

PENNSYLVANIA
VEGETABLE GROWERS

NEWS

for the commercial vegetable, potato and berry grower

PVGA

July 2023 / Volume 46 Number 7

Next PVGA Twilight at Strite's Orchard September 21

The fourth PVGA twilight meeting for 2023 will be co-sponsored by the PVGA Berry Committee. It will be held on Thursday, September 21, 2023 at Strite's Orchard, 1000 Strite's Road in Harrisburg (Dauphin County) from 5:30 to 8:00 p.m.

The Strite family has been farming in the Harrisburg area since 1843. The first fruit trees and vegetables were planted by Joseph C. Strite in 1914. His son Earl would eventually join him in the business and over time expand the farm to over 250 acres. Earl sold his produce at markets in the city of Harrisburg and door to door in nearby Hummelstown. In 1950 the original market was opened on the farm. Earl's sons Joe and Tom joined their father on the farm and expanded vegetable plantings and added greenhouse operations. All three received the honor of being named Master Farmers over the course of their careers. In 1994 a new farm market and bakery were built and the farm was expanded to 300 acres. Strites sell 95% of their produce through their on-site farm market plus their CSA which was added in 2011. They also offer customers the opportunity for pick-your-own in selected crops. The family also operates several greenhouses where they grow bedding plants as well as all of the vegetable transplants that they use throughout the year. They also have added a high tunnel for early season tomato production. Current family members actively involved on the farm are brothers Joe and Tom, wives Sharon and Sheryl, and children Jon, and Matt.

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



Pumpkin and sweet corn fields at Shenot Farms in Wexford, the site of the first 2023 PVGA Twilight Meeting.

Directors Contract with Wanner Associates to Manage PVGA

The PVGA Board of Directors voted unanimously at a special meeting on May 30, 2023, to contract with Wanner Associates of Harrisburg, to manage the Association and to authorize the Executive Committee to negotiate a final agreement with Wanner. A contract was finalized on July 21 with Wanner beginning their services on September 1, 2023. William Troxell, the current Executive Director, will continue in that role during a transition period until his retirement on December 15, 2023. Tammy K. Linn will serve as Deputy Executive Director during the transition period and will assume the role of Executive Director upon Mr. Troxell's retirement.

The selection of Wanner Associates concludes a search process that began over a year ago. Wanner Associates has been in business since 1985. The firm provides management services to 19 other associations, including the Pennsylvania Landscape and Nursery Association and the Pennsylvania/Delaware Chapter of the American Society of Landscape Architects. In addition, they offer

lobbying and government affairs advocacy services. They have a team of 13 professionals to serve their clients.

While the Board originally planned for a much longer transition period before Troxell's retirement, given Wanner's experience in managing associations and transitions, the three and-a-half-month transition should be sufficient to ensure that PVGA services, publications and events continue seamlessly. Troxell began as the Executive Secretary of the Association in December 1983, 40 years ago, while also working full-time on the farm of then PVGA President Dale Whitenight of Danville. He succeeded William Christian who had served as PVGA's first paid Executive Secretary from 1978 to 1983. Previously the Association was managed by the volunteer officers with assistance from Penn State Extension personnel. Troxell contracted with the Association as Troxell Administrative Services which included his wife Cheryl and paid assistant Trisha Hoffman.

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NEWS

Directors Contract with Wanner Associates

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Summer Directors Meeting

The PVGA Board of Directors held their regular summer meeting virtually on July 18 at 8:00 p.m. Besides the report on the final contract negotiated with Wanner Associates, the Directors received reports from the officers and other committees. The General Fund balance value was reported as \$310,712 compared to \$251,642 on July 17 last year – a reflection of healthy returns from the 2023 Farm Show Food Booth and the 2023 Mid-Atlantic Convention. The Keystone Fund balance value was \$221,474 compared to \$200,410 last year.

Disappointingly, membership for 2023 was only 831 compared to 859 at last year's summer meeting. Several representatives from the Association met with the group that is organizing the Crop Growing Expo in Quarryville for January 2024. PVGA will have a booth there to reach out to the large number of plain community growers that are expected to attend that event again this year. Since a third or more of the vegetable growers in Pennsylvania belong to the plain community, the Board feels it is important to proactively promote both Association membership and the Mid-Atlantic Convention to those growers.

The Farm Show Food Booth committee is working on plans for the 2024 Farm Show with plans to drop dill pickles and veggie burgers from the menu because of poor sales/profitability.

The Board reviewed the preliminary program plans for the 2024 Mid-Atlantic Fruit and Vegetable Convention. Special sessions on urban agriculture are planned for this year's convention again. A special outreach to urban agriculture growers is planned – hopefully bringing them to the Mid-Atlantic Convention for the first time and enabling them to see the benefit of returning in future years. The Association applied for a state matching grant to help support the urban agriculture sessions including possible scholarships for growers to attend, to sponsor a recall readiness workshop for wholesale growers and to help the Association underwrite transportation assistance for members of the plain community.

The Association is planning a series of summer twilight meetings across the state including

events at Shenot Farms in Wexford, Allegheny County; Hess/Bridgeside Farms in Waynesboro, Franklin County; and Burger's Farm Market in Drums, Luzerne County.

In reviewing government affairs issues of concern to the Association, it was noted that expansion of broadband internet availability in rural areas had received funding so that hopefully there will be some progress there in the near future. There is also some discussion of USDA's Natural Resources and Conservation Service (NRCS) classifying high tunnel in-ground production as field production thereby exempting such tunnels from storm water management requirements. The Board voted to have the Association represented at the International Fresh Produce Association's Washington Conference in September.

Director Mark Troyer, chair of the Potato Committee reported that demand for Pennsylvania potatoes is high this year. The Potato Research Program approved \$30,000 for potato research projects and is undertaking an amendment referendum to increase the rate of assessment.

The Berry Committee is continuing their monthly Berry Growers Exchange which is available virtually or by telephone. The Berry Committee is also planning a berry oriented twilight meeting in September.

The Penn State Liaison Committee reported that the vacant vegetable extension educator positions in Columbia and Franklin counties are in the process of being filled. Faculty member Dr. Robert Berghage is retiring and the position is being advertised to cover greenhouse and indoor production. Dr. Brent Hales has resigned as Associate Dean for Extension to take a position at the University of California. The horticulture extension team is planning a retreat to coordinate their efforts on behalf of growers. The College of Agricultural Sciences recently purchased a 25,000 sq. ft. greenhouse complex near the main campus in State College to provide extra capacity for research purposes. A feasibility study is also underway to replace the Plant Science research greenhouse complex on the University

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*An association of
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Our Mission:

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

Our Vision:

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

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



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NEWS

'It Just Doesn't Work' — AEWR, Labor Pressures Bearing Down on Farmers

Mitch Galloway



This year Michigan's Adverse Effect Wage Rate rose almost 13% to \$17.34. Economists say that the wage rate could approach \$25 to \$30 in the next 10 years if immigration reform isn't done. | Photo by Mitch Galloway, Farm News Media

Just this year, four growers mowed their asparagus fields and are leaving the industry.

Because of untimely weather?

Poor crop prices?

Input costs?

No. Because of low labor availability and an unaffordable rising Adverse Effect Wage Rate (AEWR), said Sarah Black, general manager of Great Lakes Ag Labor Services (GLALS), an affiliate of MFB helping farms to secure legal temporary guestworkers.

"They're getting rid of all of their vegetable entities and sticking with fruit or going back to just row crops because it's simple math, and it just doesn't work with the government mandated AEWR that's too expensive for what they can sell vegetables for," Black said.

At the farm level, a high percentage of food production now is planted, cared for and harvested by legal foreign guestworkers, according to Black, who said the nation has a decision to make.

"Do we want to continue our food production in the U.S. — that security of our production here on U.S. soil under our food safety laws and regulations — or are we OK with importing our food and not growing as much anymore?" Black said.

"If we want to keep it, then we better quickly get focused on ag labor reform and modernizing the H-2A program."

This year Michigan's AEWR rose almost 13% to \$17.34. AEWR is determined by the USDA's Farm Labor Survey, which uses the combined wage rate of field and livestock workers and is the centerpiece for calculating the required hourly pay rate for H-2A. Economists say that the wage rate could approach \$25 to \$30 in the next 10 years — if reform isn't done.

On Nov. 2, MSU will host a conference, "Understanding and Addressing Agricultural Labor Challenges in the United States," to discuss wage rates, farm-work mechanization, and policy solu-

tions, among other items. It runs 8 a.m. to 5 p.m. at the MSU University Club, with the nation's leading ag labor economists, experts, industry representatives, and local and governmental officials in attendance.

"Agriculture is unique in terms of the broader immigration debate because immigrant workers in agriculture are not really competing with American-born workers," said Zach Rutledge, assistant professor in MSU's Department of Agricultural, Food, and Resource Economics, and host of the upcoming conference.

"The conference will convene stakeholders, both national and locally, to have a conversation about not only AEWR, but what are the challenges our stakeholders are facing, and what are some of the solutions."

According to American Farm Bureau Federation data, labor accounts for nearly 40% of total production costs on some farms.

"It's really about how do we keep our family farms in businesses, and our food production here in the U.S. If this is their last option for a labor source that can help sustain their farm, yet they can no longer afford the government-dictated wage," Black added.

"When that farm goes out of business, that production will never come back."

At a time when many growers are experiencing average- or below-average returns, Black said many of them are pivoting to other crops or technology.

"But technology will never be a one-for-one replacement for labor," Black noted.

"However, it is part of the solution, so the question is, can technology get to the marketplace quick enough for where we're at with the current labor shortages, before that farm goes out of business?"

While several legislative proposals have been introduced this session, there has not yet been any Congressional action, according to MFB National Legislative Counsel John Kran.

"We are continuing to pressure lawmakers to find even small, surgical fixes to help take pressure off of growers," Kran said.

"We can't afford to wait any longer."

Earlier this summer, House Ag Committee leadership appointed a bipartisan group of members of the committee to help find additional solutions to address workforce needs. They are meeting regularly, and Kran said Farm Bureau and partners continue to share policy proposals with them.

"We need farmers to continue sharing their story with our lawmakers — they need to hear specifically how inaction on this fundamental policy issue is hurting their livelihoods," Kran added.

The last time ag labor reform legislation passed in Congress was 1986.

"We need to keep trying to do something," Rutledge said.

"This is really an issue that we need to be thinking about in terms of the security of our nation and what this means for the long-term stability of our country."

Mr. Galloway is with Farm News Media/Michigan Farm Bureau.

From the **Michigan Farm News**, <https://www.michiganfarmnews.com/aewr-labor-pressures-bearing-down-on-farmers>, August 17, 2023.

Directors Contract with Wanner Associates *continued from page 2*

Park campus.

In New Business, the Board voted to enhance the Buyer's Guide by including exhibitors from the Mid-Atlantic Fruit and Vegetable Convention and offering an Industry Membership class that would include a directory listing and regular membership benefits. The Buyer's Guide will also be posted on the Association's web-

site. In addition, the Board voted to create a free Vegetable/Potato/Berry Classified ad section that will be posted on the website, the weekly PVGA Update email and the newsletter. Free ads for used equipment and extra supplies will be available to members and non-members.

National News Briefs

Bipartisan Working Group to Tackle Ag Workforce Challenges

House Committee on Agriculture Chairman Glenn “GT” Thompson (PA-15) and Ranking Member David Scott (GA-13) released the following joint statement after announcing the formation of the bipartisan Agricultural Labor Working Group, focusing on the workforce issues faced by the nation’s agricultural producers:

“The Committee on Agriculture has heard loud and clear from producers across the nation that one of the biggest challenges confronting the agriculture industry is a lack of reliable labor. Though not directly in our committee’s jurisdiction, we have a responsibility to be a voice in Congress on the issues and policies impacting farmers and ranchers. This is a complex problem that deserves the focused attention of the Members who hear from producers every day rather than the partisan grandstanding that has plagued these efforts in the past.”

Members of the working group have been selected from current Committee members and aim to represent every sector and geographical region of American agriculture

Congressmen Rick Crawford (AR-01) and Don Davis (NC-01) will co-chair the working group. The working group will:

- Seek input from stakeholders, employers, and workers, particularly emphasizing the H-2A visa program for nonimmigrant agricultural workers;
- Produce an interim report detailing the program’s shortcomings and the impacts on food security, and;
- File a final report with recommendations to address the flaws within the program.

“A robust agriculture industry starts with a strong and healthy workforce. However, due to a labor shortage, American farmers are increasingly turning to overseas workers to fill positions on the farm. Unfortunately, this is not an easy process because our visa policies and regulations have become convoluted and burdensome. Reforms are desperately needed to address this pressing issue. I look forward to working with my colleagues on both sides of the aisle to find commonsense solutions that help our farmers and producers better staff the farm to help feed and clothe the world,” said Rep. Crawford.

“I hear from farmers and producers daily about their need for more workers to ensure they can grow the food that feeds all of us. I look forward to working with my fellow Co-Chair, Representative Rick Crawford, and the other Members of the Agriculture Labor Working Group to come together and craft bipartisan solutions to the labor issues that farmers and producers face. I thank Chairman Thompson and Ranking Member Scott for appointing me to serve as one of the Co-Chairs of the bipartisan Agriculture Labor Working Group,” said Rep. Davis.

The final report of the working group will provide a suite of potential solutions that can inform and be utilized in subsequent legislative efforts.

From PFB Government Affairs Update, Penna. Farm Bureau, July 2023.

2023 Waters of the United States Update

On May 25, the United States Supreme Court issued its long-anticipated decision in *Sackett v. EPA*, ruling that the EPA and the Army Corps wrongfully claimed oversight on wetlands owned by Chantell and Michael Sackett. The Court ruled unanimously, 9-0, that the Clean Water Act (CWA) did not apply to the wetlands on the Sacketts’ property, striking down the “significant nexus” test in determining what is considered a WOTUS. Additionally, by a 5-4 vote, the Court adopted a more stringent test for what qualifies as an “adjacent wetland” subject to the CWA jurisdiction. Writing for the majority, Justice Alito concluded that the CWA applies to wetlands that are “as a practical matter indistinguishable from waters of the United States” because they have a “continuous surface connection” with

a larger body of water. The decision will have positive, far-reaching consequences for the agricultural industry. While the Sackett case addressed the pre-2015 WOTUS definition, the Court took the opportunity to thoroughly dissect the 2023 WOTUS rule in Section IV. As a result, the 2023 rule technically is in effect, but functionally EPA and the Army Corps cannot enforce it. Moreover, the Court did note that the current rule would not withstand judicial scrutiny. AFBF is currently suing the EPA and the Army Corps over the current WOTUS rule, and the Sackett decision will aid Farm Bureau’s case significantly in arguments.

From PFB Government Affairs Update, Penna. Farm Bureau, July 2023.

State News Briefs

How Pennsylvania Farmers are Improving the Chesapeake Bay

Farm Bureau President Chris Hoffman testified at a June 26 Pennsylvania House Environmental Resources & Energy Committee hearing on the ongoing efforts to restore the Chesapeake Bay. Mr. Hoffman’s comments focused on three key areas:

- The work that Farm Bureau members are and have been doing to install conservation practices in Pennsylvania’s portion of the Bay watershed (and in the rest of the Commonwealth). Farm Bureau also touted the launch of the Pennsylvania Agricultural Conservation Assistance Program (ACAP) and the positive additional effect it will have on these ongoing efforts. Farm Bureau advocacy was critical to the enactment of both ACAP and Pennsylvania’s new “Fertilizer Law”—two elements found to be lacking in previous Pennsylvania Chesapeake Bay responses.
- The positive difference Pennsylvania farmers were already making for local water quality—and by extension, the Chesapeake Bay—according to Pennsylvania Department of Environmental Protection (DEP) data. Well in excess of 90 percent of the operations evaluated by DEP in 2021-22 met the best management practice (BMP) implementation requirements of manure management plan (MMP) BMP implementation & maintenance, as well as the BMP implementation requirements of an agricultural erosion & sedimentation (Ag. E&S) control plan. The summary also indicated strong levels of administratively complete plans at the time of inspection (for operations required to have and implement such plans). Farm Bureau also fully supports ongoing efforts to ensure that Pennsylvania farmers’ past and current BMP installations are properly credited and reported, including the work of the EPA-USDA task force created earlier this year to document un- and under-counted agricultural BMPs in the Bay watershed, as well as work by Penn State University and others to properly credit farmers for such practices.
- Our vision for the future of the Chesapeake Bay restoration. In conclusion, Farm Bureau argued that the past strategy of setting arbitrary deadlines and attempting to achieve environmental compliance and innovation through legal and bureaucratic intimidation has not worked, and there appears to be a recognition among at least some Bay stakeholders that something needs to change in order to avoid similar negative outcomes in the future. In our view, that change would include recognizing what is achievable with current levels of financial, technical, and human resources and in turn, being realistic with the public and policymakers about what can be achieved, all while continuing to advocate for the additional resources that will allow for faster progress.

From PFB Government Affairs Update, Penna. Farm Bureau, July 2023.

GENERAL

What Can Summer Cover Crops Do for Soil Health and Future Crops?

Michelle Infante-Casella



Now that some of our spring planted crops have finished, rather than leaving fields fallow or replanting fields that may have had some issues with plant diseases or insect pests, consider replanting with a summer cover crop. It is not too late to take advantage of summer cover crop benefits. What do summer cover crops do for soil health or future crop

improvements? See below:

1. **Increase Soil Organic Matter** – One of the best attributes of having organic matter in the soil is improvement in soil structure. Adding organic matter improves tilth, water infiltration, water holding capacity, nutrient holding capacity and reduction of soil crusting. Also, as important is the increase in beneficial soil microbes and earthworms. Beneficial microbes can compete with pathogens and help release nutrients. Earthworms can cycle nutrients and improve pore spaces in the soil.

2. **Reduce Soil Erosion** – Just like with winter cover crops, summer cover crops can also reduce wind and water erosion in fields, especially those with slopes. During summer rainfall events, that can be significant if resulting from tropical storms, runoff may not just include soil loss, but also fertilizer and chemical movement.



Therefore, keeping cover on a field during non-production times in any season is an excellent practice.

3. **Nitrogen Cycling in the Soil** – Nitrogen is often the most limiting nutrient for crop production, since it is so readily lost through nitrification and leaching.

Storing nitrogen through plant cycling is an excellent way to improve fertility management. Whether it is a grass or non-leguminous cover crops N is still kept in the mix by the cover crop taking up residual N that would otherwise be lost. The cover crop plant takes up the nitrogen and after the crop is incorporated it decomposes, thus releasing the N for subsequent crops to use. If legume cover crops are planted, they have the ability to “fix” nitrogen from the atmosphere and through the same decomposition process will provide N for subsequent crops. Be sure to inoculate legume seed just prior to planting with Rhizobium bacteria in order to gain the maximum N fixation benefits.

4. **Reduce Weeds** – When fields are left fallow after crops are harvested, weed growth can occur. If left to produce seeds, these weeds will multiply in subsequent crops. Therefore, managing the field by planting cover crops between cash crops is a great weed management option. As the cover crop grows, it will suppress the germination and growth of weeds through competition and shading. Some cover crop species can also suppress weeds biochemically, either while they are growing or while they are decomposing, which may prevent the germination or growth of other plants (allelopathy). Research has shown some cover crops like wheat, barley, oats, rye, sorghum, and sudangrass may suppress weeds. In some cases, it has also been reported that residues and leachates from crimson clover, hairy vetch, and other legumes have shown weed suppression.

5. **Impacts on Plant Diseases** – Cover crop residues could possibly be beneficial when it comes to plant pathogens, or can in some cases increase plant disease organisms. Some cover crop species are in the same plant families as cash crops and may be susceptible to the same disease organisms. Therefore, carrying the pathogen to the next crop. This is why paying attention to crop rotations is so important. In other cases, the cover crop residue can improve soil health in order to produce a better environment for beneficial microbes. By improving soil health, water infiltration, air pore space and other positive attributes, some soil pathogens may not survive as well, as in the case of water molds and water fungi. Some cover crops, like sorghum-sudangrass and sunnhemp, have been reported to reduce nematodes in soils. There are multiple positive factors from cover crops that can combat plant diseases.

6. **Impacts on Insects** – Like with plant diseases, cover crops can be susceptible to the same insect pests as cash crops. However, they may also attract beneficial insects into an area. Insect pests should be monitored in cover crops, just like in cash crops in order to not let populations get out of control and then move into nearby fields after the cover crop is killed.

For more resources on the use of cover crops check out these resources: Cover Crops for Sustainable Crop Rotations – SARE at <https://www.sare.org/resources/cover-crops/>.

Ms. Infante-Casella is with Rutgers Cooperative Extension. **From the Plant and Pest Advisory**, Rutgers Coop. Ext., <https://plant-pest-advisory.rutgers.edu/what-can-summer-cover-crops-do-for-soil-health-and-future-crops/>, July 14, 2023.

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Short Term Summer Cover Crops

The last month has been stormy and wet, with extreme rainfall across the region and devastating flooding in western Massachusetts this week. In cover cropped fields that are waterlogged or flooded, the roots of those cover crops are doing their job, holding onto the soil and preventing or slowing down erosion. On dryer land of course, cover crops also shade out weeds, preventing them from going to seed. There are several good legume and non-legume cover crop choices for planting now and throughout July that grow rapidly in the summer heat. When planting mixtures in the summer, select equally vigorous crops (similar height and growth rate) so they will not compete and shade each other out. For example, Jean-Paul Cortens of Roxbury Farm in Kinderhook, NY likes a mix of 50 lbs/A sunn hemp, 10 lbs/A Japanese millet, 5 lbs/A sunflower, and 50 lbs/A cowpea or field pea.

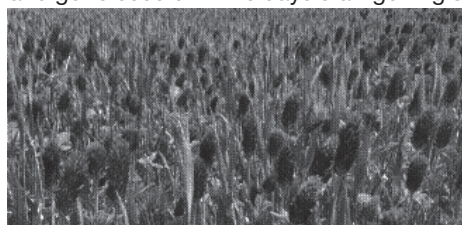
Legumes

Cowpea (*Vigna unguiculata*), also known as black-eyed or southern pea, is fast-growing with peak biomass often reached in 60 days. It also tolerates drought and heat. Cowpeas can fix up to 100 lbs N/A with biomass of 3,000-4,000 lbs/A. It breaks down rapidly after incorporation. Cowpeas also can be harvested in the



Sunn hemp. Photo credit: T. Jones

immature pod stage as a fresh legume. Drill at 40-50 lbs/A and broadcast at 70-100 lbs/A. Sunn hemp (*Crotalaria juncea*) is a tropical legume (not related to other hemp) and has great potential in our humid, tropic-feeling summers. Sunn hemp can produce a lot of biomass (3-4 tons/A in MA). It is a high nitrogen-fixing legume and can contribute over 100 lbs N/A to a following crop. Sunn hemp grows very fast in the summer, reaching 6 feet or taller in 8 weeks. Allow sunn hemp to grow 1-3 feet tall, then mow it and let it regrow. If allowed to get too tall, the stems will become tough and fibrous and will not decompose rapidly. This crop is an excellent companion for sorghum sudangrass, which can also be mowed to keep it from getting too fibrous. Sunn hemp is a day length-sensitive crop; it will grow anytime during the summer, however it will not flower and go to seed until the days start getting shorter in very late summer.



A field of crimson clover. Photo credit: N. Ng

Crimson clover (*Trifolium incarnatum*) is a beautiful cover crop that is a great choice for a short-term summer cover or perhaps seeded between plastic rows to reduce splash and erosion and suppress weeds. It is not typically considered an overwintering cover crop in Massachusetts, but in a 2016 UMass Extension cover crop research trial, it overwintered well on four Massachusetts farms. It is fairly resilient and tolerates well-drained soils, heat, drought, and low fertility soils. Shade tolerance makes this cover crop a good choice for mixes. Depending on coverage, it can fix 70-150 lbs N/A. Drill 10-20 lbs/A, and broadcast at 12-24 lbs/A.

Non Legumes

Sorghum sudangrass (*Sorghum bicolor* x *S. sudanense*) is a cross between grain sorghum and sudangrass. It is a warm-season annual grass that grows well in hot conditions and produces a large amount of biomass. Its thick root system and high biomass makes it useful for soil building. Sorghum sudangrass can reach 6-12 feet tall, but should be mowed when it reaches 2-3 feet tall to prevent it from becoming fibrous and difficult to manage. Mowing

also encourages root growth. Unmowed sorghum sudangrass will winterkill but the tough residue can be difficult to manage in the spring. Brown midrib types will decompose more quickly because they have less lignin. Expect 3-4 tons of biomass addition per acre in Massachusetts. Because it is a grass, to get the most growth you will need to add nitrogen fertilizer (40-80 lbs/A), which will be cycled on to the next crop. Sorghum sudangrass is very effective at suppressing weeds and has been shown to have allelopathic and biofumigant properties useful for nematode management. Drill 35-40 lbs/A or 40-50 lbs/A broadcast.

Phacelia (*Phacelia tanacetifolia*), also known as blue or purple tansy, is a good cover crop for use in rotation on veg-etable farms because it is not in the same family as any major vegetable crops. This fast-growing cover crop is best to seed in mid-summer. While it does not have a deep taproot, phacelia is a wonderful soil aggregator in the top 2 inches. Beneficial insects including parasitoids and pollinators are attracted to the fuzzy purple-blue flowers. This cover crop will winterkill at 15°F. Seed at 1 lb/A drilled and 3 lb/A broadcast.



A field of buckwheat in flower.

Forage-type pearl millet (*Pennisetum glaucum*) or Japanese millet (*Echinochloa* spp.) have similar functions as summer cover crops: they grow rapidly but are easier to manage than sorghum sudangrass. They also produce less biomass than sorghum sudangrass. Both millets grow about 4-6 feet tall and have similar seeding rates. They are well-adapted to sandy and/or infertile soils and do well in the summer heat. Forage types are better adapted for soil improvement than grain types. To get the most growth, you will need to add nitrogen fertilizer (40-80 lbs/A). Pearl millet has been shown to suppress some nematodes. Forage pearl millet can make a good mulch for late-summer plantings of no-till or strip-till crops. Seed at 12-15 lbs/A drilled or 15-20 lbs/A broadcast.

Buckwheat (*Fagopyrum esculentum*) is a great choice if weed suppression is your main goal. It can be sown as early as May 20, but will put on more growth if seeded after June 1. As a broad-leaf plant, it covers the ground earlier than grass cover crops, and out-competes weeds. A good stand of buckwheat attracts beneficial insects, improves soil tilth, and produces more biomass than any other cover crop in the short time it grows, but doesn't do well if the plow layer is compacted. It scavenges phosphorus from the soil and makes it available to subsequent crops. Buckwheat does well even in low nitrogen or low phosphorous soils, without additional fertilizer. Buckwheat decomposes quickly after incorporation. Mow or incorporate when the planting begins flowering to avoid seed production and volunteers. Drill at 50 lbs/A or broadcast at 70 lbs/A.

Additional Information

- Summer Soil Improving Crops for Vegetable Rotations, Gordon Johnson, Extension Vegetable and Fruit Specialist, University of Delaware, <https://sites.udel.edu/weekly-cropupdate/?p=6831>.
- Cover Crop Guide for New York Vegetable Growers. From Cornell Cooperative Extension. This site includes cover crop profiles as well as a cover crop decision tool, where you can get crop recommendations based on your management goal, planting time, and cover crop duration. <https://covercrop.org/>
- Cover Crops: What a Difference a Few Weeks Makes! Results from Cornell Organic Cropping Systems Trials. <http://www.hort.cornell.edu/extension/organic/ocs/reports/Cover%20Crops%20Planting%20and%20Termination.pdf>
- Cover Crop Periodic Table from USDA-ARS. <https://www.ars.usda.gov/plains-area/mandan-nd/ngprl/docs/cover-crop-chart/>.

From the Univ. of Massachusetts Extension Vegetable Program, **UMass Extension Vegetable Notes**, Vol. 35, No. 13, July 13, 2023.

GENERAL

Forced Air Cooling on the Farm

Chris Callahan and Andy Chamberlain, with introductory paragraphs by Lisa. McKeag

Precooling vegetables as quickly as possible after harvest and before crops go into storage helps reduce respiration and preserve product quality. Some common precooling techniques, including top-icing or hydrocooling—whether with a cool water dunk or more sophisticated equipment such as a rinse conveyor—involve direct contact with water. This water can present a food safety risk if it's contaminated with pathogens that can cause foodborne illness, either because the source water was contaminated or because contaminated product was exposed to the same water as other produce. Also, dunking warm produce in cold water creates the conditions for infiltration. The temperature gap causes a pressure differential that pulls water (and any pathogens that might be in it) into submerged produce. Because water presents contamination risks, the FSMA Produce Safety Rule requires that postharvest water be tested to ensure that it's free of generic E.coli, an indicator of fecal contamination, and that dunk tank or recirculated water be managed to reduce cross-contamination risks.

Some growers may be looking for other precooling methods that reduce their use of postharvest water. One option is forced air cooling, which uses cold air instead of water to remove heat. While commercial forced air coolers might be large and expensive, the engineers at UVM Extension developed designs for pallet- and crate-sized models that farmers can build on their own. This article describes their trials with these models, which showed that product was cooled 1.2-2.2 times faster than cooler storage alone. Note that not all cooling methods are appropriate for every crop. See Table 16 included below from the New England Vegetable Management Guide for information by crop that includes recommended cooling methods, storage temperatures and sensitivity to chilling injury.

Table 16: Handling Produce for Higher Quality and Longer Market Life
Information on optimum temperatures, relative humidity and storage life was adapted from USDA Handbook 66 and modified by experience under northeastern conditions.

Vegetable Crop	Recommended Cooling Methods ¹					Important Handling Factors			
	Forced Air or Room Cooling	Hydro-Cooling	Package Ice or Liquid Icing	Vacuum Cooling	Transit Icing ²	Recommended Transit & Storage Temp. °F ³	Recommended Transit & Storage Rel. Humidity, %	Expected Marketable Life Under Best Conditions	Sensitivity to Chilling Injury ⁴
Onion, dry					N	32	65-70	1-8 months	I
green		+	+		N	32	90-95	7-10 days	I
Parsley		+	+		E	32	95	1-2 months	I
Parsnips	+				N	32	90-95	2-6 months	I
Peas		+	+		E	32	90-95	1-2 weeks	I
Peppers	+			+	N	45-50	90-95	2-3 weeks	M
Potatoes, early	+				N	40	90	2-4 months	L
late	+				N	40-45	90	5-8 months	L
Pumpkins					N	50-55	70-75	2-3 months	H
Radishes, bunched		+	+		E	32	95	1-2 weeks	L
Rhubarb		+	+		R	32	95	3-4 weeks	I
Rutabagas	+				N	32	95	2-4 months	I
Spinach		+	+	+	E	32	90-95	7-10 days	I
Squash, summer	+	+			N	50	90-95	4-7 days	H
winter	+				N	55-60	50-75	2-6 months	M
Strawberries	+				N	32	95	1 week	I
Sweet potatoes	+				N	55-60	85-90	3-5 months	VH
Sweet corn	+	+	+		E	32	90-95	5-7 days	L
Tomatoes, green	+				N	55-70	85-90	1-3 weeks	H
pink	+				N	50-60	85-90	5-10 days	M
ripe	+				N	40-45	85-90	4-7 days	M
Turnips	+				N	32	95	4-5 weeks	I
Turnip/mustard tops		+	+	+	E	32	90-95	1-2 weeks	I
Watermelons	+				N	45-50	85-90	3-4 weeks	M

¹ Cooling Method: + = cooling method is suitable for the crop.
² Transit Icing: The importance of transit icing depends on time in transit, transit conditions, and outside temperature. N = not recommended, R = recommended, and E = essential.
³ Accurate temperature control is essential; do not allow temp to fall below 32°F
⁴ Sensitivity to Chilling Injury: I = insensitive, L = low sensitivity, M = medium sensitivity, H = high sensitivity, and VH = very high sensitivity.

Vegetable Crop	Recommended Cooling Methods ¹					Important Handling Factors			
	Forced Air or Room Cooling	Hydro-Cooling	Package Ice or Liquid Icing	Vacuum Cooling	Transit Icing ²	Recommended Transit & Storage Temp. °F ³	Recommended Transit & Storage Rel. Humidity, %	Expected Marketable Life Under Best Conditions	Sensitivity to Chilling Injury ⁴
Asparagus		+		+	N	32-36	95	1-2 weeks	L
Basil	+				N	48-50	90-95	4-7 days	H
Beans, lima	+	+			N	38-42	90-95	7-10 days	M
snap	+	+			N	40-45	90-95	7-10 days	M
Beets, bunched		+			R	32		1-2 weeks	I
Broccoli			+		E	32	90-95	1-2 weeks	I
Brussels sprouts	+	+	+	+	R	32	90-95	3-5 weeks	I
Cabbage	+				N	32	90-95	3-6 weeks	I
Cabbage, Chinese	+		+	+	R	32	90-95	4-8 weeks	I
Carrots, Topped	+		+		N	32	90-95	6-7 months	L
Carrots, bunched	+		+		E	32	90-95	1 month	I
Cauliflower	+		+	+	R	32	90-95	2-4 weeks	I
Celery		+			R	32	90-95	2-3 weeks	I
Collards & kale		+	+		R	32	90-95	1-2 weeks	I
Cucumbers	+	+			N	50	90-95	1-2 weeks	H
Eggplant	+				N	50	90-95	1 week	H
Endive & escarole				+	R	32	90-95	2-3 weeks	I
Kohlrabi	+	+	+		R	32	90-95	2-4 weeks	I
Horseradish	+				N	30-32	90-95	1 year	I
Leeks		+	+	+	R	32	90-95	1-3 months	I
Lettuce, crisphead				+	N	32-36	95	2-3 weeks	I
leaf & bibb			+	+	R	32-36	95	1 week	I
romaine				+	R	32-36	95	1-2 weeks	I
Muskmelon, 3/4 slip	+		+		R	36-40	85-90	1-2 weeks	M
full slip	+		+		R	32-36	85-90	4-7 days	M
Okra		+			N	45-50	95	1 week	VH

The preservation of quality in fresh market and storage crops on small and medium-sized farms in the Northeast depends on the rapid reduction of pulp temperature and maintenance of relatively low temperatures to slow metabolic respiration.

There is strong foundational work showing that rapidly reducing the temperature at the start of the cold chain increases product quality when delivered to the consumer. Postharvest handling is critical for fresh produce farmers and the markets they sell to. Effort and expense invested in growing fruits and vegetables can be wasted without good handling practices at and following harvest (Gross 2014). Consumers expect the best from fresh produce. Quality and freshness are ranked with high importance among consumers. Farmers market respondents respectively rank quality (63%) and freshness (59%), as highly important factors in their buying decisions. Nearly 87% of the respondents indicated that availability and quality of fresh produce affected their decision about where to purchase (Gorindasamy 2002).

Precooling involves flowing a controlled, chilled fluid (air or water) over the product to improve heat transfer for removal of field heat to depress respiration and initiate the cold chain.

Precooling

One of the most important postharvest factors influencing quality is temperature. Temperature directly impacts the rate of metabolic respiration and associated decay. Produce which is not cooled quickly degrades in quality (Sargeant 1991). Table grapes, for example, deteriorate more in 1 hour at 90 °F than in one day at 39 °F or one week at 32 °F (Thomson et. al 2008). Lower quality leads to a decrease in sales, inefficient use of storage space, and wasted labor due to the time taken to grow, clean, and store product that doesn't sell. Coolers are a good addition to most farms but fall short of meeting optimal precooling needs. When produce is packed in boxes, stacked on a pallet and directly placed into a cooler, cooling time will be a minimum of 24 hours and may take many days. (Thompson et. al 2008).

GENERAL

Forced Air Cooling on the Farm *continued from page 8*

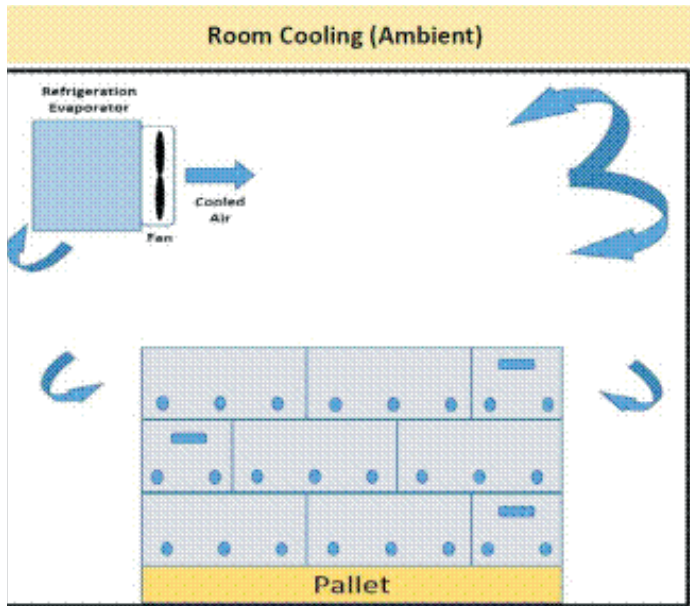


Figure 1. Produce packed in cartons, lugs, or other containers will not cool rapidly even when placed in a cooler. The cold air does not have sufficient velocity or pressure to pass into the center of the pallet or even to the center of a single carton, even when the containers have vented sides. Heat removal from the produce depends on conduction through produce and cartons which is slow. Figure: UVM Extension

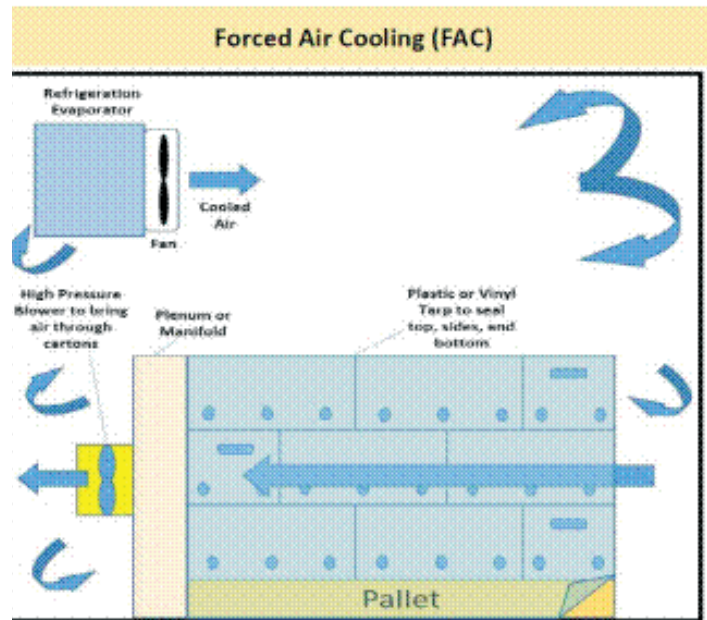
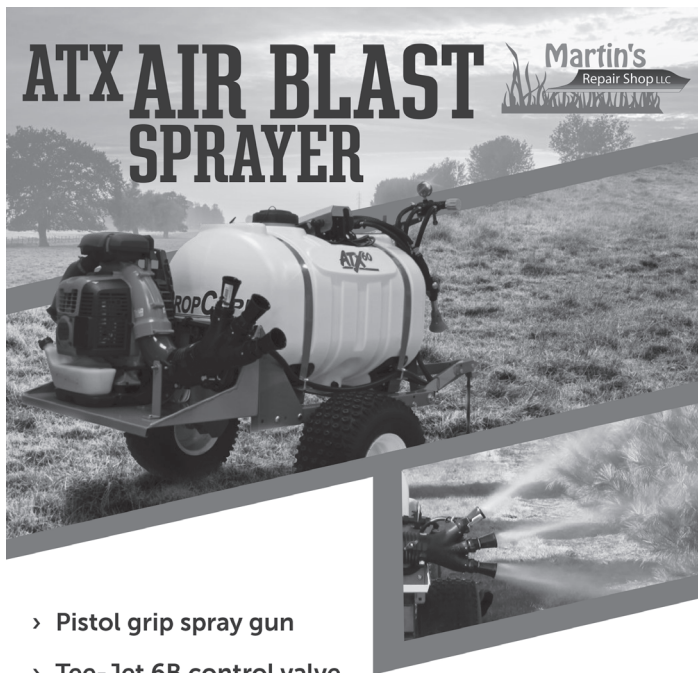


Figure 2. Using a high-pressure blower, cool air can be pulled through cartons of produce to remove field heat and reduce product temperature to storage temperature more quickly. The heat removal rate from the produce is enhanced due to increased convective cooling in addition to conduction. This lowers respiration and leads to improved quality Figure: UVM Extension

continued on page 10



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GENERAL

Forced Air Cooling on the Farm continued from page 8

One method to reduce cooling time is through forced air cooling (FAC). In FAC systems, refrigeration cools a space and blowers are set in position to actively draw the cold air through the produce. The cooling time drops from 24 hours to 10 hours or less when using a static cold room due to the increased air flow (increased convective heat transfer) (Thompson et. al 2008, Boyette 1989).

Attempts have been made at smaller scale pre-coolers to reduce field heat at harvest in absence of coolers (Thompson and Spinoglio 1996). Retrofitting a cargo container with insulation and cooling with a large capacity air conditioner was also explored (Boyette & Rohrbach 1990). This forced-air cold room offered space for many pallets of produce but it still took many hours to reduce the temperature internally, especially for the boxes on pallets in the center of the container. The key is integrating both cooling and air flow effectively (see Figures 1 & 2).

A mobile forced air cold box mounted on a trailer was constructed and demonstrated in Florida (Talbot and Fletcher 1993) aimed at farms growing produce on 5-50 acres. This unit could be self-built. Experiments showed that grapes could be cooled by 15 °F per hour. For denser produce like melons and tomatoes, the cooling times were longer. The construction cost at that time was close to \$5,000.

We have built prototype FAC's for a single, fully or partially loaded pallet (figure 2) and also a 1-3 carton (either bulb crate or 1 1/9th bushel box) "counter-top" model. These precooling systems used simple lumber frames, plywood plenums, axial blowers and polyethylene film plastic to direct cold room air directly over produce to remove field heat. The construction details of these units are provided below.

Floor Pallet Model: go.uvm.edu/palletcooler

Counter Top Model: go.uvm.edu/countertopfac



A countertop forced air cooler for 1-3 cartons of product. Photo credit: UVM Extension



A floor pallet forced air cooler. Photo credit: UVM Extension

Field Trial Results.

Last summer we performed a series of precooling trials using the small-scale forced air coolers described above to cool eggplant, watermelon, strawberries, blueberries, zucchini, and roasting peppers. The forced air cooling was done in parallel with standard room cooling and was shown to result in cooling rates ranging from 1.2 to 2.2 times faster than room cooling. This test demonstrated the feasibility and benefit of simple forced air cooling systems to smaller scale farms.

Methods. As a result of the willingness of partner farms to collaborate in these trials, the following crops were tested: eggplant, watermelon, strawberries, blueberries, zucchini, and roasting peppers.

In each trial, two batches of the crop with roughly equivalent mass were harvested into standard cartons or bins based on the practice of the farm. One batch was cooled using room cooling—allowing the product to cool as it would when simply set in the walk-in cooler or CoolBot room. The other batch was cooled using a forced air cooling system built from one of the two plans referenced above. The batches were cooled in parallel with a target of reaching 7/8 of the optimal storage temperature for each crop ("7/8 temperature").

Product temperature was monitored in each batch using an insertion probe thermocouple and a data acquisition system with a 3 second sampling period. These data were used to fit a cooling rate curve using an exponential decay model and minimizing the error between the model and the actual data. The cooling rate curves were used to estimate 7/8 cooling time for larger, more dense crops or those that did not reach 7/8 temperature during the time allowed for the test.

Results. The table on the next page summarizes the observed cooling rate of each crop comparing room cooling to forced air cooling. The results from each crop are provided in individual PDF files, linked to on the next page.

Conclusion. Forced air cooling was demonstrated using two simple systems designed to be built on farm with readily available materials. The method was applied to six crops and demonstrated a cooling rate 1.2 to 2.2 times faster than room cooling achieved. The use of forced air cooling, directing cool room air over packed product, is a common practice in larger production systems and this trial illustrates its feasibility for smaller scale farms.

Acknowledgments

Thanks to Clear Brook Farm, Adam's Berry Farm, and Jericho Settlers Farm for participation in this trial.

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Mr. Callahan and Mr. Chamberlain are with the Univ. of Vermont Extension and Ms. McKeag is with the Univ. of Massachusetts Extension Vegetable Program. Original work published on the Univ. of Vermont Extension Ag Engineering blog on October 9, 2018 and June 17, 2019. Reprinted from the UMass Extension Vegetable Notes, Vol. 35, No. 13, July 13, 2023.

Leaf Spots of Cucurbits

Susan Scheufele

Foliar diseases of all crops are running rampant at this point in this wet season. There are several diseases that cause leaf spots on cucurbit crops and they can often be hard to tell apart. Of course, a diagnosis from a trained pathologist in the lab is ideal, but we understand it is not always possible to test every spot you may encounter. Below are descriptions and photos of some of the more common fungal and bacterial leaf spots found on cucurbit crops in MA that we hope will help you tease them apart in the field. Management practices for all of these diseases are similar—recommendations can be found at the end of the article.



Angular leaf spot on zucchini. Spots will expand until they are trapped by leaf veins. Photo: S.B. Scheufele

Angular leaf spot can affect all cucurbits, but cucumbers are most commonly affected. It is caused by the bacterium *Pseudomonas syringae* pv. *lachrymans*. This disease is usually among the first of the foliar leaf spots to show up because it's seed-borne. In past years, we have received multiple reports of angular leaf spot on the same variety of cucurbit, all early in the season, indicating that the seed was infested. Bacteria proliferate in warm, moist weather and are spread from plant to plant during the season by splashing rain or runoff, as well as by insects or workers moving through the field. Small, round, water-soaked spots appear on leaf tissue, and expand until they are confined by veins, giving them the characteristic angular look. Under moist conditions, a milky white exudate containing bacterial cells may ooze out of the lesion on the lower leaf surface. The wet-looking spots will dry out and turn yellow-brown or the dead tissue may fall out leaving a "shot-hole" appearance. Yellowing of the leaf between lesions may occur where disease severity is high. Similarly, water-soaked spots may appear on stems and petioles, drying out to form a whitish crust. Spots can also appear on fruit, where they begin as tiny and water-soaked, but dry to form whitish, chalky, spots, rendering the fruit unmarketable. The spots on fruit can also develop into internal fruit decay. Fruit that is infected early may be deformed. Affected plants will grow poorly and produce less fruit. Resistant varieties are available. If you catch angular leaf

spot early, copper may be effective in reducing its spread.

Scab is caused by the fungus *Cladosporium cucumerinum* and can be a significant problem for summer and winter squash, pumpkin, melon, and watermelon. Lesions may occur on leaves, stems, petioles, and fruit, with fruit spots being the most damaging. Leaf spots are small, pale-yellow to white, and similarly to angular leaf spot, the dead tissue in the center of the lesion may fall out leaving a "shot-hole" appearance. Stem or fruit lesions may occur despite the absence of leaf lesions. Lesions on stems are elongate and light-colored, and if numerous may cause the internodes to shorten, giving the plant a deformed appearance. Scab lesions on fruit are sunken, irregular cavities with corky margins, and may produce a golden-brown ooze, which dries into brown beads. Sporulation on lesions may occur, giving them an olive-green, felt-like appearance. This disease usually occurs in mid-summer and is favored by cool, dry days and rainy or dewy nights.



Scab on zucchini. Photo: T.A. Zitter

Scab lesions on stems are elongate and light-colored, and if numerous may cause the internodes to shorten, giving the plant a deformed appearance. Scab lesions on fruit are sunken, irregular cavities with corky margins, and may produce a golden-brown ooze, which dries into brown beads. Sporulation on lesions may occur, giving them an olive-green, felt-like appearance. This disease usually occurs in mid-summer and is favored by cool, dry days and rainy or dewy nights.

Tolerant varieties of cucumber are available. Chlorothalonil, mancozeb, or polyoxin D can be used preventively, at the first sign of disease.



Shot-hole appearance of anthracnose on cucurbit leaves (Photo: R. L. Wick)



Sunken anthracnose lesions on cucumber fruit (Photo: S. B. Scheufele)

continued on page 12

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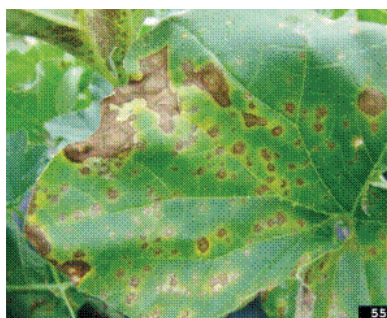
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VEGETABLE PRODUCTION

Leaf Spots of Cucurbits *continued from page 11*

Anthracnose affects mostly melons, watermelons, and cucumbers. Squash and pumpkins are less susceptible. The disease is caused by the fungus *Colletotrichum orbiculare*, which, like other anthracnose fungi, causes characteristic black, sunken lesions on affected fruit. Leaf spots are light-brown or reddish and appear near veins so may cause leaf distortion. These lesions dry out and the dead tissue may fall out, again leaving a “shot-hole” appearance. On stems and petioles, lesions are elongated and tan. Lesions on fruit are large, circular, sunken areas that turn black and may produce a pink ooze under humid or moist conditions. The fungus can be seed-borne and also survives on crop residue or volunteer plants (maybe in your compost or cull pile). Humid, rainy weather is necessary for disease to occur. There are three races of the fungus that affect different crops.

Resistant cucumber and watermelon varieties are available, but there are not resistant cantaloupe varieties.



Alternaria on cantaloupe. Concentric rings make Alternaria leaf spots look like targets. Photo: G. Holmes

Alternaria leaf spot affects all cucurbit crops but is most common on cantaloupe. This disease is caused by the fungus *Alternaria cucumerina*. Like the *Alternaria* species that cause leaf spots in brassicas and early blight in nightshades, *A. cucumerina* causes a characteristic target-like spot. Usually, leaf spots are small and start out as tan flecks that enlarge and merge together. These larger spots (up to a half-inch) may exhibit the concentric rings common of all *Alternaria* fungi. This disease

usually occurs in mid-season and can reduce late-season fruit production. Fruit lesions may also occur as sunken lesions with dark, olive-green, felt-like sporulation present in rings. Spores are spread from plant to plant via splashing rain or overhead irrigation, as well as by insects, workers, and equipment moving through the field.

Septoria leaf spot is less common, occurring in cool summers or late fall. This disease is caused by the fungus *Septoria cucurbitacearum*, which causes small, almost white, round spots on leaves and superficial, raised tan bumps on fruit. Spores are spread from plant to plant via splashing rain or overhead irrigation, as well as by insects, workers, and equipment moving through the field.

Management: The impacts of these bacterial and fungal diseases can all be reduced through field sanitation and use of preventative pesticides, whether conventional or organic.

- Start with quality seed, and/or fungicide treated seed. If saving your own seed, avoid collecting seed from fruit with any defects.
- Resistant or tolerant varieties of many cucurbit crops are available for most of these diseases. Meg McGrath of Cornell University has compiled extensive lists of disease-resistant varieties of vegetable crops at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/disease-resistant-cucurbit-varieties/>.
- Use a 2-year rotation for cucurbit fields. All of these diseases survive on crop residue in the soil, which can persist for up to 2 years.



Septoria leaf spot of cucumber. Photo: R. Wick

- Use drip irrigation to reduce the spread of bacteria and fungal spores by overhead irrigation.
- Don't work in affected fields when foliage is wet, or work in unaffected sections first and infected sections last to avoid spreading disease to unaffected areas.
- Use fungicides or bactericides when you see the first leaf spots to slow the spread of disease. Submit a sample to the [Penn State Plant Disease Clinic] so that you can choose an effective pesticide for the disease you have. Consult the cucumber, muskmelon, and watermelon or pumpkin, squash, and gourds disease sections of the [Mid-Atlantic Commercial Vegetable Recommendations] for pesticide recommendations.
- Till under crop residues promptly after harvest is complete to encourage the quick breakdown of infected tissues.

Ms. Scheufele is with the Univ. of Massachusetts Vegetable Program. From the Vegetable Notes for Vegetable Farmers in Mass., Univ. of Mass. Extension, Vol 35, No. 15, July 27, 2023.



Have Your Farm Picture Featured in a Future PVG News

We try to feature a prominent picture each month of the front page of the Pennsylvania Vegetable Growers News. In the past we have used photos from a PVGA member that we found on their Facebook page or photos a member submitted at our request. We would like to offer the opportunity for any member to submit a photo from their farm or market that they think would be appropriate for the PVG News front page. It could be a scenic view from your farm, a picture of produce displayed at your market, a photo of something unique to your farm or operation or a photo you have used on your Facebook or other social media page.

In addition, we will offer the opportunity to also include a paragraph or so about your farm or family, or an account of something unique that you are doing on your farm. We hope this will add an extra human-interest aspect to the newsletter.

VEGETABLE PRODUCTION

Harlequin Bugs are Especially Bad This Season

Gerald Brust

Harlequin bugs are being seen in especially high numbers this season. They are a pest of many vegetables, but preferentially feed on and damage brassica plants, which includes mustards, crucifers, greens and radish. They also are secondary pests of various fruit and vegetable crops such as beans, cantaloupe, onion, raspberry and even tomato.

Females will lay about 12-barrel shaped eggs in a cluster (Fig. 1). The eggs are easily recognizable by their black and white pattern. Eggs laid now will hatch in 4-5 days. Nymphs feed for a moderately long period of time of 5-8 weeks going through 5 to 6 instars. The whole process from egg to adult can take 45-75 days.

Harlequin bugs suck. They insert their needle-like mouthpart into plant tissue and suck out fluids, which destroys plant tissue and potentially kills plants, particularly young plants. Damage appears as stippling or light-colored cloudy spots in leaves (Fig. 2). Young plants will have larger areas of plant tissue with dead patches, wilting and deformed growth.

Physical removal of eggs, and the bug itself can reduce the pest population without the need for insecticides, although this method works best in smaller operations or organic systems. Harlequin bugs can be controlled chemically by using neonicotinoids or pyrethroids or in organic systems using Spinosad's. Keep in mind that insecticides are more effective against nymphs than adults. Read and follow the label for proper use.



Harlequin bug eggs, nymphs and an adult



Harlequin bug damage to broccoli leaf

Dr. Brust is the IPM Vegetable Specialist at the Univ. of Maryland. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 16, July 14, 2023.

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VEGETABLE PRODUCTION

Weird Problem in Cantaloupe Fruit

Jerry Brust and Karen Rane

There have been some strange happenings in vegetable/fruit fields this season. The latest one is with cantaloupe fruit. The fruit looks good when examining it from the outside, but cutting it open reveals an interior that has a dark, wet appearance in the fruit's wall between the outer rind and the seed cavity (Figure 1). I first thought this was possibly a disease such as charcoal rot or black rot, but Karen Rane could find no disease-causing organisms in the damaged areas of the fruit or anywhere else in the fruit. She then came up with something called glaze or glassy fruit.

Glaze fruit is an abiotic problem that is characterized by the glassy appearance of part of the cantaloupe flesh. This spot then quickly takes on a wet appearance and over time begins to break down becoming soft and watery. This damaged area then gives off an alcoholic fermentation odor. Often times, the outside of the fruit will remain clean, with no symptoms (Figure 2), but inside the fruit the watery rot is spreading. However sometimes a dark, greasy looking spot can become visible on the surface of the fruit at a very advanced stage of decline (Figure 3).

I would like to say that there is a good understanding as to what causes this decline in the fruit, but there is little definitive information out there about it. Among the factors likely to promote the appearance of this condition are, an excessive fruit load, cool weather that quickly turns hot, very dry soil conditions which promote poor root development, a deficiency in calcium and potassium and cultivar sensitivity. Bottom line, the causes are stressful weather conditions that affect some varieties more than others. Fortunately, this malady disappeared from this field after this harvest.



Fig. 1 Dark greasy or wet-looking areas of cantaloupe flesh



Fig. 2 Fruit with damaged flesh, but outside looks good

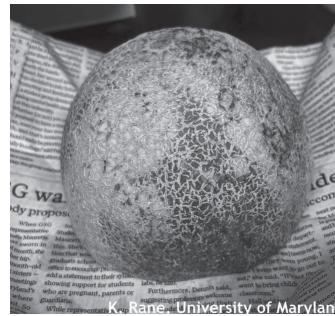


Fig. 3 Fruit with outside surface with dark areas

Dr. Brust is the IPM Vegetable Specialist and Dr. Rane is the Plant Diagnostician at the Univ. of Maryland. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, Issue 18, July 28, 2023.



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Irregular Ripening in Watermelon

Gordon Johnson

Irregular ripening is a common problem that occurs in some watermelon fields each year. This is where varieties planted at the same time do not ripen evenly in a field. Fruits that look mature on the outside are not fully ripe inside, often with significant amounts of white flesh.

Watermelons are classified as non-climacteric, that is, they do not continue to ripen significantly after harvest. Other fruits, particularly those that soften, such as peaches, release ethylene gas during the ripening process and will continue to ripen after harvest. It was once thought that ethylene was not involved in watermelon ripening, however, in 2009, USDA researchers found that watermelons released a burst of ethylene at the white fruit stage. Watermelon fruit development and ripening also is dependent on the accumulation of sugars. Sugars are produced by photosynthesis in the foliage of the watermelon plant and are translocated to the fruit.

So, what is the cause of irregular ripening? One possible explanation is deteriorating vine health. Loss of foliage or stem tissue due to diseases such as gummy stem blight or insect or mite feeding on leaves and stems can reduce the amount of sugars available to translocate into the fruit. In a field, variability in vine health therefore would lead to variability in fruit ripening. Certain viruses can also affect watermelon ripening.

The burst of ethylene that researchers found could also be an issue. In plants where ethylene production is compromised, this could lead to later ripening or incomplete ripening.

Potassium may also be an issue. Potassium is important in fruit ripening and low or variable potassium levels may lead to irregular ripening. In fields with pre-plant potassium applications only, heavy irrigation could leach potassium out of the root zone creating lower than normal levels in the soil and potential deficiencies leading to irregular ripening.



Watermelon that did not fully ripen. Note excess white rind.

Hot weather (temperatures in the 90s) can also lead to fruit disorders. In general, watermelons tolerate high temperatures; however, some varieties are less tolerant of extended hot weather, leading to irregular ripening. Long season varieties often take longer to ripen, even when outwardly they appear to be mature.

Dr. Johnson the retired Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Univ. of Delaware Extension, Vol. 31, Issue 16, July 14, 2023.

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VEGETABLE PRODUCTION

Boron and Molybdenum in Vegetable Crops

Gordon Johnson

Boron has an important role in vegetable plants. It is needed for protein synthesis, development of cell walls, carbohydrate metabolism, sugar translocation, hormone regulation, pollen grain germination and pollen tube growth, fruit set, and seed development. Boron is mobile and readily leached in sandy soils and regular additions are necessary for many vegetables, but only in small amounts.

Molybdenum (Mo) is important for the activity of several enzymes and is involved in nitrogen and sulfur metabolism. It is needed in even smaller quantities than boron and is rarely deficient.

Boron (B) is a micronutrient required in very small amounts and there is a narrow range of safety when applying boron as toxicities can occur if too much is applied.

Vegetables vary considerably in their B requirements.

High B requirement crops include broccoli, cabbage, cauliflower, beets, spinach, turnips, and rutabaga. Apply 3 lbs./a of B for these crops.

Medium B requirement crops include asparagus, carrots, cucumbers, eggplants, leeks, muskmelons, okra, onions, parsnips, radishes, squash, strawberries, sweet corn, tomatoes, and potatoes. Apply 2 lbs/a of B for these crops.

Low B requirement crops include peppers and sweet potatoes. Apply 1 lb./a of B for these crops.

Very low B requirement crops include beans and peas. No additional boron is usually needed for these crops in the current year but can be applied in the crop rotation. Snap beans are very sensitive to high B levels which will cause toxicities.

Boron deficiency symptoms in plants include the death of growing points resulting in a stunted or rosette appearance; leaves with a yellowish or reddish cast, and in members of the cabbage family most boron deficient cole crops develop cracked and corky stems, petioles, and midribs. The stems of broccoli, cabbage and cauliflower can be hollow and are sometimes discolored. Cauliflower curds become brown and leaves may roll and curl, while cabbage heads may be small and yellow. Of all the cole crops, cauliflower is the most sensitive to boron deficiencies.

It is recommended in broccoli and kale to apply 3 pounds of boron (B) per acre in mixed fertilizer prior to planting. In Brussels sprouts, cabbage, collards and cauliflower, boron and molybdenum are recommended. Apply 3 pounds of boron (B) per acre and 0.2 pound of molybdenum (Mo) applied as 0.5 pound sodium molybdate per acre with broadcast fertilizer.

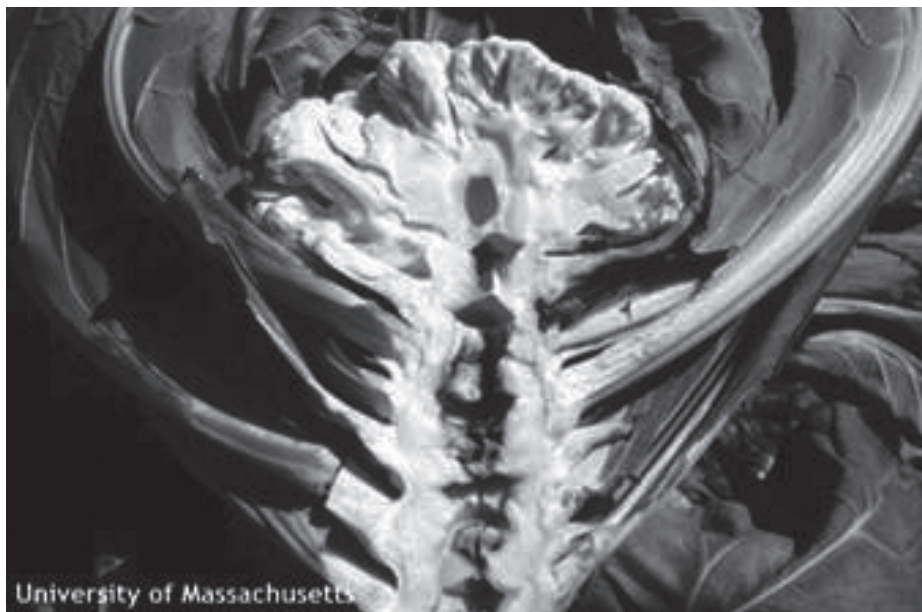
Boron may also be applied as a foliar treatment to cole crops if soil applications were not made. The recommended rate is 0.2-0.3 lb/acre of actual boron (1.0 to 1.5 lbs. of Solubor 20.5%) in sufficient water (30 or more gallons) for coverage. Apply foliar boron prior to heading of cole crops.

Boron toxicity is common in western states where boron levels in soils or irrigation water are high. In the east, we do not have high boron soils or high levels in irrigation water. In addition, boron

leaches readily from soils. Boron toxicities therefore occur only when excess boron is applied in fertilizers. The margin of safety for boron application is small and excess application or improper blending in fertilizers may lead to toxicities – deficiencies show up at 1 ppm and toxicities appear at 5 ppm of available boron in the soil (leaf tissue levels between 20 and 100 ppm are sufficient with tissue levels over 200 ppm being excessive leading to toxicities).

The vegetable crops most sensitive to excess boron are beans, particularly snap beans. Boron is generally not recommended for snap bean production in the current year and boron should never be included in starter fertilizer for snap beans. Boron toxicity often occurs where starter fertilizer containing boron for other crops, such as corn, is applied to snap beans.

Boron toxicity in beans commonly appears as yellowing in unifoliate leaves with burning of leaf edges and yellowing of leaf edges of the older trifoliate leaves that can progress to edge burn. In severe cases, plants will develop a scorched appearance and leaves may prematurely drop off.



Hollow stem in cauliflower due to a boron deficiency.
<https://ag.umass.edu/vegetable/fact-sheets/boron-deficiency>

Dr. Johnson the retired Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 31, No. 14, June 30, 2023.

Whacking Weeds in Wet Weather

Richard Bonanno

In crops that have persisted through this phenomenally wet season, weed control is becoming a big issue, with growers having trouble getting into their fields to cultivate or spray herbicides. When it comes to weed management, excess water is more of a problem than too little water. Here are some thoughts on tackling weeds under all this water.

Herbicides and cultivation: For those using preemergence herbicides, rain or overhead irrigation allows herbicides to be activated where weeds are germinating in the top few inches of soil. However, excess rain can move the herbicide below that zone, reducing control. When weeds emerge after the crop is up, there are a few options left. First, cultivate whenever it is dry and sunny; take advantage of those few days and don't delay. Weeds die better when they are small. Don't cultivate too deeply, as deep cultivation destroys crop roots and brings new weed seeds closer to the soil surface.

Second, check the [Mid-Atlantic Commercial Vegetable Recommendations] for postemergence herbicide options for specific crops. Just about every crop has a postemergence grass herbicide option available. Depending on the crop, these products include Poast (sethoxydim), Fusilade (fluazifop), Select (clethodim), Assure (quizalofop), and for sweet corn only, Accent Q (nicosulfuron). Grass herbicides work best on actively growing grasses BEFORE they flower and make seeds. Depending on the crop, broadleaf weed options may include nonselective herbicides (which work on all plants, including the crop) like Aim (carfentrazone) and Roundup (glyphosate), as well as more selective herbicides (which work on weeds and are safe on crops) like Stinger (clopyralid), Sandea (halosulfuron), and Impact (topramezone), among others. Some herbicides are labeled for use on the crop, while others are only labeled for use between rows. Make sure to read the label carefully before using any product. As with cultivation, small weeds die easier and faster than big weeds, so don't delay if you have a dry window. Herbicides are typically no longer an option after the weeds are taller than 6", and better control is achieved if they are between 1-3". If using an herbicide, always refer to the most recent product label (you can search for product labels here: <https://www.cdms.net/Label-Database>).

Hand weeding is always an option but take care not to drop those weeds back onto the soil where they might take root again after another rainstorm. Of course it's slightly slower, but consider using buckets or a wheel barrow to remove the weeds from the field. Prioritize removing weeds before they go to seed. Flowering galinsoga will produce seed if left in the field even after you pull it, so be careful to remove these from the field. When pulling weeds from the holes on plastic mulch, shake the weeds to remove excess soil and then place the weeds on the plastic where they're much more likely to die.

There are other options for managing weeds at this time of year—mowing and burning! The following is excerpted from the article *When the Time Comes to Hand Pull Weeds*, from the USDA-ARS Integrated Weed Management Resource Center:

Mowing: An option for late-season management is to mow the area of the field that contains a severe infestation. If the weeds have not yet produced seeds,

this should substantially decrease the quantity of dropped seeds. The grower would need to weigh the cost of terminating the crop where the infestation exists, but should keep in mind that preventing this weed infestation now can save a substantial amount of money on weed control next year.

Burning: When faced with a severe mature infestation that has produced seeds, a grower may choose to not only mow the affected section of the field, but also burn the mowed weeds in piles or windrows. Burning this weedy plant matter at sufficiently high temperatures kills the weed seeds. Temperatures of 800-900°F are required to kill most weed seeds. In order to achieve this temperature range, it is important to form the plant matter in windrows or piles and then wait for it to dry, in order to create the density and dryness needed. Windrows may also be formed at harvest-time and then burned – this technique is referred to as "narrow windrow burning." It is becoming widely adopted in Australia, and is being tested by Virginia Tech and the University of Arkansas for use in US cropping systems. [Editor's note: narrow windrow burning has been found to be an effective technique for controlling herbicide-resistant weeds in field crop systems in University of Arkansas trials. This practice has not been trialed in vegetable crops or trialed specifically for controlling weeds during wet seasons. Obviously there may be roadblocks in wet weather with the need for the windrows to dry out before burning, but it's a practice that is not widely used in the Northeast that may have some potential with this unpredictable weather that is the new normal.]

While late-season control measures are labor-intensive, eliminating escaped weeds is an important measure for preventing seed dispersal and new infestations especially in no-till fields. Just a few plants can produce enough to infest an entire field in a couple of seasons. Manual removal this year could save significant money, time, and labor in future years.

*Dr. Bonanno was previously the Univ. of Massachusetts Extension weed specialist. This article was updated by the Univ. of Mass. Extension Vegetable Program for 2023. From the **Vegetable Notes for Vegetable Farmers in Mass.**, Univ. of Mass. Extension, Vol 35, No. 15, July 27, 2023.*

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BERRY PRODUCTION

Plasticulture Strawberry Planting and Fall Growth Considerations

Gordon Johnson

Early to Mid-September is the optimum period for planting strawberries in the plasticulture system on Delmarva. Most strawberry varieties should be planted by the third week in September for the best spring yields.

Strawberry establishment in the plastic bed takes 3-4 weeks. During establishment, the goal is to have plants root as quickly as possible in the soil and start to send out new growth. This requires attention at planting. Most Delmarva growers use plugs. Plant so that the plug is at the level of the soil or is just covered with a small amount (1/8") of soil but avoid getting soil into the crown of the plant. Deep planting will result in reduced stands and weak plants due to rotting in the crown area. Shallow planting (where part of the plug is out of the ground) will result in plugs desiccating and reduced stands. Soil should be firm around the plug and water provided at planting. It is advantageous to overhead irrigate several times, even with water provided by drip lines, to reduce plant shock. It is also hard to wet beds completely with the drip system in sandy soils thus affecting establishment.

Rooting also requires adequate bed soil temperature. Raise high beds, the higher the better to allow for good drainage. Lay plastic making sure there is a firm crowned bed. The goal is to have the plastic tight against the soil to allow for good heat transfer. Loose plastic will have poor heat transfer and can reduce fall growth. Beds with depressions that allow water to accumulate can lead to disease problems in strawberries.

The goal coming out of the establishment period is to have 3 or more fully green leaves on the plant. After establishment, plants will send out new growth and develop branch crowns during October and November. The goal by late fall is to have 2-3 branch crowns form from the mother plant. Crown growth occurs when temperatures are above 50°F. Flower buds are also initiated during this time. Often, growers receive plugs or plants later than September 20. For later plantings, low tunnels offer an opportunity to maintain temperatures above 50°F for a longer period achieving this goal. Early row covers may also be used to achieve this goal, research has shown that early row covers may not increase crown number but can increase flower bud initiation in the fall. While planting too late can reduce spring yields, planting too early risks too many crowns being developed, especially in Chandler, making them smaller and unmarketable. That is why we don't plant in late August on Delmarva.

Plant size in the fall is also critical for high yields the following spring. Plants should be about 8 inches in diameter going into winter. Sugars produced in leaves are translocated into the crowns of the plant where they are converted into starch for winter storage. This starch is then used in the spring at greenup. Inadequate starch storage will also lead to lower yields in the spring. Plants should also go into winter with enough leaves to help insulate the crown.

Runner removal in the fall is also recommended. Avoid removing runners until about three to four weeks following transplant. Complete a follow-up runner removal operation at six weeks following transplant if necessary.

Dr. Johnson is the retired Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Vol. 31, No. 16, July 14, 2023.




Barclay Poling

A branch crown forming off the main strawberry crown.




NC State Extension

Any runners produced after planting should be removed in the fall. Photo credit NC State Extension.




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Boron Toxicity in Strawberries

Gordon Johnson

In my career, I have seen boron (B) toxicity in strawberries several times. This has always been related to over-application of boron containing fertilizers from foliar applications.

Boron has an important role to play in crops. It is needed for protein synthesis, development of cell walls, carbohydrate metabolism, sugar translocation, hormone regulation, pollen grain germination and pollen tube growth, fruit set, and seed development. Boron is mobile and readily leached in sandy soils and regular additions are necessary for many crops, but only in small amounts.

Boron (B) is a micronutrient required in very small amounts and there is a narrow range of safety when applying boron as toxicities can occur if too much is applied. Strawberries are considered a low boron requirement crop and are sensitive to foliar applications.

Boron toxicity is common in western states where boron levels in soils or irrigation water are high. In the east, we do not have high boron soils or high levels in irrigation water. In addition, boron leaches readily from soils. Boron toxicities therefore occur only when excess boron is applied in fertilizers. The margin of safety for boron application is small and excess application or improper blending in fertilizers may lead to toxicities – deficiencies show up at 1 ppm and toxicities appear at 5 ppm of available boron in the soil (leaf tissue levels between 20 and 100 ppm are sufficient with tissue levels over 200 ppm being excessive leading to toxicities).

Symptoms of boron toxicity in strawberries include necrotic spotting on lower leaves, followed by the development dead areas on leaf margins. Under severe conditions, symptoms can spread over the entire leaf and develop across the whole plant. Plant growth can be stunted and plants may collapse and die.

It is difficult to correct toxicity problems in strawberries because damage to the plants cannot be reversed from foliar applications. If excessive soil applications were made, overhead irrigation can leach some of the boron out of the root zone but it is difficult to do in plasticulture to get enough leaching.

Strawberries have a low B requirement. Test soil for B level prior to planting. Typical recommendations, based on if the soil test values indicate less than 1 ppm B, is an application of 1 pound of actual boron per acre prior to planting. Over application of boron can lead to toxicities and foliar applications of B should be avoided.

Dr. Johnson is the retired Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Vol. 31, No. 14, June 30, 2023.



Boron toxicity in strawberries from a foliar fertilizer application. Note dead spots on leaves and necrotic leaf edges.

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