

PENNSYLVANIA  
VEGETABLE GROWERS

# NEWS

for the commercial vegetable, potato and berry grower



**Volume 47**  
**Issue 3**

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# President's Message

Peter Flynn | President

Dear PVGA Members.

As we navigate through the challenging weather of another seemingly unusual spring, I'm always reminded that average weather is simply the sum of all extremes; there is no such thing as "normal" weather. We often expect our weather to align with meteorological predictions, such as average highs or rainfall. However, in my experience, spring typically brings fluctuating weather patterns. Life, like the weather, consists of numerous highs and lows, occasionally punctuated by extreme events, but the sun always shines again.

I hope this issue of our newsletter equips you with tools to proactively manage the highs and lows of operating your farm. This year, we're taking a proactive approach to planning for the Farm Show booth. We're holding bi-weekly meetings and will soon begin organizing volunteers to staff the booth in January. The Farm Show booth is PVGA's largest fundraiser and is crucial for sustaining PVGA and supporting vegetable research.

Please consider assembling your farm team to volunteer for a day at the Pennsylvania Farm Show PVGA food booth. It's an excellent opportunity for team building and connecting with fellow farmers across the state. May we all have a successful season!

PVGA President

Pete Flynn

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*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.*

# Blueberry Growers Twilight Recap

Glen Bupp | Penn State Extension



It may be feeling like summer and the growing season is well on its way now in May across the state but at the Blueberry Growers Twilight meeting held at Bowser's Blueberries in Renfrew on April 5, winter was testing the fortitude of Western Pennsylvania blueberry growers.

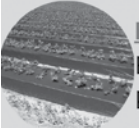
Not to be put down by a good challenge, 25 growers came out for 2 hours on a Friday evening to hear Ric Bowser and Kathy Demchak talk about blueberry growing. At one point, the wind chill was in the teens and snow was blowing sideways while Ric demonstrated how he prunes his plants. Some of the information discussed included soil health, fungicide spray schedules, irrigation, cultivar selection, and pruning. As with any twilight meeting the grower-to-grower conversation building new relationships was one of the most important parts of the evening. Several growers expressed interest in continuing to meet and discuss the upcoming growing season.

I'd like to thank PVGA for supporting this twilight meeting, the growers for showing up, and Ric Bowser for hosting us. Overall, it turned out to be one of the best Friday evenings I had in April! Consider taking time this summer to come out to Western Pennsylvania and visit Ric's you pick blueberry farm, Bowser's Blueberries, 143 McCalmont Road, Renfrew PA 16053.

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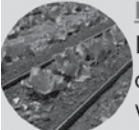
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# Strategies for Effective Management of Botrytis and Anthracnose Fruit Rot in Strawberries

Dr. Mengjun Hu, Univ. of Maryland, and Kathy Demchak, Penn State Extension

Managing gray mold (*Botrytis*) on strawberries is increasingly challenging because of fungicide resistance development, plus a new *Botrytis* species that is less susceptible to fungicides is becoming common in the mid-Atlantic region. Resistance to certain fungicides is also a problem in management of anthracnose fruit rot. This article describes disease management strategies designed to slow further resistance development, while also providing specifics for managing our two most common fruit rots.

First, what's new with Botrytis. There are at least 4 species of *Botrytis* that can infect strawberries, but only two of them have been commonly found in the region. *Botrytis cinerea*, the species traditionally infecting strawberries, is present nearly everywhere and affects many horticultural crops. Recently another species, *Botrytis fragariae*, has also been found and as its name indicates, is more specific to strawberry plants. It appears to overwinter on strawberry plant tissue, and preferentially colonizes blossoms early in the spring, causing them to "turn brown and dry up". While sometimes only one of these species is present, both can be present at the same time in a field and even in the same blossom. Using certain fungicides selects for resistant strains of either species, and also preferentially selects for one species over the other. This means that both species have resistance to multiple fungicide groups, and both species can survive in fungicide-treated fields.

How can you tell if the newer species of Botrytis might be present in your fields? While *B. cinerea* (the traditional species) is often isolated from both flowers and fruit, *B. fragariae* (the new one) is often isolated from flowers, and it has been shown that *B. fragariae* infection was much more aggressive on strawberry flowers than fruit. If you see larger-than-usual numbers of blossoms turning brown and shriveling (not to be confused with frost damage, which blackens the center of the flower), it may be prudent to choose fungicides as if *B. fragariae* presence had been confirmed in your field. If you see no more symptoms on the flowers or buds than usual, you may be able to assume that the new species isn't present, or at least not to a great extent.

Which fungicides work for each botrytis species and which ones don't? Our traditional *Botrytis* species, (*B. cinerea*), is frequently resistant to iprodione (FRAC code 2, Rovral), fenhexamid (FRAC code 17, Elevate), boscalid (FRAC code 7, one of the active ingredients in Pristine), and cyprodinil (FRAC code 9, one of the active ingredients in Switch). Notably, *B. fragariae* seemed to be more tolerant/resistant to fludioxonil (FRAC code 12, the other active ingredient in Switch and also in Miravis Prime) and polyoxin D zinc salt (FRAC code 19, Ph-D or OSO), but it is less resistant to the above active ingredients with a high *B. cinerea* resistance frequency.

Thus far, no resistance to SDHI fungicides (active ingredients in FRAC code 7) has been detected in the newer *Botrytis* species *B. fragariae*. These include pydiflumetofen (the other active ingredient in Miravis Prime besides fludioxonil, which has little effect), isofetamid (Kenja), penthiopyrad (Fontelis), and fluopyram (Luna series). Boscalid, one of the active ingredients in Pristine has less intrinsic activity on botrytis species in general compared to other newer group 7 (SDHI) fungicides and as mentioned, resistance within *B. cinerea* is high. Strobilurins (FRAC code 11) and DMIs (FRAC code 3) are ineffective against *Botrytis*.

All of the active ingredients above are single-site fungicides, as indicated by a single number in their FRAC code, aka activity group, or simply "group" as they appear on labels. They target a single step in the fungus' processes, so simply put, the fungi find it rather easy to develop workarounds. Thiram, which works for *Botrytis* (and Captan) are multi-site fungicides as indicated by the "M" in their FRAC codes, so workarounds are less likely. Both play an important role in delaying resistance development to single-site fungicides. They are protectants, meaning that they form a protective layer on the surface of plant tissues, thus preventing diseases from growing into the plant. However, new growth that does not have this protective layer is vulnerable, and while the materials may

simply be redistributed with light rains, heavy rains may wash the fungicides off.

More information related to fungicide resistance and categorization of products can be found at the Fungicide Resistance Action Committee web site (<https://www.frac.info/>).

What can you do to manage Botrytis and anthracnose? First, use all cultural methods that you can to minimize inoculum and maximize foliage drying. Having less inoculum around means less disease on your plants, and also fewer chances for resistance development. So, remove those dead and half-dead leaves from plasticulture strawberry plants in the spring, and if at all possible, remove the debris from the field. Keep weeds under control as much as possible. Weedy fields stay wet longer, and *Botrytis* of any type loves that moisture. The optimum temperature for growth of *Botrytis* is 65 to 72 degrees F – great temperatures for strawberry growth too, resulting in lots of tender easy-to-infect tissue. If foliage stays wet for 14 hours or longer, *Botrytis* infections are favored and spores are produced that easily waft around infecting blossoms, fruit, and leaves. Anthracnose is favored by wet conditions of 7 hours or longer, and its optimum temperatures for development are warmer (75 to 82 degrees F). Since its spores are produced in a liquid slime, it is primarily a rain-splashed disease that does not get spread over long distances unless extreme wind-driven rains occur, such as with hurricane events.

Second, target *Botrytis* early in the season (i.e., during bloom)

*continued on page 6*

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when applying fungicides and anthracnose later when temperatures are warmer using these strategies: 1) Use multi-site fungicides as the backbone of your spray program to minimize resistance development to the single-site fungicides mentioned above. Maintain continuous use of thiram (more effective for gray mold) and captan (more effective for anthracnose) during the critical disease control periods of bloom and fruit ripening. Use these products alone during drier spells when disease pressure is lower. Apply before rain events to have the material affixed onto the foliage before the rain occurs. 2) Add single-site fungicides only when disease pressure is high (extended periods of moisture). Recommended single-site fungicides during bloom for either Botrytis species are newer category 7 (SDHI) fungicides (Merivon, Kenja, Fontelis, and certain products in the Luna series). They can also be applied during ripening if needed. If conditions conducive to anthracnose development occur earlier than usual, products effective against anthracnose may be applied. 3) Save Switch or Miravis Prime for late-season Botrytis management since gray mold fruit rot is mainly caused by *B. cinerea* – and these products also have good effectiveness against fruit anthracnose. Other fungicides effective on anthracnose appear in the table below. Ph-D or OSO is another good choice for *B. cinerea* control during harvest. While strategies numbered 2 and 3 are helpful in targeting specific species/diseases, strategy 1 improves fungicide resistance management.

Overall, how you deploy these strategies will vary with your production system. Growers in plasticulture with anthracnose-susceptible varieties may need to focus more on anthracnose man-

agement, while growers using matted row production with anthracnose-resistant cultivars may need to focus on controlling Botrytis. Growers with anthracnose-susceptible day-neutral cultivars, which continually bloom and fruit over a long period, should try to focus on using the multi-site protectants thiram and captan prior to major or consecutive rain events.

All growers should use single-site fungicides only when necessary, such as when protectant sprays were missed prior to rain events. Rotate chemistries carefully, and minimize fungicide use during warm dry spells when fungicides are less likely to be needed.

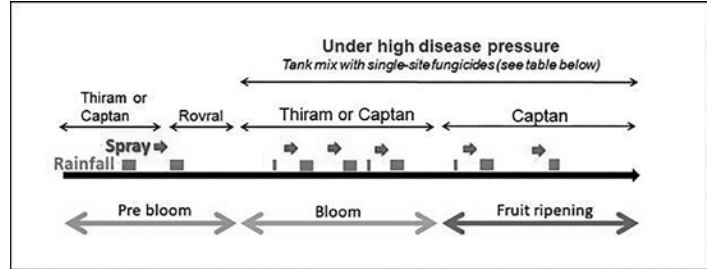


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Here is a diagram of what these management strategies would look like for June-bearing cultivars:

The table below summarizes the information presented in this article with details on specific recommended fungicides, considerations for making the best use of them while minimizing resistance development, and their activity groups. Check individual product labels for rates, pre-harvest intervals, re-entry intervals, and any other restrictions before applying (for example, Fontelis may not be applied on ‘Jewel’, ‘Clancy’, or ‘L’Amour’) and make sure the products are registered for use in your state. Specimen labels

can be found at CDMS (<http://www.cdms.net/LabelsSDS/home>) and Agrian (<https://home.agrian.com/label-lookup/>), in addition to company web sites.

Early Bloom		Late Bloom	Green Fruit	Early Harvest		Late Harvest
Maintain continuous coverage with thiram (group M3) or captan (group M4)*						
thiram or captan	thiram or captan	thiram or captan	thiram or captan	captan	captan	captan
*If in matted row production and gray mold is the major concern, utilize thiram more and captan less. If in plasticulture and when growing anthracnose-susceptible varieties, captan may be needed to a greater extent.						
If weather is wet, add one of the following single-site fungicides to the above, making not more than 2 applications of any activity group over the season.						
<i>Primarily for early season gray mold control</i>			<i>Save for use during harvest</i>			
- Fontelis, group 7, or			<i>For gray mold and anthracnose fruit rot:</i>			
- Kenja, group 7, or			- Switch, group 9 + 12, or			
- Luna Tranquility, group 7 + 9, or			- Miravis Prime, group 7 + 12, or			
- Merivon Xemium, group 7 + 11**, or			- Luna Flex, group 7 + 3			
- Luna Sensation, group 7 + 11**						
**While these products can be used for gray mold, their use will increase selection pressure for anthracnose resistance to group 11 materials.			<i>For gray mold but not anthracnose fruit rot:</i>			
			- Ph-D or OSO, group 19			
			<i>For anthracnose fruit rot but not gray mold:</i>			
<i>Alternatives to group 7 fungicides if needed:</i>			- Tilt, group 3			
- Rovral, group 2 (pre-bloom only)***, or			- Inspire Super, group 3 + 9			
- Elevate, group 17***			- Cabrio, group 11***			
			- Pristine, group 7 + 11***			
			- Quadris Top, group 11 + 3***			
			- Quilt Xcel, group 3 + 11***			
***May be used once per season if resistance to active ingredients in these products is known to be low on your farm. Do not, however, make more than 2 applications of any activity group over the course of a season.						

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# FDA finalizes rules on Pre Harvest Water

Jeff Stoltzfus | Farm Food Safety Educator | Penn State Extension

FDA has recently finalized the new FSMA regulations for pre-harvest water applied to the edible part of the crop. This will focus on irrigation, crop sprays and frost protection water. When the original Food Safety Modernization Act (FSMA) regulation was finalized in 2016, surface irrigation water sources required 5 samples per year and an average of your last 20 samples. After much feedback from the produce industry, FDA realized that this may not be helpful or practical. In 2017 FDA decided to rethink the surface water requirements. In 2022, they came up with a different proposed strategy and released it for public comment. On May 2nd, 2024 they finalized the regulation that was proposed in 2022.

It is important to note that these changes apply to pre-harvest ag water which will contact the edible part of the crop. Water applied through drip irrigation under plastic to a crop growing above the ground is not considered ag water and is not regulated. Regulations for water used for post-harvest cooling, washing, equipment washing, and hand washing have not changed and have already gone into effect.

Instead of 5 water samples per year and a 20 sample water quality profile, FDA has moved toward a written water system risk assessment for each farm which will consider the unique situations on each farm.

FSMA will ask farmers to perform a Water Quality Risk Assessment for their pre-harvest water which contacts the edible portion of the crop. This primarily refers to overhead irrigation but can also include drip irrigation of ground crops normally eaten raw like onions, garlic, radishes, turnips, and carrots. It can also refer to water used for things like spraying or frost control.

The major risks from water are a result of it's source, the timing of application, the method of application and the surface characteristics of the crop. Surface water sources are considered higher risk than groundwater. However, some surface water sources may be considered riskier than others. For example, water from a river will likely be a higher risk than water coming directly from a mountain stream or spring. Cisterns, ponds, and other impoundments are also considered surface water. In these cases, water tests may aid in assessing the risk of these water sources, but there is not an established number of tests that are required. Wells and municipal water sources are considered less

risky than surface water.

Timing of irrigation is critical to the risk level of the water. Bacteria may die off over time from drying, sunlight, competition and other environmental factors. Irrigation water that is applied weeks before harvest will be less risky than water applied the day before harvest. Water applied at planting before the edible part of the plant is formed would not be considered Ag Water.

The next area of risk to consider would be application method. The less likely the water will contact the edible portion of the crop, the lower the risk. Drip irrigation would be less risky than overhead irrigation.

Then consider the crop being grown. Does the vegetable or fruit have places where bacteria can hide and survive, like the net of a cantaloupe or the center of a head of lettuce or cabbage? Does it grow close the ground like leaf lettuce or strawberries or does the fruit grow up off of the ground like tree fruit or even peppers?

Adding these risks together will help determine if you comply with FSMA and what corrective actions you may need to take. A farmer may have a high risk water source like a river, but could pass a FSMA risk assessment if they have a low risk irrigation method or timing or a lower risk crop like watermelons which doesn't have many places for bacteria to hide.

As this regulation becomes adopted, look for tools or checklists or decision trees to help you determine your water quality risk. Look for Extension Workshops next winter to help growers develop their Risk Assessments.

The timeline for grower to comply with this regulation is as follows.

Growers over \$500,000 in sales must comply by April 7, 2025

Growers over \$250,000 in sales must comply by April 6, 2026

Growers under \$250,000 in sales must comply by April 5, 2027

For more information on this regulation go to <https://www.fda.gov/food/food-safety-modernization-act-fsma/fsma-final-rule-pre-harvest-agricultural-water> or contact Jeff Stoltzfus at Penn State Extension 717-283-2597

## Fungicide Resistance in Botrytis: An Update from PA and MD Strawberry Fields

Dr. Mengjun Hu | The University of Maryland

Kathleen Demchak | Penn State Extension

Managing Botrytis (gray mold) is a must for many strawberry producers, especially when extended wet conditions are expected. Fungicides remain a major tool for disease control, but the need for frequent sprays coupled with a high risk of resistance development in Botrytis sets the stage perfectly for the pathogen to prevail over many existing fungicides.

To better understand current resistance issues in Botrytis from fields with diverse management practices and climatic conditions, samples were collected from 7 farms in Pennsylvania and 5 farms in Maryland in Spring of 2023. Strawberry flowers are considered the gateway for Botrytis infections, and the pathogen typically remains latent within developing fruit tissue until the fruit ripens. Our samples were largely comprised of dead flowers damaged by spring frosts (Figure 1A). Collecting samples of this type allows us to get 'fresh' Botrytis strains at the beginning of each new season in growers' fields. Those strains could be a result of latent infections in transplants (plasticulture), carry-over from previous crops (matted-row), or new infections from the environment be-

*continued on page 10*

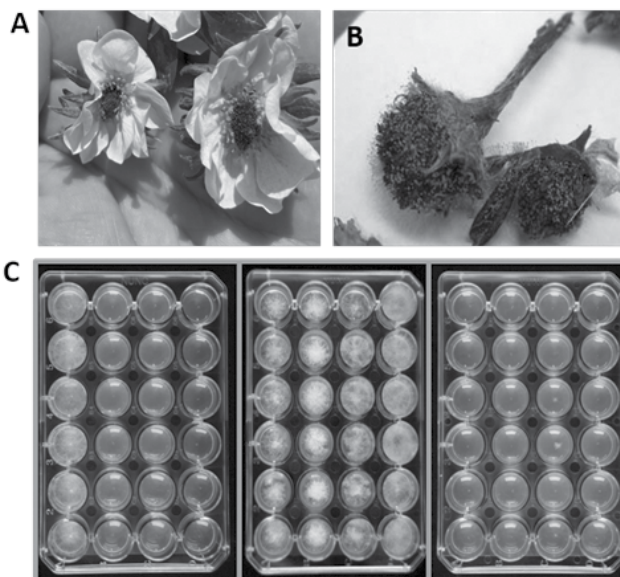


Figure 1. A) Dead strawberry flowers; B) Botrytis from the flowers after incubation; C) A set of 24 wells for fungicide resistance detection.

cause of these diseases' airborne nature (Figure 1B). Strains obtained were then subject to resistance tests by transferring them to 24-well plates containing artificial growth media amended with fungicides commonly used in strawberry fields. The resistance profiles of each Botrytis strain were then determined based on the presence or absence of their growth on plates (Figure 1C). Botrytis evolves quickly due to its short life cycle and massive spore production. Thus, the strains, even from the same fields, can have diverse genetics and growth characteristics.

*To what extent were the strains resistant to different fungicides?* A total of 231 Botrytis strains were obtained from both plasticulture and matted-row production systems. Fungicides tested including cyprodinil (one of the two active ingredients in Switch), pyraclostrobin (Cabrio), fenhexamid (Elevate), thiophanate-methyl (Topsin M), iprodione (Rovral), fludioxonil (the other active ingredient in Switch), boscalid (one of two active ingredients in Pristine), isofetamid (Kenja), penthiopyrad (Fontelis), and pydiflumetofen (one of the two active ingredients in Miravis Prime). Those fungicides represent 7 different chemical groups commonly involved in our spray programs. Resistance was detected to all of the fungicides tested with varying frequencies (Figure 2). Overall, high frequencies of resistance were detected to cyprodinil (which is in chemical class 9), pyraclostrobin (in chemical class 11), and fenhexamid (in chemical class 17) whereas low frequencies of resistance were detected to all group 7 fungicides such as Kenja and Fontelis containing isofetamid and penthiopyrad, respectively. Moreover, the majority of the isolates were resistant to more than one fungicide group (or chemical class) simultaneously, with resistance to 2, 3, 4, 5, or 6 fungicide groups occurring simultaneously in some isolates. In figure 3 below, CCR stands for chemical class resistance; a 2CCR isolate means the isolate is resistant to two different chemical groups, and so on.

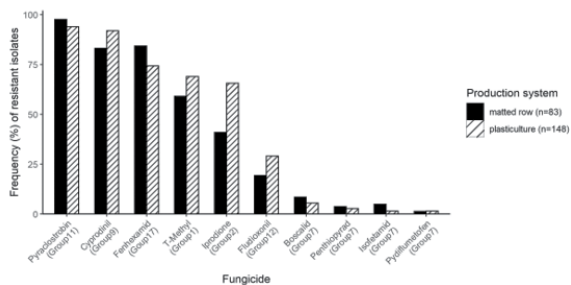


Figure 2. Frequency of Botrytis isolates with resistance to different fungicides.

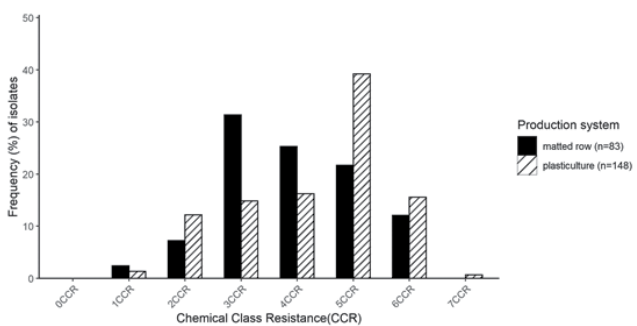


Figure 3. Frequency of Botrytis isolates with multi-fungicide resistant phenotypes.

*Were there differences between matted-row and plasticulture fields?* Based on our current data, it seems that matted-row fields

had less resistance. As shown in figures 2 and 3, both frequency of resistance and extent of chemical class resistance among fungicide groups were detected less in isolates from matted row fields. Plasticulture isolates had more resistance to Topsin M, Rovral, and Switch compared to matted-row isolates. Additionally, more plasticulture isolates were found to be resistant to 5 or 6 different chemical groups, and a few of them were even resistant to all 7 groups tested. These differences may be attributed to our assumption that fungicide sprays are applied fewer times in matted-row strawberries. For the plasticulture system, transplants typically have been treated with Botrytisicides multiple times at nurseries before they were planted in the growers' fields. As mentioned, Botrytis strains we obtained from flowers could also come from those transplants. However, as noted, we have only one year's data, which may not completely represent the overall resistance profile.

*How much resistance will significantly impact control efficacy?* Some studies have shown that fungicide efficacy will drop by as much as 30% if only 10% of isolates are resistant in the population. Once the resistant population reaches 50% or more, efficacy could be decreased by more than 60%.

*How do we slow down resistance development to avoid running out of fungicide classes?* Maintaining a minimum of 7 days between fungicide applications would be a good start. If no rain is forecasted, the interval between sprays can be extended to two weeks or longer. Some disease forecast model programs such as that from Cornell NEWA (<https://newa.cornell.edu/strawberry-diseases>) and the Strawberry Advisory System (<http://www.agroclimate.org/tools/sas/dashboard/disease>) are also useful for reducing chemical inputs, especially during dry seasons.

When referring to fungicides as "multi-site", "site-specific", or "single site", the word "site" refers to sites of activity that the fungicide affects within the disease fungi, making it less likely that the fungi can continue to live and/or multiply. Multi-site fungicides Captan or Thiram, which are not prone to resistance development, should be used as the backbone of spray programs. All of the other fungicides mentioned above are site-specific fungicides, which should only be used when the disease pressure is high (i.e. when there are extended periods of moisture during flowering and preharvest). Further, when these conditions occur, make sure to tank mix site-specific fungicides with thiram or captan which will provide some level of disease control in case there is a resistance issue. Based on our results, most of the site-specific fungicides have resistance issues, and only group 7 materials seem to be more reliable at this point, which is a cause for concern since overuse of them could result in the loss of their activity as well. Fungicide resistance profiles of Botrytis can vary from farm to farm, and year to year. As an example, resistance to fludioxonil (in Switch) has seemed to increase significantly in recent years, as it has been commonly used for control of both Botrytis and anthracnose as well as the new disease Neopestalotiopsis. The information presented here can nonetheless be used as a general guide regarding which products are most likely to have decreased effectiveness, especially if they have been used frequently on your farm or by your plant supplier.

All of this means that cultural controls are more important than ever to maximize foliage drying and minimize periods of wetness. Keep matted rows narrow, remove dead leaves from plasticulture plantings in the spring, and consider increasing plant spacing on plasticulture beds. Cultivars that are not overly vegetatively vigorous, or that are more resistant to fruit rots should be used when possible. Breeding programs that focus more on disease resistance and less on size and appearance may become more valuable over time, as will be the use of high tunnels and low tunnels. Many ongoing studies and field trials are identifying how

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# Vogel, Kinkead Host Opening Ceremony for the 14th Season of the Capitol Hunger Garden

HARRISBURG – Celebrating the 14th opening season of the Capitol Hunger Garden, Sen. Elder Vogel, Jr. (R-47) and Rep. Emily Kinkead (D-20), co-chairs of the Hunger Caucus, gathered at the Capitol Hunger Garden to share the important role the garden plays to those in need in the Harrisburg area.

In addition to Vogel and Kinkead, remarks were also offered by Tammy Linn, executive director for the Pennsylvania Vegetable Growers Association; Peter Flynn, president of the Pennsylvania Vegetable Growers Association; Joe Arthur, CEO of the Central Pennsylvania Food Bank; and Sen. Judy Schwank (D-11), minority chair of the Senate Agriculture and Rural Affairs Committee.

“Over the last 14 years, the Capitol Hunger Garden has provided vast amounts of healthy herbs and vegetables that are used to help nourish those who are in the greatest need in Harrisburg – an operation that we hope to continue for years to come,” said Vogel. “I want to thank the Department of General Services, the Pennsylvania Vegetable Growers Association, the Penn State Master Gardeners, the Downtown Daily Bread, and all the volunteers who help make this garden possible each season.”

“Every year the Capitol Hunger Garden provides hundreds of pounds of fresh produce to our neighbors at Downtown Daily Bread, who do amazing work to support homeless individuals in Harrisburg,” said Kinkead. “As co-chair of the Legislative Hunger Caucus, I’m proud to play an active role in combating food inse-

curity and eager to continue pursuing policy changes beyond this garden to end hunger in Pennsylvania.”

Last year’s Hunger Garden bounty yielded a total of over 830 pounds of produce which consisted of many different vegetables and herbs including tomatoes, eggplant, cucumbers, carrots, bush beans, swiss chard, dill, rosemary, thyme, pole beans, onions, and various assortments of peppers.

Vogel added, “Hunger does not just affect those just in Harrisburg – it affects over 1.2 million Pennsylvanians. Through the unified efforts of our bipartisan Senate/House Legislative Hunger Caucus we continue to raise awareness about the impacts of hunger in our Commonwealth.”

Plants for this year’s garden were supplied by the Pennsylvania Vegetable Growers Association and volunteers from the Penn State Cooperative Extension Master Gardeners will assist with maintaining the garden throughout the summer until the season ends in early October.

Established in 2008, the legislative Hunger Caucus seeks to raise awareness for hunger. The most visible of this caucus’s initiatives is the Capitol Hunger Garden, which is a joint effort of the Pennsylvania General Assembly.



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new and existing biorational fungicides (such as biological materials and essential oils) can be best incorporated into conventional spray programs, serving as another way to reduce the use of site-specific fungicides. Moreover, soft/organic materials may also be more reliable and effective under lower disease pressure, which could be achieved by integrating the above-mentioned practices and disease-tolerant cultivars. Stay tuned for changes to recommendations as further studies proceed.

This work was supported by the AFRI program of the U.S. Department of Agriculture, National Institute of Food and Agriculture, under award No. 2023-67013-39164. The findings and conclusions in this preliminary publication have not been formally disseminated by the U. S. Department of Agriculture and should not be construed to represent any agency determination or policy.

## Report: Tomatoes Statewide Cultivar Evaluation 2023 – Continued from Issue 2

Elsa Sánchez, Tom Butzler, Tim Elkner, Bob Pollock, and Megan Chawner | Penn State Extension

### Southeastern Site



Tomatoes were seeded on April 13 and transplanted on May 24, 2022; seeded April 20 and transplanted on May 25, 2023. Plants were placed in a single row with 18-inch in-row spacing and were suckered 3 weeks after transplanting. We also planted annual ryegrass between rows primarily to suppress weeds and allow fieldwork if/when the soil was wet. Using 10 feet between rows allowed us to mow the ryegrass periodically. Irrigation water was acidified to pH 6.3 in 2023.

We harvested thrice weekly from July 21 to August 18, 2022 (bacterial canker destroyed the planting), and from August 1 to September 25, 2023, at this site.

or concrete floors as high tunnels. Also, tunnel structures that use gutters to concentrate the flow of water to one spot can cause problems that will require additional stormwater practices to prevent erosion. For more assistance with storm water management on your farm contact the NRCS.

### "Firsts" and "seconds" yield per plant of tomato cultivars by size grown in southeastern Pennsylvania in 2022.

Cultivar	Firsts					
	Mean extra-large fruit weight/ plant (lb)	Mean extra-large fruit number/ plant	Mean large fruit weight/ plant (lb)	Mean large fruit number/ plant	Mean medium fruit weight/ plant (lb)	Mean medium fruit number/ plant
<b>Red Deuce</b>	<b>0.14*</b>	<b>0.21</b>	<b>0.16 bc</b>	<b>0.25 bc</b>	<b>0.012 b</b>	<b>0.04</b>
PSFH 16-9	0.32	0.41	0.26 bc	0.50 bc	0.036 b	0.16
Patsy	0.40	0.58	0.73 ab	1.25 ab	0.037 b	0.13
PSFH 16-90	0.50	0.63	0.55 abc	0.90 abc	0.050 ab	0.17
PSFH 16-13	0.42	0.50	0.55 abc	0.96 abc	0.027 b	0.13
Carrie	0.31	0.38	1.08 a	1.96 a	0.077 ab	0.25
Thunderbird	0.51	0.58	0.29 bc	0.46 bc	0.011 b	0.04
STM 2255	0.62	0.71	0.24 bc	0.38 bc	0 b	< 0
PSFH 18-3	0.31	0.41	0.71 abc	1.33 abc	0.029 b	0.08
Rambler	0.42	0.50	0.44 abc	0.71 bc	0.011 b	0.04
Roadster	0.19	0.21	0.51 abc	0.92 abc	0.131 a	0.40
FTM 9745	<b>0.41</b>	0.44	0.36 bc	0.67 bc	<0 b	< 0
Mountain Fresh Plus	<b>0.11</b>	0.13	0.29 bc	0.54 bc	0.031 b	0.13
PSFH 18-39	<b>0.18</b>	0.25	0.16 bc	0.25 bc	< 0 b	< 0
FTM 9744	<b>0.13</b>	0.17	0.57 abc	1.00 abc	0.029	0.08
Red Snapper	<b>0.25</b>	0.29	0.05 c	0.08 c	0	< 0

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Cultivar	Seconds					
	Mean extra-large fruit weight/ plant (lb)	Mean extra-large fruit number/ plant	Mean large fruit weight/ plant (lb)	Mean large fruit number/ plant	Mean medium fruit weight/ plant (lb)	Mean medium fruit number/ plant
<b>Red Deuce</b>	<b>3.64* ab</b>	<b>4.4 bc</b>	<b>0.09</b>	<b>0.21</b>	<b>0.022</b>	<b>0.08</b>
PSFH 16-9	5.02 a	6.9 a	0.22	0.58	0.043	0.17
Patsy	4.49 a	5.7 abc	0.18	0.42	0.051	0.21
PSFH 16-90	4.13 ab	6.0 ab	0.13	0.29	0.084	0.31
PSFH 16-13	4.08 ab	5.5 abc	0.07	0.17	0.037	0.13
Carrie	3.94 ab	5.7 abc	0.28	0.67	0.179	0.63
Thunderbird	3.92 ab	4.7 abc	0.14	0.33	0.046	0.17
STM 2255	3.86 ab	4.6 abc	0.05	0.13	0.013	0.04
PSFH 18-3	3.86 ab	5.8 abc	0.15	0.42	0.031	0.09
Rambler	3.64 ab	4.3 bc	0.20	0.46	0.074	0.21
Roadster	3.55 ab	4.9 abc	0.29	0.67	0.140	0.50
FTM 9745	<b>3.46 abc</b>	4.3 bcd	0.11	0.28	0.053	0.23
Mountain Fresh Plus	<b>3.35 abc</b>	4.6 abc	0.14	0.33	0.104	0.33
PSFH 18-39	<b>3.09 abc</b>	4.0 bcd	0.10	0.25	0.008	0.00
FTM 9744	<b>2.72 bc</b>	3.7 cd	0.18	0.42	0.063	0.21
Red Snapper	<b>1.77 c</b>	2.0 d	0.05	0.13	0.015	0.04

\*Values are means for individual plants; 'Red Deuce' (bolded) is the standard to which all other cultivars were compared; Values in the green text within a column are significantly larger than 'Red Deuce', values in the red text within a column are significantly smaller than 'Red Deuce'.

In 2022, yields were very low for all cultivars overall because the planting was severely infested with bacterial canker and only harvested for 4 weeks. Not many significant differences compared to 'Red Deuce' were observed. In the firsts harvest, the number and weight of extra-large fruit from 'Carrie' was higher than from 'Red Deuce'. Large fruit weight from 'Roadster' was higher than from 'Red Deuce'.

For the seconds harvest, the number of extra-large fruit number from PSFH 16-9 was higher, and the number and weight of extra-large from 'Red Snapper' was lower than 'Red Deuce'.

This evaluation included PHFH 16-9, 16-13, 16-90, 18-3, and 18-39 from Majid Foolad's breeding program. 16-9, 18-3, and 18-39 had poor germination. Despite overseeding, we had less than 6 plants per plot of these selections.

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**"First" and "seconds" yield per plant of tomato cultivars by size grown in southeastern Pennsylvania in 2023.**

Firsts						
Cultivar	Mean extra-large fruit weight/ plant (lb)	Mean extra-large fruit number/ plant	Mean large fruit weight/ plant (lb)	Mean large fruit number/ plant	Mean medium fruit weight/ plant (lb)	Mean medium fruit number/ plant
<b>Red Deuce</b>	<b>3.21* a</b>	<b>3.4 a</b>	<b>2.43 cdef</b>	<b>4.0 cd</b>	<b>0.13 cde</b>	<b>0.21 bcd</b>
PSFH 16-9	1.46 cdef	1.8 bcde	2.2 def	3.8 cd	0.02 de	0.08 cd
Patsy	1.91 bcde	2.2 bcde	4.85 a	8.7 a	0.55 a	1.46 a
PSFH 16-90	1.04 ef	1.2 de	4.85 a	8.7 a	0.24 bcde	0.71 bcd
PSFH 16-13	1.1 def	1.3 cde	1.98 def	3.6 cd	0.22 bcde	0.51 bcd
Carrie	1.1 def	1.3 de	3.97 abc	7.2 ab	0.31 abcd	0.79 abc
Thunderbird	1.96 bcde	2.2 bcde	1.76 def	2.8 cd	0.13 cde	0.33 bcd
STM 2255	2.05 bcd	2.3 bcd	2.2 def	3.9 cd	0.07 de	0.21 bcd
PSFH 18-3	1.21 def	1.5 cde	2.2 def	4.2 cd	0.15 cde	0.46 bcd
Rambler	2.49 ab	2.7 ab	3.09 bcd	5.0 bc	0.26 abcde	0.63 bcd
Roadster	2.01 bcde	2.1 bcde	2.2 def	3.5 cd	0.18 bcde	0.50 bcd
FTM 9745	2.31 abc	2.5 abc	1.98 def	3.1 cd	0.20 bcde	0.33 bcd
Mountain Fresh Plus	0.88 f	1.1 e	3.09 bcde	5.3 bc	0.35 abc	0.92 ab
PSFH 18-39	1.12 def	1.3 de	2.2 def	3.9 cd	0.02 e	0.04 d
FTM 9744	1.12 def	1.2 de	1.1 f	1.8 d	0.07 cde	0.13 cd
Red Snapper	1.08 def	1.3 de	1.54 ef	2.7 cd	0 e	0 d
Mountain Gem	1.91 bcde	2.0 bcde	2.43 def	3.7 cd	0.11 cde	0.17 cd
FTM9743	1.26def	1.3 de	0.88 f	1.5 d	0.07 cde	0.17 cd
PSFH 18-13	1.1 def	1.5 cde	4.19 ab	8.8 a	0.46 ab	1.46 a

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Seconds						
Cultivar	Mean extra-large fruit weight/ plant (lb)	Mean extra-large fruit number/ plant	Mean large fruit weight/ plant (lb)	Mean large fruit number/ plant	Mean medium fruit weight/ plant (lb)	Mean medium fruit number/ plant
<b>Red Deuce</b>	<b>3.09*</b>	<b>3.2</b>	<b>1.57 i</b>	<b>2.42 g</b>	<b>3.04</b>	<b>3.17</b>
PSFH 16-9	3.31	3.8	2.29 fghi	3.91 efg	3.40	3.79
Patsy	2.64	3.0	4.93 ab	8.58 b	2.67	2.96
PSFH 16-90	2.64	3.1	3.75 bcde	6.50 bcd	2.69	3.13
PSFH 16-13	2.64	3.0	2.87 defghi	4.97 def	2.56	2.98
Carrie	3.31	3.8	4.48 bc	8.13 bc	3.26	3.79
Thunderbird	3.53	3.9	2.84 defghi	4.67 defg	3.55	3.88
STM 2255	3.31	3.5	4.03 bcd	6.63 bcd	3.24	3.46
PSFH 18-3	3.31	4.2	3.97 bcde	7.63 bc	3.42	4.21
Rambler	3.09	3.3	3.31 cdefg	5.04 de	3.06	3.33
Roadster	3.75	3.9	3.04 defgh	4.54 defg	3.79	3.88
FTM 9745	3.97	4.1	1.83 hi	2.75 fg	3.97	4.13
Mountain Fresh Plus	1.76	2.0	3.53 cdef	6.21 cd	1.70	2.00
PSFH 18-39	3.31	3.7	2.65 edfghi	4.46 defg	3.31	3.71
FTM 9744	2.87	3.0	2.01 ghi	3.33 efg	2.84	3.04
Red Snapper	3.75	3.8	2.2 fghi	3.54 efg	3.70	3.79
Mountain Gem	4.19	4.5	2.89 defghi	4.75 def	4.21	4.54
FTM9743	3.31	3.4	1.61 i	2.50 fg	3.51	3.42
PSFH 18-13	2.2	2.9	6.06 a	11.17 a	2.29	2.92

\*Values are means for individual plants; 'Red Deuce' (bolded) is the standard to which all other cultivars were compared; Values in the green text within a column are significantly larger than 'Red Deuce', values in the red text within a column are significantly smaller than 'Red Deuce'.

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**Marketable and unmarketable fruit by weight and number for nineteen tomato cultivars evaluated in southeastern Pennsylvania in 2023.**

Cultivar	Mean Marketable weight/plant (lb)	Mean Marketable number/plant	Mean culls weight/plant (lb)	Mean culls number/plant
<b>Red Deuce</b>	<b>8.0 cdef</b>	<b>10.9 cdef</b>	<b>16.2 abcde*</b>	<b>22.1 cdefg</b>
PSFH 16-9	7.9 cdef	10.7 cdef	13.8 efg	22.2 cdefg
Patsy	13.9 a	22.0 a	11.6 fgh	20.5 defg
PSFH 16-90	10.3 bcde	15.7 b	13.2 efg	24.0 cdef
PSFH 16-13	7.7 cdef	11.3 bcdef	16.7 abcde	26.5 abc
Carrie	13.1 ab	21.1 a	11.8 fgh	20.4 defg
Thunderbird	9.1 cdef	13.3 bcde	14.0 defg	24.2 cde
STM 2255	11.3 abc	16.0 b	15.6 bcde	24.4 cde
PSFH 18-3	9.9 bcdef	15.8 b	10.7 gh	19.1 efg
Rambler	11.1 abcd	14.8 bc	11.7 fgh	18.7 fg
Roadster	10.4 bcde	13.2 bcde	14.3 def	23.2 cdef
FTM 9745	9.0 cdef	11.0 cdef	18.3 ab	25.8 bcd
Mountain Fresh Plus	8.8 cdef	14.3 bcd	13.7 efg	26.5 abc
PSFH 18-39	7.8 cdef	11.1 cdef	13.9 defg	24.0 cdef
FTM 9744	7.0 ef	9.3 ef	19.6 a	31.7 a
Red Snapper	7.7 def	10.0 def	17.4 abcd	27.2 abc
Mountain Gem	10.1 bcde	12.8 bcde	14.7 cdef	22.8 cdefg
FTM9743	6.5 f	7.8 f	18.1 abc	30.2 ab
PSFH 18-13	12.8 ab	22.8 a	8.7 h	17.4 g

\*Values are means for individual plants; 'Red Deuce' (bolded) is the standard to which all other cultivars were compared; Values in the green text within a column are significantly larger than 'Red Deuce', values in the red text within a column are significantly smaller than 'Red Deuce'.

In 2023, for the firsts harvest, the number and weight of extra-large fruit from 'Rambler' and FTM 9745 was not different than 'Red Deuce'. All other cultivars had a lower weight and number of extra-large fruit than 'Red Deuce'. The weight of large fruit from 'Patsy', PSFH 16-90, and PSFH 18-13 was higher than from 'Red Deuce'. The number of large fruit from 'Patsy', PSFH 16-90, PSFH 18-13, and 'Carrie' was higher than from 'Red Deuce'. 'Patsy' and 18-13 had greater weight and number of medium fruit than 'Red Deuce'; all other cultivars were not different from 'Red Deuce' for weight or number.

No significant differences were seen regarding extra-large and medium fruit for the seconds harvest. The weight of large-sized fruit from 'Patsy', PSFH 16-90, 'Carrie', STM 2255, PSFH 18-3, 'Rambler', 'Roadster', 'Mountain Fresh Plus', and PSFH 18-13 was higher than from 'Red Deuce'. All other cultivars were not different from 'Red Deuce' regarding the weight of large fruit. The number of medium-sized fruit from 'Patsy', PSFH 16-90, PSFH 16-13, 'Carrie', STM 2255, PSFH 18-3, 'Rambler', 'Mountain Fresh Plus', 'Mountain Gem', and PSFH 18-13 was higher than from 'Red Deuce'; all other cultivars were not different from 'Red Deuce'.

Marketable fruit by weight for 2023 was higher from 'Patsy', 'Carrie' and PSFH 18-3 than 'Red Deuce'. Marketable fruit by number was higher for 'Patsy', PSFH 16-90, 'Carrie', STM 2255, PSFH 18-3 and PSFH 18-13. All other cultivars were not different from 'Red Deuce' for either marketable fruit weight or number.

Unmarketable fruit by weight for 2023 was lower from 'Carrie', 'Rambler', 'Patsy', PSFH 18-3, and PSFH 18-13 compared to 'Red Deuce'. All other cultivars were not different than 'Red Deuce'. Unmarketable fruit by number was higher from FTM 9744 and FTM 9743 compared to 'Red Deuce'. All other cultivars were not different than 'Red Deuce'. The main factor affecting unmarketable fruit was cracking – mostly small cracks, ¼ - ½”, at the stem end of the fruit. While acceptable in some markets, these fruit are sold as canners in the local produce auctions and thus were considered culls. Markets with less stringent standards would have a greater amount of marketable fruit than we had in this trial. During the mid- and latter part of September rains started (the season was dry until then) and most fruit was culled due to rain damage (long radial cracks, concentric cracks and general fruit damage from excessive moisture).

The high incidence of bacterial canker makes it difficult to draw conclusions over both years of the trial at this site. Overall, PSFH 18-13, PSFH 16-90, and 'Patsy' produced more large-sized fruit by weight and number than 'Red Deuce'. No other cultivar was consistently different than 'Red Deuce'. 'Patsy', 'Carrie' and STM 2255 could be considered cultivars to consider growing as alternatives to 'Red Deuce' if extra-large fruit is not a requirement for a growers' particular market.

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**Yield per plant of tomato cultivars grown at the Seed Farm in Emmaus, Pennsylvania, in 2022.**

Cultivar	Mean marketable fruit yield (lb/plant)	Mean marketable fruit yield (number/plant)	Mean unmarketable fruit yield (lb/plant)	Mean unmarketable fruit yield (number/plant)	Mean total fruit yield (lb/plant)	Mean total fruit yield (number/plant)
Primo Red	1.4*	2.3	2.7	6.7 ab	6.4	11.0
Carrie	1.2	2.1	1.6	4.4 b	4.6	8.5
18-3	1.1	2.8	2.2	5.6 b	4.3	9.1
Patsy	1.1	3.2	1.8	4.8 b	5.3	9.2
18-10	1.0	1.8	2.0	5.8 b	4.5	8.1
Red Snapper	0.9	2.0	2.1	4.2 b	5.3	7.9
18-39	0.9	0.8	2.3	4.3 b	4.3	6.7
STM2255	0.8	0.9	2.0	6.7 ab	4.2	8.6
Rambler	0.7	1.5	2.0	6.3 b	3.8	7.9
9745	0.6	1.5	4.3	10.5 a	5.4	9.8
Thunderbird	0.6	0.8	2.2	5.8 b	4.4	7.4
9744	0.5	1.3	1.6	5.3 b	3.9	8.0
Mt. Fresh Plus	0.4	0.8	1.9	5.3 b	3.5	7.5
Roadster	0.4	0.6	1.7	4.5 b	3.6	7.8

\*Values are means of six plants per replication and four replications; 'Red Deuce' (bolded) is the standard to which all other cultivars were compared; Values followed by different letters or within a column are statistically different at  $P \leq 0.05$ . 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.

In 2022, none of the evaluated cultivars differed from 'Red Deuce' for mean marketable fruit by weight or number, mean unmarketable fruit by weight or number, and mean total fruit by weight and number. Overall, yields were very low for all cultivars. The harvest season was short because planting occurred in late June.

Plants at the northeastern site suffered in the 2023 growing season. First, the irrigation in the greenhouse broke in late spring, leaving the tomato transplants without water for a couple of days. Once the issue was discovered, the plants were immediately watered and monitored. The transplants survived, but growth was stunted, and there was browning on some of the leaves. We decided to plant the transplants into the field and see if they would still be productive. A couple of weeks later, the entire field was severely infected with septoria leaf spot, which resulted in wilting, browning, and dying of the vegetative parts of the plants. We harvested what we could for two weeks and found that the highest-yielding variety was 'Mountain Fresh Plus', followed by 'Thunderbird' (based on weight, without statistical significance).

**Tomato Sensory Evaluation**

The Penn State Centre County Master Gardeners Program invited the center site to host a sensory evaluation of the appearance and taste of tomato cultivars at their August 21, 2023, meeting. We collected data for all 13 cultivars, which were then analyzed by graduate students in Penn State University's Department of Statistics.

**Demographics**

Thirty-seven Master Gardeners participated. Of them, 59.49% were older than 65, and 32.43% were between 55 and 64. Thirty-five were women, and two were men. Additionally, 56.76% reported eating tomatoes frequently. The rest ate tomatoes sometimes. This demographic information is important because it points

to who the results represent. Our findings are applicable to women older than 55 who eat tomatoes at least sometimes. We acknowledge the limitations of these data. However, it provides additional information farmers can use to determine which tomatoes to grow.

**Tomato Appearance**

Participants rated tomatoes based on the whole tomato appearance and the appearance of fruit cut length- and widthwise. Overall, FTM 9744 was rated highest for whole and lengthwise appearance. FTM 9743 was rated highest for widthwise appearance. It should be noted that participants were presented with fruit of FTM 9743, FTM 9744, and FTM 9745 that did not have a pointed end.

Regarding whole tomato appearance, 'Red Deuce' was rated higher than 'Mountain Gem', FTM 9745, 'Red Snapper', and 'Thunderbird'. For tomatoes cut widthwise, 'Red Deuce' was ranked higher than STM 2255, 'Rambler', and 'Thunderbird', and lower than FTM 9743 for appearance. For tomatoes cut lengthwise, 'Red Deuce' was ranked higher than 'Mountain Fresh Plus' for appearance.

**Tomato Taste**

FTM 9744 was rated highest for flavor and overall liking of all the cultivars evaluated.

For flavor, 'Red Deuce' was ranked lower than FTM 9744. Considering the overall liking of the tomatoes, all cultivars were not different than 'Red Deuce'.

When marketing whole tomatoes, FTM 9744 is a great option. Compared to 'Red Deuce', 'Mountain Gem', FTM 9745, 'Red Snapper', and 'Thunderbird' were not ranked as highly.

Considering flavor, FTM 9744 was ranked higher than all other cultivars, including 'Red Deuce'. Regarding overall liking, all cultivars were not significantly different than 'Red Deuce'.

# UV Light Treats Beet Disease, Combats Fungicide Resistance

Krishna Ramanujan | Cornell Chronicle

Germicidal ultraviolet light is effective at killing a damaging fungus that infects table beets, adding an important organic tool to fight the growing problem of fungicide resistance, according to a new Cornell study.

While UV light is already used to fight powdery and downy mildew in grapes, powdery mildew in strawberries, and a contagious bacteria that causes fire blight in apples, pears and members of the family Rosaceae, this is the first proof that the germicidal light can work in a vegetable.

Fire blight and powdery and downy mildew live on the outside of leaves and shoots, but this study shows UV light suppresses *Cercospora* leaf spot fungus, which has part of its lifecycle inside the plant.

"*Cercospora* leaf spot infects the leaf and causes defoliation, and therefore, because table beets are harvested with what's called top-pulling machinery – machines that grab the roots and pull the roots out of the ground – when the leaves are gone, they don't work," said Sarah Pethybridge, associate professor of plant pathology and plant-microbe biology at Cornell AgriTech and corresponding author of a study published March 28 in the journal *Plant Disease*.

Now, the researchers can take next steps: using drone or satellite imagery to identify spectral signatures of the disease in beet fields in order to spot-treat infected plants with UV light at night rather than treating an entire field, which isn't feasible. They are also investigating the use of automated robotic vehicles that could position a wagon fitted with UV lights to shine on infected plants.

More work is needed to know whether this technology will be applicable to other vegetable diseases and crops. "It depends upon the sensitivity of the pathogen to UV light, but also the sensitivity of the particular vegetable, so it has to be trialed on a case-by-case basis," Pethybridge said.

There are three types of UV light: UVA has the longest wavelengths, followed by UVB and then UVC, with the shortest wavelengths; the latter is used to treat plant diseases. When exposed to UV light during the day, fungal pathogens have a mechanism that repairs damage to DNA, but when UVC is applied at night, that mechanism can't repair the damage, which permanently compromises DNA replication in fungal spores. One caveat is that the treatment is most effective when it is followed by four hours of darkness before sunrise, so applications are recommended right after sundown.

In the study, the researchers tested UVC light directly on *Cercospora* leaf spot fungal spores in the lab. Once proven that it worked, and after determining doses, they tested it on beet plants in the greenhouse. They found UVC light at effective doses created some toxicity to the plants, but they grew out of it. They also found that older plants were more susceptible to damage than younger plants. Pethybridge and colleagues then conducted two years of field trials in New York state – the No. 1 beet-growing state in the country – where they identified an optimal dose to suppress the fungus while causing minimal toxicity to plants.

The new tool will greatly help against fungicide resistance in *Cercospora* leaf spot, which is genetically diverse and can rapidly overcome conventional fungicides, which must be frequently applied. UVC light treatments may be used in conventional beet production as well as in organic systems, where synthetic fungicides are not permitted.

Project collaborators included Love Beets, which makes organic beet products, and Seneca Foods, known for conventional products, both major beet producers in New York. The companies provided support letters for funding; helped identify farmers for trials; and served on a stakeholder advisory panel which met every six months to provide feedback on the project.

Co-authors include David Gadoury, Sean Murphy, Frank Hay and Julie Kikkert at Cornell; and Mark Rea and Nicholas Skinner at the Light and Health Research Center at the Icahn School of Medicine at Mount Sinai, New York.

The study was funded by U.S. Department of Agriculture National Institute of Agriculture (USDA-NIFA) Organic Research and

Extension Initiative Program and the USDA-NIFA Hatch project managed by Cornell AgriTech, Geneva.

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*continued on page 19*

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*Cercospora* leaf spot on beet leaves.  
Image credit to Sarah Pethybridge.

The new tool will greatly help against fungicide resistance in *Cercospora* leaf spot, which is genetically diverse and can rapidly overcome conventional fungicides, which must be frequently applied. UVC light treatments may be used in conventional beet production as well as in organic systems, where synthetic fungicides are not permitted.

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*This article was printed with permission from Krishna Ramanujan of Cornell Chronicle.*



A wagon fitted with UV lights underneath to shine on infected plants. Image credit to Sarah Pethybridge.

## PVGA's Farm Show Booth

Bill Reynolds | PVGA Secretary/Treasurer

on behalf of the Farm Show Booth Task Force

We hope everyone had a good start to their planting and early harvest from their greenhouses and high tunnels. The Farm Show Committee is off to a good start in planning for the 2025 Farm Show. We have made some modifications to the booth design and have also implemented some changes in procedures to streamline the onsite volunteer duties.

In addition, we are working on a reorganization of the volunteer schedule and are planning to start the process of signing up volunteers earlier, with a goal of having all positions filled by mid-November. PVGA's Board has assumed the responsibility of calling volunteers to schedule coverage. When you get that phone call, we hope you will agree to assist us at the booth. Now is a great time to give some thought to what day (or days) you, your family, employees, and/or friends would be willing to help.

We are also searching for a Farm Show Coordinator, who will work with the Farm Show Task Force managers to ensure a smooth behind-the-scenes process each day. If you are interested in learning more about this position, contact PVGA at [pvga@pvga.org](mailto:pvga@pvga.org) or 717-973-5915.

It is only with YOUR help that we can continue to be successful in raising funds for our organization and fund the research which benefits all of us.

We look forward to seeing you in January!

# 2023 Specialty Pumpkin Variety Trial

Emmalea Ernest | Extension Fruit & Vegetable Specialist | University of Delaware

In 2022 Gordon Johnson and I conducted two consumer surveys on specialty pumpkin preferences in Delaware. Consumer chose from more than 30 specialty pumpkin varieties and the most popular types were warty, blue, striped/mottled, white or flat. The most popular varieties from that survey are reported in WCU 31:7, the article is Consumer Survey on Specialty Pumpkin Preferences.

Although Gordon grew the pumpkins for the 2022 survey, we did not have yield data for the varieties. In 2023 I tested 14 varieties of specialty pumpkins with the consumer preferences in mind. The other theme of the varieties that I chose is that they are all edible (in some way) as well as ornamental.

The trial was direct seeded into raised black plastic mulch beds on June 23. The beds were on 7 ft centers. The five smaller fruited varieties were spaced at 2 ft in the row and the nine larger fruited varieties were spaced at 3 ft.

Among the small-fruited varieties (Table 1, gray), there were no statistically significant differences in yield, except that Orangita produced more fruit than Heart of Gold. The tested varieties were chosen because they had striped/mottled coloration, a flat shape or both of those traits favored in the consumer survey.

Table 1. 2023 Specialty Pumpkin Yields in Fruit per 30 ft Plot

Variety	Fruit/Plot
Orangita	57.0 a
Orange Peel	54.0 a
Black Kat	53.0 a
Celebration	42.7 ab
Heart of Gold	36.3 b
Millionaire	20.7 c
Kakai	17.3 cd
Lakota	9.7 cd
Naked Bear	9.7 cd
Blue Harvest	8.7 cd
Jarrahdale	7.3 cd
Queensland Blue	6.0 cd
Red October	6.0 cd
Lady Godiva	5.0 d

gray=small-fruited, yellow = spaghetti squash, green = hulless seeds, orange = hubbard-like, blue = blue

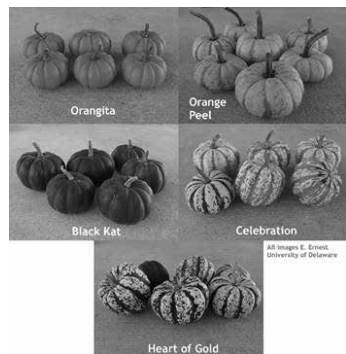
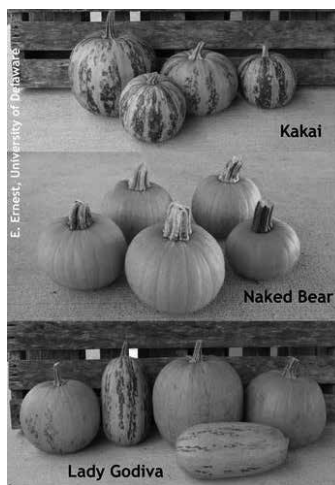


Figure 1. Small-fruited specialty pumpkins tested in 2023



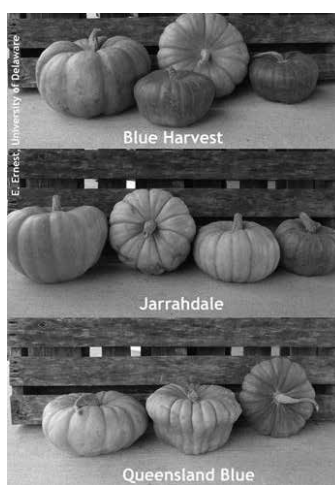
Among the large-fruited varieties, Millionaire, a striped spaghetti squash, produced the highest yields. Lakota, a orange and dark green striped squash with a unique angular shape also produced good yields. The red hubbard variety, Red October, did not yield well. These varieties are pictured in Figure 2.

Figure 2. Specialty pumpkins/squash: Millionaire, Lakota and Red October



I tested three varieties that produce edible hulless or “naked” seed (Figure 3). Kaki and Naked Bear produced good yields. Lady Godiva had the lowest yield of all the varieties tested and produced off-types that had unusual shapes and did not have hulless seeds.

Figure 3. Hulless pumpkin varieties



I tested three flat blue varieties which produced similar yields. In my opinion, the variety Jarrahdale produced the most attractive pumpkins of the three (Figure 4).

Figure 4. Flat blue pumpkin varieties

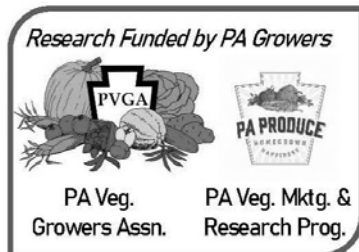
Some of the best performing varieties in the trial, Jarrahdale, Lakota, and Kakai, are open pollinated. Seed for these varieties is less expensive than that of hybrid varieties.

This article was printed with permission from Emmalea Garver Ernest, PhD | Extension Fruit and Vegetable Specialist | Assistant Professor, Department of Plant & Soil Sciences | University of Delaware

# Evaluation of Fungicide Programs for Powdery Mildew Control in Pumpkin

Tim Elkner | Penn State Extension | Lancaster County

Beth Gugino | formerly Department of Plant Pathology and Environmental Microbiology | Penn State University and currently Assistant Dean for Graduate Education and Associate Director of the Pennsylvania State Experiment Station



Powdery mildew occurs on pumpkins in PA every growing season and if not managed can result in loss of crop yield and marketable quality. The introduction of powdery mildew tolerant or resistant cultivars has helped to reduce these losses, but even resistant cultivars are not immune and typically

become infected later in the season. Fungicide efficacy trials have identified effective materials for managing powdery mildew however, many of the newer products are expensive. In addition, growers must also actively manage for fungicide resistance by selecting and rotating among FRAC codes thus requiring the use of multiple fungicides in a management program. Growers are requesting recommended fungicide programs that manage not only powdery mildew but also chemical costs and fungicide resistance. Powdery mildew is also more challenging to manage in organic production systems because products that are approved for organic certification tend to be less effective for mildew management, especially under high disease pressure. As OMRI approved products are introduced to the market, it is important to also evaluate their efficacy and how they could be used to augment current organic powdery mildew management programs while also managing product input costs. We evaluated several conventional and organic fungicide programs for the management of powdery mildew on a commercially available powdery mildew resistant pumpkin cultivar while taking into consideration the total cost of the season-long program.

## Materials and Methods

The trial was conducted at The Pennsylvania State University Southeast Agricultural Research and Extension Center in Manheim, PA in a no-till production field. Cereal rye was established in the fall of 2022 (3 bu/A). Fertilizer was broadcast (N-P-K; 11-52-0 MAP at 230 lb/A based on soil test results) on 10 June. The rye was burned down on 5 May using glyphosate (1.5 qt/A). On 13 June, plots were direct-seeded by hand with 'Gladiator' at 24-in. spacing resulting in five plants per plot. Herbicides were applied post-planting (13 June) for weed control (Credit 1.5 qt/A, Prefar 4-E 5.5 qt/A, and Strategy 4 pt/A). Plots were 20-ft-long rows planted on 15-ft centers with 10 ft plant-free gaps separating plots within the row. Fungicide treatments were replicated five times and arranged in a completely randomized design. Cucumber beetle and squash bugs were managed with applications of Scorpion (drip, 5 July), Mustang Maxx (backpack, OTR, 26 June) as well as Mustang Maxx (3, 25 Aug, and 6 Sept) and Assail (14, 30 Aug) applied via boom application. Weeds were managed by hand-weeding during the trial as needed. Plots were fertigated with UAN through the drip irrigation tape on 7 July (5 lb N/A), 18 and 27 July (10 lb N/A) and 3, 9, and 15 Aug (15 lb N/A). Fungicide treatment applications were made using a tractor mounted, CO<sub>2</sub>-powered sprayer with an offset-boom (R&D Sprayers, Opelousas, LA) traveling at 3 mph and calibrated to deliver 45 gpa at 50 psi at the tank through six TeeJet Turbo TwinJet TTJ60-11004 nozzles on 19-in. centers on 16, 23, 30 Aug and 6, 14, 20, and 29 Sept. Powdery mildew severity was rated on a continuous scale of 0 to 100% based on the percentage of upper and lower leaf surface (rated separately) showing symptoms on six leaves per plot on 22 and 29 Aug and 4, 12, 19 and 28 Sept. Rainfall totals (in.) were 4.44, 3.92, 0.17\* and 4.76 for June, July, Aug, and Sept, respectively. (\*Suspected spider web blockage of rain gauge during the month). Fruit was harvested on 6 Oct and graded into marketable and unmarketable. Unmarketable fruit

was sorted by poor handles (PM) and other defects (i.e. - shape) and each group was counted and weighed. Natural inoculum was relied upon, and symptoms were first observed on 9 Aug.

## Results and Discussion

Our 'standard' recommended fungicide program of Vivando, Quintec and Torino had the lowest percent leaf coverage by powdery mildew (disease severity) on the upper leaf surface after five weeks of treatment; programs containing only 'softer' products (sulfur, OxiDate, JetAg and PerCarb) resulted in higher disease severity except for the straight sulfur program which had less than 5% leaf coverage (Table 1). The treatment where Timorex was substituted for Torino was as effective as the standard conventional program on managing mildew on the upper leaf surface. Timorex is an oil extract of the tea tree plant and is an OMRI listed product. All programs reduced powdery mildew severity compared to the untreated control on the upper surface. However, by the end of the season, the standard program had 76.5% mildew coverage on the undersides of the leaves at the same date; this was not statistically different from the Vivando/Proline and Vivando/Quintec/Timorex programs. The other programs with softer products were even less effective in managing mildew on the undersides of the leaf. Leaf ratings of mildew coverage were stopped after five weeks because of complete leaf coverage by powdery mildew in the control plots as well as leaf loss from the disease.

Fungicide cover sprays were continued for two more weeks until fruit harvest to protect the pumpkin handles. In two programs maximum allowable label rates of the targeted fungicides (Procure/Quintec and Vivando/Proline) were reached therefore alternate fungicides were used for the last application (Table 2). The untreated plots averaged 36.1% marketable fruit with an average harvest weight of 62.1 lb fruit. All of the conventional fungicide programs resulted in a higher percentage of marketable fruit and fruit weight per plot. The programs using softer products tended to have lower yields for both percent marketable and fruit weight but there was a lot of plot-to-plot variability across the replications, and these differences were not always statistically significant. This variability was likely in part due to a delay in making the first fungicide application because of employee vacation time. However, the treatment where Timorex was substituted for Torino was again as effective as the conventional programs. The same pattern held for the percent of fruit culled for mildew on the handle as well as total weight of culled fruit per plot – the conventional fungicide programs performed better than the softer products alone while the program with Timorex substituted was as effective as the totally conventional fungicide programs.

We were not able to obtain retail costs for all of the products used in this trial so no cost comparisons can be made for all treatments. Costs of the conventional fungicides varied from \$22.50 to \$27.10 /A/application. This would give total costs of \$84.75 to \$98.55 for three applications of the fungicides used in this study (including the cost of Bravo in each application). Sulfur is very inexpensive per application (\$7.10) but the lack of control of mildew on the leaf undersides limits its usefulness in a program unless sufficient coverage can be obtained on the lower leaf surface.

We plan to repeat this study in 2024 with modifications to the spray programs. The first change we plan to look at is starting fungicide applications before mildew is present in the field. Because of the cost of traditional fungicides, we plan to evaluate materials that induce plant resistance to disease such as Regalia, LifeGard and EcoSwing. Sulfur applications before mildew is present might also be an inexpensive option. We will also look at incorporating these materials into the regular fungicide program to potentially enhance powdery mildew control and enhance yields.

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Evaluation of Fungicide Programs for Powdery Mildew Control in Pumpkin—continued from page 21

Table 1. Powdery mildew leaf coverage ratings of upper and lower leaf surfaces after five fungicide applications to “Gladiator” pumpkin in 2023 at the Penn State Southeast Agricultural Research and Extension Center in Manheim, PA. Fungicide applied was rotated weekly between listed products.

Treatment (rate/A)	% Powdery Mildew Coverage Upper Leaf (9/19/24)	% Powdery Mildew Coverage Lower Leaf (9/19/24)
Procure 480SC (8.0 oz)z Quintec 2.08SC (6.0)z	5.0 bcd	93.7 c
Vivando 2.2SC (15.4 oz)z Quintec 2.08SC (6.0)z Timorex ACT (35 oz)	2.2 cd	81.3 d
Vivando 2.2SC (15.4 oz)z Quintec 2.08SC (6.0)z Torino 0.85SC (3.4 oz)z	1.9 d	76.5 d
Vivando 2.2SC (15.4 oz)z Proline 480SC (6.0 oz)z	13.1 bcd	81.7 cd
Microthiol Disperss (5.0 lb) JetAg (3.8 oz/5 gal) PerCarb (3 lb/100gal)	22.0 b	95.8 c
Microthiol Disperss (5.0 lb)	4.4 c	97.3 bc
Microthiol Disperss (5.0 lb) OxiDate 5.0 (1% v/v) PerCarb (3 lb/100gal)	20.5 b	98.3 a
Untreated Control	69.5 a	99.4 a
z Plus Bravo Weather Stik 6SC (2.0 pt)		

Table 2. Yield of “Gladiator” pumpkin (per 20 ft plot) as affected by fungicide programs in 2023 at the Penn State Southeast Agricultural Research and Extension Center in Manheim, PA. Fungicide applied was rotated weekly between listed products.

Treatment (rate/A)	% Marketable Fruit	Marketable Fruit (lb /plot)	% Culled (PM on handles)	Weight culled (lb/plot)
Procure 480SC (8.0 oz)z Quintec 2.08SC (6.0)z	84.5 abd	180.0 a	12.6 c	20.9 d
Vivando 2.2SC (15.4 oz)z Quintec 2.08SC (6.0)z Timorex ACT (35 oz)	84.7 abc	182.0 a	8.0 c	20.5 cd
Vivando 2.2SC (15.4 oz)z Quintec 2.08SC (6.0)z Torino 0.85SC (3.4 oz)z	89.1 ab	197.0 a	10.9 c	25.6 bcd
Vivando 2.2SC (15.4 oz)z Proline 480SC (6.0 oz)z	84.3 ab	181.0 a	10.9 c	22.4 d
Microthiol Disperss (5.0 lb) JetAg (3.8 oz/5 gal) PerCarb (3 lb/100gal)	54.0 cd	119.0 ab	38.9 abc	73.7 abc
Microthiol Disperss (5.0 lb)	64.9 bcd	136.0 ab	29.7 bc	66.5 abcd
Microthiol Disperss (5.0 lb) OxiDate 5.0 (1% v/v) PerCarb (3 lb/100gal)	53.2 d	95.3 b	39.9 ab	76.9 ab
Untreated Control	36.1 d	62.1 b	58.1 a	109.0 a
zPlus Bravo Weather Stik 6SC (2.0 pt) yWeek seven fungicide was Bravo at 2.0 pt./A xWeek seven fungicide was Procure at 8.0 oz/A				

# The Busy Season

Amy Metrick | PVGA Board Member

If you haven't realized it yet, we are well into what some may call the busy season. But as farmers, we know that this term is relative. While we might have a rainy day here and there, that doesn't mean there aren't projects that need our attention. There is always something to do.

Our family owns and operates Metrick's Harvest View Farm and Market in Butler, Pennsylvania. We are a family-run business with myself, my parents Ken & Cathy, and my sister Laura and her husband Cam all serving a purpose on the farm. Even with the five of us, we are still busy!

Spring is a time of planting and putting to use all the knowledge we gained over the winter at meetings and conventions. For us, that means trying new varieties, practices, and technology.

What are we all doing that keeps us so busy, specifically here in Western Pennsylvania at the end of May? Strawberries! We picked our first batch of strawberries on May 21. There is something about that fresh off the plant, warmed by the sun, fresh taste of a strawberry. There are not many other things that taste better than that!

This year we were able to get tomatoes into the ground and under row cover. While some of you have done this for many years, this is a first for us. The weather and plant size lined up perfectly so we figured we would give it a shot. The plants look great, and the wind has behaved and left the row cover alone.

With all the good spring has brought it has also brought challenges. From having the average rainfall for the month of April happen in two weeks, to having almost 90-degree days in May, things have been a little different. But just like we always do as farmers, we adapt, keep busy and keep everything relative.



# SB 1198 – Plant and Pollinator Protection Act

Senator Carolyn Comitta has introduced the **Plant and Pollinator Protection Act**. If this legislation is of interest to you, feel free contact and/or send a letter to your state senator asking them to support [SB 1198](#). PVGA has no official position regarding SB 1198.

The Plant and Pollinator Protection Act combines two existing outdated laws, the Bee Law and the Plant Pest Act. It also establishes a new risk-based assessment for inspections, establishes opportunities to provide state approved verification programs, and

will continue to improve plant and pollinator health. This approach would build a robust early detection system to prevent the spread of pests that harm our environment and pollinators.

Extensive stakeholder outreach was involved in the drafting of the Plant and Pollinator Protection Act. Industry groups were integral in crafting the language in this new bill, and it has strong stakeholder and industry support.

The following overview and talking points provide additional information regarding SB 1198.

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## Overview of the Proposed Plant and Pollinator Protection Act: SB 1198

### Issue

Pennsylvania's apiary and plant industry account for \$83.5 billion to the state's economy. These businesses rely on local consumers, as well as domestic and international markets, to thrive. The Pennsylvania Department of Agriculture oversees these industries to ensure they are mitigating the risk of spreading pests and plant diseases and ensuring they are practicing sound industry standards.

The laws that the Bureau of Plant Industry use to regulate these industries have not been updated in 30 years while these sectors have grown exponentially along with diseases and pest threats. This has caused a deficit in the number and quality of services the Department of Agriculture's Bureau of Plant Industry can provide to Pennsylvania businesses.

### Background

Since 1921, Pennsylvania has had a Bee Law to protect bees from diseases that can cause major economic issues for the apiary industry. Pennsylvania has similarly had a Plant Pest Act since 1937 to protect the Commonwealth's plant resources from pests. Both laws have been important to the health of Pennsylvania's plants and pollinators. Since their passing however, there have been many changes in trade practices, the science of plant and pollinator health, the Department of Agriculture's enforcement authority, and the cost of simply doing business.

The proposed Plant and Pollinator Protection Act combines both the Bee Law and the Plant Pest Act. It also establishes a new risk-based assessment for inspections, establishes opportunities to provide state approved verification programs, and will continue to improve plant and pollinator health.

The risk-based program increases the frequency of inspections at businesses that have a higher risk of spreading plant diseases and pests, including invasive species. The risk-based program creates an early detection system for pests and invasive species. The Center for Rural Pennsylvania estimates the annual impact of invasive species in Pennsylvania is over \$100 million. A risk-based program will help reduce those costs over time by identifying pests in the green industries before they spread further.

The Plant and Pollinator Protection Act will allow the Department of Agriculture to offer state approved verification programs

for plant growers and beekeepers. These programs will provide Pennsylvania producers access to trading partners across the U.S. and internationally. They also allow Pennsylvania companies to expand sales to other markets that have specific shipping requirements - markets they would not otherwise be able to access without the Department provided verification.

It has been 30 years since fees were last increased, which has caused a deficit in number and quality of services the Bureau of Plant Industry can provide. These fees fund services like apiary and plant inspections. The Plant and Pollinator Protection Act will generate more revenue to cover the costs of the Bureau of Plant Industry's expenses and allow them to maintain the level of service the industry expects.

### Top things to know

Extensive stakeholder outreach was involved in the drafting of the Plant and Pollinator Protection Act. Industry groups were integral in crafting the language in this new bill, and it has strong stakeholder and industry support. It was driven and initiated by stakeholders over many years.

### The Plant and Pollinator Protection Act would:

- Improve customer service by updating and clarifying details in two outdated laws – the Bee Law and the Plant Pest Act.
- Prevent the spread of pests and pathogens by establishing a risk-based assessment for inspections. This will save the state money by catching pests and pathogens before they spread further. This would also help reduce pesticide use.
- Help Pennsylvania producers be more competitive. Providing highly sought after state- approved verification programs allow businesses to access more trading partners across the U.S. and internationally.
- Benefit pollinators by expanding management authority and protections to more species than just the honeybee. This is critical because the pollinators that benefit our crops contribute \$260 million to Pennsylvania's economy annually.

*SB 1198, PN 1621. Last revised 5/21/2024*

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## Plant and Pollinator Protection Act Talking Points for Stakeholders

### Plant and Pollinator Protection Act

- Since 1921, Pennsylvania has had a Bee Law to protect bees from American Foulbrood, a bacterial disease that remains a major economic issue for the apiary industry. Pennsylvania has had a Plant Pest Act since 1937 to protect the Commonwealth's plant resources from pests.

- Both laws have been important to the health of Pennsylvania's plants and pollinators. Since their passing however, there have been many changes in trade practices, the science of plant and pollinator health, the Department of Agriculture's enforcement authority, and the cost of simply doing business.

*continued on page 25*

- The proposed Plant and Pollinator Protection Act combines the Bee Law and Plant Pest Act to create a modern regulatory framework that reflects the needs of the horticulture and apiary industries. Combining the Bee Law and the Plant Pest Act is preferred because they are mutually dependent.
- The Plant and Pollinator Protection Act will establish a new risk-based assessment for inspections, continue to improve plant and pollinator health, and establish opportunities to provide state approved verification programs.
- The proposed risk-based program would increase the frequency of inspections at businesses that have a higher risk of spreading plant diseases and pests, including invasive species. The risk-based program would create an early detection system for pests and invasive species. The Center for Rural Pennsylvania estimates the annual impact of invasive species in Pennsylvania is over \$100 million. A risk-based program would help reduce those costs over time by identifying pests in the green industries before they spread further.
- It has been 30 years since fees were last increased, which has caused a deficit in the number and quality of services the Bureau of Plant Industry can provide. These fees fund services like apiary and plant inspections. The Plant and Pollinator Protection Act will generate more revenue to cover the costs of the Bureau of Plant Industry's expenses and allow them to maintain the level of service the industry expects.
- Extensive stakeholder outreach was involved in the drafting of the Plant and Pollinator Protection Act. Industry groups were integral in crafting the language in this new bill, and it has strong stakeholder and industry support. It was driven and initiated by stakeholders over many years.

#### **Pollinator Considerations in the Plant and Pollinator Protection Act**

- Managed pollinators have expanded to include more than the honeybee.
- A Plant and Pollinator Protection Committee will be established to address plant and pollinator health challenges and advise the Department of Agriculture. Members will be appointed by the Secretary.
- Living managed pollinators would not be
- Managed pollinators coming into Pennsylvania from another state must have a Certificate of Inspection signed by a state apiarist or Department of Agriculture-approved third-party equivalent.

#### **State Approved Verification Programs**

- In addition to the plant and pollinator modernization provisions noted above, this proposal also includes the addition and authority for new state approved verification programs.
- The state approved verification programs would be a fee-for-service model that plant and apiary industries could use to open new domestic and international market opportunities for Pennsylvania growers. This would:
  - Ensure that the Department of Agriculture could provide highly requested services to the industry.
  - Create more appeal for Pennsylvania products in local and external markets.
  - Help generate revenue for businesses and for the Bureau of Plant Industry to improve customer service and maintain the level of service the industry expects.
  - Make Pennsylvania appealing to new businesses interested in marketing products to more trading partners.
- Multiple industry groups have requested state approved verification programs, including Apiary, Greenhouse, Nurs-

- ery, Potato growers, Seed producers, and weed-free forage producers.
- The state approved verification programs are often federal programs that establish specific standards that companies must meet to be able to participate in certain trade activities. States must establish compliance agreements to offer these programs to companies. This requires trained state employees to verify that products grown within the state meet those individual program standards. Pennsylvania does not currently have the personnel required to enter into many of the compliance agreements that would allow companies to ship to other states and internationally.
- This additional verification would be an advantage in the marketplace and allow Pennsylvania producers to charge a premium for their certified products, if desired.
- Most of the verification programs the Department of Agriculture currently offers are federally funded and do not generate additional revenue. The Department of Agriculture would like to move away from this grant-led funding arrangement.
- The Department of Agriculture will charge a percentage of gross sales of certified products to generate revenue to support state approved verification programs.

#### **State Approved Verification Program Examples**

- Pennsylvania offers the Fruit Tree Improvement Program. It sets standards for pathogen testing of fruit tree nursery stock, weeds in fields with the stock plants, and other tests as designated. Programs like this are the most effective way to produce nursery trees that are free from viruses of concern. This program charges 1% of gross sales. It currently generates \$50,000-\$60,000 per year.
  - Pennsylvania offers the Systems Approach to Nursery Certification. This is a national program done in partnership with the National Plant Board and USDA for nursery and greenhouse growers and prevents the spread of pests and pathogens. This program sets a higher standard for nursery stock production, providing a healthier product. It does not currently provide any revenue to the state
  - Pennsylvania offers a Xylella Free Certification to meet EU requirements for shipping. It ensures plants are free from Xylella, a widely dispersed pathogen with no known cure. This work is currently funded by a USDA grant but does not provide any revenue to the state.
  - The Weed Free Forage and Straw program ensures invasive/noxious plants are not accidentally harvested and shipped in plant material intended for forage. The Department of Agriculture does not currently offer this service, but it has been requested by Pennsylvania suppliers.
    - Some agencies like PennDOT recommend certified weed free straw for their planting programs.
    - Weed free forage is required in many Western states that are concerned about invasive weeds.
  - U.S.-Canada Greenhouse Certification Program is a USDA program. It allows greenhouse producers to ship more freely into Canada and not require a Federal Phytosanitary Certificate and inspection for each shipment. The Department of Agriculture does not currently offer this service, but it has been requested by Pennsylvania suppliers.
- SB 1198, PN 1621. Last revised 5/21/2024*

**Information and**

# recipe

**Corner**

New to PVGA News! Each issue will feature a recipe that includes vegetables.

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## Breaded Parmesan Zucchini Sticks

*Submitted by Pete Flynn*

### Ingredients

3 medium zucchini squash, ends trimmed then cut into wedges  
2 large eggs  
1/2 cup grated parmesan cheese  
1/3 cup italian style breadcrumbs  
1/2 tsp kosher salt  
1/4 tsp ground black pepper

### Instructions

Heat oven to 400°F.  
Cover a large baking sheet with foil for easy clean-up.  
Beat eggs in a shallow bowl.  
Combine parmesan, breadcrumbs, salt and pepper on a plate.  
Dip zucchini in egg, then turn in cheese mixture to coat.  
Place wedges, skin-side down, on baking sheet in a single layer.  
Bake 20 to 25 minutes or until light golden brown.  
Serve while hot.

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## Steak Kabobs

*Submitted by Rita Resick*

### Ingredients

1/4 cup soy sauce  
3 tbs light brown sugar  
3 tbs distilled white vinegar  
1/2 tsp garlic powder  
1/2 tsp seasoned salt  
1/2 tsp garlic pepper seasoning  
4 fluid ounces lemon-lime flavored carbonated beverage  
2 lbs beef sirloin steak, cut into 1 1/2 inch cubes  
2 green bell peppers, cut into 2-inch pieces  
8 skewers  
1/2 pound fresh mushrooms, stems removed  
1 pint cherry tomatoes  
1 fresh pineapple - peeled, cored and cubed

### Directions

Mix soy sauce, light brown sugar, distilled white vinegar, garlic powder, seasoned salt, garlic pepper seasoning, and lemon-lime flavored carbonated beverage in a medium bowl. Reserve about 1/2 cup of this marinade for basting. Place steak cubes in a large resealable plastic bag. Cover with the remaining marinade, and seal. Refrigerate for 8 hours, or overnight.

Bring a saucepan of water to a boil. Add green peppers, and cook for 1 minute, just to blanch. Drain, and set aside.

Preheat grill for high heat. Thread steak, green peppers, mushrooms, tomatoes, and pineapple onto skewers in an alternating fashion. Discard marinade and the bag.

Lightly oil the grill grate. Cook kabobs on the prepared grill for 10 minutes, or to desired doneness. Baste frequently with reserved marinade during the last 5 minutes of cooking.

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## Sweet Potato Casserole

*Submitted by Lois Reynolds*

### Potatoes

1 ¼ lbs sweet potatoes  
½ cup salted butter  
½ cup light brown sugar packed  
¾ cup heavy whipping cream  
½ tbs vanilla extract  
½ tsp ground cinnamon  
⅛ tsp ground nutmeg

### Crumble topping

¼ cup all purpose flour  
3 tbs light brown sugar packed  
¼ cup old fashioned oats  
½ tsp ground cinnamon

Preheat oven to 350 degrees and grease a 9x13 inch casserole dish.

Fill a large pot with sweet potatoes and add water to cover the potatoes by an inch. Bring to a boil over high heat. Cook until fork tender, approximately 20-30 minutes.

Drain the potatoes, let them rest until completely dry and cooled. Peel potatoes and add to large mixing bowl. Using a mixer or potato masher, blend potatoes. Add butter, sugar, cream vanilla, cinnamon, and nutmeg. Mix until well combined and smooth. Put potato mixture into casserole dish.

In a medium bowl, whisk flour, sugar, oats, cinnamon, and nutmeg. Melt butter and add to dry ingredients, mix until combined to create crumbs. Sprinkle the potatoes with the crumbs.

Add marshmallows to top of crumb mixture if desired. Bake 20-25 minutes or until crumbs are crisp/browned.

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## Saint's Salad with Ginger-Maple Vinaigrette

*Submitted by Pete Flynn*

### SALAD:

bunch Tuscan (lacinato) kale (washed, dried, ribs removed)  
1 ¼ cups wild rice or long-grain brown rice (cooked)  
1 apple (peeled, cored, finely diced)  
¼ cup pine nuts, hazelnuts, or walnuts (toasted)  
½ cup pomegranate seeds (optional)

### DRESSING:

1 inch piece fresh ginger (peeled)  
1 small clove garlic (peeled)  
2 tablespoons white wine vinegar  
1 ½ teaspoons maple syrup  
1 teaspoon Kosher salt  
freshly cracked black pepper (to taste)  
¼ cup extra-virgin olive oil or grapeseed oil

For the Salad: Stack a few kale leaves and roll them like a cigar, then thinly slice them crosswise into ribbons. Remove to a large bowl.

For the Dressing: Peel the ginger and grate it on a microplane into a medium bowl. Gather the grated ginger in your fingers and squeeze to release the ginger juice, then discard the pulp. Grate the garlic into the bowl with the ginger juice. Whisk in the vinegar, maple syrup, salt, and pepper to taste. Slowly whisk in the olive oil to emulsify.

Pour the dressing over the kale and toss to combine. Add the wild rice and apple and toss to combine. Let the salad sit for 10 minutes, then sprinkle with the nuts and pomegranate seeds-(if using) and serve.

Tip: To toast the pine nuts, place them in a dry skillet over medium-low heat until golden brown, about 2-3 minutes. Remove and allow to cool.

**Pennsylvania Vegetable Growers Association**

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