen, phosphorus, calcium and magnesium, potassium does not form part of the structure of the plant and plant compounds; rather, the role of potassium is to regulate vital physiological functions such as carbon assimilation, translocation of proteins and sugars, water balance in plants, turgor pressure in plant cells, and root development. Potassium is involved in many other aspects of plant physiology such as activation of many enzymes, photosynthesis, respiration, and regulation of stomatal opening.

Often potassium deficiency in vegetables is found in soils testing high in potassium due to issues with potassium uptake, root function, and source-sink issues with fruits (high fruit demand). Potassium deficiency symptoms occur when plants cannot extract adequate potassium from the surface soil. Remember that the majority of vegetable root systems are located in the top

six inches of soil where the plant obtains much of its needed water. Inadequate potassium uptake can occur due to root restricting problems such as compaction and with reduced root function due to high soil temperatures, particularly in black plastic mulch. In addition, when the soil test potassium level is below optimum, potassium deficiencies will be likely. Grid sampling for soil nutrient evaluations has found that there is a large variability in soil test potassium levels. This means that certain areas of fields may be below critical potassium levels for good vegetable production.

Potassium uptake increases dramatically in vegetables during rapid vegetative growth just prior to flowering and during reproductive growth and uptake peaks just before flowering begins. A deficit of potassium during the late vegetative stage or during the reproductive

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Potassium deficiency on cucumber leaves. Deficiency symptoms begin as yellowing of leaf edges on oldest leaves. As potassium is mobilized from older leaves and moved into growing points, symptoms will progress and necrotic areas will develop.

Tomato Spotted Wilt Virus

Kim Leonberger and Nicole Gauthier

Tomato spotted wilt virus (TSWV) can impact numerous vegetable crops in Kentucky. Beans, cucumbers, eggplants, lettuces, peppers, potatoes, and tomatoes, in addition to more than 150 other plant species, may become infected. Homegrown and commercial vegetables may become diseased, with plants produced in greenhouses and high tunnels often being more severely affected. Once plants become infected, no management strategies are available, thus preventative measures are critical to avoid losses.

Tomato Spotted Wilt Virus Facts

Symptoms may vary depending on the plant species affected. However, common symptoms include ringspots (Figure 1), lesions, bronzing, stunting, and wilting. Leaves and stems may show damage. Fruit also becomes infected, and may exhibit mottling (Figure 2), ringspots, and irregular growth. While only portions of plants may show symptoms, all plant parts are infected, including those that appear free of disease.

TSWV is transmitted by multiple species of thrips, which introduce virus particles during feeding. Symptoms may not develop for

2 to 4 weeks after feeding has occurred.

Tomato spotted wilt virus is caused by a viral pathogen.

Management

Identification of TSWV is challenging. If TSWV is suspected, please contact a local county Extension office for additional information and guidance on sample submission and disease identification.

There are no chemical management options for virus diseases, including TSWV. Infected plants should be removed immediately and destroyed. Preventative practices are critical to limit infection and spread.

- Purchase certified disease-free seeds or transplants.
- Utilize disease resistant cultivars.
- Manage weeds in and near plantings.
- Manage thrips populations to limit the potential for disease introduction.
- Remove and destroy infected plants (roots, stems, leaves, flowers, fruit) once disease has been confirmed.

Additional Resources

- IPM Scouting Guide for Common Problems of High Tunnel and Greenhouse Crops in Kentucky (ID-235), <http://www2.ca.uky.edu/agcomm/pubs/ID/ID235/ID235.pdf>
- IPM Scouting Guide for Common Problems of Solanaceous Crops in Kentucky (ID-172), <http://www2.ca.uky.edu/agcomm/pubs/id/id172/id172.pdf>

Ms. Leonberger is a Plant Pathology Extension Associate, and Dr. Gauthier is a Plant Pathology Extension Specialist at the Univ. of Kentucky. From the Kentucky Pest News, Univ. of Kentucky, <https://kentuckypestnews.wordpress.com/2023/06/27/tomato-spotted-wilt-virus/>, June 27, 2023.



Figure 1: TSWV infected plants may exhibit a variety of symptoms, including ringspots on leaves. (Photo: Paul Bachi, UK)



Figure 2: Fruit of TSWV infected plants may exhibit mottling. (Photo: Paul Bachi, UK)

VEGETABLE PRODUCTION

Abiotic Disorders of Tomato

Field tomato season has begun, and high tunnel tomato harvest is already well underway. Now is the time to make sure you're providing tomatoes with sufficient nutrients and consistent water to avoid some of the disorders described in this article. All of the disorders described in this article are abiotic, meaning they are not caused by living pathogens but instead by environmental factors. In many cases, the answer to avoiding these disorders is proper fertility and consistent irrigation.



Blossom end rot, with *Alternaria alternata* sporulation.
Photo: D. Langstons, Univ. of GA, Bugwood.org

Blossom end rot is characterized by dark brown or black sunken areas at the blossom end of the fruit. The lesions are a direct result of a localized calcium deficiency at the blossom end. The dead tissue is initially brown or white and leathery but often becomes colonized by the saprophytic fungus *Alternaria alternata*.

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VEGETABLE PRODUCTION

Abiotic Disorders of Tomato *continued from page 19*

ta, which only infects dead tissue and produces fuzzy black sporulation. Although calcium deficiencies in the soil are sometimes responsible for blossom end rot, much of the time, blossom end rot is the result of plant water stress. When temperatures increase, so does water demand, and developing fruits have high calcium demand. Calcium is taken up primarily through the water-conducting tissues of the plant, so when the soil is dry, or overly saturated, or the plant's roots are compromised and the plant isn't taking up water, calcium deficiencies develop. The blossom end of the fruit is the last to accumulate calcium, so this is where deficiencies appear. Signs of blossom end rot typically appear two weeks after the deficiency in the plant has occurred.

Blossom end rot can be prevented by regular watering to avoid extreme fluctuations in soil moisture. In high tunnel tomatoes, it is recommended to use more than one drip line per bed to ensure that the entire extensive root system is able to supply sufficient water to the lush foliage. Be careful to avoid overwatering, though, as this can lead to root rots or other physiological disorders. Use of soil moisture monitors can help dial in watering needs. High soluble salts, low calcium, and high cation (potassium, magnesium or ammonium) levels in the soil may also contribute to blossom end rot; other cations may out-compete calcium on soil exchange sites, making it unavailable to the plant. Management: Plant into sites with good soil drainage. Use plastic or other mulch to maintain soil moisture. Avoid aggressive cultivation that damages crop roots. Maintain sufficient, even soil moisture. Use soil nutrient testing to monitor soil soluble salts and cation ratios and maintain adequate calcium in the soil.



Tomato Leaf Roll

Leaf roll is usually a reaction by the plant to conserve water by reducing the surface area exposed to solar radiation. This disorder is often seen just after plants are heavily pruned under dry soil conditions, but oddly enough, leaf roll disorder also has been found to be caused by excess soil moisture coupled with extended high temperatures. If the tomato plant's foliar growth is more vigorous than root growth and we are hit with a hot, dry period, the foliage may transpire water faster than the root system can absorb it from the soil, and the plant's reaction is to roll its leaves up to reduce transpiration. This disorder primarily affects lower leaves. Leaf rolling can also result from growing high-yielding cultivars under high-nitrogen fertility programs. Cultivars selected for high yield or early ripening tend to be the most susceptible and indeterminate cultivars are more sensitive than determinate. The good news is that leaf roll rarely affects plant growth, fruit yield, or fruit quality. Some viruses can look similar to tomato leaf roll, but if the symptoms appear suddenly, involve many of the plants in a field, and largely affects lower leaves, it is probably just physiological leaf roll. Management: Reduce symptoms by maintaining consistent, adequate soil moisture (~1 inch per week during the growing season, which will also help with calcium uptake, reducing blossom end rot incidence). Do not prune heavily during hot, dry conditions or over-fertilize with nitrogen.

Catfacing: Tomatoes are considered "catfaced" if the blossom scar is enlarged or perforated. This can happen to both field and greenhouse tomatoes and is more common in heirloom cultivars. Varieties with rounder and larger fruit may be more susceptible. Often, the fruit becomes extremely misshapen, but fruit distortion is not necessary to classify it as catfaced. This disorder has



Catfacing in heirloom tomatoes.
Photo: K. Campbell-Nelson

not been extensively researched and is still not fully understood. Cold temperatures during flowering have been shown to increase incidence of catfacing, as have extreme fluctuations in night versus day temperatures. Damage from thrips to the side of the pistil of tomato flowers can also cause this disorder, and under some conditions, pruning and high nitrogen levels can increase catfacing incidence. Catfacing can increase the chances of fruit



Stitching/zippering.
Photo: J. Howell

becoming infected via the rough blossom scar by black mold rot, a disease caused by several different fungi. Management: Avoid excessive pruning and nitrogen fertilization. Avoid low greenhouse temperatures for both greenhouse tomatoes and transplants. Use cultivars that are less prone to catfacing. Remove catfaced fruit so they don't drain plant nutrients.

Stitching/Zippering

is the term for when a thin, brown, necrotic scar extends from the stem to the blossom end on fruit. The longitudinal scar has small transverse scars along it, making it resemble a zipper or seam. Fruit can have one or several scars. This disorder is purely cosmetic and does not affect the edibility of the fruit but may render fruit unmarketable. Zippering is caused by anthers (the pollen-producing flower part) fused to the ovary wall of newly forming fruit. This disorder occurs more frequently in cool weather. Management: Plant cultivars that are less susceptible to stitching/zippering. Avoid low greenhouse temperatures.



Radial cracking (top) and small concentric cracks (bottom).
Photos: G. Johnson and G. Higgins

VEGETABLE PRODUCTION

Abiotic Disorders of Tomato *continued from page 20*

Fruit cracking can occur in several different patterns – radial cracks starting at the stem scar, concentric cracks circling the fruit shoulders, small cracks around the shoulders called “rain checking”. These cracks are caused by excessive water uptake by the plant during fruit development, when interior tissues expand faster than the inflexible skin. High temperatures can make fruits more susceptible to cracking, and cultivars with large fruit tend to be more susceptible. Opportunistic fungi and bacteria can enter the fruit through cracks and cause fruit rots. Management: Provide even irrigation and plant cultivars with smaller fruit that are less susceptible to cracking.



Yellow shoulder.
Photo: G. Higgins

Yellow shoulder is commonly caused by potassium deficiency in tomatoes. Recent surveying by several New England state Extensions has shown that tomatoes, especially high tunnel tomatoes, have very high potassium requirements and crops tend to be deficient. Nutrient recommendations for high tunnel tomatoes have been overhauled in the current edition of the New England Vegetable

Management Guide. Current recommendations advise growers to fertilize based on the potential yield of your crop (with indeterminate, disease-resistant cultivars planted early into heated tunnels expected to yield more than heirloom or determinate cultivars planted later). One recommendation for K fertility in high

tunnel tomatoes is to apply ¼ lb of K/1000 ft² through the drip every week for 10 weeks, using potassium sulfate fines. In both the field and high tunnels, the following factors can also lead to K deficiency in tomatoes: waterlogged and/or compacted soils, above-optimal nitrogen application rates, excessive application of potassium competitors, and excessively large or dense canopies. Some cultivars, including those with green shoulders that lack the uniform ripening gene, are also more prone to developing yellow shoulder than others. High temperatures and sun can also cause this disorder, both by directly damaging fruit tissue and by inducing water stress that can limit the uptake of K.

Blotchy ripening, gray wall, and internal whitening: These three disorders are not well-understood and tend to be confused with each other. Blotchy ripening is characterized by yellow or orange discolored areas on tomato fruit surfaces. Tomatoes with gray wall have grayish-brown discolorations on the fruit wall and may also exhibit internal browning. Gray wall typically appears on green fruit before ripening. ‘Gray wall’ is the term used when the outer fruit walls turn brown or gray and collapse, compared to ‘internal whitening’, which refers to when the outer and inner fruit walls become white and corky. Factors that increase the severity of these disorders include cloudy weather, wet and cool conditions, high nitrogen, low potassium, and compacted soils. Good irrigation and nutrient management will reduce the risk of these disorders.

Ripening disorders, including yellow shoulder, blotchy ripening, gray wall, and internal whitening, are most prevalent when air temperatures during mid-late stages of fruit ripening are extreme (e.g., below 60°F and/or above 90°F) or highly variable, when humidity levels remain high, and/or when these conditions prevail and light levels are low. Unfortunately, these are not uncommon conditions in New England and are largely out of our control. To-


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VEGETABLE PRODUCTION

Abiotic Disorders of Tomato *continued from page 21*

mato mosaic virus can cause similar symptoms of uneven fruit ripening and should be ruled out as the underlying cause.

Jerry Brust, IPM Vegetable Specialist at the University of Maryland, researches the management of abiotic disorders in tomato; he recommends using white plastic mulch laid early in the season to keep the crop cooler and using shade cloth on your most marketable cultivars. In over 5 years of trials, Brust's research has shown that a 30% filtering shade cloth increases marketable yields by 20-50%, depending on the year. A 4 ft-wide shade cloth covering even a quarter of the crop canopy is sufficient to achieve this increase in yield, and the cloths may be used for many years.

These disorders are irreversible in fruit that are already symptomatic, but changes to fertility and irrigation can prevent the disorder from affecting younger fruit. Take measures now to ensure that your tomatoes are receiving sufficient and consistent water and nutrients and take note of any abiotic disorders that occur this year to make changes to your fertility and irrigation plan for next year.

Sources:

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Compiled by the Univ. of Massachusetts Extension Vegetable Program. From the Vegetable Notes for Vegetable Farmers in Mass., Univ. of Mass. Extension, Vol. 35, No. 9, June 15, 2023.

Some Heat-Related Disorders in Brassicas

Brassica crops like cool temperatures and struggle in the heat. There are several heat-related disorders of brassicas that can be hard to avoid when growing these crops through the hottest part of the summer. For this reason, many growers limit most of their brassica production to early summer and fall. If you can manage to grow high quality broccoli or cauliflower through the heat of the summer, it is often well worth it; prices for these crops can spike when supply is low, and having fields to harvest year-round will give you the opportunity to capture a good price. This article includes descriptions of a few heat-related disorders that you might see in your brassica crops and some strategies for avoiding them.

First some background information: Plants take up nutrients through their roots. Some nutrients, including calcium (Ca), are then passively transported throughout the plant via the plant's water-conducting vessels (xylem). Water is pulled up through the plant during transpiration—the process of water evaporating out of stomata in the plant's leaves. If water is not moving through a plant, due to root injury, high heat or cloudy weather causing stomata to close, or dry soils, the plant's ability to take up and translocate nutrients is reduced. Even if soil nutrient levels are sufficient, heat or moisture stress can inhibit a plant's ability to take up those nutrients. This is how heat and moisture stress can lead to brassica disorders like head rot, brown beading, and tip burn, which are all caused by Ca deficiencies, or hollow stem, which is caused by boron (B) deficiency.

Head Rot and Brown Beading in Broccoli

Head rot and brown beading are both results of flower buds aborting due to Ca deficiency. Head rot results when bacteria invade aborted buds under wet conditions, while brown beading results from individual flower buds aborting under dry conditions. Excess nitrogen and extended periods of wet or dry conditions during warm temperatures give rise to rapid plant growth. Calcium uptake is diminished due to poor transpiration rates in the plants.

Research done by Thomas Bjorkman at Cornell University, using the cultivar 'Galaxy', showed that the critical period for heat sensitivity in broccoli only lasts for roughly ten days. This 'window' of sensitivity corresponds to the time when the growing tip



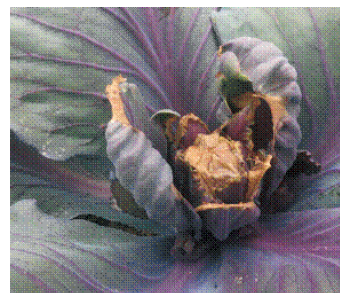
Brown beading



Head rot.

shifts from vegetative growth to flower bud initiation. This period of about 10 days begins just before a tiny crown is visible in the center of the plant. Temperatures above 36°C (85°F) for more than four days during that period causes uneven bud development, resulting in heads that are uneven and poorly shaped, and leading to head rot and brown beading. Other extension resources put the upper limit for growing high quality broccoli at about 85°F.

One way to avoid head rot and brown beading in broccoli is to grow several varieties that mature at slightly different times. This way, if your broccoli experiences high heat, you're likely to have some varieties that are not within their window of sensitivity during the heat wave, and you will not experience a total crop loss.



Tip burn on cabbage. Photos: G. Higgins, J. Howell

VEGETABLE PRODUCTION

Some Heat-Related Disorders in Brassicas *continued from page 22*

Tip burn

Tip burn is the result of Ca deficiency in brassica leaves. Margins of inner leaves turn brown, beginning at the hydathodes (structures in the leaf tip or margin that excrete excess water), and later desiccate to become thin and papery at the margin or over large portions of the leaf. The affected tissue may turn dark brown to black, occasionally being invaded by secondary bacteria that cause a watery soft rot. In cauliflower, internal leaves turn brown and fold over the developing curds. When secondary microorganisms attack these leaves, they become a mushy smear over the curd and make the head unmarketable. During the day, Ca moves with the transpiration stream to the outside leafy parts of the plant, which are actively transpiring on sunny days. On cool nights, transpiration is reduced and water movement generated by the roots is directed to the inner part of the plant and those tissues are supplied with Ca. However, on warm, dry nights, the

outer leaves continue to transpire and Ca continues to be sent to the outer leaves. Once Ca is fixed by the outer leaves, it cannot be translocated to the interior of the plant, resulting in Ca deficiencies in the center of the plant.



Boron deficiency in cauliflowerer. Photo: J. Howell

Hollow Stem

Hollow stem occurs in both heading and root brassica crops and is often not noticeable until harvest. Broccoli, cabbage,

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VEGETABLE PRODUCTION

Some Heat-Related Disorders in Brassicas *continued from page 23*

cauliflower, turnip, and rutabaga are especially sensitive to hollow stem development. This disorder can be caused by boron (B) deficiency and can be exacerbated by heat, rapid growing conditions, and soil pH above 7. Chlorotic younger leaves or rosette die-back can be a sign of B deficiency and hollow stem. Excess moisture leaches B out of the soil, while low moisture inhibits soluble B uptake and causes poor root development. Excess Ca, K, or Zn have also been shown to outcompete B in plant uptake. Other causes include excess ni-trogen fertilizer, imbalance of nitrogen and boron, or rapid growth after head initiation. High P levels in soil have been shown to increase B uptake. There are cultivar differences in B sensitivity.

Management:

- Provide even and adequate soil moisture.
- Limit head rot in broccoli by using drip irrigation instead of overhead to limit the amount of water that sits on heads.
- Variety selection: Choose heat tolerant varieties and varieties resistant to tip burn and hollow stem. Varieties that grow less vigorously are less susceptible to tip burn. These characteristics are usually included in variety descriptions in seed catalogs. The Eastern Broccoli project is a collaboration of several universities, government agencies, and private companies researching ways to increase broccoli production on the East Coast—see the project's website for a list of varieties that have performed well for late summer harvest.

Nutrient management:

- Avoid excess fertility. Excess nutrients, especially N, can promote rapid plant growth; tissues that cannot take up

nutrients quickly enough will display deficiencies.

- Maintain a phosphorous to potassium ratio of 1:1.
- Avoid using urea, ammonium nitrate, or calcium ammonium nitrate fertilizer. Both ammonium and Ca are 2+ cations and ammonium will out-compete Ca for uptake in the plant. Calcium nitrate is more expensive but the N is all in nitrate anion form, which will not compete with Ca for uptake. Use greenhouse grade calcium nitrate if applying through drip to avoid clogging lines.
- It is not necessary to apply supplemental Ca when soil levels are already sufficient.
- Avoid sidedressing brassica crops after head development begins.
- If soil tests show that soil boron levels are below 3 ppm, apply 3 lbs/A boron for broccoli and cauliflower or 2 lbs/A for cabbage, prior to planting. The best method for applying this small amount of boron is as a fertilizer additive or as a diluted spray.
- Harvest crops when mature; do not try to hold crops in the field if they are starting to show signs of these disorders.
- Avoid aggressive cultivation that could harm roots, which limits water and nutrient uptake.

*Compiled by the Univ. of Massachusetts Extension Vegetable Program, updated 2023. From the **Vegetable Notes for Vegetable Farmers in Mass.**, Univ. of Mass. Extension, Vol. 35, No. 12, July 6, 2023.*

Bacterial Wilt of Cucurbits

Bacterial wilt of cucurbit crops is a common issue for commercial producers in Kentucky. Cucumbers and muskmelon (cantaloupe) are highly susceptible to bacterial wilt, while squash and pumpkin are less susceptible. Watermelon is known to be resistant to bacterial wilt. Infected plants quickly collapse, resulting in crop loss. Preventative practices are critical for avoiding yield loss.

Bacterial Wilt Facts

Symptoms often first appear as dull green, wilted leaves or groups of leaves (Figure 1). Over time, wilting becomes prominent throughout the plant; collapsed foliage and vines turn brown, shrivel, and die (Figure 2).

Field diagnosis can be conducted using a simple “bacterial ooze test.” For cucumber and muskmelon, select a wilted vine (not dead), and using a sharp knife, make a cut through the vine. Touch the cut ends together for 3 to 5 seconds and then slowly pull them apart, looking for fine thread-like strands of bacterial ooze connecting the two parts (Figure 3). To diagnose bacterial wilt in all cucurbits, including squash and pumpkin, place cut pieces of affected vines into a clear glass container filled with water. When disease is present, a cloudy string or mass of bacterial ooze will flow into the water from cut stem pieces (Figure 4).

Striped and spotted cucumber beetles transmit the bacterial pathogen during feeding (Figure 5). The pathogen overwinters in the gut of these vectors.

Spring temperatures above 55°F promote growth of cucurbit seedlings, as well as striped and spotted cucumber beetle feeding on all plant parts.

Bacterial wilt is caused by the bacterial pathogen *Erwinia tracheiphila*.



Figure 1: Initial symptoms include dull green, wilted leaves. (Photo: William Nesmith, UK)

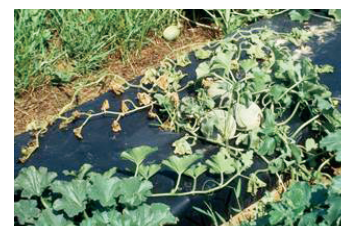


Figure 2: Infected plants eventually collapse with vines becoming brown and shriveled. (Photo: Edward Sikora, Auburn University, Bugwood.org)



Figure 3: In cucumber and muskmelon, diagnosis in the field can be conducted by cutting a symptomatic vine, touching the two end together, pulling them apart, and looking for the presence of thread-link strands connecting the pieces. (Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org)

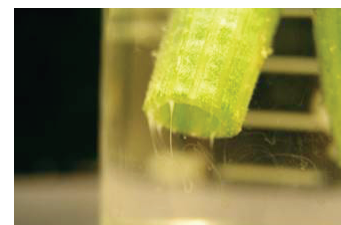


Figure 4: Diagnosis of bacterial wilt in cucurbits, including squash and pumpkins can be achieved by placing a cut stem in water inside of a glass jar. The appearance of a cloudy mass or string indicates presence of bacteria. (Photo: Bruce Watt, University of Maine, Bugwood.org)

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VEGETABLE PRODUCTION

Bacterial Wilt of Cucurbits

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Management

Once plants become infected with bacterial wilt, no disease management practices are effective. Preventative strategies should be used to limit introductions and spread of disease.

- Select resistant or tolerant cultivars.
- Rotate crops away from cucurbits for a minimum of 2 years.
- Manage weeds.
- An insecticide management program should be implemented as soon as seedlings emerge or after transplanting. An effective program should include one or more of the following.
- Contact or systemic insecticides
- Trap cropping
- Physical barriers and mulches
- Remove and destroy infected plants.



Figure 5: Striped (left) and spotted (right) cucumber beetles transmit bacterial wilt during feeding. (Photo: Ric Bessin, UK)

Ms. Leonberger is a Plant Pathology Extension Associate, and Dr. Gauthier is a Plant Pathology Extension Specialist at the Univ. of Kentucky. From the Kentucky Pest News, Univ. of Kentucky, <https://kentuckypestnews.wordpress.com/2023/06/27/bacterial-wilt-of-cucurbits/>, June 27, 2013.

Potassium and Vegetable Crops

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stages will be reflected quality problems in many vegetables.

Potassium is taken up by plants primarily through the process of diffusion rather than the process of mass flow (how nitrogen is taken up). The slow rate of diffusion and limited distance that potassium can move by diffusion means that potassium is not as easily available to crop plants as nitrogen. Deficiency symptoms appear first on the oldest leaves because potassium is mobile in plants. Because potassium is taken up by diffusion, symptoms often occur during drought periods or when irrigation has been limited.

To manage potassium in vegetable crops, the keys are to maintain high levels in soils, manage irrigation so that water deficits do not occur and potassium diffusion to roots is not interrupted, add additional potassium through fertigation or side dressing prior to flowering, and to consider foliar potassium additions during peak use periods in high demand crops.

Dr. Johnson is the retired Extension Vegetable & Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 12, June 16, 2023.



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BERRY PRODUCTION

Preparing for Pepper Anthracnose in 2023

Andrew Wyenandt



Pepper Anthracnose

Pepper anthracnose caused by *Colletotrichum* spp. has become a significant problem on some farms in southern New Jersey.

Unlike in tomato, where symptoms are only present in mature

(red) fruit, pepper anthracnose can infect pepper fruit at any growth stage. Currently, there are no commercially-available bell or non-bell peppers with known resistance to anthracnose. The pathogen overwinters, albeit, not very well on infected pepper fruit left in the field or on infected plant material at the end of the production season. Because pepper anthracnose does not overwinter very well, it always starts out as a 'hot spot' in the field and then fans out directionally with the prevailing direction of the wind and driving rain. Hot weather along isolated afternoon and evening showers are ideal conditions for anthracnose development.

On farms with a history of pepper anthracnose, precautions should be taken each year. The first, if possible, is to rotate away from those areas of the farm with anthracnose for as long as possible. Remember, it can survive (although not very well) in the soil for many years. Importantly, the same pathogens that cause tomato anthracnose and strawberry anthracnose are the same species that infect pepper, so rotating away from fields heavily used in tomato and/or strawberry production is extremely important. Fields need to be scouted as soon as fruit start to develop to locate 'hot spots'. If 'hot spots' are found, all fruit from the immediate and surrounding area need to be strip-picked (or entire plants can also be removed). Growers who have adopted this practice have had success in reducing their losses by reducing the inoculum pressure before the pathogen begins to fan out across the field. Overhead irrigation should not be used in fields with anthracnose problems.

Reducing the amount of inoculum in the field is critical for managing pepper anthracnose. Infected fruit left in the field during

and after the production season have the potential to act as a source of inoculum. Therefore, it is critically important to take the appropriate steps to help reduce that chance. During the season, all infected fruit need to be removed from the field. After harvesting, all fields should immediately mowed or hit with gramoxone. All plant debris should be thoroughly worked back into the soil so it can start to break down as quickly as possible. Abandoned fields with plants still standing going into the fall/winter only act as an increased source for inoculum. It's a misnomer to think that the cold winter weather will help breakdown and reduce inoculum found on infected plant material left on the soil surface. It's much better if infected plant material is worked back into the soil where other soil microorganisms can help with the process.

Fungicide programs do work for controlling pepper anthracnose. Fungicide programs should begin as soon as plants start to flower. The key to controlling anthracnose is to get the fungicide to where it is needed the most, on the developing fruit. Planting peppers in a single or double-row fashion may greatly affect your ability to control the disease. Your fertility program may also affect your ability to control the disease. Fertility programs high in N that promote tall, lush, dense canopies will greatly impact how much fungicide gets to where it needs to be. Growers should apply high rates of chlorothalonil or manzate in a weekly rotation; or tank mix either with azoxystrobin (11); Cabrio (pyraclostrobin, 11); Priaxor (fluxapyroxad + pyraclostrobin, 7 +11); Quadris Top (3 + 11); Aprovia Top (3 + 7); or Topguard (flutriafol + azoxystrobin, 3 + 11) with a high volume of water (50 gal/A +) to ensure adequate coverage. Organic growers need to be extremely diligent with proper crop rotations, regular scouting to detect 'hot spots' early and make sure to remove all potential sources of inoculum. Weekly OMRI-approved copper applications may help suppress anthracnose. Other organic products have shown little or no efficacy against pepper anthracnose.

For more information please see the 2022/2023 Mid-Atlantic Commercial Vegetable Production Recommendations Guide.

Dr. Wyenandt is Extension Specialist in Vegetable Pathology at Rutgers Univ. From **Plant and Pest Advisory**, Rutgers Coop. Extension, <https://plant-pest-advisory.rutgers.edu/controlling-pepper-anthracnose-2-2-2-2/>, July 3, 2023.

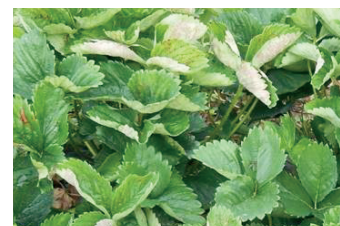
Current Issues in Pennsylvania Berries

Kathleen Demchak

Strawberry renovation season is ongoing or coming up for those carrying over matted-row or plasticulture plantings. This is one of the critical times to treat for cyclamen mites, which have been common this year. They've caused either bronzing and cracking of fruit as noted in the last update, and/or compressed plants with disfigured new leaves. These mites are very tiny. The photo below is of a new leaf that emerged from a strawberry crown and is about 3/16th of an inch wide at its base, i.e., already greatly magnified. There is a peach-colored speck in the center of the oval that is an adult cyclamen mite – nymphs are even smaller and clear in color. Several miticides are fairly effective if they can contact the mites, and therein lies the problem - it is extremely difficult to get the miticide into the crown. For this reason, a high-volume spray directed to the crown is needed at renovation after the old leaves are mowed off and just as the new ones are beginning to grow back. Agri-Mek and Portal have both shown good effectiveness in lab tests where they were in contact with the mites, but Agri-Mek has translaminar activity, so it can move into the plant tissue better while Portal must directly contact the mites.



Magnified petiole of leaf just emerging from the strawberry crown with an adult cyclamen mite barely visible in the oval. Photo: K. Demchak.



Powdery mildew on 'Galletta' strawberry. Photo: K. Demchak.

Powdery mildew had been noticed in some strawberry fields, but if the plants are being mowed for renovation, it is not worth treating right now. It is a different case with day-neutral strawberries, as fruit could be affected in addition to leaves, which develop purple splotches mainly around the edges and curl inwards. Fungicides that are effective on powdery mildew are different from the ones typically used to control other leaf spots and fruit-rotting dis-

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BERRY PRODUCTION

Current Issues in Pennsylvania Berries *continued from page 26*

ease, and are mostly in category 3 (Rally, Procure, Orbit, Tilt, etc.) or are specific powdery mildew fungicides like Quintec.

Spotted wing drosophila is out and about in PA now, and is ready to attack any ripening raspberries or blackberries - or any other small fruit crops, though brambles are its favorites. Use all cultural controls that you can, which means keeping fruit picked every day or every other day if possible, and removing any cull fruit from the field and bagging it so it doesn't become a breeding ground for more SWD. Refrigerate fruit as close to 32 degrees as possible right after picking. For brambles, effective materials that have a 1-day PHI are Delegate (group 5), Mustang Maxx (group 3A), and Exirel or Verderyn (both in group 28). Keep in mind that Mustang Maxx is a restricted-use insecticide. There are more options labeled for use on blueberries, and longer PHI's are less of an issue since they need to be harvested less frequently. More information on ratings of insecticides for spotted wing drosophila management can be found here: <https://swdmanagement.org/>



Parasitoid wasp inside of SWD pupal case just before emerging. The wasp emerges instead of an SWD fruit fly and will then attack other SWD larvae. Photo: K. Demchak.

[wp-content/uploads/2021/05/SWD-rankings-document-2021.pdf](https://www.psu.edu/wp-content/uploads/2021/05/SWD-rankings-document-2021.pdf). On a positive note, releases of *Ganaspis brasilienses*, a tiny wasp parasitoid for spotted wing drosophila management, are continuing, and last year, a second tiny parasitoid of SWD was found in many states including PA and appears to be establishing widely on its own.

Thrips are still around and have moved to bramble crops after causing problems in strawberries. They can cause a bronzing on bramble fruit, just like with strawberries. Sprays for SWD will assist in their control.

Warm wet conditions are likely to result in increasing anthracnose fruit rot disease pressure on day-neutral strawberries, so some protectant sprays of captan may be needed prior to rain events to keep this disease at bay.

One spotted lanternfly (SLF) nymph was found on blackberries in one location. This is the only report of SLF on blackberries in the state so far, perhaps because insecticides are often already being applied for SWD that would control SLF also. SLF is not expected to be a significant pest on berry crops; however, if more are seen in berries, please let your local extension educator know, or email K. Demchak at efz@psu.edu. For more info on identification of spotted lanternfly nymphs, see <https://extension.psu.edu/spotted-lanternfly-what-to-look-for>.

Ms. Demchak is with the Penn State Dept. of Plant Science. From Penn State Extension, <https://extension.psu.edu/2023-pa-vegetable-and-berry-current-issues-for-july-5>, July 5, 2023.

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BERRY PRODUCTION

Carrying Over Plasticulture Strawberries for a Second Year

The 2023 strawberry season is still going strong, and we have had a good season due largely to the cool, dry weather. As we look to later June, with annual strawberry production on plastic mulch, many growers may consider carrying the beds over for a second year's harvest. These are some guidelines for renovation of plasticulture strawberries:

- 1) Evaluate disease pressure. If the planting had significant anthracnose, botrytis crown rot, phytophthora, or identified viruses do not carry over the planting. In future variety selection, if carry over is desired, choose varieties with high disease resistance, particularly to anthracnose. For example, Sweet Charlie and Flavorfest have anthracnose resistance and can be carried over whereas Chandler does not and should not be carried over. Camino Real is intermediate in anthracnose susceptibility and may be carried over if anthracnose was well controlled.
- 2) Evaluate plastic mulch and drip lines. Do not carry over beds with deteriorated mulch or plugged drip systems.
- 3) If relatively disease free, mow the tops with a rotary mower (in smaller plantings this can be done with a line trimmer or with hand clippers). You want to leave some leaves. Do not damage the crown.
- 4) After mowing, remove any runners that are left by hand. Make any plastic mulch repairs and drip system repairs as necessary. Treat and flush drip lines as necessary.
- 5) Remove all dead plant material around the crowns. This can be done by hand or with a leaf blower. A fungicide treatment at this time might be warranted.
- 6) Evaluate crown thickness (number of crown plants). If over 4, crowns must be thinned out. This can be done by breaking off part of the crown by hand or by using an asparagus knife to cut away part of the crown. Leave a minimum of 2-3 crown plants.
- 7) Apply additional herbicides to row middles using a shielded sprayer to control weeds during the summer months. Hand weed holes during the summer if weeds emerge.
- 8) Maintain plant health by controlling diseases, insects, and mites throughout the summer months and irrigate regularly. A small amount of nitrogen fertilizer (20 lbs. N per acre) can be applied at this time if needed to maintain plant health.

Take leaf tissue samples to evaluate plant nutritional status.
9) In late August or early September, apply 60-60-60 (N, P2O5, K2O) through the drip system.

10) Replant any holes with missing plants by the middle of September.

Research has shown that with proper renovation and care, second year yields will be higher than the first year, but berry size will be smaller.

Renovating Day Neutral Plantings

Fall planted day neutral (repeat blooming) varieties such as Albion, Seascape, or San Andreas will often stop blooming in the heat of the summer. To extend bloom period, manage irrigation so plants have enough water (do not drop lower than 60 % of field capacity) in the hot period and apply 5-7 lbs. of nitrogen per acre every week and add other nutrients as indicated by tissue testing. Remove any runners that form. If crowns are crowded, thin as described above.

If production has ceased in day neutral fields (flowering often stops in mid-July), then renovate as described above but fertilize to stimulate new growth in early August to fruit again in the fall.

Carry over production of day neutral varieties to the next spring can be problematic because of the susceptibility of most varieties, such as 'Albion', to anthracnose. The variety 'Sweet Ann' may have more anthracnose resistance than other day neutral varieties.

Dr. Johnson is the retired Extension Vegetable & Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Univ. of Delaware Extension, Vol. 31, Issue 11, June 9, 2023.



G. Johnson, University of Delaware

Anthracnose is a major limiting factor in carry over of plasticulture strawberries.

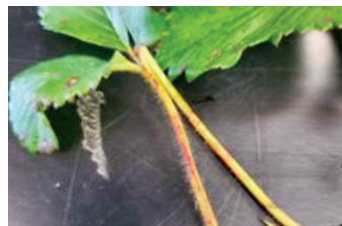
Identifying and Controlling Common Leaf Spot in Strawberry

Andrew Wyenandt

Strawberry leaf spot, caused by the soil-borne fungal pathogen, *Mycosphaerella fragariae*, can infect leaves, petioles, runners, fruit stalks (pedicels), and berry caps or calyxes. Small, dark purple to reddish-purple, round spots, 1/8 to 1/4 inch in diameter (3 to 6 millimeters), appear on the upper leaf surfaces. The center of the spots soon become tan or gray and eventually almost white, while the broad margins remain dark purple. Later in the season, dark specks (sclerotia and/or perithecia) may be seen in the older lesions. Tannish areas form on the undersides of infected leaves.



Strawberry leaf spot on infected leaves.



Symptoms of strawberry leaf spot on infected leaf petioles.

The symptoms on the other plant parts, except the fruit, are almost identical to those that develop on the upper leaf surface.

Microsclerotia and conidia from infected leaves that survive the winter can lead to infections of new growth in the spring. The period between infection and the appearance of lesions on the upper leaf surface can range from 10 to 14 days depending on weather conditions. Large numbers of conidia can cause secondary infections during prolonged periods of damp to wet, moderately warm weather. Temperatures between 65 and 75 F (18 to 24 C) are optimal for the growth of fungus and for lesion development. Infections can continue to occur throughout the growing season. Young, expanding leaves are much more susceptible to infection than mature leaves. If frequent rains occur during early- and mid-spring, a few infection sites can start an epidemic.

Control of strawberry leaf spot begins with recognizing symptoms and preventative fungicide applications. All strawberry fields need to be scouted on a regular basis. Especially, during periods of wet weather or during heavy use of overhead irrigation. Weekly applications rotating the following should be done as long as symptoms are present and weather conducive for disease development

continued on page 29

BERRY PRODUCTION

Identifying and Controlling Common Leaf Spot in Strawberry

continued from page 28

persists. For more information please see the 2022/2023 Mid-Atlantic Commercial Vegetable Recommendations Guide. Fungicide applications for strawberry leaf spot will be effective for strawberry leaf scorch and strawberry leaf blight.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
M04	Captan 50W	6.0 lb/A	captan	0	24	N
M04	Captan 80WDG	3.7 lb/A	captan	0	24	N
M04	Captan 4L	3.0 qt/A	captan	0	24	N
M04+17	Captevate 68WDG1	3.5 to 5.25 lb/A	captan + fenhexamid	0	24	N
Do not apply the same FRAC code more than twice in a row or in a season.						
1	Topsin M	1.0 lb/A	thiophanate-methyl	1	24	N
2	Meteor2	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Nevado 4F2	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Rovral 4F2	1.5 to 2.0 pt/A	iprodione	n/a	24	N
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
11	Cabrio 20EG	12 to 14 oz/A	pyraclostrobin	0	12	N
3 + 11	Quadris Top 1.67SC	12 to 14 fl oz/A	difenoconazole + azoxystrobin	0	12	—
3 + 11	Quilt Xcel 2.2SE	14 fl oz/A	propiconazole + azoxystrobin	0	12	N
7 + 11	Merivon 2.09SC	4 to 7 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 11	Pristine 38WG	18.5 to 23.0 oz/A	boscalid + pyraclostrobin	0	12	—

For organic strawberry growers, weekly applications of an OMRI-approved copper or potassium bicarbonate have been shown to be effective in mitigating strawberry leaf spot. Please see link to MSU's fungicide efficacy table for organic and conventional fungicide use.

*Dr. Wyenandt is the Rutgers Univ. Coop. Ext. Vegetable Pathologist. From the **Pest and Plant Advisory**, Rutgers Coop. Ext., <https://plant-pest-advisory.rutgers.edu/identifying-and-controlling-strawberry-leaf-spot-2-2-2/>, July 10, 2023.*



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BERRY PRODUCTION

Strawberry Flowering, Runner Formation and Temperature

So far, in 2023, the weather has been ideal for strawberry production. Strawberries produce best when daytime temperatures are in the 70's and nighttime temperatures are in the 50's. The cooler nighttime temperature promotes continued flower initiation, and the warm daytime temperature promotes fruit ripening.

In our region, commercial strawberries are grouped into two classes based on their flowering habit; those that flower and fruit mostly once in the spring and those that continue to flower and fruit as long as temperatures are moderate. Strawberries thrive in cooler weather and production is affected when temperatures are hot.

Short day or June-bearing has been used to describe plants which start to bloom in late winter and produce one fruit crop per spring. Day-neutral, long day, or repeat blooming have all been used to describe plants which flower multiple times and produce multiple crops over the course of the spring, cooler parts of the summer and fall.

Most of our commercial strawberries planted on Delmarva are June-bearing types. They start initiating flower buds after planting in the fall and begin flowering in late winter and spring as temperatures warm up. Flowering will continue until critical high temperatures are reached. This critical temperature at which flowering slows or ceases varies with the cultivar, but ranges are 80 to 86 °F daytime and 75 to 78 °F nighttime. At these temperatures runners form instead of flower-bearing branch crowns. So far, we have not reached these temperatures in 2023.

Day-neutral varieties (such as Albion, Seascape, San Andreas, and others) are being planted more frequently now on Delmarva. These varieties will continue to flower profusely under these mild temperatures but will stop flowering once temperatures hit the 90's. They will then start flowering naturally again later in the summer when temperatures drop down below the critical values noted above. Day-neutral varieties are also induced to produce flowers as days get longer.

Runner formation in day-neutral varieties is controlled by genetics so that certain varieties produce more runners than others. In addition, stress will promote runner formation (nutrient stress, water stress, high temperatures). To keep day-neutral varieties producing in the summer, remove all runners, fertilize weekly with nitrogen, and keep them well watered. Irrigating in the morning will help to keep beds cooler longer through the day and white plastic mulch will also keep temperatures lower.

*Dr. Johnson is the retired Extension Vegetable & Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 10, June 2, 2023.*



Figure 1. Runner formation in day-neutral strawberries as seen in these Albion plants is largely variety dependent but can be induced by stress such as high temperatures.



Figure 2. Current temperatures have been ideal for flowering and fruiting in strawberries.

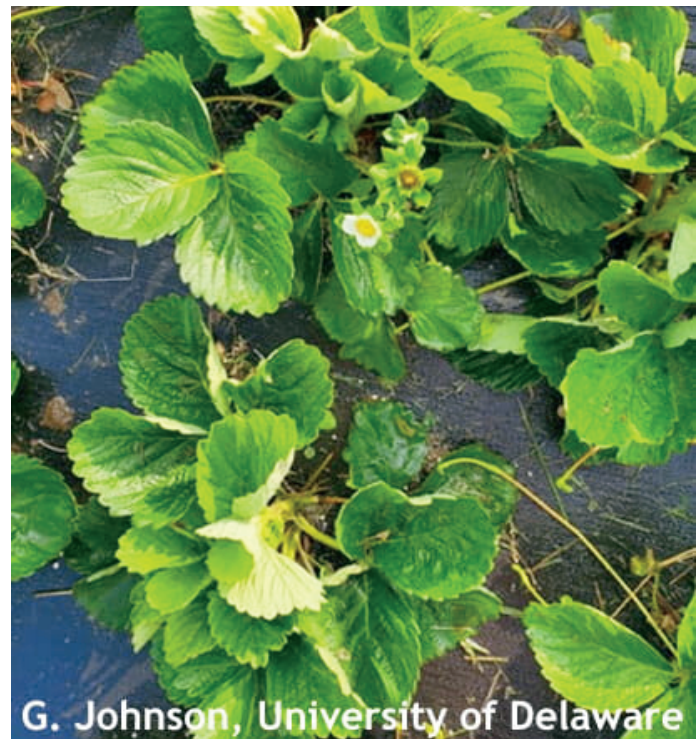



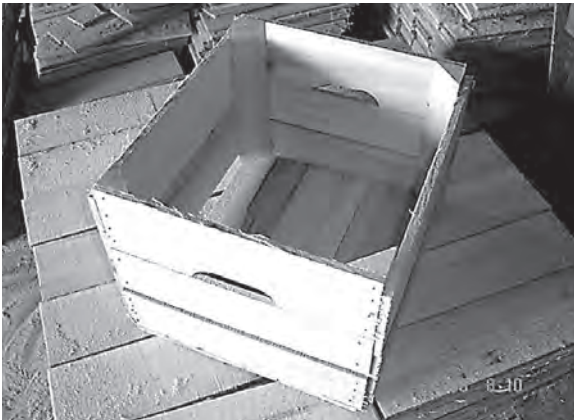
Figure 3. June-bearing strawberries starting to produce runners which is promoted by high temperatures and long days.

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