PENNSYLVANIA
VEGETABLE GROWERS

NEWS

March 2019 / Volume 42 Number 3

for the commercial vegetable, potato and berry grower

Vegetable Apprenticeship Program Approved

The Pennsylvania Department of Labor and Industry approved the first formal apprenticeship program for farmers in the state on Thursday, March 14th. Developed by the Pennsylvania Association for Sustainable Agriculture (PASA), Diversified Vegetable Apprenticeship provides a guided pathway for training aspiring vegetable farmers to manage or start a farm while also meeting the employment needs of established farms.

During a time when 75 percent of beginning and aspiring farmers under the age of 40 in the U.S. did not grow up on a farm, farmer training programs are more important than ever. Without the traditional transfer of knowledge between parents and children, aspiring farmers need hands-on opportunities to learn the intricacies of stewarding land, tending crops, and running a financially viable business.

Apprenticeship is a tried-and-true model of learning that has trained workers for careers in skilled trades for centuries. Today, a diverse array of state- and federally registered apprenticeships are available for more than 1,000 occupations—from carpentry and plumbing, to dentistry and computer programming.

Apprentice Jess Hermanofski helped pilot the Diversified Vegetable Apprenticeship program in 2018 with Plowshare Produce, an organic CSA farm in Huntingdon County, PA owned by Bethany and Micah Spicher-Schonberg.

Yet, none existed for farmers until 2011 when a group of dairy farmers in Wisconsin founded Dairy Grazing Apprenticeship to help stem the tide of farmland loss and introduce a new generation to dairy grazing. PASA partnered with Dairy Grazing Apprenticeship in 2016 to administer the national program in Pennsylvania and nearby states, and soon thereafter began developing a companion apprenticeship for vegetable farmers.

"We worked with an instructional design expert, the Pa. Department of Labor and Industry, and beginning and seasoned farmers from 19 of our member farms to build the curriculum from the ground up," said Dan Dalton, Diversified Vegetable Apprenticeship manager.

The curriculum trains apprentices in core competencies from soil fertility and irrigation, to marketing and business administration. Apprentices receive more than 2,700 hours of on-the-job training at an established farm, and complete more than 200 hours of related technical instruction over the course of two seasons. Plus, apprentices are paid an hourly wage that increases as they advance their skills.

And while the program is designed to cultivate new farmers, it's also designed to benefit farm owners and operators who often find it challenging to find skilled and reliable workers. Approved host farms can access a pool of pre-qualified apprentice candidates who are invested in farming as a career.

"We want to make sure that the program meets both the training needs of the apprentices as well as the labor needs of the farmers who host them," said Dalton. "We provide ongoing support by monitoring the progress apprentices and host farmers make as they work through the 18-month curriculum, and provide additional resources as needed."

"This is a major milestone in ushering in the next generation of Pennsylvania's farmers," said PASA Executive Director Hannah Smith-Brubaker, who also co-owns and operates an organic vegetable farm with her family in Mifflintown. "After completing a state-registered apprenticeship, graduates will be able to clearly demonstrate their competencies, better positioning them for work in the field and accessing capital and land opportunities."

PASA launched Diversified Vegetable Apprenticeship in fall 2018, when it began accepting applications for the 2019 season. The program is funded by the Hillman Foundation and more than 100 business and individual donors who invested in the program's curriculum development process as part of a fundraising campaign.

Arthur King represents PVGA on the steering committee that developed the apprenticeship program. The PVGA Board of Directors recently approved providing free registration to the Mid-Atlantic Fruit and Vegetable Convention to apprentices in the program.

Interested in becoming an apprentice or hosting one? Find more information at https://pasafarming.org/soil-institute/farmer-training-development/dva-home/.

NEWS

Directors Meet and Visit Legislators in Harrisburg

Members of the PVGA Board of Directors held their spring meeting in Harrisburg on March 19. They also visited with several members of the General Assembly and the offices of Pennsylvania's federal senators Robert Casey and Patrick Toomey to present the Association's legislative priorities for 2019.

During the morning, the Directors meet with Rep. Marty Causer of McKean, Cameron and Potter Counties; Rep. Eddie Day Pashinski from Luzerne Co.; Rep. Danilo Burgos of Philadelphia; Rep. Jonathan Hershey from Juniata; Franklin and Mifflin Counties, and the staff of Rep. Christina Sappy from Chester County. Rep. Causer is the majority chair of the House Agricultural and Rural Affairs Committee while Rep. Pashinski is the minority chair. The others are new members of the committee. Directors also met with Sen. Elder Vogel, the majority chair of the Senate Agriculture and Rural Affairs Committee and Sen. Judy Schwank, the minority chair of the Committee. Teams of Directors also met with Jeff Klukey on the House Appropriations Committee staff and Russell Miller on the Senate Appropriations Committee staff. As mentioned earlier, a team also visited Sandra Garcia in the Harrisburg office of Sen. Robert Casey and Larissa Bailey in Sen. Patrick Toomey's office.

Darrin Youker from Pennsylvania Farm Bureau arranged the visits, purposely choosing leaders of of the Agriculture and Rural Affairs Committees as well as newer members of the committee who are not as familiar with agricultural issues. The PVGA representatives had an opportunity to explain the importance of funding for Penn State agricultural research and extension to our growers. The Directors also emphasized the benefits that the Farmers' Market Nutrition Program coupons provide to growers as well as to the Women, Infant and Children (WIC) program recipients and senior citizens. They also urged increased funding for the Pennsylvania Agricultural Surplus System (PASS).

The issue at the top of the PVGA list of priorities was the exemption of H-2A worker employers from unemployment taxes. Employers are exempt from paying federal unemployment taxes on the wages paid to H-2A workers since these workers are not eligible to collect unemployment benefits and have 75% of the contract wages guaranteed. It is PVGA's position that employers should also be exempt from state unemployment taxes. The three teams of directors also reminded legislators of the Association's continued opposition to Sunday hunting and gave each legislator a copy of the Association's newly adopted Policy Resolutions.

At their meeting that afternoon, the Board voted to continue to contract with Troxell Administrative Services to manage the day-to-day operation of the Association for the sum of $72,800, a 4% increase. The fee not only covers William Troxell's time but also the services of his wife Cheryl and their hired help as well as the use of office space and office equipment plus storage space for Association records

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*The **Pennsylvania Vegetable Growers News** is the official monthly publication of the Pennsylvania Vegetable Growers Association, Inc., 815 Middle Road, Richfield, PA 17086-9205*
phone and fax - 717-694-3596, email - pvga@pvga.org website - www.pvga.org

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

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

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

NEWS

National News Briefs

Farm Bureau Urges Congress to Reject Proposed Agriculture Cuts

Farm Bureau and other agricultural organizations are urging Congress to protect funding for important farm programs, warning that cuts would "deliver a significant blow to U.S. agriculture at a time when farmers, ranchers, and rural America are already struggling." President Donald Trump's 2020 budget proposal calls for cutting $3.6 billion in U.S. Department of Agriculture funding, a 15 percent reduction. The plan would cut $1.6 billion from farm bill programs over 10 years by imposing an income cap on crop insurance, reducing average crop insurance premium discounts for farmers, reducing subsidies to crop insurance companies, and eliminating several farm bill programs. It would also eliminate the Rural Energy for America and Rural Economic Development programs and establish user fees for Food Safety and Inspection Service, Animal and Plant Health Inspection Service, Grain Inspection, Packers and Stockyards Administration, and Agricultural Marketing Service. In a letter to leaders on the House and Senate Budget and Appropriations committees, Farm Bureau and other organizations noted that spending on agriculture programs has already been reduced through the 2014 and 2018 farm bills but that farmers cannot withstand further cuts as they grapple with a struggling farm economy. "There is no doubt that farm country and the economies of agricultural-based rural America are hurting," the groups wrote. "With the agriculture and rural economy struggling and as USDA begins implementation of the 2018 Farm Bill, we respectively request you reject cuts to vital farm policy programs."

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

Deal Reached to Avoid Second Shutdown

Congress and President Donald Trump have reached a deal to continue funding the federal government, averting a repeat of the impasse that partially shuttered the federal government in January and delayed key agricultural programs.

While the agreement doesn't resolve ongoing disagreement between the Republican president and congressional Democrats over funding a U.S.-Mexico border wall, it shifts the fight to a different venue (Trump plans to pay for the project through executive action while opponents have sought to block the move in court). That stops another shutdown from occurring and further delaying implementation of the 2018 Farm Bill and other important farm programs.

*From the **Penna. Agricultural Alliance Issues Update**, Penna. Farm Bureau, March 2019.*

rograms including the Mobile Ag Ed Science Lab, Ag on the Go, Educator's Ag Institute, Ag Literacy Week, our Scholarship programs, and other ag literacy outreach events.

Created by a group of forward-thinking farmers and business leaders in 1986, Pennsylvania Friends of Agriculture Foundation, a charitable organization supported by Pennsylvania Farm Bureau, carries out the mission of preserving and promoting agriculture.

The foundation tournament will be conducted as a four-person scramble and will be held on its scheduled date, rain or shine. The cost of the golfing package is $175 per person and includes greens fees and cart, driving range privileges, lunch and refreshments on the golf course, golf contests and prizes, gifts, dinner and a basket raffle. New this year is a beat the pro contest.

The deadline for reservations is June 1. Be sure to reserve your foursome early since space is limited to 124 golfers. To make your reservation or to learn more about sponsorship opportunities, visit www.pfb.com/golf or contact Natalie Slembarski at 717.731.3555 or NASlembarski@pfb.com.

*From the **Penna. Agricultural Alliance Issues Update**, Penna. Farm Bureau, March 2019.*

State News Briefs

Disaster Designation Approved for Most of Pennsylvania

U.S. Secretary of Agriculture Sonny Perdue has approved a disaster designation for most of Pennsylvania, enabling farmers to seek assistance as they recoup from last year's excessive rain. The designation covers all but six Pennsylvania counties: Butler, Delaware, Lawrence, Montgomery, Philadelphia and Pike. Farmers in all other counties will be eligible for aid related to losses suffered as a result of flooding and excessive rain that occurred July 21, 2018 and later. Farmers in the designated counties now have up to eight months to apply for emergency loans through USDA and will be eligible to apply for for any other ad hoc relief programs related to the disaster if any are established by USDA. For more information, contact your local Farm Service Agency office

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

Senate May Consider Sunday Hunting Legislation

A bill opposed that would effectively expand Sunday hunting in Pennsylvania recently cleared the state Senate Game and Fisheries Committee.

The 8-3 vote sends Senate Bill 147 to the full Senate for consideration. The bill would give the Pennsylvania Game Commission full authority to allow for Sunday hunting in its establishment of seasons and bag limits.

Pennsylvania Farm Bureau members (and PVGA members) oppose Sunday hunting and believe the bill would exacerbate the issue of hunting-related trespass and disrupt the current arrangement that allows both hunters and other outdoor enthusiasts a day to enjoy our state's wilderness without coming into conflict with each other. While the bill would strengthen penalties for hunting-related trespass, it does not address many other concerns and policy objectives farmers have related to Sunday hunting.

PFB is urging farmers across the state who oppose expanding Sunday hunting to contact their legislators to make their voices heard. That can be done by contacting your state legislators directly or by responding to PFB's Action Alert at http://bit.ly/2NIvdGp.

*From the **Penna. Agricultural Alliance Issues Update**, Penna. Farm Bureau, March 2019.*

Updates to Ag Security Law Clear House

A Pennsylvania Farm Bureau-supported bill that would update the state's Agricultural Area Security Law to clarify how

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NEWS

State News Briefs (continued from page 3)

landowners may want to handle the need for additional farm residences when preserving their farm cleared the state House this week. Lawmakers voted unanimously to send House Bill 370 to the state Senate for consideration. The state Senate Agriculture and Rural Affairs Committee passed an identical bill earlier this month and that version is also awaiting action by the full Senate. Currently, state law allows for the creation of one additional farmstead residence on preserved farms. The bill, sponsored by Rep. Kate Klunk of York County, would give farmers the option to waive this right for an additional farmstead in order to reduce the value of their land. Additionally, the legislation would clarify that preserved farm owners can subdivide their land for a second residence, whether it is standing or needs to be constructed. State law currently allows for subdivision only when another farmhouse is going to be constructed, not for one that is standing.

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

Ag Security Law Updates Advance in General Assembly

State lawmakers have taken their first steps towards approving legislation that would clarify how landowners may want to handle the need for additional farm residences when preserving their farms.

Identical bills that would provide the necessary updates to the state's Agricultural Area Security Law to each passed the House and Senate Agriculture and Rural Affairs committees last month. House Bill 370, sponsored by Rep. Kate Klunk of York County, and Senate Bill 145, sponsored by Sen. Gene Yaw of Lycoming County, can now be considered by the full House and Senate.

Currently, state law allows for the creation of one additional farmstead residence on preserved farms. The bills would give farmers the option to waive this right for an additional farmstead in order to reduce the value of their land. Additionally, the legislation would clarify that preserved farm owners can subdivide their land for a second residence, whether it is standing or needs to be constructed. State law currently allows for subdivision only when another farmhouse is going to be constructed, not for one that is standing.

*From the **Penna. Agricultural Alliance Issues Update**, Penna. Farm Bureau, March 2019.*

Bill to Help Fight Against Spotted Lanternfly Passes House

The state House this week unanimously approved a Pennsylvania Farm Bureau-supported bill that aims to help the state's effort to combat the invasive spotted lanternfly by adding the plant known as Tree of Heaven to the state's noxious weeds list. The vote sends House Bill 404, sponsored by Rep. John Lawrence of Chester County, to the state Senate for consideration. Tree of Heaven, an invasive species itself, plays a key role in the lifecycle of the spotted lanternfly. PFB supports its eradication and inclusion on the noxious weeds list as part of the effort to stop the spread of the spotted lanternfly. The spotted lanternfly was first sighted in the U.S. in Berks County in 2014. It has since spread throughout southeastern Pennsylvania and is a major threat to several agricultural crops, including hardwoods, grapes, fruit trees and hops.

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

State House Approves Wind Power Bill

A Pennsylvania Farm Bureau-supported bill that would allow construction of wind turbines on preserved farmland passed the state House this week. Lawmakers approved House Bill 441, sponsored by Rep. Curtis Sonney of Erie County, with a 185-9 vote, sending the legislation to the state Senate for consideration. The plan would allow the owner of preserved farmland with 50 or more acres to grant a right-of-way for the installation of a wind power generating system. Now, such landowners may grant rights-of-way for other utilities, such as water, sewage, electric, telephone, underground mining and gas- or oil-product lines. The bill would add wind power to that list. Some farmers have seen benefits from leasing space to wind farms and PFB believes those who operate on preserved farmland shouldn't be denied that opportunity. A similar bill was approved by the state House last session but was not voted on by the full Senate.

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

Ag Literacy Week Continues to Grow

Schools across Pennsylvania were once again host to farmers telling the story of how food makes the journey from farm to plate as part of the third annual Ag Literacy Week. Spearheaded by the Pennsylvania Friends of Agriculture Foundation, Ag Literacy Week brought volunteer readers to more than 1,460 classrooms across the state, a greater than 20 percent increase over last year. More than 200 readers told the story of agriculture to approximately 36,000 students in 54 counties. Farmers and other volunteers read the book "Right This Very Minute," which tells the story of the hard work and dedication farm families put into producing the food we enjoy at every meal. During the visits, volunteers led the kids through an interactive game that invited students to review what they learned by matching meal times on a clock to the work farmers do to produce the foods in those meals. Ag Literacy Week helps students make the connection between the foods they eat at home and the farms that their foods come from. And it gives farmers the opportunity to tell students about their own farms, and the work they do to put food on their tables.

*From **Farm Bureau Express**, Penna. Farm Bureau, March 22, 2019.*

Penn State Research Determines Manure Injection Effectiveness on Local Water Quality

Penn State researchers compared manure broadcast applications on top of fields to liquid manure that was shallow-disk injected into the soil. The fields in the research were planted to corn and utilized a cover crop in the fall.

The results indicated more runoff of phosphorus from fields receiving the broadcast treatment compared to the fields using the shallow-injection method. Researchers measured subsurface flows for phosphorus and included that data in their results.

The research was conducted from 2013 to 2017 and concluded that manure injection could help the Chesapeake Bay states achieve the EPA total maximum daily load stream regulations. Reductions in phosphorus will vary depending on crop rotation and soil type and slope.

*From the **Penna. Agricultural Alliance Issues Update**, Penna. Farm Bureau, March 2019.*

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NEWS

PA Farm Bill Proposes $24 Million in New Ag Funding

Governor Tom Wolf joined Secretary of Agriculture Russell Redding to unveil the PA Farm Bill, an historic proposal to provide support for and continued investments in the commonwealth's agriculture industry. The proposal, which has already gained bipartisan support, was modeled after the governor's six-point plan to cultivate future generations of Pennsylvania's agriculture industry.

"Pennsylvania has a long, proud history of agriculture, and this comprehensive package of funding opportunities and resources will help expand this important industry," said Governor Wolf. "The PA Farm Bill allocates $24 million in additional funding to chart a real path for a dynamic and prosperous farming economy in Pennsylvania. It's about providing more opportunities to our farmers by creating more jobs, more income, and more hope."

The PA Farm Bill will provide for business development and succession planning, create accommodations for a growing animal agriculture sector, remove regulatory burdens, strengthen the ag workforce, protect infrastructure, and make Pennsylvania the nation's leading organic state.

"Pennsylvania's story can't be told without agriculture, and the PA Farm Bill will help inspire all of the chapters yet to come," said Secretary Redding. "By further supporting the agriculture industry and investing in business operations, infrastructure, education and the workforce, we are setting the course for a future filled with increased opportunities and prosperity."

The **Pennsylvania Farm Bill** invests more than $24 million in Pennsylvania's agriculture industry to grow opportunities and resources, remove barriers to entry, and cultivate future generations of leaders within agriculture. The plan includes:

1. Agricultural Business Development and Succession Planning

- **Pennsylvania Agricultural Business Development Center,** funded at **$2 million,** to serve as a resource to help every farmer create a business plan, transition plan, or succession plan to ensure the best chance of success.
- **Realty Transfer Tax Exemption** for any transfer of preserved farmland to a qualified beginning farmer.

2. Creating more processing capabilities to accommodate a growing animal agriculture sector

- **Pennsylvania Dairy Investment Program,** funded at **$5 million,** to fund research and development, organic transition assistance, value-added processing, and marketing grants in support of Pennsylvania's dairy industry.
- **Center for Animal Agriculture Excellence**, funded at **$1 million,** to support the animal agriculture industry by expanding processing capacity, technical assistance, providing resources for food safety compliance, and assisting with the establishment of hemp as an approved animal feed.
- **Incentivizing Access to Meat Processing Inspections**, funded at **$500,000**, to encourage access to new and expanded markets for small or new producers by reimbursing federal meat inspection costs and subsidizing the first-time purchase of equipment needed for federal compliance.

3. Removing regulatory burdens and strengthening the state's business climate

- **Conservation Excellence Grant Program,** funded at **$2.5 million,** to provide financial and technical assistance to

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State News Briefs *(continued from page 4)*

Register Now for Friends of Ag Golf Tournament

The 27th Annual Richard Prether Golf Classic, Pennsylvania Friends of Agriculture Foundation's major fundraising initiative, is coming up Monday, June 17. The outing at the Hershey Country Club, West Course is sponsored by the foundation and Nationwide Insurance.

The golf outing proceeds help support agriculture education outreach through the foundation's many programs including the Mobile Ag Ed Science Lab, Ag on the Go, Educator's Ag Institute, Ag Literacy Week, our Scholarship programs, and other ag literacy outreach events.

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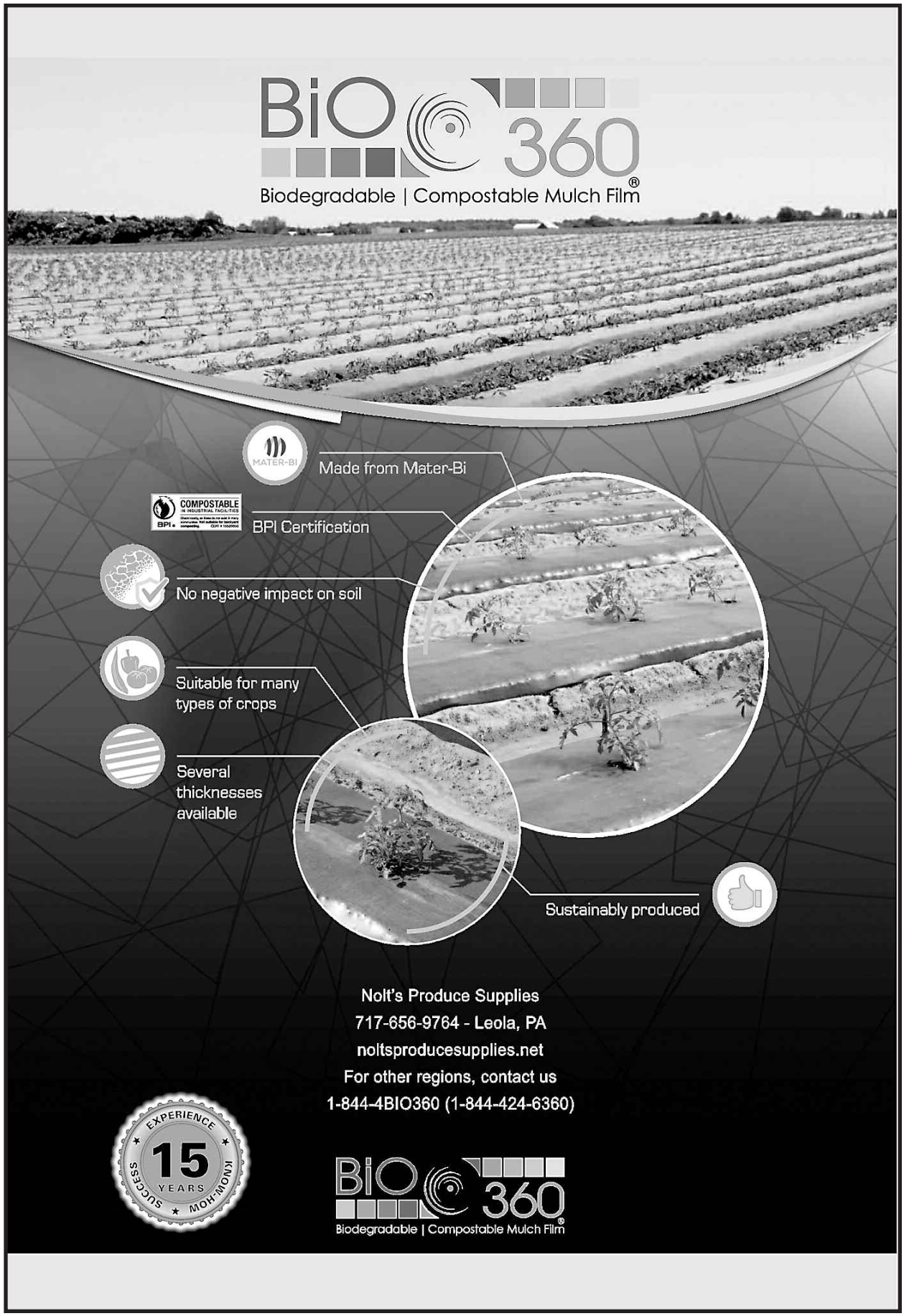
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PA Farm Bill... *(continued from page 6)*

farmers to install and implement best management practices.

- **Agriculture Linked Investment Program**, funded at **$500,000**, to re-establish this low-interest loan program for the implementation of best management practices.
- **Resource Enhancement and Protection Tax Credits,** expanded by **$3 million**, to increase the lifetime cap and increase availability.
- To ensure that farmers are better able to transport agricultural products or supplies, the Farm Bill proposes to **expand the allowable width for the use of implements of husbandry on roads**, such as farm tractors and combines, from 16 feet to 18 feet.
- To enhance diversification or transition to other ag operations for preserved farms where the original operation is no longer feasible, the Farm Bill proposes to amend the **Ag Area Security Act** to allow for subdivision of preserved farms.
- Repeal unnecessary audit provisions from the Cooperative Agricultural Association Law that currently require agricultural cooperatives to provide certified financial audits to the department, removing an antiquated burden for existing cooperatives and a barrier for new cooperatives.

4. Strengthening Pennsylvania's workforce to ensure the next generation is prepared to lead

- **Agriculture and Rural Youth Organization Grant Program,** funded at **$500,000,** to re-establish this program to fund agricultural and rural youth organizations to help increase knowledge and awareness of agricultural issues within the commonwealth.
- **The Pennsylvania Farm to School Grant Program,** funded at **$500,000,** to improve childhood nutrition while increasing exposure to agriculture.

5. Protecting agriculture infrastructure

- **Pennsylvania Rapid Response Disaster Readiness Account**, funded at **$5 million,** to allow for a quick response to agricultural disasters, including utilizing animal or plant health officials to contain an outbreak or threat, such as Spotted Lanternfly or Avian Influenza; or providing an immediate response to a foodborne illness.

6. Increasing Market Opportunities and Making Pennsylvania the Nation's Leading Organic State

- **PA Preferred Organic Initiative,** funded at **$1.6 million,** to make Pennsylvania the nation's leading organic state by further enhancing the growth of the organic industry.
- **PA Preferred Program,** funded at an additional **$1 million,** to support the overall PA Preferred program and to bolster enrollment in the Homegrown by Heroes Program.
- **State-level Specialty Crop Block Grant Program**, funded at **$500,000**, to invest in and encourage farming of high-priority horticultural crops like hemp, hops, and hardwoods.
- **Urban Agriculture,** funded at **$500,000,** to improve agriculture infrastructure in urban areas, the aggregation of product, sharing of resources, and support for community development efforts.

From the Governor's Office.

Directors Meet... *(continued from page 2)*

erty. The Directors also finalized the change in Mr. Troxell's title from Executive Secretary to Executive Director.

The Board will be asking the Scholarship Committee to review the criteria for the PVGA scholarship in view the lack of applicants in recent years. They also agreed to finalize the appointment of two non-Directors to the newly created Succession Planning Committee at the July meeting.

The Farm Show Committee presented an updated financial report and a report on their meeting with Michaels Concessions families. The Committee is considering several new menu items for next year and also having two managers present each day.

The Capacity Development Committee presented a proposal to have the Crisis Management Plan updated and will make a recommendation on that at the July meeting. The Committee is continuing to work on the transition to a 501(c)3 organization.

The Board agreed to limit convention speakers to three or four presentations at a given convention and also to ask Dr. Beth Gugino to serve as the Vegetable Program Chair on the Convention Joint Committee.

In other business, the Board voted to accept the previous meeting's minutes and the financial reports.

GENERAL

Worker Protection Standards Apply to All Farm Workers

Susan B. Scheufele

The Worker Protection Standards (WPS) are federal regulations designed to reduce poisonings and injuries among agricultural workers and pesticide handlers. The WPS require that farm owners and employers provide protection from potential pesticide exposure to workers and handlers, train them about pesticide safety, and provide mitigations in case exposures occur. These regulations apply to all farm workers on farms that use any kind of pesticide: restricted- or general-use, synthetic or organic—all farms need to be in compliance with these laws. (Some exemptions apply to farm owners and their immediate family members). Luckily, the regulations are straightforward and relatively easy to implement.

The main components of WPS are:

1. All workers must undergo pesticide safety training that provides information on how and where pesticide injuries may occur and how to prevent them. This training must be given annually, and on a worker's first day of work.

2. Pesticide handlers must be given specific training before they perform any pesticide-related task or enter a treated area before the restricted entry interval (REI) is over.

3. Information about pesticides used must be made available to workers at a central posting location. The central posting area must be maintained and must include:

- a map of the farm {not necessarily required in Pennsylvania]
- labels and Safety Data Sheets (SDSs) for any pesticide used on the farm. SDSs as well as the most current pesticide labels can be found here: http://www.cdms.net/Label-Database
- spray records including what was sprayed where and when
- a pesticide safety poster
- location of nearest medical facility [and in Pennsylvania the contact information for the regional office of the Pennsylvania Department of Agriculture.]

4. Workers must be informed about which areas of the farm have been treated and are under a (REI) and when the REI will end. Signage may be used to keep people out until the (REI) has ended.

5. Decontamination materials (soap, water, and paper towels) must be available [for routine washing and] in the event of an accident.

6. Access to emergency assistance must be provided.

A worker is any farm employee who does tasks directly related to the production of plants, such as harvesting, weeding, carrying nursery stock, repotting plants, pruning or watering. A worker does not mix or apply pesticides and only handles unopened or decontaminated containers, and does not enter a treated area before the REI has passed.

A handler is any farm worker who applies general-use pesticides and/or performs tasks such as mixing and loading pesticides, transferring or cleaning opened pesticide containers or spray equipment, or goes into a treated area before the REI has expired.

"Restricted-use" is a federal EPA designation that restricts a pesticide to be used only by a certified pesticide applicator, or under the direct supervision of a certified applicator. Only about 25% of all pesticides fall into this category, with atrazine being the most common restricted-use active ingredient. Massachusetts Department of Agriculture Resources (MDAR) [in Pennsylvania, the Pennsylvania Department of Agriculture (PDA)] requires that farmers who want to apply restricted-use pesticides on their farms have a private certification for pesticide application—they must pass a test to get the certification and must attend continuing educational programs throughout the year in order to maintain it.

Most pesticides fall into the "general-use" category. In Massachusetts*, farmers who use only general-use pesticides are not required to be certified or licensed by the MDAR—but they still must comply with WPS regulations and provide training for workers and handlers as described. There is often a misconception that pesticides used in organic systems are exempt

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GENERAL

Worker Protection... (continued from page 10)

from these regulations but this is not at all the case and organic farms must also comply with WPS. For example, copper formulations which are widely used on organic farms tend to have "warning" hazard labels, as opposed to the lower "caution" label, because they are corrosive, can be fatal if swallowed, and can cause blindness if gotten in the eye. They have some of the longest REI's (48 hours) and therefore, under WPS, treated areas must be posted with a no-entry sign until the REI has passed. Since organic farms don't use any restricted-use pesticides, they don't need to be certified or licensed, and so how do they get the training they need to train their workers and handlers according to WPS?

[While some states provide special "Train the Trainer" courses, in Pennsylvania workers must be trained by a licensed pesticide applicator. While a neighboring grower who is a licensed pesticide applicator can provide the training if no one on the farm is a licensed applicator, even organic growers may want to consider being a licensed applicator so they can train their own workers even if they are not applying restricted use pesticides.]

Below is a detailed list of WPS requirements. More information can be found in the Pesticide Worker Protection Standard "How to Comply" Manual at https://www.epa.gov/pesticide-worker-safety/pesticide-worker-protection-standard-how-comply-manual.

- Pesticide safety training — for workers and handlers
- Access to labeling information — for pesticide handlers and early-entry workers including product labels and SDSs
- Access to specific information — for workers and handlers, which includes providing information about when and where on the farm pesticide applications are made, emergency information, and a pesticide safety poster at a central location
- Keep workers out of areas being treated with pesticides
- Keep workers out of areas that are under a restricted-entry interval (REI), with a few narrow exceptions
- Protect early-entry workers who are doing permitted tasks in pesticide-treated areas during an REI, including special instructions and duties related to correct use of personal protective equipment
- Notify workers about pesticide-treated areas so they can avoid inadvertent exposures
- Monitor handlers using highly toxic pesticides
- Provide required personal protective equipment to handlers
- Decontamination supplies — a sufficient supply of water, soap, and towels for routine washing and emergency decontamination
- Emergency assistance — making transportation available to a medical care facility in case of a pesticide injury or poisoning, and providing information about the pesticide(s) to which the person may have been exposed.

WPS Farm Inspections. All farms using restricted or general use pesticides are subject to a pesticide inspection to ensure the WPS regulations are being met. State agencies generally have primary jurisdiction for enforcing WPS misuse violations.

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Managing Aphids in Early-Season Tunnels

Susan Scheufele

As some of you may already have noticed, aphids can survive in tunnels where crops were produced throughout the winter, and their populations can really start to increase at this time of year. Young seedlings and early-season tunnel crops being planted now are very susceptible to damage from aphid feeding, and must be protected. Scout now to catch problems before the population skyrockets, treat infested areas, and start thinking about how you will protect your main season crops by making a plan now to incorporate aphid biocontrols from the beginning.

If aphids are active in your tunnel crops now you can consider releasing ladybeetles (active between (62-88°F), or spraying insecticides, whether to treat harvested crops or as cleanup sprays before terminating a crop. For a list of conventional and OMRI-approved insecticides for aphid control in protected culture please see this table in the New England Vegetable Management Guide at http://nevegetable.org/table-20-insecticides-labeled-insect-and-mites-vegetable-transplants-and-bedding-plants.

Planning Ahead for Successful Aphid Biocontrol

Correctly identifying the species of aphid affecting your crop is an important first step before selecting which biocontrol organisms will be effective:

Green peach aphid: This aphid species can be distinguished from the melon/cotton aphid by the length and color of the cornicles (the pair of tube-like protrusions extending from the end of the abdomen). Green peach aphids have long (approximately the length of the body) cornicles and only the tips are black. In addition, the head has a distinct indentation at the base of the antennae. Hosts include peach, apricot, and over 200 species herbaceous plants including vegetables and ornamentals.

Melon/cotton aphid: The cornicles on melon/cotton aphid are short (approximately 1/3" or 8.0 mm, the width of the body) and vary in color from light yellow to very dark green (making them appear black). The antennae are typically shorter than the body. Melon/cotton aphids do not have a distinct indentation at the base of the antennae like that of the green peach aphid. Its host range includes hundreds of species such as pepper, eggplant, spinach, asparagus, okra, and it is particularly damaging on cucurbits.

Foxglove aphid: Foxglove aphids have green flecks located at the base of their cornicles. In addition, they have black markings on their leg joints and antennae. Foxglove aphids tend to fall off plants when disturbed and they can cause severe leaf distortion, more so than the green peach and melon/cotton aphid. This aphid has many hosts including foxglove, lettuce, potato, clover and bulbs.

Potato aphid may be difficult to identify because their sexual forms produce both green and pink aphids, however they move more quickly than the other aphids. These aphids complete 2-6 generations on their winter host of rose plants before moving on to their summer hosts such as potato and tomato. Therefore, this aphid pest is not typically seen in tunnels until later in the season but they have been reported as a growing problem among high tunnel tomato growers and keeping an eye out for them early is a good idea.

Cabbage aphid: Not typically considered a tunnel pest, this species has been reported recently in several tunnels where brassicas have been overwintered. Mature females are greyish green with dark heads and cornicles. They are approximately 1/12 inch long. Hosts are only the brassica species.

Root aphid: The primary root aphid (Pemphigus species) overwinters as eggs and infests plants in the spring and fall. Root aphids may be misidentified as mealybugs because they are covered with white wax although they are smaller than mealybugs. Root aphids have reduced cornicles that resemble rings, which are located on the end of the abdomen. These cornicles can be seen when magnified.

Biological Control Using Parasitoids

In general, parasitoids are more effective than predators (such as ladybeetles, green lacewings, and predatory midges) in reducing aphid populations, although parasitoids may fail to provide acceptable control under conditions that are too cold or too warm (outside the range of 65-77°F) or at times when aphid populations tend to increase rapidly. Parasitoids lay eggs inside aphids and when those eggs hatch, larvae feed on the aphid internally, killing it. Parasitoid larvae pupate within the dead aphid exoskeleton, which becomes a tan, dome-shaped shelter known as a "mummy." Adult parasitoids emerge from aphid mummies and continue the cycle. Aphid parasitoids are host-specific in terms of the aphid species they attack. For example, *Aphidius ervi* attacks foxglove and potato aphid while *Aphidius colemani* attacks both green peach and melon aphids. Currently no parasitoids are commercially available for cabbage and root aphids. Mixtures of different parasitoid species are commercially available and should be used when multiple aphid species are present. Parasitoids are shipped either as adults or 'aphid

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Managing Aphids... (cpntinued from page 12)

mummies' from which parasitoid adults soon emerge. To increase the parasitoids' effectiveness, place small groups of the aphid mummies in cups near aphid colonies. Do not let these aphid mummies get wet. Release rates may vary depending on the parasitoid species. Containers often contain approximately 250 aphid mummies, which can treat 5,000 ft2 at the high release rate (for high aphid populations) or 25,000 ft2 at the low release rate (for less severe outbreaks).

Greenhouse temperatures should be 65-77°F, with 70-85% relative humidity. Aphid parasitoids must be applied preventively to suppress aphid populations. They are less effective when aphid populations are high and already causing plant damage. Release parasitoids on a regular basis to sustain their populations during the growing season. Avoid releasing parasitoids near sticky cards to prevent capturing the released parasitoids. When scouting, look for aphid mummies that have circular holes on one end. These are the exit holes created by adult parasitoids during emergence. Aphid parasitoids are sensitive to pest control materials. Release parasitoids preventively on crops you know are susceptible to aphids, so that the parasitoids will be present when aphids are first noticed.

Banker Plant Systems.

One of the challenges associated with trying to build up parasitoid populations before the pest aphids emerge are that they may leave the tunnel in search of food, however, there is a way to keep the parasitoid in your tunnels by giving them an alternate food source. Banker plant systems may be useful in controlling aphids and reducing the costs associated with applying pest control materials. Aphid banker plants are containers with winter barley, common rye, or oats on which colonies of grass-feeding aphid species such as bird-cherry oat aphid *(Rhopalosiphum padi)* are established. Banker plants are primarily used to rear prey or hosts, in order to have a sufficient population of continually reproducing natural enemies. The bird-cherry oat aphid, is too small for *Aphidius ervi* to develop but can support *A. colemani*. *A. ervi* parasitizes larger aphids such as the foxglove or potato aphid. If foxglove or potato aphids are your predominant species, one option is to use the predatory midge, *Aphidoletes aphidimyza* for release onto your banker plants. If using predatory midges, placing the pots in trays with moist sand will help provide pupation sites for the predatory midges, which pupate in soil.

Banker plants need to be placed along walkways and at the end of benches. It is essential to evenly distribute them throughout a greenhouse. Some growers will place the banker plants in hanging baskets with drip irrigation to ensure that the banker plants will remain irrigated without inadvertently washing the parasitized aphids off of the plant. Distribute containers of rye or barley, with the grass-feeding aphid, among the main crop at a rate of one banker plant per 1,000 ft^2 even before aphids are detected. It should be noted that existing recommended rates may vary since limited research has been conducted; start with this rate and adjust in succeeding years based on your experience. Research with aphid banker plants in greenhouse pepper production in the Netherlands showed that when 4 banker plants per acre were introduced every two weeks, aphid pests were kept below threshold. With this rate and frequency of introduction of banker plants, the average number of *Aphidius*

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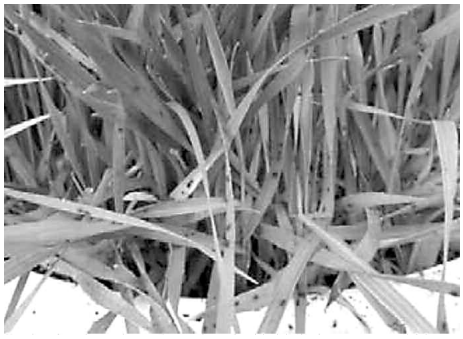
Managing Aphids... *(cpntinued from page 13)*

caught per sticky card (3.9" by 9.75") per week was 10 per card per week. Banker plants may have to be placed closer together or placed in greater frequency within a given area in order to allow parasitoids such as *Aphidius colemani* to find prey on plants, since research has found that this parasitoid migrates just 3.2 - 6.5 feet from the point of release. Occasionally, the banker plant aphids may be found on your main crop; this should not cause alarm, as they only feed on grasses, and it may be a sign that the pot of barley oats or rye has been fed on too heavily needs to be replaced. It is helpful to start fresh pots of banker grass every 2 weeks to keep the aphids well fed.



Barley banker plants inoculated with bird-cherry oat aphid attract Aphidius colmani released to control green peach and melon aphids. Photo: UMass Extension

Starter aphid banker plants are available from several biological control suppliers including BioBest and IPM Labs. One starter kit is enough to get your banker plant system started for the season, as long as you're growing your own pots of oat, rye or barley.

Tips for using Banker Plants:

- Place orders for banker plants up to 6 weeks before aphids are expected in your greenhouse.
- Transplant the plugs or seed directly into larger-sized pots (10 inch) so that the grass plants have plenty of room to grow.
- Wait one or two weeks for grass feeding aphid populations to grow.
- Lightly release the "aphid mummies" or *Aphidius colemani* adults onto the starter banker plants. For example, 100 hundred *Aphidius* per banker plant before it is divided and repotted. *Aphidius colemani* attacks the grass-feeding aphid, which is not an aphid pest of most greenhouse-grown crops except monocots such as ornamental grasses.
- Check banker plants weekly and look for newly parasitized aphids ("aphid mummies"), which indicate that the parasitoids are establishing on the banker plants.
- Start new banker plants every 2 weeks because they will decline from aphid feeding within a few weeks.
- Inoculate new banker plants by physically transferring aphids from old banker plants onto new ones every 2 weeks. This can easily be done by gently rubbing the aphid infested grass plants over the fresh banker plants.
- It may be necessary to "protect" or isolate your replacement banker plants from natural enemies (either established in your greenhouse or naturally occurring natural enemies that may enter the greenhouse from outdoors during warmer weather). If so, place banker plants in "starter cages" so you can build up your population of grass feeding aphids before releasing *A. colemani*.

For more detailed instructions please read this factsheet from UVM and BioBest at https://ag.umass.edu/greenhouse-floriculture/photos/banker-plants-with-aphids.

Entomopathogenic fungus:

The entomopathogenic fungus, *Beauveria bassiana*, is commercially available for use against aphids. However, because aphids have high reproductive rates and molt rapidly, especially during the summer, repeat applications are typically required. *Beauveria bassiana* is most effective when aphid populations are low. This fungus may not be compatible with the convergent ladybird beetle *(Hippodamia convergens)* depending on the concentration of spores applied.

Compiled from the following resources:

- Aphids on Greenhouse Crops, by Tina Smith, UMass Extension http://ag.umass.edu/greenhouse-floriculture/fact-sheets/aphids-on-greenhouse-crops
- Managing Aphids in the Greenhouse, by Leanne Pundt, UConn Extension http://ipm.uconn.edu/documents/view.php?id=1113.
- Aphid Banker Plants, by Leanne Pundt, UConn Extension http://ipm.uconn.edu/documents/view.php?id=1411

Other helpful resources:

- Aphid Banker Plant System for Greenhouse IPM: Step-by-Step, by Margaret Skinner & Cheryl Frank, UVM Entomology Research Lab and Ronald Valentin, BioBest
- Scheduling Biologicals, by Linda Taranto, D&D Farms and Tina Smith, UMass Extension

Ms. Scheufele is with Univ. of Massachusetts Extension Vegetable Team. From ***Vegetable Notes for Vegetable Farmers in Massachusetts,*** *Univ. of Mass. Ext., Vol. 31, No. 3, Mar.*

Improving Mechanical In-Row Weed Control for Vegetables and Row Crops

Bryan Brown, John Wallace, and Elizabeth Maloney

In the crop row, it can be challenging to control weeds mechanically without damaging the crop. Based on the encouraging results of previous research using "stacked" combinations of in-row cultivation implements, we attempted to refine the use of these tools by testing several setups and adjustments. In snap beans, several implement combinations controlled over 90% of the weeds with very little crop damage. In 2-leaf beets, crop damage was unacceptably high, even when using standard implements such the spring tine harrow. But in 4-leaf beets, damage was greatly reduced and satisfactory weed control was obtained with a setup of sweeps followed by finger weeders followed by disk hillers. These setups and adjustments may be used as a starting point for growers investing in this equipment.

Background and Justification: Mechanical weed control is an important part of an integrated weed management approach for vegetable and field crop operations. While between-row cultivation is typically very effective, it is challenging for growers to control in-row weeds without damaging their crop. In this project, we looked to build on previous research that found by "stacking" several different cultivation implements together in a synergistic way, it is possible to dramatically increase the percentage of weeds that are killed (Brown and Gallandt 2018). Specifically, the most effective combination of implements involved first undercutting, then uprooting, and finally burying the weeds. However, crop damage remained a concern from previous trials. Therefore, in this project we aimed to adjust or replace the implements which I believed to be causing the crop damage in previous trials.

Objectives: Refine the setup and adjustment of "stacked" cultivation so that high efficacy is maintained but with minimal crop damage.

Procedures: Experimental design. In this project, we conducted several field trials comparing several "stacked" cultivation setups to standard sweeps and harrows. The first trail was conducted in snap beans (*Phaseolus vulgaris* cv Provider) planted on 30" rows with 1.6" in-row spacing on June 14, 2018. The second trial was in beets (*Beta vulgaris* cv Ruby Queen) planted at 10 pounds per acre on 30" rows. Half of the beet plots were cultivated at the 2-leaf stage and the other half where cultivated at the 4-leaf stage. In both trials, planting and cultivation were conducted using GPS guidance and each treatment was replicated four times. Weeds in the 4" in-row zone were counted several days after cultivation and compared to uncultivated controls to calculate efficacy.

Rationale for implement setup. The implement responsible for undercutting weeds in previous trials of Brown and Gallandt (2018) was a torsion weeder, but super-slow-motion video analysis revealed that this tool was very aggressive on the crop, despite its spring-steel design. Therefore, we replaced this

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Improving Mechanical... *(continued from page 15)*

Figure 1. Sweeps were the first implement in the stacked sequence.

Figure 2. A row harrow (foreground) and finger weeders (background).

Figure 3. A small disk hiller with guide wheels.

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Table 1. Treatments and implement adjustments for each cultivation trial. All treatments were conducted at 2.5 mph, except spring tine harrowing, which was conducted at 7 mph. All implements were adjusted to operate about 0.5" deep.

Trial conditions	Treatment	Adjustment
Snap beans (1st trifoliate, 4" tall). Weeds mostly broadleaf, 1" tall	Sweeps	8.5" in-row space. This adjustment was used for the "stacked" treatments.
	Sweeps (aggressive)	6.9" in-row space.
	Sweeps+Fingers	Finger tips 1" apart when not in use.
	Sweeps+Row Harrow	Drop weight on heaviest setting.
	Sweeps+Disk Hiller	Disks 7.8" apart in front, 4.7" apart in rear.
	Sweeps+Fingers+Row Harrow	Finger tips 1" apart when not in use. Row harrow on heaviest setting.
	Sweeps+Fingers+Row Harrow (light)	Finger tips 2" apart when not in use. Row harrow on lightest setting.
	Sweeps+Fingers+Disk Hiller	Finger tips 1" apart when not in use. Disks 7.8" apart in front, 4.7" apart in rear.
Beets (2-leaf, 1.5" tall). Weeds mostly broadleaf, 0.5" tall.	Spring tine harrow	Tine angle at middle setting.
	Sweeps	7.5" in-row space.
	Sweeps+Fingers	Finger tips nearly touching when not in use.
	Sweeps+Row Harrow	Drop weight on lightest setting.
	Sweeps+Disk Hiller Disks	7.8" apart in front, 4.7" apart in rear.
	Sweeps+Fingers+Row Harrow	Finger tips 2.4" apart when not in use. Drop weight on lightest setting.
	Sweeps+Fingers+Disk Hiller	Finger tips 2.4" apart when not in use. Disks 7.8" apart in front, 4.7" apart in rear.
Beets (4-leaf, 3" tall). Weeds mostly broadleaf, 1.5" tall	Spring tine harrow	Same as above trial.
	Sweeps	
	Sweeps+Fingers	
	Sweeps+Row Harrow	
	Sweeps+Disk Hiller	
	Sweeps+Fingers+Row Harrow	
	Sweeps+Fingers+Disk Hiller	

Improving Mechanical... (continued from page 16)

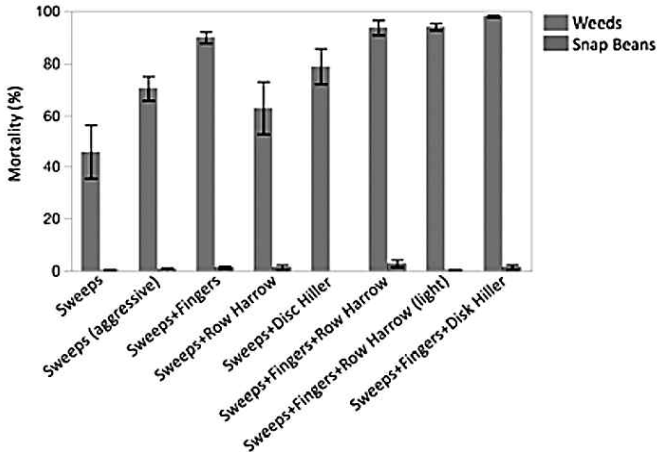

Figure 4. Mortality of weeds and snap beans resulting from different implement combinations and adjustments.

implement with shallow sweeps, which operated farther from the crop but undercut weeds and loosened soil in a similar manner to the torsion weeders (Figure 1). The finger weeder remained as the implement responsible for uprooting weeds but the fingers were widened to allow more space for the crop to pass through. A row harrow was the final implement in the previous trials, but video revealed it was primarily burying weeds, so we sought other ways to achieve burial without having tines contact the crop. Specifically, we removed the five center tines from the row harrow and re-arranged the outer tines to pull soil into the crop row (Figure 2). We also tested a small disk hiller

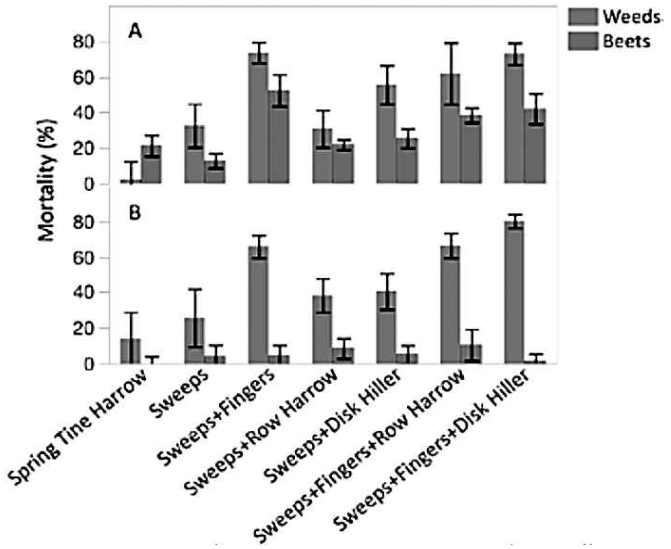

Figure 5. Mortality of weeds and beets resulting from different implement combinations and adjustments. Cultivations occurred in either 2-leaf (A) or 4-leaf (B) beets.

(Figure 3). Several one-, two- and three tool setups were tested (Table 1). All tools were obtained from KULT Kress and mounted on their 2-row Argus system with rear steering.

Results and Discussion: In snap beans, weed control efficacy was very high relative to crop damage (Figure 4), reflect-

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Improving Mechanical... (continued from page 17)

ing the dry conditions that allowed the crop to emerge with almost no weed pressure until several weeks after planting. While sweeps alone threw some soil into the row to bury 50-70% of the weeds, the "stacked" combinations had the greatest efficacy. In particular, the combinations of three implements all killed over 90% of the weeds. The "light" adjustment of the sweeps+fingers+row harrow appeared to reduce crop damage while retaining high weed control.

In 2-leaf-stage beets, crop mortality from cultivation was unacceptably high (Figure 5A). But damage was greatly reduced when beets were in the 4-leaf stage (Figure 5B). Unexpectedly, weed control efficacy remained high despite larger weeds present when beets were in the 4-leaf stage. This may relate to drier conditions during the latter cultivation. Most of the "stacked" combinations killed a greater percentage of the weeds than the spring tine harrow. The sweeps+finger+disk hiller combination performed very well in this trial.

Overall, the cultivation setups in these trials provide a relatively low-tech solution for farmers to improve their in-row weed control. These extra implements can be "stacked" onto farmers' existing equipment at a reasonable cost.

Literature Cited:

Brown B, Gallandt ER (2018). Evidence of synergy with 'stacked' intrarow cultivation tools. Weed Research. doi.org/10.1111/wre.12309.

Video: Brown, B. Stacked cultivation trials, 2018. NYSIPM. Available at https://youtu.be/jdzv6x8QI2A

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Dr. Brown, is the Integrated Weed Management Specialist, NYSIPM at Cornell Univ., Dr. Wallace, is an Assistant Professor at Penn State Univ. and Ms. Maloney, is a Field Technician at Cornell University. From ***Vegetable Notes for Vegetable Farmers in Massachusetts,*** *Univ. of Mass. Ext., Vol. 31, No. 4, March 29, 2019.*

Worker Protection... (continued from page 11)

Inspectors [PDA in Pennsylvania] will be looking to see if your workers have had WPS training, if you have a WPS Central Posting Area, and if you are following all the other requirements of the WPS regulations.

Pennsylvania growers with questions can contact Jim Harvey, the Farm Worker Protection Safety Specialist at Penn State University, at 814-863-8214or jdh18@psu.edu. He supplied information for this article to make it correct for Pennsylvania growers. Pennsylvania growers can contact Mr. Harvey for a free updated vegetable WPS training DVD that they can use to train their workers.

**Please note that other states may require pesticide certification for farmers who apply general use products. Check with your department of agriculture to determine pesticide use requirements in your state.*

Ms. Scheufele, is with the Univ. of Massachusetts Extension Vegetable Program. From ***Vegetable Notes for Vegetable Farmers in Massachusetts,*** *Univ. of Mass. Ext., Vol. 31, No. 3, February 14, 2019.*

Scouting for Pests

Lisa McKeag

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

Some things to consider before you go into the field:

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

Pest identification. Know what you're looking for! It's important to be able to identify some of the key insects that may be feeding on your crop and to be able to tell the good bugs from the bad. You should also be able to recognize some of the signs and symptoms of insect feeding, and common diseases and physiological disorders. There are lots of great ID guides out there, including the Northeast Vegetable & Strawberry Pest Identification Guide (http://northeast%20vegetable%20%26%20strawberry%20pest%20identification%20guide/) —a collaborative effort of the New England Extensions. It can be very tricky to identify problems in the field, though, so if you find something suspect, consider having it diagnosed at the [Penn State Plant Disease Clinic - https://plantpath.psu.edu/ facilities/plant-disease-clinic] or testing soil or plant tissues for nutrients at the [Penn State Agricultural Analytical Services Lab - https://agsci.psu.edu/aasl].

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

Economic threshold and economic injury level (Fig. 1). The

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Scouting for Pests (continued from page 19)

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

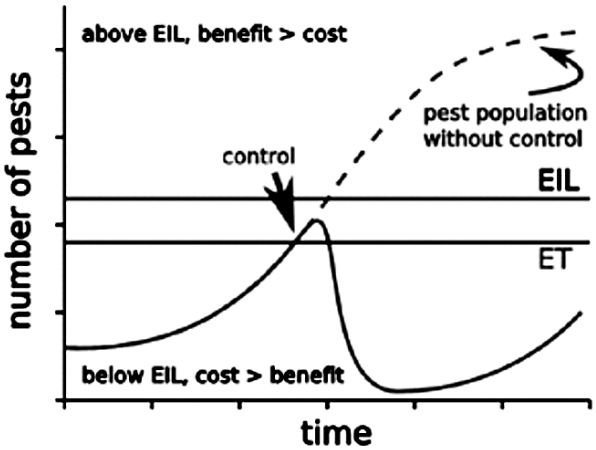

Figure 1. Relationship between economic threshold (ET) and the economic injury level (EIL)

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

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

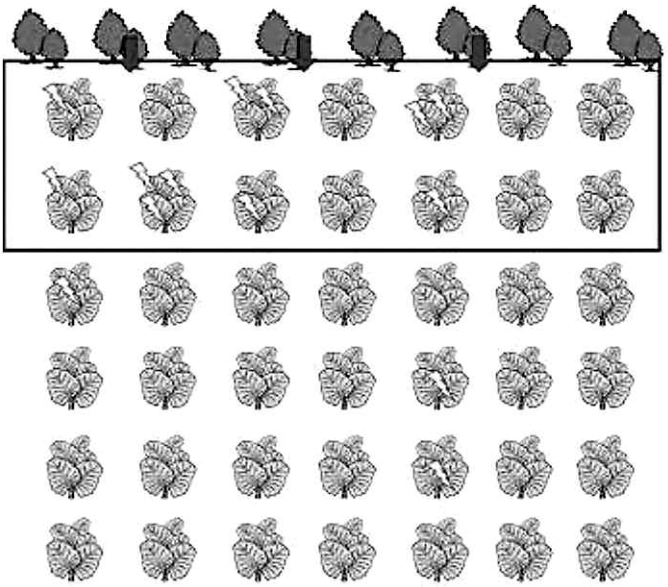

Figure 3. After surveying the whole field, the farmer finds that only the plants near the treeline have heavy pest pressure, while the whole field is under threshold and no treatment is necessary. Image: S. Scheufele

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

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Scouting for Pests (continued from page 20)

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

We have scouting sheets for the following crops:

Allium - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/allium.pdf

Brassica - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/brassica.pdf

Cucurbit - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/cucurbit.pdf

Eggplant - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/eggplant.pdf

Pepper - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/pepper.pdf

Potato - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/potato.pdf

Strawberry - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/strawberry.pdf

Sweet Corn - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/sweet_corn.pdf

Tomato - https://ag.umass.edu/sites/ag.umass.edu/files/projects/related-files/tomato.pdf

Each sheet has a list of common pests, thresholds if available, along with some sampling instructions. Thresholds or control options may vary depending on the stage of the crop, so there is a place to note that as well. For example, in potato you should scout 3 plants per site when the crop is small or 3 individual stalks once the plants are hilled. Note the unit you are using and what the threshold is.

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

When you have finished sampling, count your results. Take the average for whatever unit you are considering for your threshold—it may be insects per leaf, or damage per plant—and compare that number to your threshold. If you are above threshold, apply your control strategy. If you are below, wait to treat and scout again at some regular interval (e.g. the following week). If you implement a control, scout again afterward to determine if the treatment worked and when/if you should make another application. If you found natural enemies when scouting, consider them when deciding which material to use or whether a pesticide application is warranted.

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VEGETABLE PRODUCTION

Coupling Host Resistance with the Evaluation of Biofungicides

Beth K. Gugino

Biofungicides and OMRI-approved products, whether based on microbial or biochemical active ingredients, are a primary tool for vegetable disease management in organic production and are becoming increasing used more frequently as a part of conventional fungicide programs. This is partly due reduced environmental and human safety risk as well as increased production flexibility in terms of reduced REIs and PHIs, potential market opportunities and significant industry marketing. In addition, due to the expedited EPA registration process, an increasing number are becoming available each year and marketed in trade magazines. For example, in the October 2017 issue of American Vegetable Grower, five of the seven pest management advertisements were for biopesticides. In university trials, product efficacy is often evaluated on highly susceptible cultivars under augmented conditions to promote high disease pressure as an "acid" test. Under these conditions when disease development is assessed regularly throughout the season, biofungicides, in general, are most effective when disease pressure is low and then fail later in the season when it is high. In typical product efficacy trials, the use of biofungicides or OMRI-registered products are less frequently leveraged with the use of host resistance; a scenario where they are most likely to be effective. Thus, we coupled host resistance with the evaluation of conventional fungicide programs augmented with biofungicide/OMRI-approved products for the management of powdery mildew on pumpkin, downy mildew on cucumber, early blight on tomato in Pennsylvania. Although established, unfortunately, due to the extreme wet weather this past season usable data was not obtained from the tomato late blight trial. However, for the other three trials, a description of the establishment,

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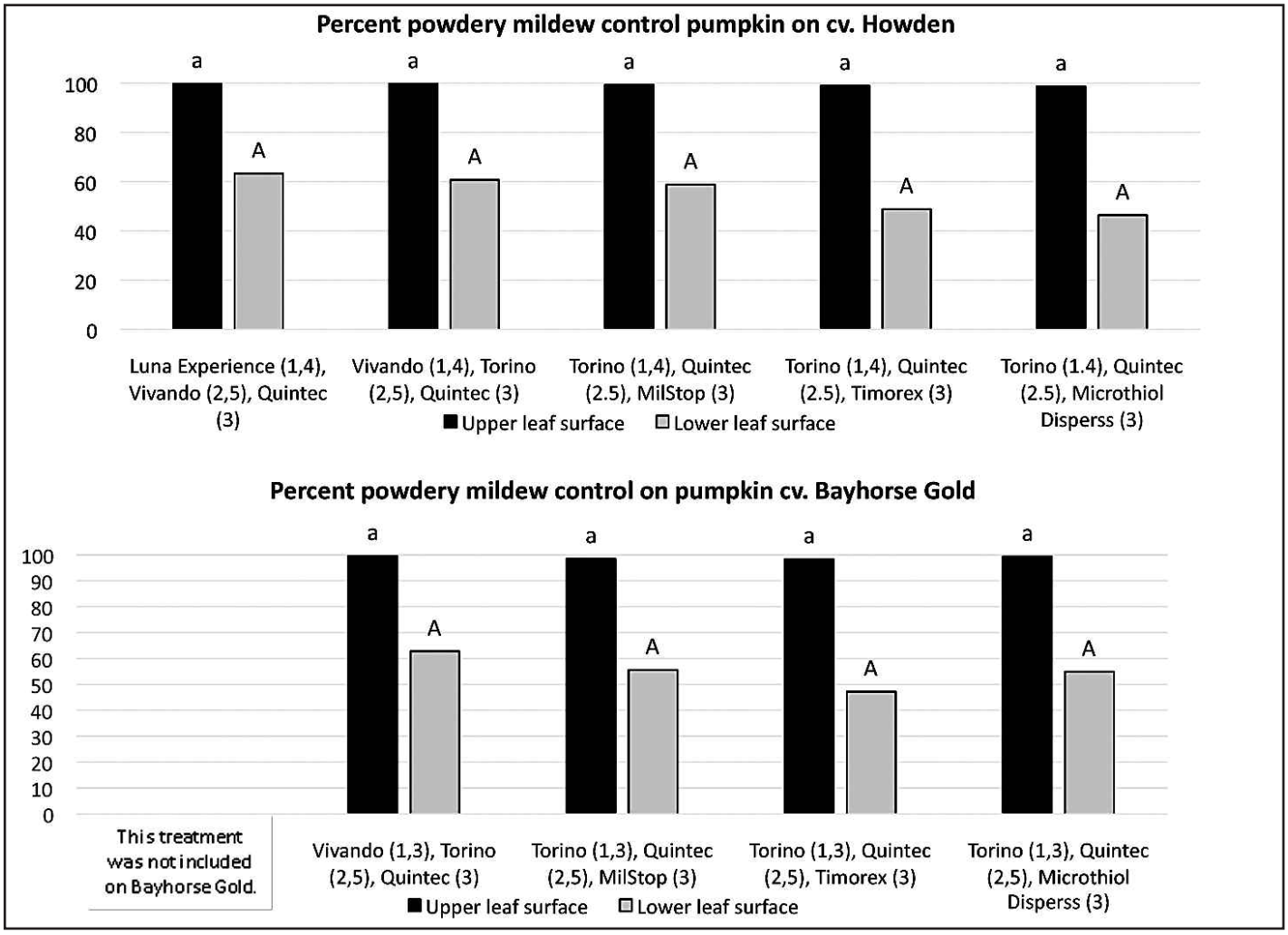

Figure 1. All fungicides were applied at the highest label rate. Luna Experience, Vivando, and Torino were tank-mixed with Bravo Weather Stik (2.0 pt/A) plus Induce (0.125% v/v) when applied. The numbers in parentheses indicate the following fungicide applications dates: 1 = 29 Jul; 2 = 7 Aug; 3 = 16 Aug; 4 = 23 Aug and 5 = 19 Aug. As indicated by the letters at the top of the bars, there was no significant differences in the level of disease control obtained on the upper leaf surface (black bars; lower case letters) and lower leaf surface (gray bars; upper case letters) across treatments for either pumpkin cultivar ($P < 0.05$). There was also no difference in disease severity between the cultivars (data not shown).

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maintenance, data collection, results and analysis can be found below. All trials were conducted at The Pennsylvania State University Russell E. Larson Agricultural Research Center in Pennsylvania Furnace, PA in Centre County.

Pumpkin Powdery Mildew Trial

Methods: The field was plowed and fertilizer (N-P-K; 19-19-19 at 395 lb/A and 0-0-60 at 75 lb/A based on soil test results) was broadcast and incorporated on 18 May. Nineteen raised beds with 1.5-mil black-plastic mulch and a single row of drip-irrigation tape were formed in early Jun. Raised beds were 48-in. wide and 6-in. high and were laid on 13-ft centers. For each set of three rows, the center row was an untreated guard row and the two outer rows were treatment rows. On 14 Jun, pumpkin cvs. Howden (susceptible) and Bayhorse Gold (moderately resistant) were direct-seeded in designated plots, two seeds per hole, spaced 36-in. apart, one row per bed. Plants were thinned to one plant per hole or missing plants were replaced with transplants in early Jul so that each plot consisted of six plants. Plots were single rows, 20-ft long and separated by 22-ft of bare plastic. Fungicide treatments were replicated four times and arranged in a randomized complete block design with five treatments being applied to cv. Howden and a subset of four of the same treatments being applied to cv. Bayhorse Gold for a comparison of host resistance. Cucumber beetle was managed with an application of Admire 2F applied with a Solo backpack sprayer (mixed 5 ml/1gal then drench applied 5 fl oz/plant) on 20 Jun. Weeds were managed with an application of Medal EC (1.33 pt/A) plus Profine 75DF (0.5 oz/A) on 7 Jun along with supplemental hand weeding. Plots were fertigated regularly (N-P-K; 20-20-20 at 7 lb/A) and at increasing intervals as the crop matured. Fungicide applications were made using a tractor mounted, R & D CO2-powered sprayer with an offset-boom traveling 2 mph and calibrated to deliver 42 gpa at 32 psi at the tank through six TX-18 hollow-cone nozzles on 20-in. centers on 29 Jul and 7, 16, 23 and 29 Aug for a total of five treatment applications. Natural inoculum was relied upon and symptoms were first observed on 26 Jul. 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 powdery mildew symptoms on six leaves per plot on 10, 19, 16 Aug and 2 Sep. Area under the disease progress curve (AUDPC) was calculated at the end of the season and then the data converted to percent control relative to the untreated treatment (data presented below). Downy mildew was observed and confirmed in the trial on 5 Aug and the entire trial was maintenance sprayed with a rotation of Ranman (2.5 oz/A on 7 and 24 Aug) and Tanos (8 oz/A on 15 Aug). Rainfall totals (in.) were 2.06, 10.2, and 7.22 for 14 to 30 Jun, Jul, and Aug, respectively. Data was analyzed separately by cultivar using an analysis of variance and treatment means separated using Fisher's Least Significant Difference test (SAS v. 9.4, SAS Institute, Cary, NC).

Results: Disease pressure was severe, with the untreated control plots in both cultivars reaching near 100% disease severity by the end of the trial. All treatments significantly reduced powdery mildew symptoms on both the upper and lower leaf surface, regardless of the cultivar planted. In this trial, replacing the application of Quintec (a.i. quinoxyfen), a targeted powdery mildew specific fungicide, in the fungicide program with a biofungicide/OMRI-approved fungicide Microthiol Disperss (a.i. sulfur from United Phosphorus, Inc.), Timorex Act (a.i. tea tree oil from STK Stockton Group) or MilStop (a.i. potassium bicarbonate from BioWorks, Inc.) were equally as effective as the fungicide programs only consisting of targeted powdery mildew fungicides. However, within individual fungicide treatments there was not an added benefit of host resistance on helping to manage powdery mildew on either the upper ($P = 0.2477$) or lower ($P = 0.7973$) leaf surface using a paired T-test. This was likely due to the favorable weather conditions this past season.

Cucumber Downy Mildew Trial

Methods: The field was plowed and fertilizer (N-P-K; 11-52-0 at 145 lb/A and 46-0-0 at 130 lb/A based on soil test results) was broadcast and incorporated on 15 and 18 May. Nineteen raised beds with 1.5-mil black-plastic mulch and a single row of drip-irrigation tape were formed in early Jun. Raised beds were 48-in. wide and 6-in. high and were laid on 9-ft centers. For each set of three rows, the center row was an untreated guard row and the two outer rows were treatment rows. On 7 Jun, cvs. Darlington (susceptible) and DMR 264 (resistant) were direct seeded, two seeds per hole, spaced 24-in. apart, one row per bed in designated treatment plots. Guard rows were directed seeded with cv. Straight Eight (susceptible). Plots were single rows, 16-ft long and separated by 8-ft bare plastic buffer. Fungicide treatments were replicated four times and arranged in a split-plot randomized complete block design with cultivar as the whole-plot and fungicide treatment as the sub-plot. Plots

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were thinned to one plant per hole or missing plants replaced with transplants in late Jun so that each plot consisted of six plants. Cucumber beetles were managed with an application of Admire 2F applied with a Solo backpack sprayer (mixed 5 ml/1gal then drench applied 5.0 fl oz/plant) on 14 Jun and Baythroid (2.8 fl oz/A) was applied on 10 Aug. Weeds were managed with an application of Profine 75DF (1 oz/A) plus Prefar (6 qt/A) on 29 May that was activated with 0.5 in. of overhead irrigation on 1 Jun. On 6 Jun, Round-up (1.5 pt/A) was applied between the plastic and supplemental hand weeding was conducted throughout the season. Plots were fertigated regularly (N-P-K; 20-20-20 at 7 lb/A) and at increasing intervals as the crop matured. Fungicide applications were made using a tractor mounted, R&D CO2 powered offset-boom sprayer traveling 2 mph and calibrated to deliver 42 gal/A at 32 psi at the tank through six TX-18 hollow-cone nozzles on 20-in. centers on 16 and 26 Jul, 6, 15 and 23 Aug for a total of five applications. Natural inoculum was relied upon and symptoms were first observed on 8 Aug. Downy mildew severity was rated on a continuous scale of 0 to 100% based on the percentage of the leaf surface showing symptoms across the whole plot on 9, 16, 19 and 26 Aug. That data was used to calculate the area under the disease progress curve which was then converted to percent control achieved relative to the untreated treatment (data presented below). Rainfall totals (in.) were 4.49, 10.20 and 6.84 for 7 to 30 Jun, Jul, and 1 to 26 Aug, respectively. Data was analyzed using PROC GLM which indicated a significant cultivar by fungicide treatment interaction ($P < 0.0001$) in additional to significant main effects (cultivar $P = 0.0002$; treatment $P < 0.0001$), so fungicide treatments were analyzed separately within cultivar using an analysis of variance and treatment means separated using Fisher's Least Significant Difference test (SAS v. 9.4, SAS Institute, Cary, NC).

Results: Disease pressure was severe, with the untreated control plots of cv. Darlington reaching nearly 100% disease severity by the end of the trial. In contrast, very little to no downy mildew developed on cv. DMR 264 regardless of whether receiving fungicide treatments (no data shown due to low disease incidence). DMR 264 is a new next generation downy mildew resistant cucumber cultivar from Dr. Michael Mazourek's breeding program from Cornell University and is sold by Commonwealth Seeds. It has also performed well in trials conducted at the University of Massachusetts. Foliar symptoms of angular leaf spot were observed early in the season and foliar anthracnose was observed later in the season on both cultivars, however, neither disease was significant enough to impact downy mildew ratings or necessitate a maintenance fungicide spray.

Fungicide programs that consist of targeted downy mildew fungicides applied in a rotation to manage for fungicide resistance using FRAC codes and tank-mixed with Bravo Weather Stik (unless already in the pre-mix) were most effective at managing cucumber downy mildew. Further tank mixing with the biofungicide LifeGard (a.i. Bacillus mycoides isolate J from Certis USA) or the biostimulate Keylate Colbalt (a.i. 4% nitrogen and 5% cobalt from Stoller) did not provide any disease management benefit. Substituting Zonix (a.i. rhamnolipid surfactant from Jeneil Biosurfactant Company) or Stargus (a.i. Bacillus amyloliquefaciens strain F727 from Marrone Bio Innovations) from the targeted downy mildew fungicide Zampro significantly reduced downy mildew control by approximately 28 and 53%, respectively.

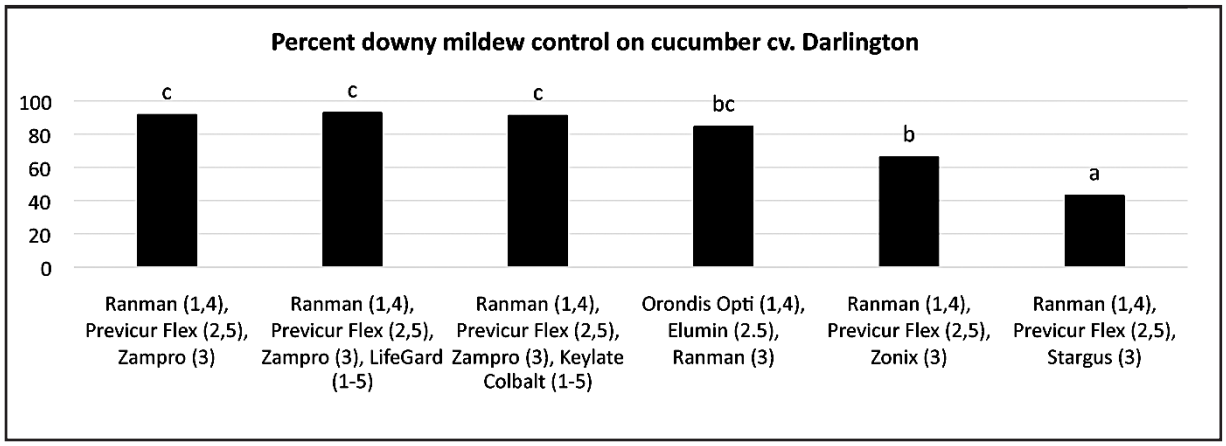

Figure 2. All fungicides were applied at the highest label rate. When applied Ranman, Previcur Flex and Zampro were tank-mixed with Bravo Weather Stik (2.0 pt/A) and Ranman, Zampro, and Orondis Opti were also applied with Silwet L-77 (0.125% v/v). The numbers in parentheses reflect the following fungicide applications dates: 1 = 16 Jul; 2 = 26 Jul; 3 = 6 Aug; 4 = 15 Aug and 5 = 23 Aug. Bars with different letters at the top indicate significant differences in the level of downy mildew disease control (P = 0.0006).

Tomato Early Blight Trial

Methods: The field was plowed and fertilizer (N-P-K, 46-0-0 at 180 lb/A and 11-52-0 at 155 lb/A based on soil test results) was broadcast and incorporated on 15 Jun. Tomato transplants cvs. Mountain Fresh Plus and BHN 964 were transplanted on 26 Jun. Planting was delayed multiple times due to prolonged wet field conditions. A starter fertilizer (N-P-K, 20-20-20 at 7 lb/A) along with Admire 2F (1.0 pt/A) was applied in the transplant water. Each plot was 12-ft-long and separated by a 5-ft break within the row and 5-ft between row centers. Untreated guard rows planted with cv. H4007 on 15 Jun (susceptible processing cultivar) separated each treatment row. Each plot was planted with eight transplants spaced 18-in. apart. Treatments were replicated four times and arranged in a split-plot randomized complete block design with cultivar as the whole plot and fungicide treatment as the subplot. Weeds were managed with an application of Medal EC (1.5 pt/A) and Tricor DF (0.33 lb/A) on 20 Jun. Plots were fertigated regularly (N-P-K, 20-20-20, 7.0 lb N/A) with a single row of drip irrigation tape was laid with the plastic and located just to the left of the plant. Fungicide appli-

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cations were made using a tractor mounted, R & D CO2-powered offset-boom sprayer traveling at 3 mph and calibrated to deliver 28 gal/A at 32 psi through three TX-18 hollow-cone nozzles on 27 Jul, 7, 16, 24, 30 Aug, and 6, 13 and 20 Sep for a total of eight fungicide applications. Several foliar late blight lesions resulting from natural inoculum were observed on 25 Aug, therefore the trial was maintenance sprayed with Curzate (5 oz/A) on 27 Aug, Ranman (2.75 oz/A) on 31 Aug and 14 Sep and Presidio (4 oz/A) on 7 Sep. This was the first observation of natural late blight on the research farm in several years. Maintenance sprays were made with a Solo backpack sprayer with a TX-18 hollow cone nozzle. On 30 Jul, the guard rows were inoculated with a mix of three Pennsylvania Alternaria solani isolates (1.75 x 104 spores/ml sprayed in three to four spots per 12 ft guard row using a hand-held Hudson sprayer). Supplemental water was delivered using overhead misters to extend the dew period and create more favorable conditions for disease progression. Foliar early blight severity was evaluated on 3, 8, 16, and 23 Sep by estimating the percent of symptomatic foliage across the whole plot. Area under the disease progress curve was calculated. Rainfall totals (in.) were 2.71, 10.20, 7.22, and 6.22 for 26 to 30 Jun, Jul, Aug and 1 to 23 Sep, respectively. Data was analyzed using PROC GLM which indicated a significant cultivar by fungicide treatment interaction (P = 0.0006) in additional to significant main effects (cultivar P = 0.0366; treatment P < 0.0001), so fungicide treatments were analyzed separately within cultivar using an analysis of variance and treatment means separated using Fisher's Least Significant Difference test (SAS v. 9.4, SAS Institute, Cary, NC).

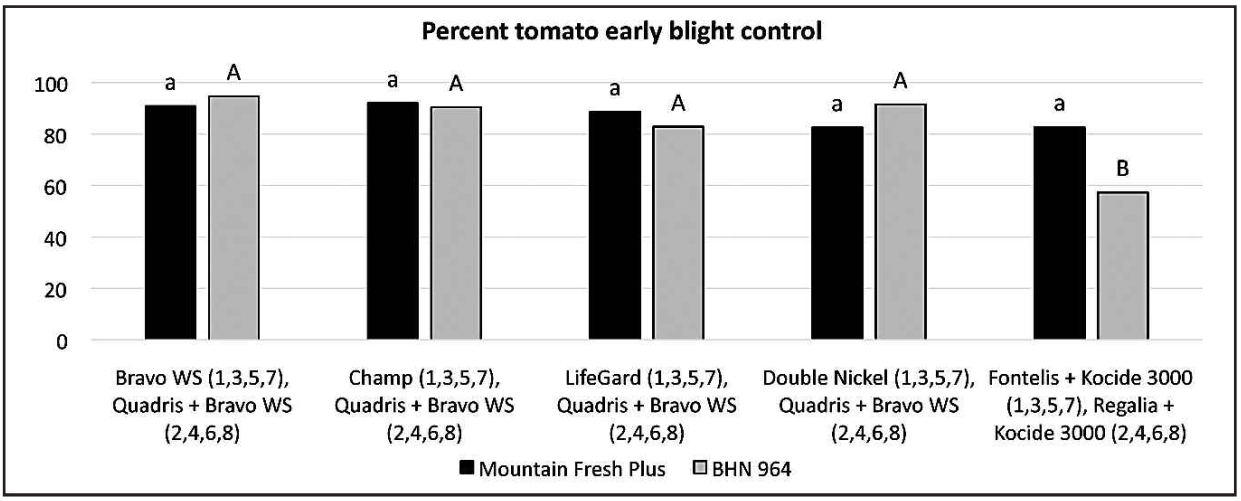


Figure 3. The fungicide rates are as follows: Bravo Weather Stik (Bravo WS 2 pt/A), Quadris (5 fl oz/A), Champ (3.2 lb/A), LifeGard (4.5 oz/100 gal), Double Nickel (3 lb/A), Fontelis (1 pt/A), Kocide 3000 (1 lb/A) and Regalia (4 qt/A). The numbers in parentheses reflect the following fungicide application dates: 1 = 29 Jul; 2 = 7 Aug; 3 = 16 Aug; 4 = 24 Aug; 5 = 30 Aug; 6 = 6 Sep; 7 = 13 Sep and 8 = 20 Sep. As indicated by the letters at the top of the bars, there was no significant differences in the level of disease control obtained on cv. Mountain Fresh plus regardless of treatment (lower case letters and black bars; P = 0.4106). The Fontelis/Regalia plus Kocide treatment was not as effective on cv. BHN 964 (upper case letters and gray bars; P = 0.0021).

Results: Disease severity developed slowly but did reach near 100% in the untreated control plots of both tomato cultivars by the end of the trial. All treatments significantly reduced early blight disease severity compared to the untreated controls for both cultivars. Replacing Bravo Weather Stik with the biofungicides LifeGard (a.i. Bacillus mycoides isolate J from Certis USA), Double Nickel (a.i. Bacillus amyloliquefaciens strain D747) or the OMRI-approved copper Champ (a.i. copper hydroxide from Nufarm Agricultural Products) reduced half of the number of chlorothalonil applications but did not reduce tomato early blight control on either Mountain Fresh Plus or BHN 964. It in not know why a completely different program rotating Fontelis and Regalia (a.i. Reynoutria sachalinensis extract from Marrone Bio Innovations) tank mixed with Kocide 3000 was equally effective on cv. Mountain Fresh Plus but not as effective on cv. BHN 964. In general disease severity was higher on cv. BHN 964 compared to Mountain Fresh Plus but this may be explained in part due to the difference in plant growth habit when the plants are not staked and tied.

Conclusion/Summary:

Although these trials only reflect the results from one year, it is clear depending on the crop and disease, augmenting conventional fungicide programs with select biofungicides or OMRI-approved products can still provide the same or similar level of disease control as the conventional program. Except for cucumber downy mildew (cv. DMR 264), the additive effect of coupling with host resistance was less clear this season when disease pressure was high and the wet conditions favorable for disease development. Evaluating programs such as these over multiple field seasons is important. When evaluating the incorporation of new products into your own fungicide programs, it is important to not only review the research-based results available to help select the most promising biofungicides and OMRI-approved products but also consider conducting your own on-farm comparisons. The efficacy of fungicide programs can also be dependent on farm-specific factors so conducting a side-by-side comparison in conjunction with regular scouting to monitor disease development are important for successful disease management.

Dr. Gugino is with the Department of Plant Pathology and Environmental Microbiology at Penn State Univ. *This research project was funded by PVGA and the Pennsylvania Vegetable Marketing and Research Program.*

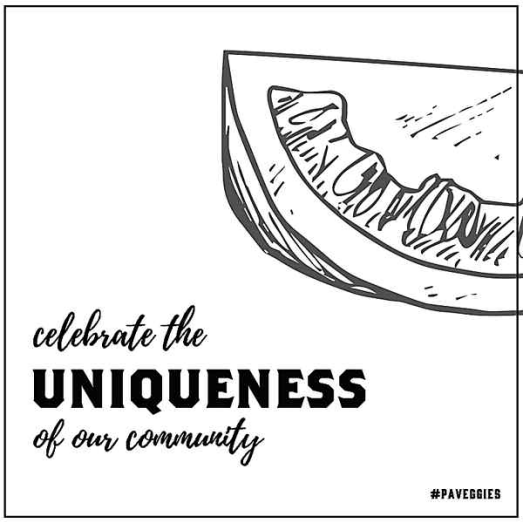
2018 Specialty Melon Trial

Michael Orzolek

Transplanting date: May 29, 2018
Production system: Raised beds with drip irrigation and black plastic film.
Design: Randomized Complete Block with 3 replications and 5 plants/rep/variety.
Spacing: 2' in-row and 7" between rows
Harvest dates: July 27 through August 29, 2018

Variety	Source	Type	Days to Maturity
Earli Dew	Harris Seeds	Honeydew	85
Dream Dew	Harris	Honeydew	82
Lambkin	Harris	Piel de Sapo	75
Durasol	Harris	Canary	75
Masada	Harris	Galia	80
Passport	Harris	Galia	70
Honey Blonde	Johnny's	Honeydew	71
Snow Leopard	Johnny's	Honeydew	71
Sapomiel	Johnny's	Piel de Sapo	85
San Juan	Johnny's	Ananas	78
Savor	Johnny's	French Charentais	78
Lilly	Johnny's	Crenshaw	78
Brilliant	Johnny's	Canary	75
Dewlightful	Seedway	Honeydew	90
New Moon	Seedway	Honeydew	85
Camposol	Seedway	Canary	80
Camino	Seedway	Canary	84
Visa	Seedway	Galia	69
Pixie	Seedway	Palm	76
Ginkaku	Pinetree Gardens	Korean	70
Green Nutmeg	Pinetree Gardens	Heirloom	80
Ogden	Pinetree Gardens	Middle Eastern	85

Table 1. The marketable yield and quality of 22 specialty melon varieties grown at the Horticulture Research Farm, Rock Springs, PA - 2018.



Variety	No. fruit per plant	Avg fruit wt. - lbs	% Soluble solids	# rotten fruit
Earli-Dew	1.8	2.8	8.8	23
DreamDew	2.0	3.9	6.8	7
Lambkin	0.5	1.0	5.2	0
Durasol	2.2	2.9	8.8	7
Masada	1.4	3.2	8.3	0
Passport	1.3	3.3	9.3	18
Honey Blonde	3.4	3.3	12.4	0
Snow Leopard	4.8	2.3	8.5	0
Sapomiel	1.9	6.5	8.9	0
San Juan	2.7	3.3	10.3	0
Savor	3.0	2.8	10.2	45
Lilly	2.5	6.0	9.0	0
Brilliant	1.3	1.9	7.8	3
Dewlifghtful	2.0	5.1	12.1	0
New Moon	3.1	3.1	9.8	2
Composol	2.0	4.6	8.1	2
Camino	2.0	2.7	9.3	0
Visa	2.6	3.2	9.9	0
Pixie	1.6	2.6	10.9	0
Ginkaku	6.5	1.3	14.7	9
Green Nutmeg	5.1	1.4	7.8	5
Ogden	1.2	2.9	8.0	0

Discussion

The weather in 2018 was not ideal for specialty melon production. Cooler, cloudy than normal days resulted in extended maturity to harvest and lower than normal soluble solid readings in most varieties. However, there was a variety of melon sizes, shapes and colors to chose from. The two varieties that produced the highest fruit per plantVarieties were Ginkaku and Snow Leopard. Not only did Ginkaku have the highest number of fruit per plant, but the fruit also were the sweetest with a soluble solids reading of 14.7%. Both Delightful and Honey Blonde fruit had higher soluble solids readings compared to other varieties in the trial. Varieties with the highest average fruit weight were Sapomiel and Lilly. The variety with the smallest average fruit weight was Lambkin which also had the lowest number of fruit per plant.

Varieties that have potential for production in PA because of their yield, fruit size and quality (%SS) include Ginkaku, Honey Blonde, Dewlightful, Lilly and Visa. These 5 varieties and a few more will be re-evaluated in 2019.

Dr. Orzolek is Professor Emeritus of Vegetable Crops at Penn State Univ. *This research project was funded by PVGA and the Pennsylvania Vegetable Marketing and Research Program.*

GREENHOUSE PRODUCTION

Dealing with Algae in Transplants

Onions and leeks are some of the earliest crops to be seeded in the greenhouse. Every year we get calls about poor stands and green growth or crust forming on soil in transplant trays. The green growth is algae, which can grow on any greenhouse surface and comes in on dust or irrigation water. Algae thrives in sunny, wet areas with high organic matter, e.g. an overwatered tray full of potting media, especially if the media is compost-based or contains a lot of peat. Algae do not harm plants directly, but can slow gas exchange through media, thereby slowing root growth. Algae also attracts fungus gnats and shore flies, which not only feed on algae and other fungal growth in the growing medium, but also on plant roots, creating wounds where pathogens might gain entry into plant roots. Once you have algae it is hard to get rid of, so how can you prevent algae from growing?

Pre-season cleaning and managing moisture are key in preventing algae in greenhouses. Algae doesn't need potting soil to grow in a greenhouse – it can grow on any moist surface – so thoroughly cleaning and sanitizing your greenhouse benches, floors, trays, and any other surfaces in your greenhouse can help reduce algal "inoculum". Manage moisture and make sure that your transplants are able to quickly take up all the water you apply when irrigating. Avoid overwatering, especially on cloudy days. Leeks and onions start out so small that if they are planted in a large cell their roots can't access all the water and the soil stays wet and algae begins to grow. Leeks and onions don't need big cells—you can use as small as 288-celled trays!—and they should transplant up well since they have big root systems. You can also achieve faster drying of soil by using lighter media and/or mixing in extra perlite to improve drainage.

*From **Vegetable Notes for Vegetable Farmers in Massachusetts,** Univ. of Mass. Ext., Vol. 31, No. 4, March 29, 2019.*

VEGETABLE PRODUCTION

Scouting for Pests *(continued from page 21)*

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

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

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

Cucurbit Disease Scouting and Management Guide –

https://ag.umass.edu/vegetable/publications/guides/cucurbit-disease-scouting-management-guide

*Ms. McKeag is with the Univ. of Massachusetts Vegetable Program. From **Vegetable Notes for Vegetable Farmers in Massachusetts,** Univ. of Mass. Ext., Vol. 31, No. 2.*

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