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

PVGA

2025 Mid-Atlantic Fruit and Vegetable Convention

JANUARY 28-30, 2025 | HERSHEY LODGE | HERSHEY, PA

Volume 47
Issue 6

President's Message

Dear PVGA Members.

As we close the book on yet another unusual growing season, there is much to reflect upon. We are fortunate to have had a dry, sunny fall, which contributed to disease-free crops and excellent retail weather. However, this season also brought its fair share of challenges.

It is with great sadness that I share the passing of Bill Lamont Jr. in November. Bill was one of my favorite educators from Penn State and a valued contributor to our community. His enthusiastic speaking style and deep knowledge made him a trusted resource for growers. Bill was also a prolific writer, generously contributing an article to every issue of our newsletter. His loss will be deeply felt, and he will be greatly missed.

On a different note, I recall a time several years ago when a friend invited me to hear a speaker at a Mennonite church in Lititz. Initially hesitant about spending eight hours at a lecture, I reluctantly agreed. The speaker, Joel Salatin, quickly won me over with his engaging and thought-provoking presentation. Anyone who can keep me captivated for eight hours – especially back when I was farming and could hardly stay awake during a church service– is truly exceptional.

Joel Salatin, known for his innovative and sometimes controversial views on agriculture, will be the keynote speaker at the upcoming Mid-Atlantic Fruit and Vegetable Convention. While you may not agree with everything Joel says, his presentations are sure to entertain and inspire. Joel, who has been selected by the new administration to advise the Secretary of Agriculture, is also the author of books such as "Everything I Want to Do Is Illegal."

The Mid-Atlantic Fruit and Vegetable Convention will once again feature a full lineup of educational seminars, opportunities to earn pesticide credits, and exceptional speakers. We encourage you to plan to attend.

Additionally, we are seeking volunteers for our Farm Show booth, which runs from January 3-11. This booth is our largest fundraisers for vegetable research, and we rely on the support of our community to make it a success. With all the cuts to research PVGA's support is critical. If you receive a call to volunteer, please say yes – your help is greatly needed.

We look forward to seeing you all at the Farm Show and then at the convention!

Pete Flynn

President PVGA

Inside this Issue

Pennsylvania Vegetable Growers News *is the official publication of the Pennsylvania Vegetable Growers Association*

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Our Mission:
PVGA serves Pennsylvania's commercial vegetable, potato and berry growers through education, research, advocacy and promotion.

Our Vision:
PVGA is 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 PVGA at the above address.

Penn State Extension to Host Food Safety Modernization Act (FSMA) Training Courses Throughout Pennsylvania

The Food Safety Modernization Act(FSMA) is the most comprehensive change to produce farming in the past 70 years. Farms growing more $30,000 in gross Produce sales are covered under this Act. The FSMA law covers growers who grow any fruit or vegetable crop normally consumed raw. Growers who exclusively grow crops not normally consumed raw like potatoes, pumpkins, and sweet corn, for example, are not covered by FSMA

One of the requirements of the law is that all growers covered under the Act attend a Grower Training Course. Participants will receive a notebook and receive a certificate of attendance. The cost for the course is typically in the $150 range. This year we have funding from PDA to reduce the cost to $40 per PA grower. The course will cover seven hours of instruction time that will be spent on the following modules:

- Introduction to Produce Safety
- Worker Health, Hygiene, and Training
- Soil Amendments
- Wildlife, Domesticated Animals, and Land Use
- Agricultural Water (Part 1: Production Water and Part 2: Postharvest Water)
- Postharvest Handling and Sanitation
- How to Develop a Farm Food Safety Plan

After attending the entire course, participants will be eligible to receive a certificate from the Association of Food and Drug Officials verifying that they have completed the training.

Dates and Locations for in person trainings:
Others may be added

December 18, 2024
Adams County Extension Office

February 4, 2025
Yoder's Country Market, New Holland

Two Day FSMA training webinar
November 12 and 13th

April 8 and 9, 2024 10 AM - 3 PM each day

To register for the trainings, please visit http://extension.psu.edu/fsma-grower-training or call 1-877-345-0691. Checks, credit cards, and debit cards are accepted.

Please direct any questions about the program to Jeff Stoltzfus at (717)283-2597.

Remembering Dr. William J. Lamont – Extension Vegetable Specialist

Submitted by Dr. Mike Orzolek

Bill was born on December 18, 1945, in Philadelphia, PA. He was the son of the late Jane Maurer Lamont and William James Lamont. On April 3, 1976, in Holtwood, PA, he married Phyllis Susan Shaub who survives. Bill was a 1963 graduate of Abington Senior High School and received two B.S. degrees, one from Lebanon Valley College (1967) in Business Administration and Economics and the other from Delaware Valley College (1975) in Horticulture. Also, he received an M.S. (1979), and a Ph.D. (1981) from the Department of Vegetable Crops at Cornell University.

Serving on active duty in the United States Navy between 1967-1971, Bill spent 25 months in Japan and left active duty as a Petty Officer Second Class. In 1975, he applied for and was accepted in a highly competitive special program for Naval Intelligence Officers in the Naval Reserves. Sworn in as an Ensign, Bill served 30 years, retiring with the rank of Commander in 2005.

Bill began his professional career in 1980 at North Carolina State University, then worked at Kansas State University, and finally joined the Horticulture Department in 1997 at the Pennsylvania State University. He retired in 2017 as Professor Emeritus of Vegetable Crops in the Department of Plant Science. Bill's appointment included both Extension as vegetable specialist and applied research. When Dick Cole retired and Pete Ferretti was more interested in small fruit and specialty vegetables, Bill agreed to take over the statewide potato trials for both fresh and processed potatoes. He eventually came up with the idea of colored potato chips of different universities school colors including Penn State. Bill started marketing blue and white potato chips (Penn State colors) in 2006. Annually, Bill would evaluate colored potato chip varieties every year to match other university's school colors - as Cornell's red and white.

Bill's other research focus was high tunnels. In 1999, Bill and Dr. Mike Orzolek initiated the construction of 24 research high tunnels each 17' X 36' at the Horticulture Research Farm, Rock Springs. Pa. Much of the construction costs were from a research grant from the Pennsylvania Department of Agriculture and the support of Secretary of Agriculture Russell Reading. In addition, Bill constructed demonstration high tunnels in several counties throughout the state including Philadelphia and the beginning of their Urban Agricultural program. Bill, in his Extension program worked directly with growers at their farms conducting many on farm demonstrations during his career. He enjoyed making presentations at Winter Extension meetings not only to interact with the growers but also the Extension Agents - Eric Oesterling, Andy Muza, Bob Libby, Tom Ford, George Perry, Tom Butzler and many other Extension Educators..

Bill also focused on plasticulture - the use of plastics in agriculture - with Mike and Jim Garthe, He worked with plastic mulch and drip irrigation in all of his production systems. In fact Bill, Mike and Jim and a Korean burner manufacturer developed a system of recovering the energy from used plastics through combustion and eliminated the used ag plastics from going to landfills.

Bill was very active in PVGA with his participation at the Mid-Atlantic Fruit and Vegetable Convention at Hershey as a speaker, helping out with Farm Show exhibits and helping at the Ag Progress Day PVGA Food Booth.

Bill was President of the American Society of Horticultural Sciences and President twice of the American Society for Plasticuture. Because of his leadership ability, he was known throughout the US and many other countries. He made visits to Isreal, Mexico, India and Ireland.

Bill was a prolific writer of multiple academic publications and a wide variety of nationally syndicated magazines. His most recent column called "Cultivating Thoughts" appeared once a month in the Country Folks Grower Magazine since 2021, and his twice monthly gardening column "Over the Garden Fence" has been a staple in the Centre Daily Times weekend edition since 2005. Bill was also an avid hunter and fisherman and would spend falls hunting and fishing in both PA and New Jersey.

In addition to his wife Phyllis, Bill is survived by their children William James Lamont III, his wife Jillian, granddaughter Baylee and grandson James; and Kevin Arthur Lamont, his wife Kelly and grandson Emmitt, and granddaughter Adalyn. He is also survived by his younger brother Richard Mauer Lamont.

Crown and Root Issues in Strawberries

Leah Fronk and Kathy Demchak, Penn State Extension

Reprinted from the Penn State Extension Vegetable and Small Fruit Gazette, November 2024.

Photo credit, all photos. K. Demchak, Penn State

A lot can go wrong with strawberries, and problems involving the crown and roots can be especially tricky to diagnose.

When roots and crowns are not healthy, you may notice above-ground symptoms first. This includes wilting during the day with possible recovery overnight, reduced vigor, small berries, and poor runner development. Plant growth will be reduced, but often the problem is not noticed until the plants collapse and die, usually during the stress of fruit production in the spring. All of this occurs because the plant simply cannot move nutrients, water and carbohydrates around like it can when it is healthy.

To make a diagnosis, plants must be dug up carefully to examine their crown and root system, keeping as much of the root system intact as possible. It is generally best to do this when you first suspect that there is a problem, and always before the plants are completely dead.

Image 1. Cut strawberry crown showing a healthy cream color.

Image 2. New secondary roots growing from darkened primary roots. Here the primary roots were severed from the crown when it was cut lengthwise.

What's Normal?

Young, healthy crowns and new primary roots will be white or cream-colored throughout when first cut and feel firm (Image 1). Once the crown is cut open and exposed to air, it will quickly darken (like cut apples would), at first becoming more golden in tone and then reddish-brown.

New primary (aka "peg") roots emerge from the crown as it grows taller. These primary roots grow many lighter-colored secondary ("feeder") roots when healthy and live for 1 to 2 years (Image 2). Feeder roots will also continue to be produced from older roots.

It's normal for the surface of older roots to darken as the roots age as a protective waxy layer is formed. Eventually, however, these older primary and secondary roots will turn brown and die, as feeder roots normally only live for 1 or 2 years, and primary roots for 2 or 3. This is seen on older roots on plants being carried over in the plasticulture planting, and on mother plants in matted-row plantings. In matted row plantings at renovation, where the soil is thrown up around the crown, the root system is renewed as new roots grow out above the old ones. In plasticulture, the plant is dependent solely on primary roots that are aging if the planting is being carried over. On plants that are several years old, eventually, the lower portions of the crown will also turn brown and die.

Roots grow best in the 50- to 60-degree F range in the spring and fall. They stop growing during winter and harvest, and nearly so if the soil temperature is above 86 degrees. Because of this, there may be times of the year when no new primary roots are being produced from the crown and there is little or no new secondary root growth from the primary roots. However, there should still be many fine roots on the plant.

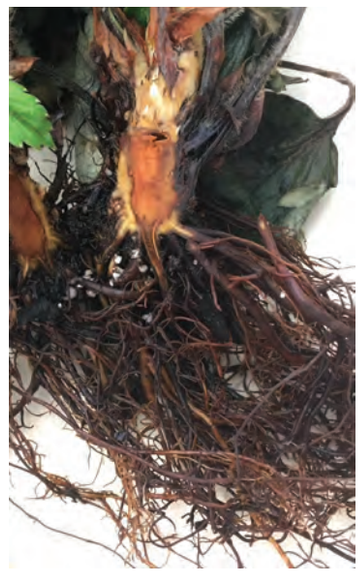

Image 3. In this photo of a 'Malwina' plant affected by Phythophthora crown and root rot, the area where the initial infection took place is unknown, but it appears that the infection may have traveled from a root into the crown or from the crown into a root.

What's Not Normal?

Crowns and roots on plants that are unhealthy will show a brown or reddish-brown discoloration. In many cases, it is possible to see that the tissue is being invaded with discoloration appearing to travel from the crown to the roots or vice versa (Images 3, 4). There will often be an acute change in color from healthy disease to infected tissue, or there may be a water-soaked appearance to the tissue. Discoloration is often, but not always, asymmetrical. Sometimes, it is apparent that the invasion is taking place where soil is getting into the crown area, as in some cases of Phytophthora crown rot, or through a branch crown or root.

When the environment causes problems, as in the case of winter injury or high soluble salts in the soil, a connection to other plant parts where invasions are taking place usually isn't apparent.

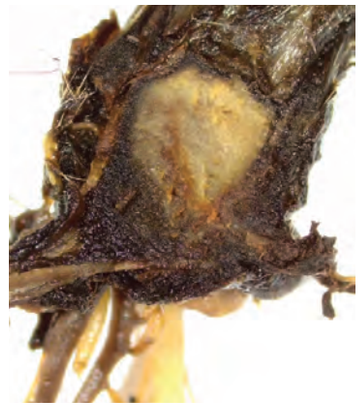

Image 4. Crown tissue may have a water-soaked appearance as it is being invaded.

Crowns of dead plants are typically a dark reddish-brown color, and completely dead roots turn black. Once entirely dead, there will be no difference in appearance whether the cause of death was a disease organism, severe winter injury, an herbicide application error, or severe drought and heat stress.

(Continued on p.6)

Crown and Root Issues in Strawberries—*continued from page 5*

When attempting to diagnose problems, for the reasons mentioned above regarding root appearance as roots age, it is often helpful to find young roots and determine if discoloration can be seen on them rather than trying to diagnose the problem on older roots.

Diseases listed below, insect feeding, and winter injury can damage strawberry roots and crowns.

Red Stele, *Phytophthora fragariae.* Red stele is caused by a soil-borne phytophthora species and is more common in low spots and wet areas. As indicated by its name, when roots are cut lengthwise, the core (stele) of the root is red. "Rat-tail" roots are a diagnostic characteristic of red stele (Image 5). As the disease progresses, fine lateral roots may be missing, and larger primary roots may be rotted from the tip back. The red stele fungus can persist as a dormant spore for many years in soil. In wet soil conditions, the fungus grows through the roots and produces spores, which can then swim to infect healthy roots in the field. If the soil stays saturated, the disease process can repeat itself. Varieties are available with varying levels of resistance to red stele. Ridomil and Aliette or Phostrol aid in managing red stele.

Image 5. Rat-tail appearance of roots with red stele.

Black Root Rot (BRR), Disease complex of *Rhizoctonia* spp., *Pythium* spp., other fungi and lesion nematode, *Pratylenchus penetrans.* A disease complex means that several different organisms can be responsible for the disease. BRR is more common in older plantings or replanted fields. Also, fields that are already experiencing stress from wet soils, drought conditions, and poor fertility are more susceptible to BRR. When examining the field, an uneven "patchy" appearance can be seen. Feeder roots decay, and primary roots blacken and deteriorate, allowing for the outer root surface to slough off and leave a white core (Image 6). Dark brown lesions may be observed on healthy roots as they begin to decline (Image 7). BRR can be managed

Image 6. Roots affected with black root rot with only the white core remaining after the outer rotted surface was pulled off.

Image 7. Strawberry root with fungal entry points apparent, which may have been a result of lesion nematode feeding.

by rotating a field out of strawberries for 4-5 years, using raised beds, and planting in well-drained soils with high organic matter content. No fungicides are currently recommended for control, but some growers have found success using beneficial bacteria dips prior to transplanting.

Phytophthora crown and root rot, *Phytophthora cactorum.* Phytophthora crown and root rot is caused by a different fungal species than red stele. It is becoming more common, perhaps due to varietal susceptibility. Symptoms first appear as stunting or wilting of plants. Eventually, the plant will collapse, and the crown will appear red or cinnamon-colored when cut (Image 8). Plants infected with phytophthora crown rot may break off completely from the crown when pulled for sampling. The disease may begin in low-lying areas of the field or in a scattered pattern if the disease was brought in from nursery stock. Management strategies for phytophthora crown and root rot include avoiding planting varieties that are known to be susceptible, including 'Flavorfest' and 'Sweet Charlie,' in fields that were planted to strawberries in the past 5 years. Also, use a plant dip of fosetyl-A1 or a phosphite product at the time of planting.

Image 8. Phytophthora crown and root rot.

Neopestalotiopsis. This is a new disease that can cause crown rot, leaf spot, and fruit rot. The first symptoms are seen on the leaves and appear as tan to brown V-shaped lesions that are wider at the edge of the leaf or large tan spots. The disease can invade the crown and kill the plant, causing fruit rot symptoms like anthracnose fruit rot. Crowns, when cut, appear more brown than red when infected with *Neopestalotiopsis* (Image 9). Outbreaks of *Neopestalotiopsis* have been associated with prolonged rainfall events, while disease pressure is low under dry

Image 9. Neopestalotiopsis invasion in the crown of 'Chandler' strawberry.

weather conditions. Much of the research thus far has been done in Florida and shows that sprays of thiram and Switch 7-10 days apart can reduce the disease by about 40%, with certain category 3 fungicides (Rhyme, Tilt, Inspire) also having some effectiveness.

Anthracnose Crown Rot, *Colletotrichum gloeosporioides.* Anthracnose is mainly a problem in rainy, warm seasons and especially troublesome in plasticulture production systems with susceptible varieties such as 'Chandler.' The first symptom of anthracnose crown rot is that plug plants fail to grow following transplanting. However, symptoms are often not apparent until the plants collapse or die, usually in the fall or spring following transplanting during warm weather. When the crown is cut lengthwise, a reddish-brown color can be found. The primary source of infection is thought to be from infected nursery stock, though weeds and infected plant debris can harbor inoculum in fields. Mulching with straw, even in plasticulture systems, can decrease the spread of the disease because it helps to reduce rain splash off the plastic. Fungicide recommendations are tricky because of resistance concerns, and growers should consult the most recent edition of the Mid-Atlantic Commercial Vegetable Production Recommendations for guidance.

Verticillium Wilt, *Verticillium dahlia.* Verticillium is a fungus that can be found in many soils, especially those that previously grew tomatoes, potatoes, eggplant, and pepper. Weeds such as pigweed, horsenettle, and lambsquarters can also host the fungus. Infection is a threat, especially when new plantings are established, and disease distribution may appear scattered in the field. The fungus infects the vascular tissue of plants and blocks water flow, causing plants to wilt and die. A distinguishing symptom of verticillium wilt is that often the center-most leaves remain green and turgid while the outer leaves wilt and dry. Planting verticillium-resistant strawberry varieties and using a 3-5 year rotation in fields avoiding all verticillium-susceptible crops is recommended.

Winter Injury. Winter injury is one of the factors that can result in the development of the black root rot complex. Symptoms are seen in late winter or early spring when the plants begin growing. Discoloration in the central crown area ranges from brown flecking to reddish-brown discoloration (Images 10, 11). If over half of the crown tissue is affected, yields will be reduced, but plants may recover and yield nearly normally otherwise. To reduce winter injury, adequate and timely straw mulch or row cover application is important. Raised beds are more susceptible to winter injury, but often the benefits of raised beds outweigh the risk.

It can be difficult to sort out reasons for plant decline. There can be multiple causes of crown and/or root damage, and several may be present at one time. Also, many causes display similar symptoms, which makes diagnosis challenging. When diagnosing problems, look for other symptoms that may provide clues and check multiple plants. Dig plants carefully to preserve fine roots. Try to rule out causes based on field history, variety, and timing of symptom appearance. For additional assistance, consult with your local Extension educator. A sample may be submitted to a diagnostic lab such as the Penn State Plant Disease Clinic.

Image 10. MIld winter injury.

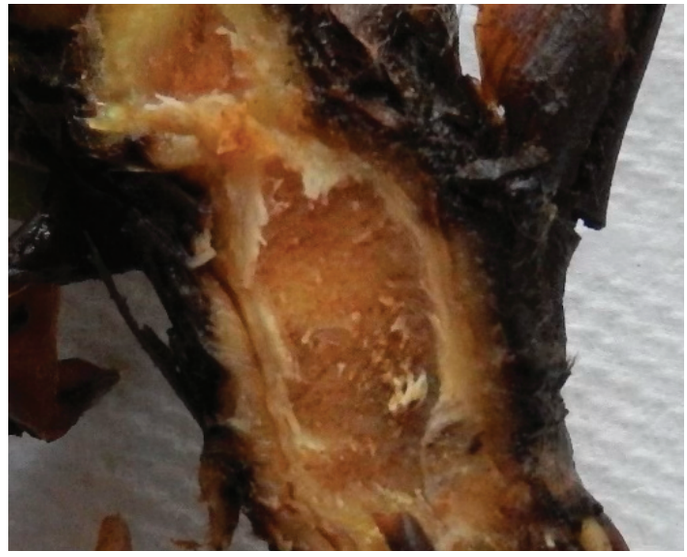

Image 11. Severe winter injury.

Mid-Atlantic Fruit and Vegetable Convention
January 28-30, 2025 – Session Schedule

Monday – January 27, 2025 – Preconvention Workshops and Bus Tour

Microgreens

$80 – lunch included

9:00 am	Introduction to the Workshop and to Microgreens as High-Value Specialty Crop – Francesco Di Gioia
9:45 am	Starting and Growing a Microgreen Business – Andy Mussaw
10:30 am	Opportunities and Challenges of Growing Microgreens – Andrew Blunk
11:15 am	Break
11:30 am	Microgreen's Food Safety – Jeffrey Stoltzfus
12:00 pm	Lunch
1:00 pm	Business Planning for Microgreens – Prof. Claudia Schmidt
1:30 pm	Marketing Microgreens – Prof. Kathy Kelley
2:00 pm	Microgreens Biofortification Employing Agronomic Strategies – Pradip Poudel
2:45 pm	Microgreens' Response to Light – Aline Novaski
3:15 pm	Microgreen's Production Aspects and Q&A Session – Francesco Di Gioia
4:30 pm	Adjourn

PA Pesticide Credit

$85 - lunch and manual included

9:00 am - 4:00 pm

If you intend to purchase and/or apply restricted use pesticides for the purpose of producing an agricultural commodity on land which is owned or rented by you, then you need a Pennsylvania Department of Agriculture Pesticide License. To become a certified private applicator, testing is required. This full day session on January 29 will cover the basics and prepare you for the pesticide applicator's exam which will take place the next morning, January 30, from 8:30 am – 11:30 am

YGA Offsite Event

$20 – lunch not included

The Young Grower Alliance will be touring the Knouse Foods Peach Glen plant and Rice Fruit Company on Monday, January 27, as part of the pre-conference workshops at the Mid-Atlantic Fruit and Vegetable Convention. The Knouse tour will begin at 9:00 am and the Rice Fruit Co. tour will be directly after, starting at 10:45 am. The tour will wrap up by noon. Carpools will be organized from the Adams County Extension Office in Gettysburg. For more information and to RSVP, please email Nettie Baugher at nettie@acnursery.com or Don Seifrit at dus970@psu.edu.

Apple Tree Decline Summit 2025

No charge – lunch not included

Tentative agenda

8:30 am	Welcome and Introductions
9:00 am	Updates from Those Currently Working on Apple Tree Decline
10:30 am	Break
10:45 am	Updates Continued
12:00 pm	Lunch on Your Own
1:30 pm	Updates Continued
3:15 pm	Break
3:30 pm	Updates Continued

This meeting will be held in person; however, participating in Zoom is also an option.

What is the purpose of the 2025 Apple Tree Decline Summit?

There have been many instances of apple tree decline over the last many years: RAD, soilborne diseases, viruses, winter injury, herbicide injury – just to name a few. The purpose of the summit is to bring together folks of different backgrounds and expertise to discuss the latest research and observations involving apple tree decline. Due to the overwhelmingly positive feedback from the 2024 Apple Decline Summit on August 2, 2024, and the importance of apple tree decline, we decided to host another summit in 2025 with similar topics discussed in 2024.

Who can attend? EVERYONE is welcome! This event is open to anyone, and everyone connected to the apple industry: researchers (academic/ federal), Extension, growers, packers, nurseries, state and federal agencies, consultants, agrochemical industry, etc.

To Register:

- Online: If you are interested in participating (in person or via Zoom), please fill out this registration form by typing the web link into your browser: http://bit.ly/3YWXfTI
- Telephone: If registering online is an issue, please call Kristy Loper at Penn State FREC at 717-778-4589 and mention you want to register for the 2025 Apple Tree Decline Summit.
- Note: If you are signing up on behalf of a group, each person must register separately.
- **We ask that you register by January 24, 2025.**

Questions, contact: Dr. Kari Peter at Penn State FREC, kap22@psu.edu, 717-778-4587

Farm Transition

$25 – lunch not included

Begin with the End in Mind: An Overview of the Farm Transition Process

9:00 am – 12:00 pm

Join Penn State Ext Certified Farm Transition Coordinators for a half-day workshop focusing on the vital components needs to ensure your farm transitions in the manner and to the people you desire. All farm and ag business owners and operators of all levels are welcome.

Attendees will learn:

- How to identify family and business goals
- Best practices for family conversations and meetings
- Strategies for business management and ownership transfer
- Budgeting considerations for new generations and enterprises
- Legal consideration for land and business transfer

Bus Tour – Lancaster and Chester Counites Farm Operations

$95 –lunch included

Departs from the Hershey Lodge Chocolate Lobby entrance at 7:45 am and will return at approximately 5:30 pm

September Farm – Honey Brook, PA –
The Rotelle family has been successfully farming for four generations, being named a Dairy of Distinction in 2002. September Farm Cheese was established in 2007 when the family decided to make their dream a reality, and now offers over 60 types of cheese from Cheddar to Gouda. Besides cheeses, their market features a bakery, sandwich shop, and ice cream shop. They offer retail, wholesale, and online sales. www.septemberfarmcheese.com

I & J Manufacturing, LLC – Gordonville, PA
Specializing in small equipment that can be drawn by tractors or horses, I & J equipment is sold by dealers from North Carolina to Indiana to Quebec. This family-owned company has been in business since 1984, growing steadily over time. With an interest in supporting the needs of regenerative ag farmers, I & J specializes in manufacturing sicklebar mowers, cultivators and roller-crimpers, as well as forecarts. i-jmanufacturing.com

Lunch at Shady Maple Smorgasbord – East Earl, PA
Shady Maples's buffet is the largest in the U.S. and features Pennsylvania Dutch food items ranging from salads to main course items to desserts. The smorgasbord won the 2024 USA Today Reader's Choice Award for "Best Buffet Restaurant". We'll reserve plenty of time to eat, with a little left over to browse Shady Maple's farm market and 44,000-square-foot (that's an acre!) gift shop packed with items for the home and family. shady-maple.com

Garden Spot Farm Market – New Holland, PA
Garden Spot Farm Market, owned by Darryl and Dorothy Martin, is a family business best known for its fresh local produce grown on the farm's 18 acres, supplemented with products from neighboring farms, cut flowers and baked goods. Their new farm market building built in 2022 provided additional space and the ability to operate year-round. The market is currently expanding its offerings of winter produce grown in nearby high tunnels and greenhouses.

HB Farms – New Holland, PA
This family farm's business is focused on vegetable production under cover. With 14 high tunnels and 6 greenhouses totaling 125,000 square feet of covered growing space, this farm now grows and sells vegetables year-round. While covers are removed from many of the tunnels for the winter, greenhouse production continues on. Tomatoes are the farm's bread and butter, with other vegetable crops also sold during the winter, all mainly at auction.

Tuesday Morning – January 28, 2025

Vine Crops

9:00 am	*Successful Disease Control – Mary Hausbeck, Univ of Michigan
9:45 am	Methods for Growing Trellised Cucumbers in High Tunnels and in the Fields – Peter Flynn, Pete's Produce
10:30 am	Adjourn to Keynote

Green Beans

9:00 am	Green Beans-Seeds to Table – Art King, Harvest Valley Farms
9:45 am	Snap Bean Variety Trials – Emmalea Ernest, Univ of DE
10:30 am	Adjourn to Keynote

Food Banking

9:00 am	Bridging Grower Donations & Food Bank Limitations – Rob Amsterdam, FeedingPA (retired); Julie Bancroft, FeedingPA
9:15 am	Working with Food Banks & Regional Cooperative – Erica Mower, CPFB; Beth Hamilton, MARC
10:00 am `	Selling Produce to Pennsylvania Food Banks – Tom Mainzer, FeedingPA Brian Campbell, Brian Campbell Farms
10:30 am	Adjourn to Keynote

Drones and AI

9:00 am	Agricultural Drone Benefits, Features, Requirements – Nathan F. Graham, Hoober, Inc.
9:45 am	Pitfalls and Potentials of Using AI – James Ladlee, Penn State Ext
10:30 am	Adjourn to Keynote

Argo Forestry

9:00 am	Goods From the Woods: Diversifying Landowner Income – Cat Pugh, Penn State Ext
9:45 am	Nut Tree Grafting Demonstration – Zach Elfers, Future Forest Plants
10:30 am	Adjourn to Keynote

Marketing

9:00 am	Customer Focused Marketing for U Pick – Rose Robson, Robson Farms; Julianne Roba, Roba Farms
10:30 am	Adjourn to Keynote

Tree Fruit

9:00am	Invocation – Brad Hollabaugh, Hollabaugh Bros., Inc.
9:05am	President's Address – Corey McCleaf, Cherry Hill Orchards
9:15am	**George Goodling Memorial Lecture –** Honeycrisp Nutrition and Mitigation of Bitter Pit – Dr Lailiang Cheng – Cornell Univ
10:00 am	What Packers Are Looking for from Growers ▪ Dr. Shanthanu Kumar, Penn State (Moderator) ▪ Ben Rice, Rice Fruit Company ▪ Ryan Hess, Hess Bros. Fruit Company
10:30	Adjourn to Keynote

Tuesday Afternoon – January 28, 2025

Pumpkins

1:30 pm	*New Options for Controlling Cucumber Beetles and the MyIPM App – Tom Kuhar, Virginia Tech
2:00 pm	Bringing the Next Generation of Pumpkins to Market – Chris Hernandez, Univ of New Hampshire
2:30 pm	*Phytophthora Crown and Fruit Rot of Pumpkin – Mary Hausbeck, Michigan State Univ
3:00 pm	Industry Show and Tell
3:15 pm	Lessons From the Pumpkin Patch: Insights from U-Pick Operations (grower panel) ▪ Carl and Stewart Ramsey, Ramsey's Farm ▪ John Carpenter, Carpenter's Pumpkin Farm ▪ Ben Butler, Butler's Orchard
4:00 pm	*Weed Management in Cucurbits - Update on Strategies and Tools – Thierry Besancon, Rutgers Univ
4:30 pm	Adjourn

(Continued on p.10)

Mid-Atlantic Fruit and Vegetable Convention Schedule—*continued from page 9*

Hydroponic

1:30 pm	Water Quality – Krystal Snyder, Penn State Ext
2:00 pm	Efficiency, Yield, and Quality of Bok Choy Grown in Alternative Soilless Systems – Aline Novaski, Penn State Univ
2:30 pm	Microbial Quality of Bok Choy Grown in Alternative Soilless Systems – Auja Biwater, Penn State Univ
3:00 pm	Adjourn Industry Show and Tell
3:15 pm	Hydroponic Production of Culinary Herbs – Jianyu Li, Univ of Massachusetts
4:00 pm	Enriching Microgreens with Iron and Zinc Through the Nutrient Solution – Rishi Ravichandran, Penn State Univ
4:30 pm	Adjourn

Soil Health

1:30 pm	Sunn Hemp as a Summer Cover Crop for Improving Soil Health in an Organic Strawberry Crop System – Jianyu Li, Univ of Massachusetts
2:00 pm	No-Till Vegetable Production – Sjoerd Duiker, Penn State Univ
2:30 pm	Healthier Food with No-Till Practices –Sjoerd Duiker, Penn State Univ
3:00 pm	Industry Show and Tell
3:15 pm	Anaerobic Soil Disinfestation: A biological Solution to Restore Your Soil Health – Francesco Di Gioia, Penn State Univ
4:00 pm	Soil Health Management Practices in a Diversified Vegetable Farm – Art King, Harvest Valley Farms
4:30 pm	Adjourn

General Vegetable

1:30 pm	**Update on Herbicide Label and EPA Herbicide Strategy Plan – Thierry Besancon, Rutgers Univ
2:30 pm	*Choosing the Right Copper Formulation – Karly Regan, Certos
3:00 pm	Industry Show and Tell
3:15 pm	Winter Sales with Storage Crops and High Tunnel Greens; Hydroponic Lettuce Growing in the Winter Months – George Brittenburg, Taproot Farm; Chris Powell, Good Harvest Farms
4:00 pm	*Asparagus Disease - Mary Hausbeck – Michigan State Univ
4:30 pm	Adjourn

Retail Marketing

1:30 pm	Google Analytics – Miranda Harple, Penn State Ext
2:30 pm	Market Assessment Data Results 2024 – Brian Moyer, Penn State Ext
3:00 pm	Industry Show and Tell
3:15 pm	Packaging Fruit & Vegetable for Market – Art King, Harvest View Farm
4:00 pm	Tips from the Road: Retail Farm Market Bus Tour Highlights – Miranda Harple, Penn State Ext; Brian Moyer, Penn State Ext
4:30 pm	Adjourn

Marketing

1:30 pm	Online Sales – Lonnie Kauffman, Kauffman Orchards
2:30 pm	Marketing with Reels – Julie Flinchbaugh-Keene, Flinchbaugh's Orchard
3:00 pm	Industry Show and Tell
3:15 pm	Marketing with Innovative Events – Liz Wagner, Crooked Row Farm
4:00 pm	Adjourn

Tree Fruit

1:30 pm	*Focusing on Control of All Fire Blight Phases: Cankers, Blossom Blight, and Shoot Blight – Dr Srdjan Acimovic, Virginia Tech
2:00 pm	*Fighting Fire Blight with Fire Blight-A Potential New Fire Blight Biopesticide - Dr. Tim McNellis, Penn State
2:30 pm	*IPM Benefits of NEWA (Panel) ▪ Dr. Kari Peter, Penn State (Moderator) ▪ Dr. Greg Krawczyk, Penn State ▪ Dr. Shanthanu Kumar, Penn State ▪ Dr. Mizuho Nita, Virginia Tech
3:00 pm	Industry Show & Tell
3:15 pm	*An Update About the Status of Apple Tree Decline – Dr Kari Peter, Penn State
3:45 pm	**Recording and Assessing Weather – Ed Crow, Penn State Ext
4:15 pm	Adjourn
4:30 pm	SHAP Annual Business Meeting

Wednesday Morning – January 29, 2025

Greenhouse

9:00 am	Temp/Lighting Effects on Plant Growth – Dr. John Erwin, Univ Maryland
10:00 am	Industry Show & Tell
10:15 am	Best of the Penn State Flower Trials – Krystal Snyder, Penn State Ext
11:00 am	**Looking at Pesticide Labels – Glen Bupp, Penn State Ext
11:30 am	PVGA Annual Meeting

Tomatoes

9:00 am	**EPA Pesticide Use Updates Affecting Vegetable Production – Megan Luke, Penn State Ext
9:30 am	Penn State Tomato Breeding Program and Research Update – Jonathan Bonfiglio, Penn State Univ
10:00 am	Adjourn Industry Show & Tell
10:15 am	Maximizing Foliar Nutrition and Update on Silicon – Steve Bogash
11:00 am	Challenging Diseases on Tomatoes – Mary Hausbeck, Michigan State Univ
11:30 am	PVGA Annual Meeting

Organic

9:00 am	Understanding and Managing Blossom End Rot in Vegetable Crops – Michelle Infante-Casella, Rutgers Univ

9:30 am Biofungicides for Brassica Alternaria Management-A New Hope? – Teresa Rusinek, Cornell Univ Cooperative Ext; Ethan Grundberg, Cornell Cooperative Ext
10:00 am Industry Show & Tell
10:15 am Managing Allium Leafminer with OMRI-Listed Insecticides – Teresa Rusinek, Cornell Univ Cooperative Ext; Ethan Grundberg, Cornell Cooperative Ext
10:45 am Can OMRI-Listed Herbicides Take the Place of Flame Weeding in Carrots? – Ethan Grundberg, Cornell Cooperative Ext
11:00 am Using Organic Nutrient Sources-New Smart Sheet – Elsa Sanchez, Penn State Univ
11:30 am PVGA Annual Meeting

Root Crops

9:00 0am Red Beets, the High Profit Crop - David King
9:30 am Tomato Breeding Program and Research Update- Mary Hausbeck, Univ of Michigan
10:00 am Industry Show & Tell
10:15 am Beating Cercospora Leaf Spot of Table Beets – Sarah Pethybridge, Cornell Univ
11:00 am Small Scale Potatoes, Big Scale Profits – Art King, Harvest Valley Farms
11:30 am PVGA Annual Meeting

Marketing

9:00 am Consumer & Food Trends – Claudia Schmidt, Penn State Univ; Kathy Kelley, Penn State Univ
10:00 am Industry Show & Tell
10:15 am POS Excellence – Caleb Torrice, Tabora Farm; TBD
11:00 am Facebook Followers, Now What? (Panel)
- Megan Coopey, Way Fruit Farm
- Deb Colitas, Valley Fruit & Veg
- Paul Hellerick, Hellerick's Family Farm

12:00 pm Lunch

Small Fruit

9:00 am Wacky Winters: Straw Mulch and Row Cover Timing for Strawberries – Dr. Ed Durner, Rutgers Univ.
9:30 am Unpredictable Springs: Frost Protection for Strawberries – Kathy Demchak, Penn State Univ
10:00 am Industry Show & Tell
10:15 am Chestnut Hill Farm and Market: What We've Learned along the Way – Kevin Donnelly, Chestnut Hill Farm and Market, LLC
11:00 am Pump it up! Calcium Uptake and Fertilizer Application Strategies in Caneberry – Dr. Lisa DeVetter, Washington State Univ
11:30 pm How Trellising Blackberries Affects Production – Dr. Haley Sater, Univ. of Maryland
12:00 pm Lunch

Labor/Farm Management

9:00 am Workplace Culture and Onboarding Strategies – Linda Falcone, Penn State Ext
9:30 am Safety for Non-Native Speakers – Florence Becot, Penn State Ext
10:00 am Adjourn Industry Show & Tell
10:15 am Producers Primer on Farm Labor Contractors – Brook Duer, Penn State Ext
11:00 am Tax Withholding/Filings for H-2A Employees – Brook Duer, Penn State Ext
11:30 am Apprenticeships in Agriculture – Cher Harpster, Penn State Ext
12:00 pm Lunch

Tree Fruit

9:00 am *Endangered Species Act Compliance in Pest Management: 2025 and Beyond – Dr. Clayton Myers, USDA
9:30 am *Blossom Thinning of Honeycrisp and Gala – Dr. Shanthanu Kumar, Penn State
10:00 am Industry Show & Tell
10:15 am Nitrogen Fertilization for Apple Orchards - Dr. Lailiang Cheng, Cornell Univ
10:45 am Nursery Rootstock Update (Panel)
- Dr. Shanthanu Kumar, Penn State (Moderator)
- Eric Haller, Adams County Nursery
- Marshall Saunders, Saunders Bros. Inc.

11:15 am *Developing Challenges in the Management of Internal Fruit Feeders – Dr. Greg Krawczyk, Penn State
12:00 pm Lunch

Spanish

9:00 am Welcome and Ice Breaker – Maria Gorgo-Simcox, Elsa Sanchez, Maria Alejandra Gil Polo, and Deivis Garay Salas, Penn State Univ
9:30 am **Equipo de Protección Personal/Personal Protective Equipment – Beth Sastre, Virginia Cooperative Ext and Maria Gorgo-Simcox, Penn State Univ
10:00 am Consideraciones de Túneles Altos/High Tunnel Considerations – Carolyn Lowry, Penn State Univ Plant Science
10:45 am Break
11:00 am Mercadeo y Turismo Agrícola/Marketing and Agritourism – Claudia Gil Arroyo, Rutgers Cooperative Ext
11:45 am Agricultura de Presición/Precision Agriculture – Paul Esker and Adriana Murillo, Penn State Univ

Wednesday Afternoon – January 29, 2025

31 Greenhouse

1:30 pm Can supplementary LED light improve tomato seedling quality? – Francesco Di Gioia, Penn State Univ
2:00 pm Leafy Greens and Herb Production – Dr. John Erwin, Univ of Maryland
3:00 pm Industry Show & Tell
3:15 pm IoT-Based Precision Monitoring System for Soilless Leafy Greens – Chenchen Kang, Penn State Univ; Long He, Penn State Univ
4:00 pm **Respirator Training for WPS Compliance - Shane Williams, Penn State Ext
4:30 pm Adjourn

(Continued on p.12)

Mid-Atlantic Fruit and Vegetable Convention Schedule—*continued from page 11*

Peppers/Eggplant

1:30 pm **Best Practices for Mixing Small Amounts of Pesticides – Leah Fronk, Penn State Ext
2:00 pm *Pepper Anthracnose – Sarah Pethybridge, Cornell Univ; Elizabeth Buck, Cornell Univ
3:00 pm Industry Show & Tell
3:15 pm *Update on Flea Beetle Management in Eggplant and a Discussion of What's Bugging You in Eggplant and Peppers – Tom Kuhar, Virginia Tech
4:00 pm Pepper and Eggplant Variety Trials for Field and Tunnel Production – Debra Deis, Seedway; Dani Sauder, Seedway
4:45 pm Adjourn

Organic

1:30 pm Organic Late Blight Tomato Cultivar Evaluation – Tom Butzler, Penn Cooperative Ext and Elsa Sanchez, Penn State Ext
2:00 pm Living Mulches in Plasticulture Systems – Zack Hayden, Michigan State Univ
2:30 pm Can Drones Help with Organic Nutrient Management? – Zack Hayden, Michigan State Univ
3:00 pm Industry Show & Tell
3:15 pm How Land Use Surrounding a Farm Influences Pest and Beneficial Insect Populations – Heather Grab, Penn State Univ
4:00 pm Evaluating Integrated Weed Management Approaches in Vegetables – Dr. Dwayne Joseph, Univ of MD
4:45 pm Adjourn

Argitourism

1:30 pm Navigating the Maze of Agritourism Regulations and Community Relationships – Claudia Schmidt, Penn State Univ
2:00 pm Hayride Regulations and Options for Liability Protection – Jacqueline Schweichler, Penn State Center for Agricultural and Shale Law
2:30 pm Amusement Rides in Pennsylvania (Hayride Attractions) – Walter Remmert, PDA
3:00 pm Industry Show & Tell
3:15 pm Agritourism Regulations and Community Relationships (Producer Panel)
- Julianne Roba, Lakeland Orchard and Cidery and Roba Family Farms
- Elizabeth Riffle, Riffle Farms – American Bison
- Julie Friend, Wildom Farm
- Brad Gritt, Gritt's Farm

4:00 pm Adjourn

Small Fruit

1:30 pm Heat Stress Effects and Management in Strawberries – Dr. Edward Durner, Rutgers Univ; Kathy Demchak, Penn State Univ
2:00 pm Favorite Blueberry Varieties and Production Tips
- Denny Doyle, New Jersey Blueberry Industry Advisory Council
- Ben Butler, Butler's Orchard
- Bobby Morgan, Paupack Blueberry Farm

3:00 pm Industry Show & Tell
3:15 pm Trash It or Till It? Insights on Soil-biodegradable Plastic Mulches for Strawberry Production – Dr. Lisa DeVetter, Washington State Univ
4:00 pm **Preparing for a Pesticide Spill – Tim Elkner, Penn State Ext
4:30 pm Adjourn

Labor/Farm Management

1:30 pm Strategies for Recruiting Talent – Cher Harpster. Penn State Ext
2:00 pm A Grower's Guide to the H-2A Program
- Mikell Grimm, Adams County Orchard Inc
- Eleanor Rice, R & L Orchard Co
- Sarah Zost, Bonnie Brae Fruit Farms Inc

3:00 pm Industry Show & Tell
3:15 pm Minors Working on the Farm: What Ag Employers Need to Know About Child Labor Laws – Audry E Thompson, Penn State Ext
4:45 pm Adjourn

Tree Fruit

1:30 pm *How an Agricultural Technology Innovation Hub Will Benefit Our Growers – Dr. Long He, Penn State
2:00 pm U.S. Apple Update – Chris Gerlach, U.S. Apple Association
2:30 pm Industry Show & Tell
2:45 pm Managing Pre-Harvest Fruit Drop and Coloration in Apples: Insights from ReTain, Harvista, and Accede Applications – Dr. Sherif Sherif, Virginia Tech
3:30 pm Independent Farm Crew Labor/Hiring a Second Crew
- Brook Duer, Penn State Ag Law Center
- Chris Lerew, Lerew Brothers
- Terra Slaybaugh, Mt. Ridge Farms

4:15 pm Adjourn

Stone Fruit

1:30 pm *Thinning with ACC – Dr. Shanthanu Kumar, Penn State
2:00 pm National Peach Council Update – Kay Rentzel, National Peach Council
2:30 pm Industry Show & Tell
2:45 pm Ernie Christ Lecture-Breeding Peaches for the True North: A Moving Target Amidst Climate Change and Consumer Demands – Dr. Jay Subramanian, Univ of Guelph
3:30 pm Economic Forces Shaping Stone Fruit – Dr. David Magana, RaboBank
4:15 pm Adjourn

Spanish

12:15 pm Lunch and Visit Trade Show – Sponsored by Penn State Ext Latinx Agricultural Network and West Virginia Univ
1:30 pm Prácticas de conservación en su finca: la perspectiva de un agricultor/ Conservation Practices on Your Farm: A Farmer's Perspective – Emilyn Sosa, Bilingual Beginning Farmer Program Specialist, GrowNYC; Tracy Lerman, GrowNYC; Martin; Gaudencia Rodgriguez, El Mimomex

	Farm and PA NRCS
2:15 pm	Blackberry Production/Pruning – Dr. Rafie Reza - CROSSROAD FARM
2:45 pm	*Common Apple Tree Insect Pests – Carlos Quesada, West Virginia Univ
3:15 pm	Beekeeping PA Project – Robyn Underwood, Maria Gorgo-Simcox, Elsa Sanchez, and Lina Tami Barrera, Penn State Ext
3:45 pm	Evaluation, Group Picture and Adjourn

Thursday Morning – January 30, 2025

High Tunnel

9:00 0am	How Crop Complexity Impacts Insect Dynamics in High Tunnel Systems – Allison Zablah, Purdue Univ
9:30 am	**Pesticide Storage: Basic Practices and Emergency Response – Kara Pittman, Penn State Ext
10:00 am	Industry Show & Tell
10:15 am	High Tunnel Cucumber Variety Selection and Performance – Francesco Di Gioia, Penn State Univ
11:00 am	The Art of Growing Top Quality High Tunnel Tomatoes Season After Season – JJames Reiff, Reiff Farm; Anthony Reiff
12:00 pm	Lunch

Cut Flowers

9:00 am	Utilizing Natural Pest Predators and OMRI Chemicals for Pest Control – Glen Bupp, Penn State Ext
10:00 am	Industry Show & Tell
10:15 am	Soil Fertility and Plant Nutrition for Cut Flowers – Margaret Pickoff, Penn State Ext
11:00 am	Getting Scrapy with Marketing and Season Extension – Margie Dagnal, Goose Creek Gardens; Kate Dagnal, Goose Creek Gardens
12:00 pm	Lunch

Potatoes

9:00aam	Potatoes USA Update and Marketing – Blair Richardson, CEO, PotatoesUSA
9:30 am	Tips for Growing Potatoes in Hot Weather – Bob Leiby, Pennsylvania Co-Operative Potato Growers
10:00 am	Industry Show & Tell
10:15 am	Organic Potatoes- Five Years In – Nolan Masser, Red Hill Farm
11:00 am	New Potato Varieties Coming Out of the NY/Cornell Pipeline – Walter DeJong, Botanist, Cornell Univ
11:30 am	2024 Potato Variety Trials in Pennsylvania – Xinshun Qu, Penn State Potato Specialist
12:00 pm	Lunch

Sweet Corn

9:00 am	Mapping Corn Earworm – Heather Grab, Penn State Univ
9:30 am	Corn Earworm Management Strategies – Kelly Hamby, Univ of MD
10:00 am	Industry Show & Tell
10:15 am	Sweet Corn Grower Panel ▪ Mike Groszkiewicz ▪ Art King, Harvest Valley Farm ▪ Jon Strite, Strite's Orchard
11:00 am	Impact of Water Quality on Pesticide Performance in Spray Mixes – Tim Elkner, Penn State Ext
11:30 am	Sweet Corn Weed Control Updates– Lynn Sosnoski, Cornell Univ
12:00 pm	Lunch

Marketing Technology & Tools

9:00 am	Powerful Visuals: Creating Marketing Materials using Canva – Miranda Harple, Penn State Ext
9:30 am	Leveraging Artificial Intelligence to Enhance Farm Direct Marketing – Sarah Cornelisse, Penn State Univ
10:00 am	Industry Show & Tell
10:15 am	Harvesting Attention: Mixed Reality to Boost Engagement – James Ladlee - Penn State Ext
11:00 am	Marketing Technology & Tooks – Kelly Jackson, Emily's Produce; Robert Mowery, Forever Heart Farm
12:00 pm	Lunch

45 Small Fruit

9:00 am	Growing Elderberries Successfully – Henriette den Ouden, Univ of Maryland Eastern Shore
9:30 am	Buzzworthy Insights: Best Practices for Blueberry Pollination – Dr. Lisa DeVetter, Washington State Univ
10:00 am	Industry Show & Tell
10:15 am	*Crown and Root Rots in Strawberries: What's Normal and What's Not – Leah Fronk, Penn State Ext; Kathy Demchak, Penn State Univ
11:00 am	*Top Strawberry Insect Pests of 2024 – Dr. Kelly Hamby, Univ of Maryland
11:30 am	*Determining why blueberry pollination lacks adaptability – Dr. Beth Ferguson, Rutgers Univ

Tree Fruit

9:00 am	*An Update for the Latest Management Strategies for Powdery Mildew in Tree Fruit – D. Kari Peter, Penn State
9:30 am	*Virginia Orchard IPPM: Native Wildflower Plot to Provide Alternative Forage, Habitat, and Refuge for Bee Pollinators ▪ Dr. Ian McKellips, Virginia Tech ▪ Dr. Kevin Rice, Virginia Tech ▪ Dr. Maggie Couvillion, Virginia Tech
10:00 am	Industry Show & Tell
10:15 am	*Codling Moth Control Programs in Apple and Impacts on Secondary Pests – Dr. David Biddinger
11:00 am	*Effect of Climate Change on Insect Pest Biology and Management – Dr. Kevin Rice, Virginia Tech
11:30 am	*USDA Pome Fruit Breeding Programs: Apple Pre-Breeding and Pear Scion Improvement – Dr. Christopher Gottschalk, USDA-ARS
12:00 pm	Lunch

Stone Fruit

9:00 am	*Season Long Multi-Pest Management in Peaches – Dr Anne Nielsen, Rutgers Univ
9:30 am	*Black Knot Resistance in Plums – 15-year Odyssey in

(Continued on p.14)

Mid-Atlantic Fruit and Vegetable Convention Schedule—*continued from page 13*

	the Black Hole of a Disease – Dr Jay Subramanian, Univ of Guelph
10:00 am	Industry Show & Tell
10:15 am	SuperSweet Nectarines: Prospects for New Cultivars with Consumer-Focused Traits – Dr Chris Dardick, US-DA-ARS
11:00 am	**Worker Protection Standard Compliance - Not Once and Done – Joni Davis, Penn State
11:30 am	Stone Fruit Training Systems for PYO (Grower Panel) ▪ Don Seifrit, Penn State Ext (Moderator) ▪ Henry Chiles, Crown Orchard Company ▪ Ed Weaver, Weaver's Orchard ▪ Steve Linvill, Linvilla Orchards
12:00 pm	Lunch

Thursday Afternoon – January 30, 2025

High Tunnel

1:30 pm	The Art of Using Cover Crops in High Tunnels – Judson Reid, Cornell Cooperative Ext
2:15 pm	Vegetable Grafting: A Toolbox for Securing Yield Stability and Profitability – Francesco Di Gioia, Penn State Univ
3:00 pm	Natural Enemy Food Webs in High Tunnel Systems – Laura Ingwell, Purdue Univ
4:00 pm	Can Beneficial Insects Pay Their Way? A Cost-Benefit Analysis for High Tunnel Spinach – Ariana Torres, Purdue Univ
4:00 pm	Adjourn

General Vegetable

1:30 pm	The Impacts of Invasive Species on Honey Bees – Robyn Underwood, Penn State Univ
2:15 pm	Things I Wish Someone Would Have Told Me (Grower Panel) ▪ Reuben Martin, Maplewood Farm ▪ Mike Brownback, Spiral Path Farm ▪ Peter Flynn, Pete's Produce
3:00 pm	What's New in Vegetable Grating - Mike and Kaitlyn Horst
3:30 pm	Adjourn

Potatoes

1:30 pm	Developing New Potato Varieties Past, Present, and Future - Walter DeJong, Cornell Univ
2:15 pm	Update on Some New Insecticide Options for Wireworms and Colorado Potato Beetle – Tom Kuhar, Virginia Tech, Entomologist; Kemper Sutton, Eastern Shore AREC
3:00 pm	Identifying Potato Problems in the Field – Jonathan Price, Senior
3:30 pm	**Impact of Water Quality on Pesticide Performance in Spray Mixes – Kara Pittman, Penn State Ext
4:00 pm	PA Cooperative Potato Growers; Plan for the Future – Nathan Tallman, CEO, PA Co-Operative Potato Growers
4:30 pm	PA Co-Operative Potato Growers Annual Business Meeting Update

PA Preferred

1:30 pm	PA Preferred Program Updates for Vegetable Producers – Michael Keefe, PA Dept of Agriculture; Gwyn Rowland, PA Dept of Agriculture

Digital & Social Media Marketing

1:30 pm	Selling Safely Online: Avoiding Legal Pitfalls and Risks – Nicole Cook, Univ of Maryland
2:15 pm	Short Form Video Trends + Social Media Algorithms: Beyond the Basics – Maureen Ballatori - Agency 29
3:00 pm	Facilitated Audience Discussion
3:30 pm	Adjourn

Small Fruit

1:30 pm	*New Blueberry Crop Protection Tools - What's Registered and in Development – Dr. Janine Spies, Rutgers Univ
2:15 pm	*Blueberry Pests: Identification and Management – Dr Patricia Prade, Penn State Ext
3:00 pm	Top Takeaways about Berries from the Last 30 Years – Kathy Demchak, Penn State Univ
3:30 pm	Adjourn

Labor/Farm Management

1:30 pm	AgrAbility: Resources for Farmers with Disabilities – Suzanna Windon, Penn State Ext
2:15 pm	Dealing with Stress - Suzanna Windon, Penn State Ext
3:00 pm	Tips for Retaining Talent – Linda Falcone, Penn State Ext
4:00 pm	Giving Employee Feedback – Linda Falcone, Penn State Ext
4:30 pm	Adjourn

Tree Fruit

1:30 pm	*Optimizing Herbicide Application Timing and Modes of Action – Dr Caio Brunharo, Penn State
2:00 pm	Lightning Talks ▪ Nate Boeckman, Virginia Tech ▪ Chenchen Kang, Penn State ▪ Lawrence Arthur, Penn State ▪ Tyler Seutter, Penn State ▪ Cameron Mehalek, Penn State
2:30 pm	PA Apple Maturity Program ▪ Dr. Shanthanu Kumar, Penn State ▪ Dr. Daniel Weber, Penn State ▪ Don Seifrit, Penn State Ext
3:00 pm	Rootstock Influence on Frost Tolerance and Bud Mortality in Apple: Key Genes for Germplasm Innovation – Dr Amolpreet Saini, Virginia Tech
3:30	**Water Quality – Dr Daniel Weber, Penn State Ext
4:00	Adjourn

Online registration will be available at www.pvga.org. Registration forms will be mailed to members without email addresses. If you need a registration form, reach out to us at pvga@pvga.org or 717-973-5915.

Do You Recognize this Disease of Arugula?

Bacterial blight on arugula. Meg McGrath, 2019

The Northeast Arugula Team (NEAT) at Penn State is looking to growers for help in identifying bacterial diseases of arugula and other brassica leafy greens in Pennsylvania vegetable production systems. Other goals of the research group include evaluating arugula cultivars for bacterial disease resistance, effective management strategies, and more. If you would like your plantings surveyed, have diseased arugula or brassica leafy green samples that you'd like to submit, or would just like to learn more, please contact Cameron Cedeno at cjc315@psu.edu / 724-732-2238. You can also visit NEAT's website here to view our latest informational webinar, take a grower survey, and learn more about our project: https://plantpath.psu.edu/research/labs/bull/research/neat.

Give Input on Soil Treatment

Bill Reynolds | Chair, PVGA Farm Show Task Force

To all fruit and vegetable producers:

We invite you to participate in an important survey conducted by the University of Florida and Penn State. This survey seeks to gather insights on Anaerobic Soil Disinfestation (ASD) practices across the United States. Your input will be instrumental in enhancing ASD methods, addressing any barriers to their adoption, and understanding your views on this innovative approach to soil health.

Your participation is essential for the success of this initiative. We encourage you to share your experiences and challenges, even if you are not currently using ASD. The survey is now open and will remain available until February 2025. You can access the survey online using the following link: https://ufl.qualtrics.com/jfe/form/SV_2rGDGbm58rDtD8O

Farm Show Update

Bill Reynolds | Chair, PVGA Farm Show Task Force

I hope everyone had a great fall season! We are less than two months from the opening of the 2025 Farm Show. The PVGA Farm Show managers will have started making calls for volunteers by the time you read this. Hopefully, all who volunteered in the past will sign up again in 2025, as well as those who haven't volunteered before will consider it for 2025.

The Farm Show aids the association in raising money for research, twilight meetings, and other outreach and education which PVGA helps fund. It is also a fantastic opportunity to get to know other volunteers, share ideas, and reconnect with acquaintances. Come early or stay after your shift and enjoy all the Farm Show has to offer.

Some changes to the booth and in the serving of food/drinks have been made – the goal is to make it easier for our volunteers, in addition to increasing our sales.

Another goal is to mail out the parking passes earlier in December to ensure everyone has their pass before their scheduled day to help. We encourage you to sign up early so this can happen.

Thank you again to those who have volunteered to assist us throughout the years, we are truly grateful for your assistance. We are looking forward to seeing returning faces and new ones during the 2025 Farm Show. Let's make this our best year ever!

Enhancing Microbial Populations for Optimizing Vegetable Yields

Submitted by Mike Orzolek
Prof. Emeritus Vegetable Crops, Penn State University

Soils consist of sand, silt and clay as well as organic matter, minerals, water, air and significant microbial populations that contribute to soil structure and fertility. The types of microbes found in soil consist of algae, fungi, Actinomyces, and bacteria. All these microbes are present in the soil in a population of millions in a gram of dry soil. Algae is generally found in the upper inch of arable soils. There are three general groups: blue-green, green and diatoms. All of the ordinary types of algae are stimulated by the application of farm manure.

Fungi are microscopic cells that usually grow as long threads or strands called hyphae. Hyphae interact with soil particles, roots, and rocks forming a filamentous body that promotes foraging for food. These networks release enzymes into the soil and break down complex molecules that the filaments then reabsorb. Fungus act like natural recycling bins, reabsorbing nutrients in the soil. Hyphae are usually only several thousandths of an inch (a few micrometers) in diameter. Single hyphae can span in length from a few cells to many yards. Fungi perform important services related to water dynamics, nutrient cycling, and disease suppression. Along with bacteria, fungi are important as decomposers in the soil food web, converting hard to digest organic material into usable forms.

Actinomyces are unicellular like bacteria, but produce a mycelium that is non-septate (coenocytic) and more slender, like true bacteria they do not have distinct cell-wall and their cell wall is without chitin and cellulose (commonly found in the cell wall of fungi). On culture media unlike slimy distinct colonies of true bacteria that grow quickly, actinomycetes colonies grow slowly, show powdery consistency and stick firmly to agar surface. They produce hyphae and conidia / sporangia like fungi. Certain actinomycetes whose hyphae undergo segmentation resemble bacteria, both morphologically and physiologically. Actinomyces actively degrade/decompose all sorts of organic substances like cellulose, polysaccharides, protein fats, organic-acids and humus. One of the species of actinomycetes, Streptomyces scabies, causes the disease "Potato scab" in potato.

Soil bacteria are some of the smallest and most abundant microbes in the soil. In a single gram of soil, there can be billions of bacteria. There are an estimated 60,000 different bacteria species, most which have yet to be even named, and each has its own particular roles and capabilities. Most live in the top 10cm (4 inches) of soil where organic matter is present. Some bacteria species are very fragile and can be killed by slight changes in the soil environment. Other species are extremely tough, able to withstand severe heat, cold or drying. Some can lie dormant for decades waiting for favorable conditions. Others can extract nitrogen directly from the air or break down some toxic substances.

Populations of microbes can boom or bust in the space of a few days in response to changes in soil moisture, soil temperature or carbon substrate. To gain advantage in this process, many microbes release antibiotic substances to suppress particular competitors. In this way some species can suppress other disease-causing microorganisms. There are several different types of soil bacteria with specific functions.

Decomposing bacteria play an important role in decomposition of organic materials, especially in the early stages of decomposition when moisture levels are high. In the later stages of decomposition, fungi tend to dominate. Bacillus subtilis and Pseudomonas fluorescens are examples of decomposer bacteria. Additions of these bacteria have not been proven to accelerate formation of compost or humus in soil.

Nitrogen fixing bacteria such as Rhizobium bacteria can be inoculated onto legume seeds to fix nitrogen in the soil. These nitrogen-fixing bacteria live in special root nodules on legumes such as clover, beans, medic, wattles etc. They extract nitrogen gas from the air and convert it into forms that plants can use. This form of nitrogen fixation can add the equivalent of more than 100kg of nitrogen per hectare per year (86 lbs/A). Azotobacter, Azospirillum, Agrobacterium, Gluconobacter, Flavobacterium and Herbaspirillum are all examples of free-living, nitrogen-fixing bacteria, often associated with non-legumes. To date, inoculating the soil with these organisms has not proved an effective means of increasing nitrogen fixation for non-legume crops.

Disease suppression of bacteria. Bacillus megaterium is an example of a bacterium that has been used on some crops to suppress the disease-causing fungus Rhizoctonia solani. Pseudomonas fluorescens may also be useful against this disease. Bacillus subtilis has been used to suppress seedling blight of sunflowers, caused by Alternaria helianthi.

A number of bacteria have been commercialized worldwide for disease suppression. However, suppression is often specific to particular diseases of particular crops and may only be effective in certain circumstances.

Aerobic and anaerobic bacteria. Aerobic bacteria are those that need oxygen, so where soil is well drained aerobes tend to dominate. Anaerobes are bacteria that do not need oxygen and may find it toxic. This group includes very ancient types of bacteria that live inside soil aggregates. Anaerobic bacteria favor wet, poorly drained soils and can produce toxic compounds that can limit root growth and predispose plants to root diseases.

Though largely unaffected by cultivation, bacteria populations are depressed by dry conditions, acidity, salinity, soil compaction and lack of organic matter. Therefore, maintaining soil health by reducing/eliminating soil compaction, increasing soil organic matter and maintaining an optimum soil pH (5.8 to 7.2) will enhance and support healthy populations of soil bacteria.

In the last 5 years, many agricultural chemical manufactures have introduced a biological organism for plant growth stimulation, disease suppression and/or nematode control/elimination. While not currently adopted by growers on a large scale, many growers are taking advantage of a non-chemical tool that will help increase crop production while decreasing disease and insect problems in commercial field production.

It has been shown that bacteria in soil can produce the three most active plant growth regulators (auxins, gibberrellins and kinetins) in significant amounts that can be utilized by crops to increase their production and quality. In the next 5 years, there will be a shift by agricultural companies to produce more biologically active compounds and fewer hard –core chemical compounds.

Rudolph Grob Memorial Scholarship

The Pennsylvania Vegetable Growers Association is pleased to be able offer several annual scholarships in the amount of $500 to $2,000 in memory of Rudolph Grob of Millersville who served the Association for 50 years as a Director, 20 years as Secretary-Treasurer and for over 20 years as manager of the Association's Farm Show Booth. Mr. Grob was a horticulture graduate of Penn State University who was employed for many years at Funk's Farm Market in Millersville.

Visit PVGA's website at **https://www.pvga.org/services/scholarship/** or contact PVGA at **717-973-5915** for more information

Extending the Production Season With the Use of High Tunnels

Submitted by Drs. Michael D. Orzolek and William James Lamont Jr.
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Penn State High Tunnel with cole crop production` in permanent raised beds covered with a row cover. A 17-foot wide by 96- foot long high tunnel with the sides rolled up for ventilation.

Lettuce production in hydroponic beds in high tunnels at the Penn state High tunnel Research and Education Center, Rock Springs, PA.

Introduction

For centuries a wide variety of techniques have been used to extend the growing season of horticultural crops. Glass jars, glass cloches, hotcaps, cold frames, hotbeds, low tunnels and greenhouses of various types have all contributed to season extension. More recently high tunnels have become popular with growers because of their simplicity and effectiveness in protecting crops from low temperatures, wind, and moisture stress in both spring and fall.

High tunnels do not offer the precision of conventional greenhouses for environmental control, but they do sufficiently modify the environment to enhance crop growth, marketable yield, and quality. Although they provide some frost protection, their primary function is to elevate temperatures as much as 20°F each day over a period of several weeks. If night ambient temperatures fall below 28°F for several nights in a row and days are cloudy and cool, the plants may not be killed, but their growth and development slowed down considerably.

In addition to temperature control, there are also the benefits of wind and rain protection, soil warming, and in some instances control of insects, diseases, and predators such as rodents, deers and birds. Overall, this growing system should be considered a protected growing system that enhances earliness and promotes higher yields, improves quality and shelf life, and reduces the use of pesticides.

High tunnels have become sufficiently versatile to make them useful on a wide diversity of crops and in various cropping systems. Vegetables, small fruits, flowers, medicinal and culinary herbs, and even tree fruits are all suited to this growing system; but the specific crops which might be grown will to a large extent depend on marketing opportunities for the individual crops being grown by individual growers.

A survey completed in 2007 by Penn State and Kansas State Universities on the construction and use of high tunnels in the United States concluded that there were currently over 4,000 acres of high tunnels in the US with an annual growth rate of 5% per year.

High Tunnel System

High tunnels encompass a crop growing system that fits between row covers and greenhouses. They are relatively inexpensive (about $2.00 to $3.00/sq. ft, excluding labor), permitting a grower to enter into high tunnel crop production with limited capital. This system is particularly appealing to new-entry growers who utilize retail-marketing channels.

High tunnels are not conventional greenhouses. But like plastic-covered greenhouses, they are generally a peaked or quonset-shape, constructed of metal bows that are attached to metal posts which have been driven into the ground about two feet deep. They are covered with a single layer of 6-mil greenhouse-grade polyethylene, and are ventilated by manually rolling up the sides each morning and rolling them down in early evening. There is no permanent heating system although it is advisable to have a standby portable propane heater to protect against unexpected below-freezing temperatures. There are no electrical connections. The only external connection is a water supply for trickle irrigation. Dr. Otho Wells, from the University of New Hampshire, was a pioneer in promoting the use of high tunnels in the northeastern United States and developed the New Hampshire design and system of production that involved covering the entire soil surface inside the tunnel with a solid

sheet of 6-mil thick plastic. At Penn State we re-designed the endwalls so that they can be raised up to facilitate easy access into the tunnel with a small tractor and tiller and a system of production that uses 18- inch wide raised bed covered with plastic mulch and drip irrigation tape buried 2-3 inches beneath the bed. The raised mulch beds are 44 inches apart, which allows 4 rows in a 17 foot wide high tunnel or 5 rows in a 21 foot wide tunnel.

Construction of a High Tunnel Using the Penn State Design

High tunnel types available are single-bay and multi-bay tunnels. Single-bay tunnels tend to result in greater environmental modification, while multi-bay tunnels are typically much larger, and do not tolerate a snow load or significant wind events. Within single-bay tunnels, it is important to choose a design suited for your weather conditions. Designs with a peaked, or Gothic, roof design are better-suited to locations that receive snow than those with an arched, or Quonset-style roof. High tunnels are relatively easy to construct. Erection of the pipe framing is the same whether the New Hampshire Design or the Penn State Design is used. The changes come in the construction of the endwalls and the hipboard and attachment of the plastic covering. Detailed construction information for the high tunnel design used in Penn State research can be found at http://plasticulture.cas.psu.edu/Design_construction.pdf.

General Suggestions for High Tunnel Management

High tunnels are not automated. Consequently, for maximum efficiency, they require regular daily attention, especially in the morning and evening, and during heavy rain events or strong winds. Temperature and humidity are the two critical factors that should be controlled as much as possible. Early each morning in the Spring (March-May) and Fall (September-December), the sides should be rolled up to flush out the humidity and to keep temperature in check during the day. The temperature in a closed high tunnel rises very rapidly on a clear morning! In other words, don't put off rolling up the sides. Ken-Bar Inc., Reading, MA. has developed a top vent that fits right on the plastic film and can be used to ventilate a tunnel in the early spring and late fall when one does not really need to roll the sides up for temperature control. In the early evening, roll down the sides to entrap as much heat as possible. To increase soil and air temperatures within a high tunnel the following materials have been used successfully over the last ten years: floating row covers, thermal blankets, and hoop supported low tunnels (plastic film with or without ventilation holes or row cover material). Close the sides each evening until the night temperature reaches about 60oF. In the northeastern United States, this could mean that the sides would be rolled down each day well into the summer. Ventilation is best accomplished when wind moves through the tunnel from side to side; therefore orient the tunnel so that the length of the high tunnel is perpendicular to the direction of the prevailing winds. The width of the tunnel also impacts ventilation. It is hard to be specific on the maximum width, but from experience, about 21to 26 feet seems to be the maximum high tunnel width that will allow for good ventilation, especially as plants grow taller and block the airflow.

Benefits of High Tunnels

The primary benefit of high tunnels is earliness. Tomatoes planted in a high tunnel will mature on average about one month before tomatoes planted in the field. Earliness is the combination of being able to plant in high tunnels about two to four weeks earlier than in the open- field and faster ripening (about two weeks) inside the high tunnel. Overall, the cost of a high tunnel is usually recovered the first year when selling tomatoes at retail prices. Another highly beneficial advantage of tunnels is disease control. The plastic cover acts like a rain shelter, the raised plastic mulch beds are a barrier against evaporation of soil moisture, and early morning ventilation reduces relative humidity. Therefore, the leaves of crops are dry for most of the day and night. Because of low humidity, plant leaves remain dry, impeding the incidence and spread of both fungal and bacterial diseases. For example, early blight of tomatoes, a serious foliage and fruit disease on field tomatoes, is not a problem in high tunnels when the tunnels are vented daily, though powdery mildew can be a problem because the conditions in a high tunnel are more favorable for the development of this disease.

Crops

The following crops have been successfully grown in high tunnels at the Penn State High Tunnel Research and Education Facility located at the Horticulture Research Farm, Rock Springs, PA. There are several production systems that are used to grow the various horticultural crops in high tunnels: 1) annual raised beds with plastic mulch and drip irrigation, 2) permanent raised beds 8" to 12" tall and 3' or 4' wide and 3) conventional production on bare soil with drip irrigation. Generally one or two drip tapes are placed on the surface of the permanent raised bed depending on bed width and crop density. Also, plastic mulch is placed on top of the soil of the raised beds to increase soil temperature, reduce evapotranspiration, and reduce/eliminate weeds during the growing season.

Snow accumulation on high tunnels at the Horticulture Research farm, Rock Springs, PA..

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Extending the Production Season With the Use of High Tunnels — *continued from page 11*

Vegetables

The high tunnel allows growers to produce crops over a longer period of time and in some climates, even produced year-round. Many times the plastic mulch is double-cropped with the first crop being removed and the second crop being planted on the plastic. The following vegetables have been grown successfully in the high tunnels: tomato (Lycopersicon esculentum), eggplant (Solanum melongena), pepper (both hot and sweet) (Capsicum annuum Grossum group), muskmelon (Cucumis melo) summer squash (Cucurbita pepo), cucumber (Cucumis sativus), spinach (Spinacia oleracea), Swiss chard (Beta vulgaris var. cicla) , lettuce (Lactuca sativa) , broccoli (Brassica oleracea var. italica)., cabbage (Brassica oleracea var. capitata), cauliflower (Brassica oleracea var. botrytis), kale (Brassica oleracea var. acephala), kohlrabi (Brassica oleracea gongyloides), okra (Abelmoschus esculentus), onions (Allium cepa), leeks (Allium ampeloprasum porrum) , garlic (Allium sativum), peas (Pisum sativum), turnip (Brassica Rapa – Rapifera group), beets (Beta vulgaris), asparagus (Asparagus officinalis), gourds, celery (Apium graveolens), daikon radish (Raphanus sativus), bitter melon (Momordica charantia), luffa (Luffa aegyptiaca), specialty potatoes (Solanum tuberosum) for the red, white and blue potato salad for the 4th of July. In addition, a wide variety of herbs such as dill (Anethum graveolens), basil, thyme, rosemary, oregano, cilantro and parsley have been grown in the high tunnel.

Small Fruits

The extended production season and improved shelf-life of these products make high tunnel production a very viable option for the direct marketer. Primocane-bearing red raspberries (Rubus idaeus), and thornless blackberries (Rubus subgenus Eubatus) are produced on bare ground with drip irrigation. Strawberries (Fragaria x ananassa) are grown using the small raised bed with drip irrigation or in 6 inch wide drainage gutters that are supported by a 2″ x 4″ wooden frame.

Cut Flowers

There are many options for cut flowers in the high tunnels ranging from herbaceous perennials over-wintered for spring cut-flower production to summer annuals, and natural season fall mums. This production system permits cut flowers to be harvested earlier in the spring and later in the fall compared to cut flowers grown in the field, and provides excellent flower quality.

Tree Fruit

Sweet cherries on dwarfing rootstock have been planted in high tunnels since 2000. Initial harvest of this environmentally sensitive crop begin in 2003. Benefits of growing sweet cherries in high tunnels are earlier maturity, elimination of fruit cracking and bird damage.

Summary

High tunnels can provide an ideal protective growing environment for any number of crops, but all crops might not be economical for any number of reasons. Therefore, a good approach to take would be to try different crops in light of market demands and marketing strategies. Although tunnels do require more manual attention than do greenhouses, the benefits of high tunnels in a diversified farm operation have proven to be a valuable asset in overcoming a short growing season and expanding the marketing season.

There are temperature limitations in high tunnels since they are not designed to be as warm as a greenhouse. Some type of supplemental heat should be available just in case there is a sudden unexpected drop in the temperature that would permanently injure the crop. The critical low temperature will depend on the crop. If the intent is to have a permanent heat source in a high tunnel, then if would be well to consider constructing a bona-fide greenhouse which easily could be used year around.

Strawberries growing in a 30′ x 48′ high tunnel in plastic GroBags at Bob and Linda Sewart's Farm, Saulsburg, PA

Table 1. Suggested spacing of horticultural crops when transplanted or seeded in high tunnels.

Crop	Within-Row Spacing (inches)	Number of Rows spacing between double rows (12 inches)
VEGETABLES		
Honeydew	24	Single (option trellis)
Cucumber	12-4	Single (option trellis)
Summer Squash	36	Single
Eggplant	18-24	Double (staggered planting)
Pepper	18-24	Double (staggered planting)
Tomato- staked	18-24	Single
Lettuce	6-12	Double
Spinach	4	Double
Swiss Chard	8	Double
Kale	8	Double
Kholrabi	6-8	Double
Onion	4-6	Double
Leeks	4-6	Double
Garlic	4-6	Double/Triple
Potato	6-10	Double (staggered planting)
Cabbage	12	Double (staggered planting)
Broccoli	12-16	Double (staggered planting)
Cauliflower	12-16	Double (staggered planting)
Okra	12-16	Double (staggered planting)
English Peas	3	Double (option trellis)
SMALL FRUITS		
Raspberries	18	Single (bare ground) 6 ft. between rows
Blackberries	18	Single (option trellis) 6 ft. between rows
Strawberries	14	Double 8 in. between rows
CUT FLOWERS		
Small size plants (12 to 20 inches tall)	8	Double 14 in. between rows
Large size plants (greater than 20 inches tall)	12	Double 14 in. between rows

For additional information on plasticulture contact the following websites:
American Society for Plasticulture: http://www.plasticulture.org/
Center for Plasticulture, Penn State University: http://plasticulture.cas.psu.edu

Penn State High Tunnel Production Guide is available for $30.00 U.S. dollars from
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Organic Late Blight Tomato Cultivar Evaluation

Elsa Sánchez and Tom Butzler

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

Tomatoes are a top crop for Pennsylvania vegetable farmers, where field-grown tomatoes are produced on 1,203 farms comprising 2,466 acres (Census of Agriculture, 2022). They are grown on more vegetable farms in Pennsylvania than any other vegetable. By acreage, tomato ranks fifth after sweet corn, potato, snap bean, and pumpkin. Using Census of Agriculture data (2022), the average tomato planting in Pennsylvania is about 2 acres, while the average farm size is 11.3 acres (Census of Agriculture, 2022). Tomatoes encompass a significant part, about 18% of acreage on average, of diversified vegetable farms. Additionally, we asked 304 growers at the 2011 Mid-Atlantic Fruit and Vegetable Convention, "What specific crops should researchers focus on to maintain your operation's profitability and that of the Mid-Atlantic Vegetable and Fruit Industry?" Tomatoes came out as the top response of 18 crops listed.

When we asked 110 farmers at the 2019 Mid-Atlantic Fruit and Vegetable Convention to rate vegetable management activities by their importance, cultivar selection was rated third (behind irrigation management and crop rotation; Sánchez et al. 2021). All farmers benefit from using disease-resistant cultivars. However, their importance on organic farms is amplified because available fungicides are limited compared to other types of farms. Late blight (caused by *Phytophthora infestans*) is a devastating tomato disease. Since the 2009 Late Blight pandemic in the Eastern U.S., this disease has been a yearly challenge. According to Fry et al. (2013), during the pandemic, "Many home gardeners and many organic producers lost most if not all of their tomato crop, and their experiences were reported in the mainstream press. Some CSAs (Community Supported Agriculture) could not provide tomatoes to their members." Pennsylvania farmers and gardeners can select disease-resistant cultivars to avoid late blight. However, organic farmers have indicated that consumers do not always favor the appearance and flavor of late blight-resistant cultivars.

In 2024, we evaluated indeterminate and determinate late blight-resistant slicing tomato cultivars using organic practices at Penn State University's Russel E. Larson Agriculture Research Center in Pennsylvania Furnace to provide farmers with up-to-date information for successful late blight-resistant cultivar selection based on yield. We had also hoped to evaluate the cultivars based on appearance and taste; however, that part of the evaluation was unsuccessful (explained below).

Methods:

The study was conducted in central Pennsylvania at Pennsylvania State University's Russell E. Larson Agricultural Research Center in Pennsylvania Furnace in a field managed using synthetic fertilizers and pesticides before 2024.

The project consisted of two experiments, one evaluating seven indeterminate cultivars and the other six determinate cultivars (Table 1). For both experiments, four-week-old transplants were

'Abigail,' an heirloom-style pink cultivar, with blossom-end scarring (right), is a contributing factor to the unmarketable tomatoes in this trial.

planted on June 5th, 2024, into a plasticulture system consisting of raised beds and two lines of drip irrigation tape (T-Tape model 508-12-450, John Deere, Moline, IL) covered with embossed black plastic mulch (1 mil, Wrap Bros., Chicago, IL); one line was used for irrigation and the other for fertigation. Plots consisted of 6 plants planted with 1.5 ft in-row spacing and 10 ft between rows. Plants were provided with 1-1.5 acre-inches of water each week. Before pulling beds, organic granular fertilizer (Fertrell Blue N 5-1-1; Fertrell, Bainbridge, PA) was applied at a rate of 150 lb/acre N. Additionally, the planting was fertigated weekly with 2 lb/acre N of organic liquid fertilizer (Alaska Fish Emulsion 5-1-1; Home Depot, State College, PA). Diseases were managed with a copper-based fungicide (Kocide 3000-O; Certis Biologicals, Columbia, MD; 2 lb/acre), applied weekly, beginning September 3rd. Weeds were suppressed by planting a cover crop of annual ryegrass (Johnnys Selected Seeds, Winslow, ME; 25 lb/acre) between planting rows and surrounding the field. Plants were trained vertically using a Florida Weave system with 1-inch square wooden stakes placed in the following pattern: plant, plant, stake, plant, plant, stake, etc. The first string was placed when plants were about 10 inches tall. Stings were placed twice more in the determinate experiment and thrice more in the indeterminate experiment.

Tomatoes were harvested weekly when they reached red maturity, starting on August 2nd, 2024, and ending on October 3rd, 2024. Immediately after harvesting, the tomatoes were categorized as marketable or unmarketable, counted, and weighed. Additionally, marketable tomatoes were sized as small (< 2 inches in diameter), medium (2 – 2.75 inches in diameter), large (2.75 – 3.5 inches in diameter), or extra-large (> 3.5 inches in diameter).

A randomized complete block design was used for both experiments, and each cultivar was replicated four times. Data was collected from 6 plants per cultivar per replication and analyzed using the mixed procedure with means separated using pdiff.

Table 1. Indeterminate and determinate Late Blight-resistant cultivars evaluated in an organic production system in Pennsylvania Furnace, Pennsylvania, at Pennsylvania State University's Russell E. Larson Agricultural Research Center in 2024.

Tomato Type	Cultivar	Notes	Seed Source
Indeterminate	Abigail	Heirloom-type; pink at maturity; minimal fruit cracking and stem scarring; large-sized fruit (10-16)	Johnny's Selected Seeds (Winslow, ME)
	Big Beef	All-America Selection Winner; red at maturity; resistance to several other diseases and nematodes; large-sized fruit (10-12 oz)	Johnny's Selected Seeds
	Beef Maestro	Heirloom-type; red at maturity; large-sized fruit (≥13 oz)	Totally Tomatoes (Randolph, WI)
	Damsel	Pink at maturity; resistance to Verticillium Wilt and nematodes; medium-sized fruit (8-12 oz)	Johnny's Selected Seeds
	Rose de Berne	Heirloom; pink at maturity; resists cracking; medium-sized fruit (4-8 oz)	High Mowing Organic Seeds (Wolcott, VT)
	Strawberry Fields	Heirloom-type; red at maturity; tolerance to blossom end rot and shoulder cracking; medium-sized fruit (7-10 oz)	Johnny's Selected Seeds
	Mountain Rouge	All-America Selection Winner; pink at maturity; resistance to nematodes; large-sized fruit (12-14 oz)	Totally Tomatoes
Determinate	Defiant	Red at maturity; resistance to Early Blight; medium-sized fruit (8-12 oz)	Johnny's Selected Seeds
	Galahad	All-America Selection Regional Winner; red at maturity; resistant to several other diseases and nematodes; medium-sized fruit (7-12 oz)	Johnny's Selected Seeds
	Iron Lady	Red maturity; resistance to several other diseases; medium-sized fruit (about 5 oz)	High Mowing Organic Seeds
	Mountain Gem	Red at maturity; resistance to Tomato Mosaic Virus; medium-sized fruit (6-8 oz)	Totally Tomatoes
	Mountain Merit	All-American Selection Regional Winner; red at maturity; resistant to several other diseases and nematodes; medium-sized fruit (8-10 oz)	Johnny's Selected Seeds
	Stellar	Red at maturity; intermediate resistance to Early Blight and Septoria Leaf Spot; medium-sized fruit (5-7 oz)	Totally Tomatoes

Sensory Evaluation. We invited the Penn State Master Gardeners to evaluate the appearance and taste of the tomato cultivars during one of their September meetings. Unfortunately, interest in participating was low, and we could not conduct the sensory evaluation. We will attempt to hold a sensory evaluation on Pennsylvania State University's University Park campus if we receive funding to repeat this study.

Results

Indeterminate Cultivar Evaluation. 'Mountain Rouge' was used as the standard.

'Strawberry Fields', 'Big Beef', 'Beef Maestro', and 'Rose de Berne' produced more marketable tomatoes than 'Mountain Rouge' (Table 2). 'Damsel' and 'Abigail' did not have marketable yields that differed from 'Mountain Rouge'. The mean marketable yield by weight was higher for 'Strawberry Fields', 'Big Beef', and 'Beef Maestro' than for 'Mountain Rouge'. All other cultivars were not different from 'Mountain Rouge'.

The number of unmarketable tomatoes was higher from 'Damsel' and lower from 'Strawberry Fields' than 'Mountain Rouge'. All other cultivars were not different than 'Mountain Rouge'. Mean unmarketable yields by weight were lower from 'Strawberry Fields' than 'Mountain Rouge'. All other cultivars were not different than 'Mountain Rouge'.

(Continued on p.24)

Organic Late Blight Tomato Cultivar Evaluation — *continued from page 23*

Table 2. Marketable and unmarketable yield of seven indeterminate Late Blight-resistant tomato cultivars evaluated in an organic production system in Pennsylvania Furnace, Pennsylvania, at Pennsylvania State University's Russell E. Larson Agricultural Research Center in 2024.

Cultivar	Marketable Yield (Mean No/Plant)	Marketable Yield (Mean Lb/Plant)	Unmarketable Yield (Mean No/Plant)	Unmarketable Yield (Mean Lb/Plant)
Strawberry Fields	24.0 a*	8.9 a	10.6 d	3.7 d
Big Beef	19.6 b	9.1 a	17.6 bc	9.6 bc
Beef Maestro	19.3 b	8.4 a	15.4 cd	8.9 bc
Rose de Berne	17.0 bc	5.9 b	22.9 ab	8.3 c
Damsel	12.7 cd	6.0 b	27.0 a	13.5 a
Mountain Rouge	**10.3 d**	**4.9 b**	**18.7 bc**	**11.3 abc**
Abigail	9.1 d	5.0 b	16.7 c	12.2 ab

**Values are the means of six plants per replication and four replications. 'Mountain Rouge' (bolded) is the standard to which all other cultivars were compared. Values followed by different letters or within a column are statistically different at P ≤ 0.05. A randomized complete block design was used for the experiment, with each cultivar replicated four times. Data were analyzed using the mixed procedure, and means were separated using pdiff. Please read this article for more information on interpreting tables like this: Science, Tomatoes, and How to Read a Table (psu.edu).*

Overall, not many tomatoes were categorized as extra-large (Table 3). None of the cultivars produced different extra-large yields by number than 'Mountain Rouge'. Mean extra-large fruit weight was higher from 'Abigail' than 'Mountain Rouge'. All other cultivars were not different than 'Mountain Rouge'.

Most tomatoes were categorized as large- and medium-sized. 'Strawberry Fields', 'Beef Maestro', and 'Big Beef' had more large tomatoes by number and weight than 'Mountain Rouge'. All other cultivars were not different than 'Mountain Rouge'.

The mean number of medium-sized tomatoes was higher from 'Strawberry Fields' and 'Rose de Berne' than 'Mountain Rouge'. All other cultivars were not different than 'Mountain Rouge'. Mean large-sized fruit by weight was highest from 'Strawberry Fields', 'Rose de Berne', and 'Big Beef' than 'Mountain Rouge'.

Few tomatoes were categorized as small. In fact, for many cultivars, the mean number and weight of small-sized tomatoes was zero. 'Strawberry Fields' produced a larger mean number of small-sized fruit than 'Mountain Rouge'. No other differences compared to 'Mountain Rouge' were observed in the small category.

Table 3. Marketable yield by size of seven indeterminate Late Blight-resistant tomato cultivars evaluated in an organic production system in Pennsylvania Furnace, Pennsylvania, at Pennsylvania State University's Russell E. Larson Agricultural Research Center in 2024.

Cultivar	Extra-large (mean no/ plant)	Extra-large (mean lb/ plant)	Large (mean no/plant)	Large (mean lb/ plant)	Medium (mean no/ plant)	Medium (mean lb/ plant)	Small (mean no/ plant)	Small (mean lb/ plant)
Strawberry Fields	0.6 b*	0.5 c	10.9 a	5.1 a	12.3 a	3.4 a	0.3 a	<1 a
Beef Maestro	2.0 a	1.6 abc	9.8 ab	4.9 a	7.6 ab	1.9 bc	0.0 b	<1 a
Rose de Berne	0.4 b	0.3 c	5.1 cd	2.6 bc	11.4 a	3.0 ab	0.1 ab	<1 a
Big Beef	2.1 a	1.9 ab	8.4 ab	5.0 a	9.1 ab	2.3 ab	0.1 ab	<1 a
Damsel	1.4 ab	1.1 bc	7.0 bc	3.9 ab	4.4 b	1.0 c	0.0 b	<1 a
Mountain Rouge	**1.6 ab**	**1.4 bc**	**4.3 cd**	**2.4 bc**	**4.4 b**	**1.1 c**	**0.0 b**	**<1 a**
Abigail	2.6 a	2.8 a	2.1 d	1.2 c	4.3 b	1.0 c	0.0 b	<1 a

**Values are the means of six plants per replication and four replications. 'Mountain Rouge' (bolded) is the standard to which all other cultivars were compared. Values followed by different letters or within a column are statistically different at P ≤ 0.05. A randomized complete block design was used for the experiment, with each cultivar replicated four times. Data were analyzed using the mixed procedure, and means were separated using pdiff.*

Determinate Cultivar Evaluation. 'Mountain Merit' was used as the standard.

'Defiant', 'Stellar', and 'Iron Lady' produced more marketable tomatoes than 'Mountain Merit' (Table 4). No other cultivars were different than 'Mountain Merit'. Mean marketable yield by weight was higher from 'Defiant' and 'Stellar' than 'Mountain Merit'. All other cultivars were not different than 'Mountain Merit'.

'Defiant' and 'Stellar' produced more unmarketable tomatoes than 'Mountain Merit'. All other cultivars were not different than 'Mountain Merit'. No differences between cultivars for mean unmarketable yield by weight were observed.

Table 4. Marketable yield by size of six determinate Late Blight-resistant tomato cultivars evaluated in an organic production system in Pennsylvania Furnace, Pennsylvania, at Pennsylvania State University's Russell E. Larson Agricultural Research Center in 2024.

Cultivar	Extra-large (mean no/plant)	Extra-large (mean lb/plant)	Large (mean no/plant)	Large (mean lb/plant)
Defiant	22.6 a*	6.3 ab	24.1 a	6.5 a
Stellar	22.4 ab	7.9 a	21.0 a	7.3 a
Iron Lady	16.5 b	5.6 bc	20.8 ab	7.2 a
Mountain Merit	**9.6 c**	**4.0 c**	**14.4 bc**	**6.7 a**
Galahad	**8.6 c**	**3.7 c**	**17.6 abc**	**7.3 a**
Mountain Gem	**8.6 c**	**4.7 bc**	**13.0 c**	**8.6 a**

**Values are the means of six plants per replication and four replications. 'Mountain Rouge' (bolded) is the standard to which all other cultivars were compared. Values followed by different letters or within a column are statistically different at P ≤ 0.05. A randomized complete block design was used for the experiment, with each cultivar replicated four times. Data were analyzed using the mixed procedure, and means were separated using pdiff.*

'Mountain Gem' produced more extra-large fruit by number and weight than 'Mountain Merit'. All other cultivars were not different than 'Mountain Merit' (Table 5).

No differences compared to 'Mountain Merit' were observed in the large category.

'Stellar' and 'Defiant' produced more medium fruit by number and weight than 'Mountain Merit'. All other cultivars were not different than 'Mountain Merit'.

No differences compared to 'Mountain Merit' were observed in the small category.

'Mountain Gem' stands out for its ability to produce extra-large tomatoes, surpassing other cultivars in both number and weight in the determinate late blight-resistant tomato cultivar trial.

(Continued on p.26)

Organic Late Blight Tomato Cultivar Evaluation — *continued from page 25*

Table 5. Marketable and unmarketable yield of six determinate Late Blight-resistant tomato cultivars evaluated in an organic production system in Pennsylvania Furnace, Pennsylvania, at Pennsylvania State University's Russell E. Larson Agricultural Research Center in 2024.

Cultivar	Extra-large (mean no/ plant)	Extra-large (mean lb/ plant)	Large (mean no/ plant)	Large (mean lb/plant)	Medium (mean no/ plant)	Medium (mean lb/ plant)	Small (mean no/ plant)	Small (mean lb/plant)
Mountain Gem	2.6 a*	2.5 a	2.3 b	1.2 bc	3.7 d	0.9 d	0.0 a	<1 a
Galahad	0.6 b	0.5 b	4.2 ab	2.2 abc	3.8 d	1.0 d	0.1 a	<1 a
Mountain Merit	**0.5 b**	**0.4 b**	**4.0 ab**	**2.2 abc**	**5.1 cd**	**1.3 cd**	**0.0 a**	**<1 a**
Stellar	0.3 b	0.2 b	7.5 a	3.7 a	14.5 b	4.0 b	0.1 a	<1 a
Iron Lady	0.2 b	0.1 b	6.0 a	2.9 ab	9.3 c	2.4 c	1.1 a	<1 a
Defiant	~0 b	~0 b	2.0 b	0.9 c	20.1 a	5.2 a	0.6 a	<1 a

**Values are means of six plants per replication and four replications. 'Mountain Rouge' (bolded) is the standard to which all other cultivars were compared; Values followed by different letters or within a column are statistically different at P ≤ 0.05. A randomized complete block design was used for the experiment, with each cultivar replicated four times. Data were analyzed using the mixed procedure, and means were separated using pdiff.*

Discussion:

To confirm our results are repeatable, we need to conduct the study again. The results and this discussion should be viewed as preliminary.

We did not observe any incidence of Late Blight in either experiment.

Indeterminate Evaluation.

We observed unmarketable tomatoes to be widespread across most cultivars. Specifically, six out of the seven indeterminate cultivars produced higher unmarketable yields by weight compared to marketable ones, while five out of the six determinate cultivars also yielded more unmarketable than marketable tomatoes by weight. Fruit with large blossom end scarring, blossom end rot, and tomato pox were culled. The greatest cause of culled fruit was concentric and radial cracking and rain check. We have observed an increase in water-related disorders, where a hot, dry start to the season led to issues such as blossom end rot, followed by early fall rain events that became more extreme and frequent, resulting in higher rates of concentric and radial cracking and rain check. For example, in June, the average temperature was 70.5°F, compared to the historical norm of 68.1°F, and rainfall was only 2.58 inches, significantly below the historical average of 4.09 inches. July also followed this pattern, with an average temperature of 74.7°F (compared to a normal 72.2°F) and total precipitation of 2.41 inches versus the typical 3.79 inches. This hotter, drier summer contributed to early-season disorders. In August, temperatures stabilized at the historical average of 70.5°F, but rainfall surged to 6.03 inches, well above the historical 4.16 inches, intensifying water-related disorders in the later part of the season.

The mean unmarketable yield per plant exceeded the mean marketable yield for 'Rose de Berne', 'Damsel', 'Mountain Rouge', and 'Abigail' by number and 'Damsel', 'Mountain Rouge', and 'Abigail' by weight. Seed source descriptions of 'Abigail', 'Rose de Berne', and 'Strawberry Fields' mentioned minimal cracking or resistance or tolerance to cracking. We observed the expression of this trait to be strongest for 'Strawberry Fields' in our evaluation. Indeed, 'Strawberry Fields' produced significantly less unmarketable fruit per plant than any other cultivar evaluated and a higher marketable yield per plant than 'Mountain Rouge'.

Fruit from 'Strawberry Fields' was red at maturity. For markets demanding pink fruit, 'Rose de Berne' produced more marketable tomatoes than 'Mountain Rouge'. By marketable weight per plant, all four pink-fruited cultivars ('Rose de Berne', 'Damsel', 'Mountain Rouge', and 'Abigail') were not different from each other. It should be noted that all four produced significantly lower marketable yield per plant by weight than the red-fruited cultivars.

The commonality between all the cultivars we evaluated was that they were slicing tomatoes and had resistance to Late Blight. They differed in size (medium and large), shape (standard and heirloom), and fruit color at maturity (red and pink).

Very few tomatoes were extra-large. We didn't observe any cultivar produce a different number of extra-large fruit per plant than 'Mountain Rouge'. 'Abigail' produced a higher weight of extra-large fruit per plant than 'Mountain Rouge'. 'Abigail' was described as producing the largest-sized (10-16 oz) fruit in this evaluation (Table 1). Fruit were an heirloom type. They were largely flattened in shape and tended to have gnarly blossom ends. Many fruit were discarded because of the extent of the blossom end scars. 'Abigail' may be more suited for home gardens.

'Strawberry Fields' produced a higher marketable yield (number per plant) and lower unmarketable yield (pound per plant) compared to other indeterminate late blight-resistant tomato cultivars.

Most fruit fell in the large- and medium-sized categories. The red-fruited cultivars produced more large-sized fruit per plant by number and weight than 'Mountain Rouge', while the pink-fruited ones were not different. Any of the red-fruited cultivars may be good options for large-sized fruit. The pink-fruited cultivars produced a smaller amount of large-sized fruit per plant; however, they may be grown for markets demanding pink fruit. Using other visual and flavor characteristics may help determine which cultivars to grow for large-sized fruit. We noted, for example, that 'Beef Maestro' produced a blocky fruit compared to the other cultivars, and 'Strawberry Fields' produced very uniform fruit.

'Strawberry Fields' and 'Rose de Berne' produced more medium-sized fruit per plant by number and weight than 'Mountain Rouge'. These may be good options for red- and pink-fruited cultivars, respectively.

Very few fruit were categorized as small. Additionally, very few statistical differences were observed in this category. None of the cultivars we evaluated were described by seed companies as small-fruited. We did not observe enough small-sized fruit to be able to make a cultivar recommendation for this category.

Determinate Evaluation.

Less visual differences were present between the determinate cultivars than the indeterminate ones. All cultivars evaluated were red-fruited, medium-sized slicers. Marketable yields were higher by number per plant from 'Defiant', 'Stellar', and 'Iron Lady', and by weight from 'Defiant' and 'Stellar' than 'Mountain Merit'. As observed in the indeterminate evaluation, excessive water-related issues (cracking and rain check) were the primary cause of culled fruit. Apart from 'Defiant', all cultivars produced more unmarketable than marketable fruit per plant by number, and apart from 'Stellar', all cultivars produced more unmarketable than marketable fruit per plant by weight. 'Defiant' and 'Stellar' produced more unmarkable fruit per plant than 'Mountain Merit'. However, no differences were observed by mean unmarketable weight per plant. Overall, 'Defiant' and 'Stellar' appear to be the best options based on marketable yield.

Notably, most 'Defiant' culls had yellow shoulder. While some other cultivars also exhibited this disorder, 'Defiant' seemed to be especially prone. Tomatoes have a high need for potassium during fruiting. 'Defiant' may have a higher need relative to other cultivars.

'Mountain Gem' produced more extra-large tomatoes per plant than 'Mountain Merit'. In fact, 'Mountain Gem' was the only cultivar that produced more than one extra-large tomato per plant. 'Mountain Gem' appears to be the best option among the cultivars evaluated for producing extra-large fruit, although the amount of fruit in this category was small.

All cultivars may be good options for large-sized fruit as none differed from 'Mountain Merit'.

Overall, the largest category of fruit was medium-sized. 'Stellar' and 'Defiant' produced more medium-sized fruit by number and weight than 'Mountain Merit' and may be good options. 'Stellar' is reportedly resistant to Early Blight (caused by *Alternaria solani*) and Septoria Leaf Spot (caused by *Septoria lycopersici*), two other commonly encountered diseases in tomato production.

Too few fruit were small to recommend which cultivar to grow in this category.

Acknowledgments. This work was only possible because we belong to a strong community of people who helped us succeed. Chris Sánchez prepped the field for planting, helped set up and clean up after every harvest, planted and maintained the cover crop, and took care of all post-harvest field cleanup. Austin Kirk supported field operations and helped make sure that we were set up for success. Chris Igo, Harvey Gilbert, Jeanie Kim, Tim Damico, Dave Wolfgang, Ann Shallcross, Leigh Steingraber, Tara Mather, Michal Stump, Dan Kottloski, Karen Kottloski, and Darlene Bachmann planted the field, assisted with the weekly harvests, and made Thursday morning harvests enjoyable. We also wish to acknowledge all the farmers who grow the food instrumental to our survival; you do get thanked enough. We are grateful to the scientists who came before us and laid the groundwork for research like ours. Lastly, we express our sincere appreciation for the remarkable tomato plant (*Solanum lycopersicum*), which has inspired some of the best-tasting dishes we've ever eaten. Thank you!

Crop Growing Expo

PVGA will have a booth at the Crop Growing Expo January 15-16, 2025 at Spooky Nook in Manheim. Contact us at pvga@pvga.org or 717-973-5915 if you are interested in helping us at the booth.

Soil Health: Key to Success

Dr. Mike Orzolek
Professor Emeritus Olericulture, Plant Science Department, The Pennsylvania State University

Success in vegetable crop production has focused on crop plant health for the last fifty years. However, in the last five years soil health has emerged as a critical factor in determining vegetable crop yields and quality. Soil health is the continued capacity of soil to function as a living ecosystem that sustains plants, animals, and humans. Viewing soil as a living ecosystem that has 'health' reflects a fundamental shift in the way we think about soil. Soil isn't an inert growing medium that needs to be filled up with water and nutrients when it runs out. Rather, if the soil is healthy, it is teeming with large and small organisms that live together in a dynamic, complex web of relationships. Farm crops and animals become part of this unique 'cycle of life.' The other consideration regarding annual addition of microbes to soil is that soil temperature during the year in northern US affects microbe viability.

In their natural environment, plants are part of a rich ecosystem including numerous and diverse microorganisms in the soil. It has been long recognized that some of these microbes, such as mycorrhizal fungi or nitrogen fixing symbiotic bacteria, play important roles in plant performance by improving mineral nutrition and soil tilth. However, the full range of microbes associated with plants and their potential to replace synthetic agricultural inputs has only recently started to be uncovered. In the last few years, significant progress has been made in the knowledge on the composition of rhizospheric microbiomes and their dynamics in soil. There currently is clear evidence that plants shape microbiome structures, most probably by root exudates, and also that bacteria have developed various adaptations to thrive in the rhizospheric niche. The mechanisms of these interactions and the processes driving the alterations in microbiomes are, however, largely unknown

While the use of cover crops will help improve soil health, cover crops cannot improve soil health by themselves. At the Horticulture Research Farm at Rock Springs, PA, cover crops were planted every fall for 10 years to generally improve soil health and specifically soil tilth. Unfortunately, soil tilth never improved and soil when tilled would form large, hard clumps when wet and a low water holding capacity soil when dry. In my 40 year career as a horticulturist conducting applied field research, I have had many requests to evaluate organic and biological products that potentially resulted in extremely high crop yields and soil health improvement. I thought that these products were SNAKE OIL and not worth evaluating. In 2016, I initiated a 3 year evaluation of microbes applied to soil as a broadcast application at 3 different rates with SP1 from Douglas Plant Health, Liberty, Missouri. Not only was the corn yield higher than the check, but more importantly, soil health parameters were significantly improved - soil tilth, soil organic matter, reduction in soil penetrometer readings and soil water infiltration rates.

SP-1™ is a diverse mix of microbes known to build soil biology. The SP-1™ formula supplies the soil with a proprietary blend of beneficial microbials to support a balance and healthy soil environment. SP1 increased both soil organic matter and Cation Exchange Capacity when applied to soil at 1.5 gallons per acre or higher. But SP1 also reduced the nutrient levels of phosphorus, potassium and calcium compared to soils with no SP1 treatment. WHY! SP1 contains bacteria, fungi and algae that like us have to eat. So the biological organisms in SP1 utilize the P, K and Ca as food sources to maintain growth and reproduce.

Interesting Snippets from Harvest Valley Farms

Cabbage

As I was walking through the cabbage I couldn't help but get a picture of it. To me, it screams "delicious". The head in the foreground has a slight tinge of gray on the top of the head. This tells me it has been "kissed" by the frost. That tells me it is going to be a very sweet head of cabbage, and at its peak of flavor. Here is the scoop on cabbage:

Cabbage

Cabbage was most likely domesticated somewhere in Europe before 1000 BC. China grows more than 47% of the world's production.

Cabbage can provide you with some special cholesterol-lowering benefits if you will cook it by steaming. Cabbage is an especially good source of sinigrin. Sinigrin is one of the cabbage glucosinolates that has received special attention in cancer prevention research. The sinigrin in cabbage can be converted into allyl-isothiocyanate, or AITC. This isothiocyanate compound has shown unique cancer preventive properties with respect to bladder cancer, colon cancer, and pro cancer. This is the reason why nutrition advocates recommend a member of the cabbage family at least once a week in your diet. Cabbage will keep for more than a week in your crisper drawer.

**By now if you read my newsletter you have realized, the way to your best health and good nutrition is by eating lots of vegetables. Please pass this information to your children too.

Sunflowers

Every year we try to get a sunflower field blooming in October for people to see when they come for our Pumpkin Festival. It is very difficult to get it perfect for the whole month. This year I decided to get it in early and since we had an extended summer in early September the field is in full bloom right now. So if you want a great picture, come this weekend.

Broccoli

Eli helped me pick broccoli the other day. We picked 14 bushel of beautiful broccoli. Our current crop of cole crops (broccoli, cauliflower, cabbage, kale, etc,) is fantastic. Again, Dave has been vigilant with watering and fertilizer. I have been picking the broccoli every morning and it is amazing how fast it grows in one day. The weather we have been having is perfect for it.

Information and recipes Corner

Submitted by Art King of Harvest Valley Farms

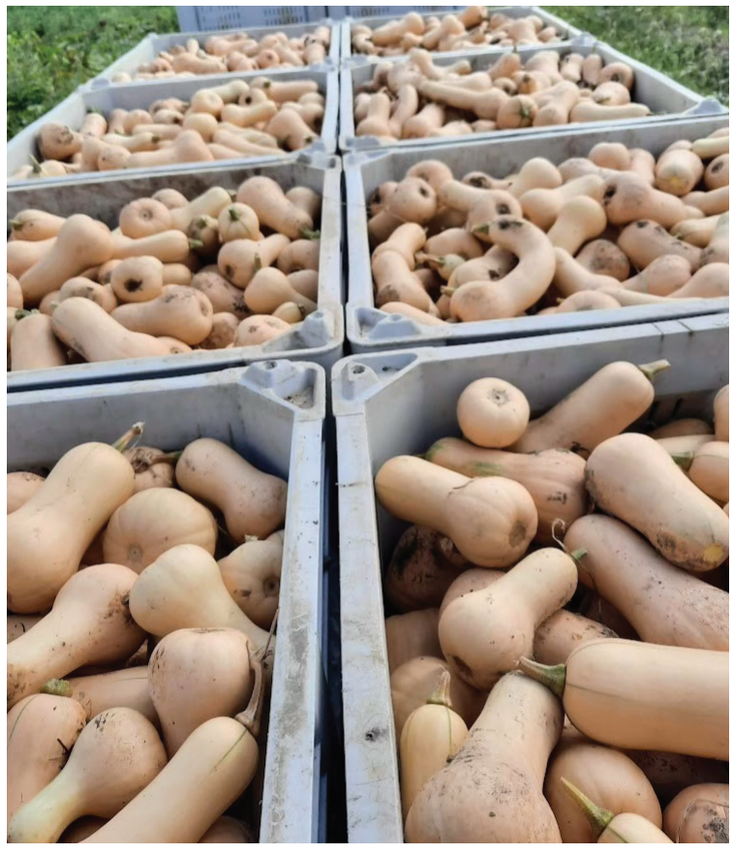
Butternut Squash

Butternut Squash are the most popular of all the fall squashes. That's why we grow more of them than any other squash. The thing is that our fall squash crop this year was extremely successful. We had a great cover crop in the fields from last year, and the rain came at exactly the right time to make the fruit come out large. Larger fruit means more bins filled. Here is the scoop on Butternuts:

Butternut Squash

Talk about a powerhouse vegetable, this is certainly one of them. An unbelievable 452% of the RDA of vitamin A in a single serving! That's because it is loaded with Beta Carotene. They are also high in vitamin C and many trace minerals. Butternuts also receive a high score for Omega 6 and Omega 3 fatty acids.

Couple this information with the tremendous keeping ability (about 4 weeks @ 52 degrees), and the multitude of cooking possibilities, it makes Butternut Squash a wonderful food!



As with any of the fall squashes, just cut it in half, remove the seeds, lay it open side down on a shallow baking sheet with a little bit of water in the bottom. Cook at 350 degrees for 45 minutes or until tender with a fork. Turn it over and put a tablespoon of butter in the cavity. You can eat it right out of the shell if you want. Or, try this recipe:

Butternut Squash and Apple Soup

Ingredients

2 tablespoons unsalted butter
2 tablespoons good olive oil
4 cups chopped PA Simply Sweet onions (3 large, or 2 jumbo)
½ teaspoon mild curry powder
1/8 C. maple syrup
1 teaspoon cinnamon
5 pounds butternut squash (2 large)
1 ½ pounds sweet apples, such as Courtland (4 apples)
2 teaspoons kosher salt
½ teaspoon freshly ground black pepper
2 cups water
2 cups good apple cider or juice

Directions

- Warm the butter, olive oil, onions, and curry powder in a large stockpot uncovered over low heat for 15 to 20 minutes, until the onions are tender. Stir occasionally, scraping the bottom of the pot.
- Peel the squash, cut in half, and remove the seeds. Cut the squash into chunks. Peel, quarter, and core the apples. Cut into chunks.
- Add the squash, apples, salt, pepper, and 2 cups of water to the pot. Bring to a boil, cover, and cook over low heat for 30 to 40 minutes, until the squash and apples are very soft. Process the soup through a food mill fitted with a large blade, or puree it coarsely in the bowl of a food processor fitted with a steel blade.
- Pour the soup back into the pot. Add the apple cider or juice and enough water to make the soup the consistency you like; it should be slightly sweet and quite thick. Check the salt and pepper and serve hot.

Spinach

We have a beautiful crop of spinach right now. The nice thing about spinach is that it is about the most cold tolerant crop we grow. I have brushed snow off of it and picked it before. It is very versatile in ways to prepare it, and I would definitely choose it for a side dish at Thanksgiving. Here is the scoop on Spinach:

Spinach

Of course spinach is good for you, remember Popeye? Well, I don't recommend eating it through your pipe, or eating it out a can, for that matter. And I can't guarantee it will give you bulging muscles and superior strength. Spinach does contain a powerful nutrient combination that makes it extremely healthy to eat. Only carrots and parsley are higher in Beta Carotene. Your body changes beta carotene into vitamin A as you need it. It is also a good source of 9 other vitamins which are, in most cases, bioavailable in spinach. Spinach is nature's #1 source of Alpha Lipoic Acid, a potent antioxidant and cancer fighter. To put it lightly....If you eat your spinach you will be "strong to the finish".

Spinach Salad with Warm Bacon Dressing

Alton Brown

Ingredients

8 ounces spinach (one bag)
2 large eggs, hard boiled and pealed
8 Slices bacon, chopped
3 tablespoons red wine vinegar
1 teaspoon sugar
1/2 teaspoon Dijon mustard
Kosher salt and freshly ground black pepper
4 large white mushrooms, sliced
3 ounces PA Simply sweet onion (1 small), very thinly sliced

Directions

- Remove the stems from the spinach and wash, drain and pat dry thoroughly. Place into a large mixing bowl and set aside
- Slice each egg into 8 pieces and set aside.
- Fry the bacon and remove to a paper towel to drain, reserving 3 tablespoons of the rendered fat. Crumble the bacon and set aside.
- Transfer the fat to a small saucepan set over low heat and whisk in the red wine vinegar, sugar and Dijon mustard. Season with a small pinch each of kosher salt and black pepper.
- Add the mushrooms and the sliced onion to the spinach and toss. Add the dressing and bacon and toss to combine. Divide the spinach between 4 plates or bowls and evenly divide the egg among them. Season with pepper, as desired. Serve

Spaghetti Squash

Yes, those are all spaghetti squash. All of our fall squashes look fantastic! We followed soil test suggestions and applied tons of lime and organic fertilizer before we tilled the ground. Also, we had a nice rye cover crop in the field over winter. Although we were worried about not having enough rain, we had just enough at just the right time for all the fall squashes. The butternuts, acorn, delicata, and honey nut squash also look like it's going to be a good yield. Unfortunately there will be no sweet lightning squash this year. There were no seeds available because they had a crop failure. Here is the scoop on Spaghetti Squash:

Spaghetti Squash

Spaghetti Squash is a fairly new vegetable. I suspect that a seed company was looking for something different and stumbled on this oblong gourd that has curious strands of flesh. The Food Chronology timeline mentions spaghetti squash in 1962 in a longish list of innovations by Frieda's, which began then.

We never grew spaghetti squash when I was growing up. In fact I can only recall acorn squash. This is probably why I could never find a recipe for spaghetti squash in any of my old cookbooks. However it has become a well know vegetable in the past 10 years. More and more recipes are being discovered.

Both pasta and spaghetti squash have low amounts of fat, salt and fiber. However, pasta has over 100 calories, while spaghetti squash has only about 20 calories, is richer in protein and has a lower carb content than pasta's 31 grams. Spaghetti squash is high in vitamin C, vitamin A, and folate. And it is a good source of omega 3 and omega 6 fats.

Here is the easiest way to cook Spaghetti Squash:

Easy Spaghetti Squash

- Cut the spaghetti squash in half and remove the seeds. Place it open side down on a plate with a little water in the microwave, cook on high for about 10 minutes or until a fork inserts easily
- While the squash is cooking, in a large frying pan, add a crushed clove of garlic, and a large sweet onion, diced. Sauté till the onion is transparent.
- When the squash is done hold it with an oven mitt and shred the strands of spaghetti out with a fork into the frying pan, sauté for about 10 minutes. The spaghetti squash takes on the sweet flavor of the onion. It is a wonderful combination, and it is even better the next day.

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