PENNSYLVANIA
VEGETABLE GROWERS

NEWS

September 2022 / Volume 45 Number 9

for the commercial vegetable, potato and berry grower

PVGA Young Grower Award Applications Being Accepted

The "PVGA Young Grower" award was an award established six years ago. Brandon Christner was the first recipient at the 2017 Mid-Atlantic Convention and Peter Salerno III was the recipient at the 2018 Convention. Unfortunately, there were no nominees for 2019 but in 2020 two young growers were recognized: Wesley Nell and Nick Lubecki. Wyatt Schriver won the award for 2021 and Jennifer Glenister received the 2022 award.

The winner is chosen each year by the PVGA Leadership and Recognition Committee. PVGA members are asked to nominate a young grower (someone they know or themselves) who meets the following criteria for the Award:

- is a PVGA Member who is 35 years old or younger;
- is successfully growing vegetables, potatoes or berries; and
- has contributed to advancing or promoting the Pennsylvania vegetable, potato or berry industry.

The prize for the winner will be free registration and lodging for the Mid-Atlantic Fruit and Vegetable Convention. To nominate someone or yourself, send a brief but comprehensive description of the farm operation and the nominee's qualifications to PVGA at pvga@pvga.org or 815 Middle Road, Richfield, PA 17086, by November 30, 2022.

Wyatt Schriver – 2021

Jennifer Glenister - 2022

Brandon Christner - 2017

Peter Salerno III - 2018

Nick Lubecki - 2020

Wes Nell and family - 2020

Needed: Nominations for PVGA Directors

The terms of six members of the PVGA Board of Directors expire at the Annual Meeting scheduled for Wednesday, February 1, 2023. The Directors whose terms expire are:

Rita Resick – Somerset – first elected 2017
Christopher Harner – State College – first elected 2014
Christopher Powell – Strasburg – first elected 2017
John Shenk – Lititz – first elected 2011
Jeffrey Stoltzfus – Atglen – first elected 2011
Joel Weaver – Windber – first elected 2020

All the directors are eligible for re-election. The members will elect five members to the Board and the Board will name a sixth Director. The Board was given the opportunity to appoint one of the Board members each year to provide diversity and potentially certain expertise in the Board makeup that the election process does not always provide.

The election will be conducted by a mail-in ballot that will be mailed to all members with the dues renewal notices in early December. The Leadership and Recognition Committee will be seeking additional nominees to be included on the ballot. Members who want to nominate someone for Director, or who would like to be considered, should contact the PVGA office at 717-694-3596 or pvga@pvga.org or Brian Campbell, who as Past President serves as chair of the Committee, at brian@briancampbellfarms.com.

NEWS

Produce Industry Advocates Issues to Congress

Over 400 representatives of the produce industry from across the country and beyond visited with members of Congress during the last week of September. The visits were part of the International Fresh Produce Association's (IFPA –formerly the United Fresh Produce Association) annual Washington Conference designed to both update industry representatives on the current issues and to present the views of the industry on those key issues to government officials. PVGA Executive Director William Troxell represented PVGA at the event.

The top issue on the agenda was Immigration Reform. While the House passed the Farm Workforce Modernization Act last year, the Senate has not yet addressed the issue although Sen. Michael Bennet (D-CO) and Sen. Mike Crapo (R-ID) are working on drafting a bi-partisan ag workforce bill, they have not to date introduced a bill. Relatively few legislative days remain before the current session of Congress ends this year. The key points that IFPA stressed are the need for a streamlined H-2A-like guestworker program that involves less red tape for growers with the elimination or capping of the Adverse Effect Wage Rate (AEWR) and a pathway for falsely documented agriculture workers with otherwise clean records already in the US to earn legal status to continue as agricultural workers in the US. While opponents of immigration reform often stress the need to first secure the border, it was pointed out that establishing a workable guestworker program that allows workers to legally come to the U.S. to work in agriculture and periodically return home would reduce the incentive for them to attempt to gain entry illegally.

The second issue industry visitors to Congress addressed was the importance of maintaining the specialty crop provisions in the Farm Bill when it is re-authorized next year. The Farm Bill represents the largest investment of federal resources with approximately $800 million allocated annually to programs that help the competitiveness of the U.S. fruit and vegetable industry in the global marketplace. Key programs for specialty crops include market access programs, nutrition priorities, organics, targeted research, addressing pest and disease challenges (the Specialty Crop Research Initiative or SCRI), state and local market development grants (like the Specialty Crop Block Grants or SCBG), and urban agriculture.

The last day of the Washington Conference coincided with the opening of the White House Conference on Food, Nutrition, Hunger and Health – the first such White House conference to address these issues in 52 years. Given that 9 out of 10 Americans do not meet the 2020-2025 Dietary Guidelines for Americans fruit and vegetable consumption recommendations and that 74% of adults in America are overweight or obese, IFPA was encouraged that the White House Conference was supporting six of the eight IFPA federal policy recommendations to help increase access and consumption of fruits and vegetables by 2030. Among them was support for the movement to encourage medical professionals to "prescribe" consumption of additional fruits and vegetable to their patients who would benefit from such dietary modifications.

Finally, IFPA urged members of Congress to encourage the Food and Drug Administration to elevate, consolidate and streamline its food regulatory responsibilities by appointing a Deputy Commissioner for Foods. Currently, the FDA's food regulatory activities are carried out by different parts of the agency that historically have not always coordinated their policies and actions.

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*The **Pennsylvania Vegetable Growers News** is the official monthly publication of the*
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815 Middle Road, Richfield, PA 17086-9205
Phone and fax: 717-694-3596 • Email: pvga@pvga.org • Website: www.pvga.org

Our Mission:

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

Our Vision:

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

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

NEWS

Three PVGA Nominees Receive 40 Under 40 Awards

The Fruit + Vegetable 40 Under 40 Awards honor 40 outstanding individuals making their marks in the industry. Three persons nominated by PVGA were selected for this year's class of honorees - Jennifer Glenister, owner of New Morning Farm; Kaitlyn Horst, co-owner of Re-Devined and Marcus Nolt, president of Nolt's Produce Supplies.

These 40 young professionals represent the best in the industry. The Fruit + Vegetable 40 Under 40 Class of 2022 will be honored at the Great Lakes Fruit, Vegetable & Farm Market EXPO, and recognized in the October 2022 issues of Fruit Growers News and Vegetable Growers News. PVGA will recognize the three Pennsylvania honorees at the Mid-Atlantic Fruit and Vegetable Convention in Hershey.

The 40 Under 40 recognition program is sponsored by: Corteva Agriscience, Stokes Seeds, FMC Corporation, BioWorks, and AgBiome Innovations. See details about the three Pennsylvania honorees below:

Jennifer Glenister

Organic Vegetable Grower, New Morning Farm

Jennifer Glenister started out as an apprentice and worked her way up to owning New Morning Farm in Pennsylvania. She has worked over twelve years as an organic vegetable grower. Jennifer has been active in both the Pennsylvania Vegetable Growers Association (PVGA) and Pasa Sustainable Agriculture, has served at the Farm Show booth, and is on the PVGA Convention Program Planning committee. In 2022, she received PVGA's Young Grower Award.

Kaitlin Horst

Co-Owner, Re-DiVined

Kaitlin (Dye) Horst started Re-DiVined, a vegetable grafting business in 2011. It serves produce farmers across the US, focusing on healthy plants and relationships. Kaitlin is inspired in her work by God's heart to restore all of creation from disease and corruption. She is now married to Mike Horst with 3 children: Elena, Judah, and Peter. Together, they own the first farm in either of their families and grow produce along with the grafted plants.

Marcus Nolt

President, Nolt's Produce Supplies LLC

Marcus and a few employees took over the Nolt's Produce Supplies business in 2018 and divided it into two businesses. Nolt's provides vegetable growing supplies in the horticulture industry in the mid-Atlantic region. Marcus handles the purchasing, advertising, accounts payable and other management aspects. He and his team have a passion for the success of their customers. They constantly look for new equipment to make their small, diversified growers more successful and profitable.

NEWS

Federal News Briefs

USDA Announces $500 Million Fertilizer Product Expansion Program

On September 27, USDA Secretary Vilsack announced the Fertilizer Product Expansion Program (FPEP), which is the department's new $500 million grant program. The goal is to help eligible applicants increase or expand the production of nutrient management products and technologies in the U.S. The FPEP is intended to drive competition and help lower input costs for U.S. farmers by providing an incentive to increase the manufacturing and processing of fertilizer domestically. As a result of lower input costs for farmers, the U.S. consumer should also see relief at the grocery store. The maximum award amount is $100 million, and the minimum award amount is $1 million. Shortly, USDA will begin accepting applications for FPEP.

*From Penna. Farm Bureau **Federal Affairs Update**, September 2022.*

Efforts on the SEC Climate-Related Disclosures Rule

In June, Representative "GT" Thompson (PA-15) introduced H.R.8069, the Reducing Farm Input Costs and Barriers to Domestic Production Act. In September, Representative Frank Lucas (OK-3) introduced Protect Farmers from the SEC Act (no bill number yet). H.R.8069 would eliminate the SEC's proposed climate-related disclosure rule in its entirety. The Protect Farmers from the SEC Act would prohibit the SEC from requiring agricultural producers from reporting Scope 3 greenhouse gas emissions. AFBF supports both bills. While we do oppose the rule in its entirety, we also recognize the need to compromise for the sake of agriculture. If congressional members do not agree with eliminating the rule all together, our hope is that they will understand the importance in at least creating an exemption for agricultural producers.

Additionally, on September 15, the Senate Banking Committee had an oversight hearing of the SEC with Chairman Gensler. This was the same week as our Fall 2022 Federal Affairs Trip. On September 13, PFB members met with Senator Toomey's staff and one of the key takeaways was the compliance, privacy, liability, and small business concerns with the SEC's climate-related disclosure rule. Furthermore, the rule could have a potential overreach of Congress. In Ranking Member Toomey's opening remarks at the hearing, he questioned Chairman Gensler on the relevancy of the proposed rule to the SEC's mission. Chairman Gensler's response was that the intent of the rule was never to hurt the agriculture community.

*From Penna. Farm Bureau **Federal Affairs Update**, September 2022.*

EPA's Proposes Rulemaking for PHAS

On August 26th, the EPA announced a proposed rule to designate PFOA and PFOS as a "hazardous substance" under the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA), also known as the "Superfund" law. PFOA and PFOS are the most commonly used chemicals in the PFAS family. This is a first of a series of regulations that EPA is going to propose regarding PFAS. PFAS is a "forever" chemical that is found in everyday items—water repellent outdoor apparel, nonstick cookware, household items, food packaging, stain-resistant furniture, and firefighting foam. PFAS has been places that use biosolids for decades, unbeknownst to us. EPA's concern is its penetration into surface and groundwater.

AFBF is concerned that if there is a farm field that has PFAS contamination, this rule would label the land as a superfund site. We expect this rulemaking to significantly impact land values. AFBF policy on the matter states that farmers should not be held liable for PFAS on their land. AFBF plans to comment on the rulemaking but also will be requesting an extension be made due to the current deadline being November 7th. AFBF President Zippy Duvall had a conversation with Administrator Regan and he assured President Duvall that the intent of the rule is to go after the chemical companies, not farmers. However, the intent only goes so far.

An example of how PFAS has impacted the agriculture industry already is the New Mexico dairy that was devastated by a PFAS contamination from Cannon Air Force Base. A New Mexico dairyman is struggling to maintain a livelihood after PFAS was found on his farm, and is now unable to sell the milk, beef, cows, or crops. Cannon Air Force Base knew the base was polluted but failed to mention it.

*From Penna. Farm Bureau **Federal Affairs Update**, September 2022.*

State News Briefs

PDA Announces Opening of 2022 PA Farm Bill Farm-to-School Grant Applications

Pennsylvania Agriculture Secretary Russell Redding invited schools and childhood education centers to apply for $500,000 in PA Farm Bill Farm-to-School Grants on Tuesday.

Up to $15,000 per school is available for projects aimed at improving access to healthy, local foods and increasing hands-on learning experiences for children in pre-kindergarten through eighth grade.

The Pennsylvania Farm Bill Farm-to-School Grant Program enriches the connection between families and local producers of fresh, healthy food by changing food purchasing habits in schools. In doing so, the program increases access to markets for local farms, and exposes children early to agriculture, agriculture careers, and healthy food choices.

Any school district, school, charter school, private school, or center with prekindergarten, kindergarten, elementary, or middle school classes through eighth grade that participates in a Federal Child Nutrition Program is eligible to apply.

Projects identify local farmers to supply fresh, in-season products to support educational programming, or cultivated their own school gardens. In addition to improving student access to local, nutritious foods, funded projects provide hands-on agriculture education experiences.

Grant applications must be submitted online through the PA Department of Community and Economic Development Electronic Single Application. Applications are due by 5:00 PM on October 14, 2022.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, September 2022.*

Grants Available to Pennsylvania Farmer Veterans Through PA Farm Bill

Governor Tom Wolf announced that Pennsylvania's farmer-veterans have the opportunity to apply for grants of up to $10,000 to meet their agricultural business needs.

"This grant program is designed to recognize the great commitment of Pennsylvania's farmer-veterans: to love and defend their country and also to serve humanity by growing the food that we all need to survive," said Gov. Wolf. "When I created the Pennsylvania Farm Bill we included funding dedicated to this group of Pennsylvanians. It's a 'thank you' for their service and a commitment to better serving their needs as they serve ours."

Through Gov. Wolf's PA Farm Bill, the Department of Agricul-

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GENERAL

Farm Aid's Hotline is Hearing from More Farmers – Here's What They're Calling About

Resources for Farmers: Our Farmer Resource Network (https://www.farmaid.org/our-work/resources-for-farmers/) contains services and opportunities that can help your farm thrive. Those of us working on the Farm Aid Hotline have experienced a major increase in call and email volume recently. Like most of us in the United States, farmers have been hit hard by inflation for the cost of essential goods and services. Skyrocketing input costs greatly increase risk for our farmers who are also facing climate extremes of every kind. Many areas of the country have had record flooding while others are in a multiyear drought that seems to have no end in sight. Farmers are both tough and independent, but many are nearing their breaking point, accounting for the upsurge in our call volume.

Throughout the month of August, Hotline Operator Molly Carey noticed similar trends in her hotline cases. Molly spoke to multiple farmers in Texas, California, Oklahoma and Nebraska struggling with drought and water management. Many of these farmers and ranchers have gone through extensive periods without rainfall, are lacking adequate irrigation infrastructure for crops and livestock forage, and are struggling to keep their animals fed. Molly also spoke to several farmers in Wisconsin, Oklahoma and Washington struggling due to the effect inflation has had on farm inputs and operating costs. These farmers are struggling to be able to afford typical farming expenses such as feed, seed, fertilizer and fuel due to inflated prices. Despite these increasingly prevalent issues, the overwhelming majority of Molly's hotline cases in August were from beginning and future farmers seeking start-up funding and land access resources in order to establish their farm businesses. Molly finds it encouraging to hear the enthusiasm these farmers have about bringing their farming visions to reality in order to feed their communities.

Hotline operator Rachel Van Boven says the increase in calls from farmers is essentially boiling down to inflation and high input costs, and weather-related stresses. As far as weather-related stress, Rachel has heard from a lot of farmers impacted by the drought in the West, and other extreme weather events around the country. Rachel says, "The drought has been going on for a very long time, and folks have been using up their reserves until now, a couple years down the road, they will be out. Some of it is still related to Covid as well. Folks are hanging on to get through it, but it's now 2.5 years on, and things are starting to really fray. There are some massive crises going on, that have been ongoing, and it feels like it's taking its toll on even the most resilient folks. While these crises impact almost every farmer, it seems like it has had the greatest impact on "beginning farmers," folks who have been farming for less than 10 years. It takes a while to establish a farm business, and the first few years are precarious. However, still surprisingly, many of our calls are also from folks looking to get into farming!"

"It's helpful just to have someone listen and understand our needs, thanks for being there to take my call and offer resource options."

All farmers have a kinship, and they know they are one extreme weather event from disaster, such as the recent floods in 9 Eastern Kentucky. However, not every call is from a farmer in distress. It's more than a little encouraging when we hear from farmers who call the hotline wanting to help other farmers. Sometimes all we can do is just encourage farmers and let them know they are not alone and connect them to farmers who want to help their fellow farmers. The Hotline team tries our best to point farmers to both private and government sources of assistance wherever it can be found. As one recent caller told us, "It's helpful just to have

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State News Briefs

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ture has awarded $200,000 to two veterans' service organizations which will offer the farmer-veteran grants. Grants of up to $10,000 will be awarded for various agricultural business needs ranging from food safety and biosecurity planning, to equipment, marketing, or working capital.

"Pennsylvania's veterans spent their military career protecting and serving others. When returning to civilian life, they bring critical skillsets and a commitment to service with them," said Agriculture Secretary Russell Redding. "We have worked hard to ensure that everyone who wants to be a part of agriculture has the opportunity to contribute without barriers. These grants are a down payment on the success of farmer-veterans in the industry, for the success of Pennsylvania."

Military veterans in Pennsylvania continue to join the agricultural community in a variety of ways. According to the U.S. Department of Agriculture's Census of Agriculture, Pennsylvania is home to more than 7,000 military veterans identified as agricultural producers. This program aims to support their success in Pennsylvania's $132.5 billion agriculture industry.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, September 2022.*

CREP Program Opportunity Available for PA Farmers

Most Pennsylvania farmers have at least a few acres that are hard to farm: Too steep, too rocky, too shady, etc. And if that land is prone to flood, you risk losing all your work — and your profit — on those lands in any given year.

If you are working twice as hard to earn half as much on some of your land, then maybe it's time to investigate the Conservation Reserve Enhancement Program (CREP). In a nutshell, the Conservation Reserve Enhancement Program (CREP) pays farmers to retire and restore land that erodes easily or floods often. CREP is 100% voluntary for farmers. CREP is administered by the U.S. Department of Agriculture Farm Services Agency, and many Conservation Districts in Pennsylvania can help farmers get enrolled.

CREP helps landowners with projects like these in two ways. First, the CREP program reimburses much or all of landowners' costs to restore the land. Then, CREP pays a guaranteed annual rent for up to 15 years. This can allow a farmer to focus their efforts on their own best land. Many farmers use their rental payments to help lease more productive land to make up for the acres taken out of production.

If projects like these pique your interest, check out www.CREPPA.org. This website provides a user-friendly introduction to the program, with case studies, payment scenarios, and other information that can help you decide if CREP is a good fit for your farm. And you can schedule a consultation with a nearby CREP planner in just a few clicks.

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*From Penna. Farm Bureau **Federal Affairs Update**, September 2022.*

GENERAL

Mental Health Resources Available

Research has found that many farmers are experiencing new stress and mental health concerns as a result of the COVID-19 pandemic, the farm economy and other pressures.

If you or someone you know is struggling or has concerns about their mental health, please know that you are not alone and there is help available.

There are unique factors that affect stress in the farming community as well as unique warning signs that someone is struggling. Those include:

Change in routines or social activities
Decline in the care of domestic animals
Increase in illness or other chronic conditions
Increase in farm accidents
Decline in appearance of the farm
Decreased interest in activities or events
Signs of stress in children including struggles with school

Help and Resources Available:

National Suicide Prevention Lifeline: Call 1-800-273-TALK (8255) or use the online chat at suicidepreventionlifeline.org/chat 24/7 for free and confidential support and to be connected with a skilled, trained counselor in your area.

Crisis Text Line: Text HOME to 741741 for 24/7 support via text.

PA 211 is a United Way statewide partner which offers trained resource navigators who can tell farmers what services may be available in their area to help with a variety of health and human service needs, from utility or food assistance to mental health support. Visit www.pa211.org, dial 211 from any landline or cell phone, or text your zip code to 898-211.

Avera Health Farm and Rural Stress Hotline: Call 800-691-4336 to be connect with a skilled, compassionate mental health professional.

Substance Abuse and Mental Health Services Administration: Call 1-800-662-HELP (4357) for treatment locators, SAMH SA's National Helpline, a Disaster Distress Helpline and other important information.

Find additional resources, learn tips for starting important conversations about mental health, and register for free rural resilience training by visiting farmstateofmind.org.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, September 2022*

Farm Aid's Hotline is Hearing from More Farmers

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someone listen and understand our needs, thanks for being there to take my call and offer resource options."

Farmers in difficult financial circumstances are a large percentage of our calls and emails but more than half of our contacts are from beginning and future farmers. Some are military veterans motivated to make the farm both a profitable business and a form of personal therapy. We find that those coming from the military are dedicated to a mission whether it's protecting our country or starting a small farm. They are task-oriented and are very familiar with stressful conditions. Another hopeful trend is the number of young people who are not from a farming background but want to start a new farm. It is our privilege to try and help farmers and future farmers like these on a daily basis.

We all know that farming is a challenging occupation in the best of times, but the double whammy of extreme weather events and high input costs are particularly difficult coming immediately after a worldwide pandemic that impacted farmers just as much, if not more than, the rest of the economy. Farm stress is extremely high and sometimes farmers need help dealing with that stress. This is another significant subset of callers we hear from. It's not a stretch to say most of our calls from experienced farmers have stress related issues as an underlying, if not front and center, concern. We can be a listening ear but often farmers need more help than we can provide, and we try to connect them with mental health experts who understand farm related stressors. Thankfully we have more resources to which to refer farmers than ever before so they can get the help they need.

Despite the difficulty of both established farms and those trying to get started, the mission of Farm Aid to "keep family farmers on the land" remains unchanged. As our founder Willie Nelson said, "After more than 30 years, we are still here, you're still here, and together we're still fighting for the farmers. The fight ain't over yet but we're gaining on those suckers, so stay with us." The Hotline Team is proud to be a part of this fight.

If you are a farmer, Farm Aid is here for you. We have more than 35 years of experience working with farmers – whether you're looking to expand your farm or you're in need of emergency resources. When you contact Farm Aid, our goal is to connect you with helpful services, resources and opportunities specific to your individual needs. Our Farmer Resource Network (https://farmerresourcenetwork.force.com/FRN/s/

GENERAL

Pesticide Calculations for Small Acreages

Ric Bessin

Most agricultural pesticide labels list use rates on a per acre basis, but this can pose an issue for many producers of specialty crops. Often only a small fraction of an acre needs to be treated and it is important to apply these pesticides at the correct dose. Over-application is illegal as it may result in excessive residues on the harvested produce and injury to plants; it would also be a waste of money. Under application can result in ineffective control, foster the development of resistance, and also be a waste of money. So, determining the correct amount for the proper dosage is required. While there are many different methods to do this, this article outlines the simple process I use to determine amounts of products needed for small acreages.

1. Select the rate per acre

While this sounds simple and straight forward, select the rate listed on the label for the crop to be treated; many labels list a range of rates allowing the user to select a rate within the range. Generally, the low rate is used for small plants and light insect or disease pressure. As the plants get larger or insect and disease pressure increases, higher rates within the range should be selected. However, do not apply more than what is listed on the pesticide labelling.

2. Determine the area to be treated

The simplest method is to measure the width and length of the area to be treated and multiply those two numbers together. For example, if the area to be treated is 24 feet by 150 feet, then the area would be 3,600 square feet (24 x 150 = 3,600). There are 43,560 square feet in an acre, so in this example, the acreage to be treated would be 3,600 divided by 43,560, or 0.0826 acre (3,600 / 43,560 = 0.0826).

Figure 1. *Mapping program, like Google Maps, can be used to determine the area of irregular-shaped fields.*

While this method works well for rectangular fields, it can be difficult to determine the area of some irregular-shaped fields. Online mapping programs, like Google Maps, can calculate the area of irregularly shaped objects. Bring up the field with the mapping program and right click on the edge of the area to be treated and select 'measure distance.' Add more points around the perimeter by right clicking on those points until the object is encircled. The area of the object will be provided in square feet. Convert square feet to acres by dividing the number by 43,560 square feet.

3. Determine the amount of product needed for the area to be treated

Take the rate per acre you selected in #1 and multiply that by the acreage you calculated in #2. For example, you want to apply 5.2 fluid ounces per acre and the area to be treated is 0.0826 acres, then the amount of product needed would be 0.43 fluid ounces (5.2 x 0.0826 = 0.43). You would need to put the 0.43 fluid ounces in the correct amount of water and apply it evenly to the area to be treated. But it can be difficult to measure 0.43 fluid ounces, so I would convert this to milliliters (ml) so I can use a plastic syringe for accuracy. There are 29.6 ml in a fluid ounce, so in our example, you would multiply 0.43 by 29.6 to get 12.7 ml. This is the amount of pesticide needed to treat the field and this can be measured easily and accurately with a syringe.

Another way to measure small amounts of fluids is to use teaspoons or tablespoons. A teaspoon is approximately 5 ml and a tablespoon is 15 ml. So, 12.7 ml would be about 2 1/2 teaspoons. But keep in mind that these spoons must to be dedicated to only measure pesticides and not used for other purposes.

4. Determine the amount of water needed

The method I use is to completely fill the sprayer I plan to use with plain water, and then spray a known area. Then, I measure the amount of water needed to refill the sprayer. For example, I measure out an area 3 feet wide by 100 feet in length (300 square feet). I fill my sprayer and apply water to that area in the same way I plan to apply the pesticide (same speed, pressure, nozzles, etc.). Suppose it took a quart of water to refill the sprayer. To determine the water per acre, take the water needed and multiply by 43,560, and then divide by the area we treated. So, in this example, 1 quart x 43,560 / 300. The result is 145.2 quarts per acre which equals 36.3 gallons per acre. Multiply this by the area to be treated from #2 to determine the amount of water you need to mix with the pesticide. Here we would need 0.0826 acres x 36.3 gallons. The total amount of water needed would be 3 gallons of water (0.0826 x 36.3 = 3.0).

So to apply the pesticide in this example, put 12.7 ml in 3 gallons of water to treat an area 24 by 150 feet in size.

The same process can be used with dry pesticides, but the conversion from ounces to grams would be 1 ounce equals 28.35 grams.

Dr. Bessin is with the Department of Entomology at the Univ. of Kentucky. From the Kentucky Pest News, Univ. of Kentucky, https://kentuckypestnews.wordpress.com/2022/08/30/pesticide-calculations-for-small-acreages/ August 30, 2022

What's That on My Cucurbit?

Ashley Leach

As noted by Sally Miller last week, bacterial wilt and yellow vine decline are being found in cucurbit fields across the state. There are two primary insects responsible for these outbreaks, the Striped cucumber beetle (*Acalymma vittatum*) and squash bug (*Anasa tristis*). I was just scouting some of my pumpkins this past week and counted 20 beetles in one flower! But sometimes looks can be deceiving as we can encounter as many as 4 different types of beetles in our cucurbit fields. It's important to know what's in your cucurbit since it could be the difference between making an insecticide application (or not). Below, I have included an image of different beetle species you may encounter in your cucurbit fields. As a reminder, we generally want to make an insecticide application when the striped cucumber beetle density exceeds 1 beetle/plant in a field. If you want information about specific products, check out my former post here.

Squash bugs are arguably easier to scout for since there aren't many other insects that resemble them. However, we need to keep track of different squash bug life stages (shown below). Squash bug eggs are fairly diagnostic with a bright amber coloring. They are typically found along the midribs on the undersides of leaves. Those egg masses eventually give rise to nymphs which are powdery blue. Adults have a flattened appearance and are typically brown with alternating white and orange spots along their abdomen. Insecticide applications are warranted when squash bugs exceed a cumulative threshold of 1 egg mass, nymph or adult bug/ plant in a field.

*From the **VegNet Newsletter**, The Ohio State University, August 6, 2022.*

Highest Risk

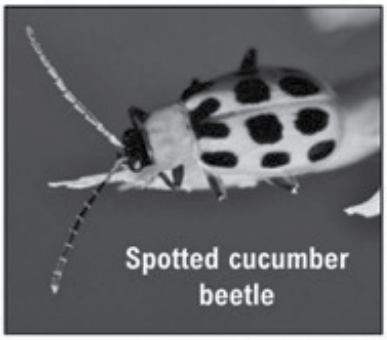
Striped cucumber beetles

Striped cucumber beetles are strongly correlated to outbreaks of bacterial wilt. Unlike western corn rootworm (pictured below), the *black bands will be clean, solid lines and continue to the bottom of the abdomen.*

Moderate Risk

Spotted cucumber beetles

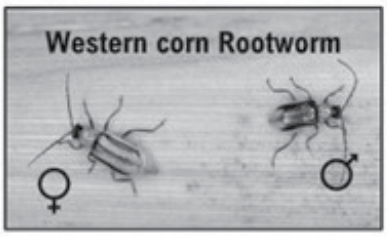
Spotted cucumber beetles have also been implicated in the transmission and spread of bacterial wilt, however less than the striped cucumber beetle. Spotted cucumber beetles can be distinguished from corn rootworms and striped cucumber beetles because they are -you guessed it- *spotted*.



Lowest Risk

Western and Northern Corn Rootworms

Other corn rootworm species, including the **Western and Northern corn rootworms** appear to be capable vectors of bacterial wilt, however, outbreaks have not been associated with either species. These beetles are often found in cucurbit flowers in large numbers (especially the Western corn rootworm). Northern corn rootworms are easily differentiated from other cucumber beetles by a *solid lime green body*. Western corn rootworms are the trickiest to identify since they look a little like a striped cucumber that's had a bad day. Western corn rootworms will have dark lines or blotches on their abdomen, but it will not stretch to the bottom (as we see in Striped cucumber beetles). *Females have three black lines on their abdomen, but the lines will not be crisp, nor will they extend to the bottom of the abdomen. Male western corn rootworms, in contrast, have blotchy black patterns on their abdomen.*



VEGETABLE PRODUCTION

Is Downy Mildew Taking a Bite of Your Lettuce Crop?

Leah Fronk

During the main growing season, it is common for growers to monitor and treat for downy mildew on cucurbit crops.

Lettuce downy mildew cause by Bremia lactucae. Photo: Gerald J. Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

However, when growing lettuce in a protected setting during the colder months, downy mildew can affect the yield and quality of lettuce.

Lettuce downy mildew (DM), *Bremia lactucae*, is favored in cool, moist environments, often found in low tunnels or greenhouses in late fall and winter. Lettuce downy mildew is caused by a fungal-type organism, an oomycete, that enjoys damp, wet conditions. Growers may notice white fuzzy sporulation on the underside of the leaves, which could be easily mistaken for powdery mildew. Primary symptoms of lettuce downy mildew include leaf yellowing in angular patches. Yellow patches observed on the upper leaf surface may correlate with white sporulation on the lower leaf surface, as shown in the photo. The yellow patches turn brown and papery as the disease progresses, and the leaf tissue dies. Discoloration of red leaf lettuce may appear more gray than yellow. Older, mature leaves are usually the first to show symptoms of DM. Damaged leaf tissue may allow for the entry of secondary pathogens, reducing yield and making lettuce quality worse.

Cucurbit downy mildew is caused by a different causal agent than lettuce downy mildew. Spinach is affected by yet another downy mildew organism. When growers observe lettuce downy mildew in protected cultures, they should not blame the occurrence of cucurbit downy mildew debris in fields. Downy mildew can be persistent in overwintering spores or blown in from other regions. The role of seed contamination associated with downy mildew is not certain.

As with many plant diseases, prevention is the best strategy. Use the heater and vents in the greenhouse to remove moist air. Employ irrigation practices that reduce leaf wetness. Fungicides are available that are oomycete-specific. A few conventional products available for greenhouse use include Tanos, Ranman*, Curzate, Aliette, Fontelis, and Sonata. Some fungicide products can be tank-mixed with copper to increase protection (*Do not tank-mix Ranman with copper-based fungicides, or plant injury may be observed).

Rotate modes of action so that the pathogen does not become resistant to the fungicides you are using. Organic options include Stargus, Cease, Actinovate, and copper. As with the application of any product, conventional or organic, please read the label to ensure you are using it properly.

Lettuce downy mildew tends to develop new races, so proper pathogen diagnosis is essential. Careful selection of resistant or tolerant plant varieties may help to ease disease pressure. The Penn State Plant Disease Clinic is open year-round to accept plant samples for diagnosis. Visit their website for instructions or contact your Extension Educator for assistance. our privacy policy.

Ms. Fronk is with Penn State Extension in Juniata Co. From Penn State Extension, https://extension.psu.edu/is-downy-mildew-taking-a-bite-of-your-lettuce-crop?, January 26, 2022.

Composite photo showing both sides of the same leaf. Photo: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org.

Large Crabgrass Life Cycle Disruptions for Effective Control in Specialty Crops

Meredith Melendez and Thierry Besancon

Large crabgrass (*Digitaria sanguinalis*) is an annual weed found across New Jersey. It is commonly found on roadsides, fallow land, and in farm production areas. Large crabgrass can form robust root systems thanks to its numerous tillers and capacity to root at nodes, allowing it to out-compete crops for moisture and nutrients. Understanding the life cycle and biology of large crabgrass is key to figuring out the best options for its control on your farm.

Plant Description and Growth Habit

Large crabgrass reproduces through seeds. These seeds can survive in the soil for up to three years, depending on their depth from the soil surface. Plants emerge from the soil in late spring and early summer, once the soil temperature exceeds 50–58°F. In New Jersey, seedling emergence currently starts in late April and peaks in May before rapidly declining during the summer. Roots form at the nodes found on tillers of established plants, allowing for multiple plants to be formed from one plant when these rooted nodes are separated from the main plant. Flowers will set seed when the length of the day begins to shorten through the first hard frost. Plant density impacts seed production, which can range between 100 to 145,000 seeds produced per plant. Large crabgrass is frost-sensitive, grows best at high temperatures, and can withstand drought conditions. Roots can penetrate up to 6' deep in loam soils. Large crabgrass tends to be more prevalent and therefore a bigger issue in perennial cropping systems, such as tree fruit and blueberries, and in no-till fields when compared to annual cropping systems where there is regular cultivation. Large crabgrass tolerates a wide range of soil conditions, but grows especially well in well-drained soils, and responds positively to improved soil fertility. Characteristics of large crabgrass include:

- Appears in spring through early summer
- Sprawls across the soil with tillers producing roots at each node
- Seedlings grow upright and will produce tillers after forming 4 or 5 true leaves
- Stiff hairs are present on both the upper and lower leaf blade surface
- Collars are broad with hairs along the edges
- Mature stems will flatten and become red at their base
- Mature leaf blades can be up to 8" long
- Grows best in hot weather and full sun
- Tarping can create an environment that promotes large crabgrass growth

Fig. 1: Large crabgrass plant.

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VEGETABLE PRODUCTION

Large Crabgrass Life Cycle Disruptions

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Fig. 2: Large crabgrass. Photo credit: Thierry Besancon.

Fig. 3: Seedling with two leaves.

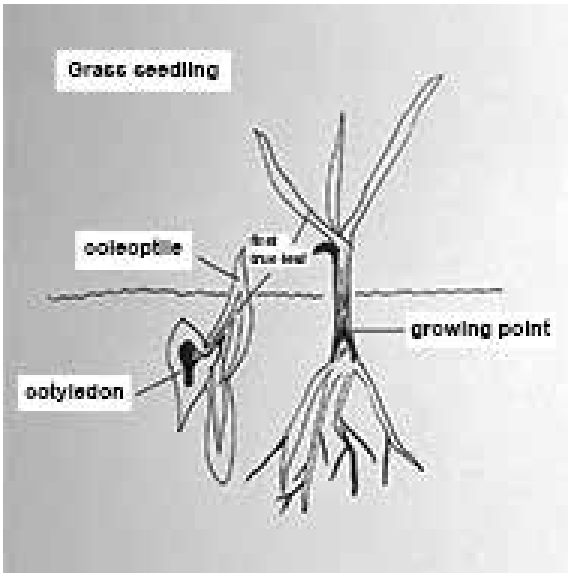

Fig. 4: Seedling structure.

Management Strategies

Control of large crabgrass at the seedling stage (≤ 2–3" tall) is much easier to do before more extensive roots and tillers develop. Seedlings are easily killed by using weeders or rotary hoeing just after they emerge but before they start tillering. Weeding of larger plants should be done in a manner that exposes the entire root system at the surface, allowing it to dry and die, as partially buried plants can re-root and continue to grow. Organic and no-spray farming operations can utilize well-timed weeding and cultivation to kill newly emerged plants. Early detection and multiple control methods are needed to reduce the presence of large crabgrass throughout the farm.

Flame or steam weeders can be effective at controlling young crabgrass seedlings but will loose efficacy as crabgrass is tillering and growing taller. Because the growing point of crabgrass is located at or below the ground surface and protected by layers of leaves, the plant can easily generate new leaves after being exposed to heat.

Prevention

- Scout for early-season detection of large crabgrass seedlings, especially in areas where populations are known to be established.
- Clean equipment and tools used in areas where there are known, large crabgrass populations prior to using the same equipment in uninfested areas.
- Soil solarization with clear plastic can be used to kill seeds during the summer. However, it will likely not be effective before crabgrass emergence in spring due to low temperatures.

Weeding, Mowing, and Cultivation

- Persistent, early spring through early summer weeding of young crabgrass seedlings.
- Fallow fields should have regular cultivation during the first four to six weeks of warm weather to uproot young seedlings.
- Cultivate prior to tillering or rooting at tiller nodes.
- Grow crops that require repeated cultivation close to the production row to disturb young seedlings.
- Remove or mow established large crabgrass plants before they produce seed, typically between July and September.

Competition, Stale Seedbed, and Mulching

- A grassy cover crop that is established in the fall and is terminated in the spring before crabgrass emergence may slow down crabgrass emergence through cooling of the soil.
- Stale seedbeds, allowing a flush of weed seedling emergence followed by cultivation or flaming/steaming between bed prep and planting, and timed with crabgrass emergence in April and May, can reduce seed densities in the soil. Grasses will likely need multiple passes with a heat weeder to kill them because their growing point is below the soil.
- Crops harvested in late spring that are followed by stale seedbed practices and then summer plantings can disturb the crabgrass life cycle.
- In areas where large crabgrass is present, avoid growing crops that require little management during the growing season. Low management crops create an environment for large crabgrass seedlings to grow unimpeded.
- In areas heavily infested with large crabgrass, rotating into a sod crop for a few years can help reducing the infestation, if crabgrass emerging in the sod crop is not allowed to produce seeds.

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Farm Decision Tool

Large crabgrass management is a multi-year process for farms not relying on synthetic herbicides. Identification and mapping of existing populations on the farm, along with reflection on your activities and how they impact these populations, is the first step to developing a management plan.

Use the charts below to identify your large crabgrass populations, your current management methods, and develop a plan of action to reduce large crabgrass from your production areas.

Crabgrass Field Locations			
Field	**Size of Population**	**Suspected Introduction**	**Future Prevention Plan**
Example: Field 4	*Patchy throughout*	*Equipment borrowed*	

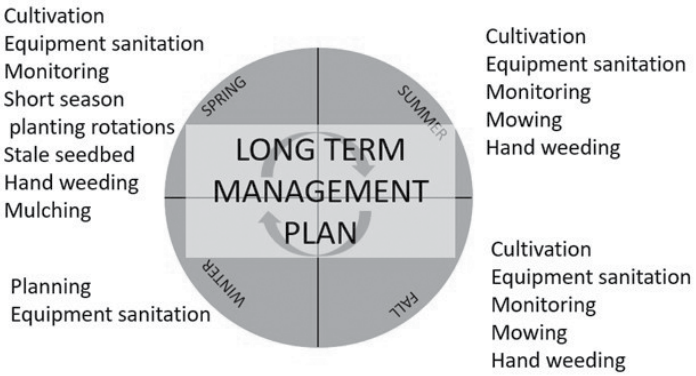

Figure 5. Long-term management plan.

Current Strategies	Timeframe
Example: hand weeding	*spring*
Potential Future Strategies	**Timeframe**
Weed on 21-day cycle, mow monthly	*spring–fall*

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Ms. Melendez is Agriculture and Natural Resources Agent and Dr. Besancon is Extension Specialist in Weed Science with Rutgers Cooperative Extension. *This is Cooperative Extension Fact Sheet FS1347 from Rutgers Cooperative Extension, https://njaes.rutgers.edu/fs1347/.*

VEGETABLE PRODUCTION

Identifying and Preventing Freeze Damage in Fall Vegetables

Benjamin Phillips and Collin Thompson

A "water-soaked" appearance is a common identifier of freeze damage on fruiting vegetables. These decorative gourds will still harden off, but the discoloration is permanent. Photo by Ben Phillips, MSU Extension.

Vegetable crops planted for fall harvest can be susceptible to early overnight cold snaps, and delayed summer plantings may not fully mature before cold temperatures put the brakes on growth. Preventative actions can be taken, but once severe freeze injury occurs, it is irreversible.

Frost versus freezing

A frost occurs when air temperatures dip to 32 degrees Fahrenheit or lower at ground level. With a frost, the water within plant tissue may or may not actually freeze, depending on other conditions. A frost becomes a freeze event when ice forms within and between the cell walls of plant tissue. When this occurs, water expands and can burst cell walls like cracks in Michigan roads in January. However, some plants have more room to spare in their tissues and can withstand a certain amount and duration of internal ice formation without serious injury. However, when freeze damage occurs, it is irreversible.

Climate and topographical conditions

Frost and freezing conditions can be combated in early fall by keeping up to date on weather forecasts and taking appropriate action. This “First Frost” map shows ranges when frost first occurs, on average, in Michigan, but you can also check for the up-to-date overnight hours below freezing at Michigan State University's Enviroweather.

Michigan has a large range of first-frost zones, dictated by the macroclimate of the Great Lakes region and the microclimates of local topography and land-use. For example, the Saginaw Valley region has typically had its first freeze events of the year later (Oct. 21-31) than the upland areas directly to the east (Oct. 1-20) and west (Oct. 11-20). The PlantMaps website also compiles and displays interactive climatological data showing last frost ranges, heat-zones, drought conditions and plant-hardiness zones that can be useful for planning a season for a new crop.

Plant hardiness

Depending on crop tolerance, a killing frost can result from canopy temperatures dropping 2-5 degrees below freezing for 5-10 minutes, or from a sustained temperature 31.5–32 F lasting 3-5 hours. Fall vegetables have a range of temperature tolerances, reflecting their area of origin. Vegetables that come from flowers, such as vine and solanaceous crops, okra, sweet corn and beans, have largely been cultivated and bred from tropical and subtropical plants, and are easily damaged by a light frost (28-32 F).

When freezing occurs, water expands and can burst cell walls. However, leaf and root vegetables are generally more capable of withstanding hard frosts (less than 28 F), and have more room to spare in their tissues for water expansion and internal ice-formation.

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Hard frost hardy (less than 28 F)
- Collards
- Endive/escarole
- Kale
- Kohlrabi
- Lettuce
- Mustard
- Onion (sets and seeds)
- Pea
- Potato
- Rhubarb
- Rutabaga
- Spinach
- Turnip

Light frost hardy (28–32 F)
- Beet
- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Celeriac
- Celery
- Chard
- Onion (plants)
- Parsnip
- Radish

Light frost susceptible (28–32 F)
- Cucumber
- Edible beans
- Eggplant
- Muskmelon
- Okra
- Pepper
- Pumpkin
- Squash, summer/winter
- Sweet corn
- Sweet potato
- Tomato
- Watermelon

How to tell if you have frost-damaged vegetables

Freeze-killed leaves will at first turn brown and look somewhat transparent as they thaw, a term generally referred to as "water-soaked." Once dry, they may curl up and become brittle. The marketable part of the plant may also show signs of damage.

The list below is adapted from Purdue Extension Bulletin HO-203, "Effects of Cold Weather on Horticultural Plants in Indiana," and describes what to look for in freeze-damaged vegetables.

Beet: External and internal water-soaking; sometimes blackening of conducting tissue.

Broccoli: The youngest florets in the center of the curd are most sensitive to freezing injury. They turn brown and give off strong odors upon thawing.

Cabbage: Leaves become water-soaked, translucent and limp upon thawing; epidermis separates.

Carrot: Blistered appearance, jagged, length-wise cracks. Interior becomes water-soaked and darkened upon thawing.

Cauliflower: Curds turn brown and have a strong off-odor when cooked.

Celery: Leaves and petioles appear wilted and water-soaked upon thawing. Petioles freeze more readily than leaves.

Cucumber: Transparent, water-soaked appearance in cross section, just under the skin.

Garlic: Thawed cloves appear grayish-yellow and water-soaked.

Lettuce: Blistering; dead cells of the separated epidermis on outer leaves become tan; increased susceptibility to physical damage and decay.

Onion: Thawed bulbs are soft, grayish-yellow and water-soaked in cross section; often limited to individual scales.

Pepper: Dead, water-soaked tissue in part or all of pericarp surface; pitting, shriveling and decay follow thawing.

Potato: Freezing injury may not be externally evident, but shows as gray or bluish-gray patches beneath the skin. Thawed tubers become soft and watery.

Pumpkin: Water-soaked spots on upper surface of fruit which soften the rind. Badly damaged fruit will eventually collapse in on itself.

Radish: Thawed tissues appear translucent; roots soften and shrivel.

Squash: Water-soaked spots on upper surface of fruit. Ornamental and winter squashes may still harden, but others will soften and rot.

Sweet corn: Reduced ear size and weight with shriveled kernels. Ears can take a "bar-bell" shape if they are still developing.

Sweet potato: A yellowish-brown discoloration of the vascular ring and a yellowish-green, water-soaked appearance of other tissues. Roots soften and become very susceptible to decay.

Tomato: Water-soaked and soft upon thawing. In partially frozen fruits, the margin between healthy and dead tissue is distinct, especially in green fruits.

Turnip: Small, water-soaked spots or pitting on the surface. Injured tissues appear tan or gray and give off an objectionable odor.

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VEGETABLE PRODUCTION

Identifying and Preventing Freeze Damage

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Methods for protecting frost-sensitive crops

Depending on what materials are available, as well as what crops are being protected, there are several options growers can use to extend the productive season. Commercial growers often rely on passive or heated high tunnels, greenhouses, hoop houses or cold frames to offer several degrees of protection for light-frost susceptible crops in the fall. These structures can also be used to protect hard and light frost hardy crops deeper into the winter months, long after the internal temperatures have dropped below what is appropriate for light frost-susceptible crops.

Commercial growers and home gardeners also rely on floating row covers and other protective covers as a low-cost way to protect sensitive crops from frost. These covers are supported above the crop using wire or metal hoops, or bent PVC hoops. Material edges are commonly weighted with sand bags or simply buried with soil to prevent loss due to wind. Lightweight covers come in varying sizes and weights, providing different levels of frost protection.

The table below provides a few examples of row cover options that provide frost protection. It must be noted that as covers grow heavier, the light transmission drops, meaning less photosynthetic activity will occur unless covers are removed. A notable exception is that of greenhouse film (plastic), which provides significant frost protection while still allowing substantial light transmission. The primary drawback, however, is that this material is not self-venting, meaning growers must remove the cover on sunny days to prevent overheating.

Row covers that provide frost protection		
Product	**Frost protection (degrees)**	**Light transmission (%)**
Floating Row Cover 0.55 ounces per square yard	4	85
Floating Row Cover 0.9 ounces per square yard	6	70
Floating Row Cover 1.5 ounces per square yard	8	50
Floating Row Cover 2.0 ounces per square yard	10	30
Typar Row Cover 1.25 ounces per square yard	6	70
Greenhouse Film 6 mil	10	95

Hoop house and greenhouse structures can be more effective when used in conjunction with interior floating row covers. This double layer of protection creates a microclimate at plant level that can be significantly warmer than exterior temperatures. In areas with relatively mild winters, a lightweight row cover can be effective and does not need to be removed for ventilation or to allow solar exposure. In colder climates, multiple layers of lightweight covers or heavier covers can be used to protect cold-hardy crops throughout the winter months. These covers are typically removed on sunny days to warm the soil, allow plants to thaw or photosynthesize, as well as ventilate and exchange air to discourage disease.

For further reading on low-cost season extension options for commercial growers and home gardeners, visit the MSU North Farm's Resources page at http://www.msunorthfarm.org/resources.html, including the Low-Cost Season Extension Skill-Seeker workshop presentation at http://www.msunorthfarm.org/uploads/3/8/2/8/38288527/the_north_farm_-_low_cost_season_extension.compressed.pdf.

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Mr. Phillips and Mr. Thompson are with Michigan State Univ. Extension. From Michigan State Univ. Extension, https://www.canr.msu.edu/news/freeze_damage_in_fall_vegetables_identifying_and_preventing, October 4, 2019.

The same row covers used in early season production can also protect some vegetables now. Fall plantings can be double-insulated under low tunnels inside of high tunnels or greenhouses as well, but will need ventilation on sunny days. Photos by Ben Phillips, MSU Extension.

Good Time to Check for Root Knot Nematode in Vegetables

Jerry Brust

Each year I put this information out near the end of a growing season in the hopes that growers will take a look in their fields for root knot nematode problems as we are seeing increasing difficulties with this nematode complex over the last 4-5 years. So as this growing season winds down it is a good time to examine vegetable roots for root knot nematode (RKN) which can be done by growers with little equipment or time needed.

Where should a grower look in a field for this pest? I would be suspicious of having RKN if my vegetables seemed to need more water than normal or wilted during the heat of the day and recovered later or plants had nutrient deficiency symptoms and the addition of fertilizers did not seem to alleviate the deficiency symptoms. Other symptoms to be suspicious of include some plants appearing stunted with either lower yields or poorer fruit quality. If these vegetable problems were noticed in spots that seemed to follow down a row, there is a chance you have RKN and you should check your vegetable roots for galls.

When you are done harvesting your tomato, watermelon, cucumber, pepper field dig—do not pull up– your plants that are showing problems and some of the plants that border these problematic plants. If the ground is moist when you dig it makes the whole process much easier. Wash the roots with water or dip plant roots into a barrel of water and gently swish the roots around. Inspect the roots of the plants for the tell-tale symptoms of RKN, i.e., galls on the fine and larger roots of a plant (Fig. 1a) vs uninfected roots being white, smooth and thin (Fig. 1b). At other times entire roots can become swollen and appear 'lumpy' and rotted (Fig. 2).

Soil fumigants or nematicides can be effective in reducing RKN damage to vegetable roots, but they will not eliminate the pest from the soil and populations will still be high at the end of the season, but roots will be protected long enough for a crop to be produced. More information on fumigants and nematicides can be found in the 2022-2023 Mid-Atlantic Commercial Vegetable Production Recommendations guide.

There are other options that can be used to reduce RKN populations. One of these options is using certain cover crops that can decrease RKN severity and crop damage. Rapeseed (relative of canola) is one of these cover crops that is planted in late September early October in Maryland at 800,000-900,000 seeds per acre and letting it grow throughout the fall, winter and early spring and then tilling it under in mid-March through mid-April. Rapeseed crops have a high sulfur requirement, so be sure you have adequate levels of sulfur in your soils for this cover crop. The key is getting a good solid stand of the cover crop so that weeds do not grow along with the crop as many weed species can act as hosts for RKN.

In the summer a good cover crop to use is sorghum-sudangrass that can be planted following an early season vegetable crop such as cucumber, pea or snap bean. Planting seed at 20 lbs/a in mid to late July produces enough biomass to reduce RKN populations. For best control, the sorghum-sudangrass crop should be chopped while green into smaller pieces and incorporated into the soil by mid-October. Well incorporated sorghum-sudangrass can be as effective as fumigation. Adding poultry litter or poultry litter compost into the sorghum-sudangrass biomass produces the most effective reduction in nematodes.

Dr. Brust is the IPM Vegetable Specialist at the Univ. of Maryland. From the ***Weekly Crop Update****, Univ. of Delaware Extension, Vol. 30, Issue 26, September 16, 2022.*

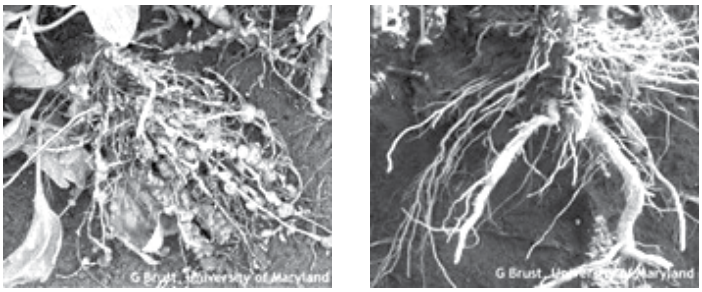


Figure 1. Tomato roots with (a) and without galls (b) from root knot nematode infection

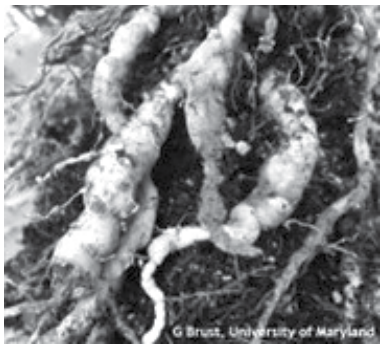


Figure 2. Lumpy rotted roots of a cucumber plant caused by RKN infection

VEGETABLE PRODUCTION

Identifying Diseases of Carrots

Susan B. Scheufele

Storage crops of carrots are sizing up now, putting energy into root growth as we enter fall. Carrots can be affected by many bacteria, fungi, and nematodes in the field or while in storage. Foliar diseases may cause lower yields due to loss of photosynthetic ability, difficulty harvesting if the tops are weakened, and lower marketability if the carrots cannot be sold in bunches. Root diseases can lower yields of fresh eating carrots and can spread in storage, drastically reducing sales through later markets. Root diseases are caused by soil-dwelling organisms and therefore their incidence may vary considerably from farm to farm or even from one side of a field to the other. Proper disease identification will help you to prevent future outbreaks by adjusting crop rotations accordingly, and prevent moving infested soil from field to field. Some of the major carrot disease symptoms are described below. If you are noticing foliar or root symptoms like those described, send a sample to your state diagnostic lab to confirm, and take steps to protect current and future crops.

Foliar Diseases

Alternaria leaf blight (*Alternaria dauci* and *A. radicina*) symptoms first appear along leaflet margins as greenish-brown, water-soaked lesions, which enlarge, turn brown to black, and often develop a yellow halo. Older leaves are more susceptible to infection. Leaves often appear singed or burned from afar. When about 40% of the leaf is infected, the leaf yellows, collapses, and dies. Lesions on petioles are also common and can quickly kill entire leaves. *A. radicina* can also produce a dry, mealy, black decay on known as black rot on carrot roots held in storage.

Bacterial leaf blight (*Xanthomonas campestris pv. carotae*) symptoms initially look similar to those of Alternaria leaf blight; symptoms appear primarily on leaf margins as small, yellow, angular leaf spots, which expand, turn brown to black with a yellow halo, and become dry and brittle. Leaflets may become distorted and curled. Symptoms can extend into petioles where they produce a yellow-brown, gummy exudate, and may also occur on flower stalks. Infected umbels can be completely blighted and seed infection can occur—use treated seed to prevent introducing this disease.

Alternaria leaf blight (left) and bacterial leaf blight (right). Photos: R. L. Wick

Root Diseases

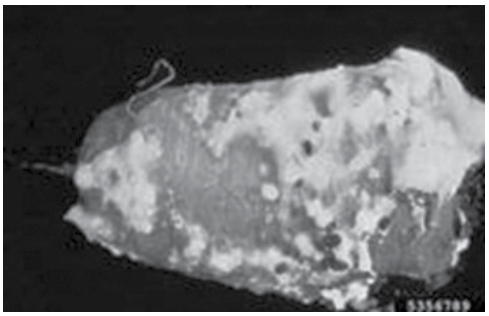
Root knot nematode (*Meloidagyne hapla*) forms galls or root thickenings of various sizes and shapes. Where soil populations of *M. hapla* are high, symptoms include stunted plants, uneven stands, premature leaf death, and forking and swelling of both lateral and tap roots, which can significantly reduce marketable yield. *M. hapla* persists in the soil and has a very wide host range so rotation can be difficult, but grasses are non-hosts so small grains, corn, and grassy cover crops like Sudangrass can be grown in rotations to reduce the size of the population.

Root knot nematode. Photo: R. L. Wick

Black root rot (*Thielaviopsis basicola*) occurs primarily in storage when conditions are not ideal and temperature and humidity are too high. The fungus causes superficial, irregular, black lesions on roots. The discoloration, caused by masses of dark brown to black chlamydospores, is limited to the skin. The pathogen rapidly invades wounded tissue and is favored by long post-harvest periods without cooling, so careful harvest and immediate cooling (< 41°F) can minimize the impact of this disease.

Black root rot. Photo: R. L. Wick

White mold (*Sclerotinia sclerotiorum*) affects many vegetable crops but carrots are particularly susceptible, especially late in the season and dur¬ing storage. The fungus may be present in soil, storage areas, or contain¬ers. Symptoms include characteristic white mycelial growth and hard, black sclerotia (masses of fungal tissue that serve as long-term survival structures), which may be seen on the crown of infected carrots. In storage, carrots develop a soft, watery rot, and fluffy, white mycelia and scle¬rotia can also develop. Sclerotia can persist in soil for many years and the fungus has a very wide host range, making this disease difficult to manage. Grasses and onions are non-hosts that can be used in rotations, and a commercially available biocontrol product, Contans, has been shown to be effective in parasitizing overwintering sclerotia. Contans should be incorporated into infested soils in the fall to give the biocontrol fungus time to infect the sclerotia.



White mold. Photo: William M. Brown Jr., Bugwood.org

Cavity spot and root dieback (*Pythium* spp.) Infections from several Pythium species can occur during early root development and are favored by moist soil conditions. Root dieback symptoms appear as rusty-brown lateral root formation, or forking and stunting; symptoms that can be eas-ily confused with damage from nematodes, soil compaction or soil drain¬age problems. Cavity spot often shows up later in the season, closer to harvest. Horizontal, sunken lesions varying in size from 1-10 mm appear on the surface of the root and can provide an ingress for secondary fungal or bacterial infections.

Cavity spot. Photo: S. Livingston

Crown rot (*Rhizoctonia carotae*) Early symptoms are horizontal dark brown lesions around the root crown. As the crop matures, the tops may die in patches in the field and as the disease progresses, lesions coalesce to form large, deep, rotten areas on the crown of the root. R. carotae can also cause crater rot and violet root rot, but these diseases are less common in MA. Crown rot is favored by moist conditions, so planting on raised beds and/or in well-drained fields can minimize disease inci¬dence.

Scab (*Streptomyces* spp.) can cause both raised and sunken, dry, corky lesions on the carrot root. This disease is less common and when it does occur symptoms are rarely severe enough to cause major losses in yield or marketability. Avoid planting carrots in alkaline soils, which are known to favor the incidence of scab, or in potato fields with high incidence of scab, as the species that infects potatoes can also infect carrots.

Scab. Photo: R. L. Wick

Bacterial soft rot (*Pectobacterium carotovorum* subsp. *carotovorum*) is a common disease in storage where it infects roots that were previously wounded or diseased. It occurs in the field only rarely, under extremely wet soil conditions. Symptoms start as small, water-soaked lesions that quickly spread and cause affected areas to become mushy, though the skin may remain intact over the liquefied flesh underneath. To avoid problems in storage, avoid wounding carrots during harvest and washing and maintain proper storage conditions.

To avoid losses in storage, try to achieve optimum storage conditions of 32-34°F (essential to minimize decay and sprout¬ing during storage) and high relative humidity (required to prevent desiccation and loss of crispness). Mature topped carrots can be stored for 7-9 months at 32°F with 98-100% RH. Those ideal conditions are difficult to achieve and topped carrots are often successfully stored for 5-6 months at 32-41°F with 90-95% RH. Prompt cooling of harvested carrots to below 41°F also helps maintain crispiness. Carrots produce very little ethylene (a by-product of respiration) themselves but are sensitive to ethylene produced by other crops in storage and exposure causes production of the bitter compound isocoumarin, which is concentrated in the peel—peeled carrots are not affected. Unless outside temperatures are very low or very high, ventilation is an inexpensive method of reducing ethylene levels. Ethylene can also be absorbed on commer¬cially available potassium permanganate pellets.

Ms. Scheufele is with the Univ. of Massachusetts Extension Vegetable Program. From ***Vegetable Notes for Vegetable Farmers in Massachusetts****, Univ. of Mass. Extension, Vol. 34, No. 20, September 1, 2022.*

POTATO PRODUCTION

Potatoes Need Oxygen

Paul Bethke

It is not difficult to ruin quality potatoes. The accompanying photograph illustrates this point. The potato in Figure 1 was healthy and attractive when harvested. Then it was stored wet for three days. In that time, it became unattractive, unhealthy, and unpleasant to handle.

Raised and discolored lenticels are apparent. Diseased areas are present. Not visible is the unmistakable smell of soft rot decay. This potato needed more oxygen.

Every potato needs oxygen, and every spud has lenticels to satisfy that need. Lenticels contain the microscopic passageways that allow oxygen to enter a potato.

Under favorable conditions, the many small lenticels in each tuber supply the oxygen needed for metabolism. When the lenticel pores are blocked with water, however, oxygen entry is severely restricted and internal oxygen content drops quickly.

To alleviate oxygen deficiency, new cells are produced below the lenticel. As these cells proliferate and expand, they enlarge the lenticel pore by pushing the surrounding skin up and outward.

Eventually, these new cells will break through the skin and form white bumps that look like miniature popcorn, cauliflower, or snowflakes. If the tuber surface dries subsequently, most of the newly formed cells perish and the enlarged lenticels become suberized.

Lenticels with white bumps are often referred to as open lenticels or proliferated lenticels. In this article, I use the term enlarged lenticels to emphasize that they have increased the area for oxygen entry. “Open” conveys a similar idea but suggests that lenticels return to their original condition by closing, which is not true.

Figure 1. *A Lamoka chipping potato shows discolored and raised lenticels, enlarged lenticels where new white cells have pushed through the skin, and patches of soft rot.*

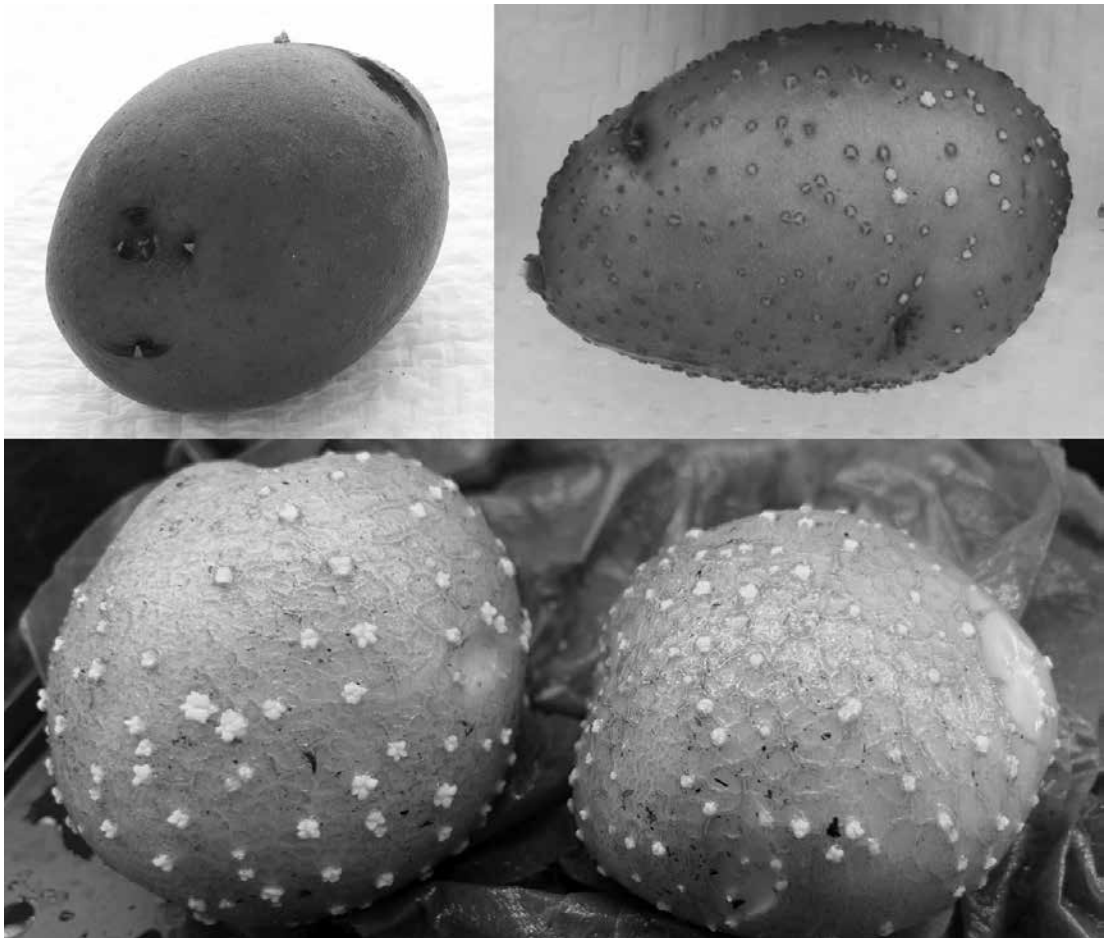


Figure 2. *The Red Prairie potato on the top left has small lenticels that have not enlarged while the Red Norland on the top right has elevated lenticels, several of which have ruptured the skin and appear as raised white bumps. Extensive enlargement of lenticels is seen in the Snowden potatoes on the bottom of the figure.*

Lenticel Appearance

The Red Prairie potato in **Figure 2 (top left)** has small lenticels that have not enlarged. The lenticels appear as tiny spots scarcely darker than the surrounding skin. The skin on this potato is very attractive.

Many of the lenticels in the Red Norland potato (Figure 2, top right) are raised above the tuber surface because of localized cell proliferation just below the skin. Newly formed cells have burst through the skin in several places and appear as white bumps.

Lenticel-associated cell proliferation was extensive for the Snowden potatoes on the bottom of Figure 2. The bright white appearance indicates that cells emerging from these lenticels have remained moist and avoided a damaging pathogen infection.

Lenticel enlargement has obvious short-term benefits for the potato, but growers and shippers are likely to focus on the adverse consequences of enlarged lenticels.

For one thing, enlarged lenticels are entry points for pathogenic bacteria and fungi. It is common for enlarged lenticels to become infected with soft rot bacteria. Infections that are halted relatively quickly result in localized haloes of decay around the lenticels.

In more extreme infections, diseased areas coalesce, and the entire tuber may rot. Tuber rot in the field reduces yield and generates inoculum for further disease.

Tuber rot in packages sent to distributers or retailers creates a financial liability.

Once dried, enlarged lenticels collapse and form an unattractive brown blemish where a protective layer of suberin is deposited. These lenticel spots diminish tuber quality, especially for fresh market potatoes, even when they do not become infected.

Avoid Enlarged Lenticels

Anyone who would like to minimize the detrimental effects of enlarged lenticels should develop an awareness of the conditions that promote enlargement. Management strategies can then be implemented to avoid those conditions as appropriate.

Lenticel enlargement can occur before or after harvest. It is well known that water-saturated soil promotes lenticel enlargement. Wet conditions after harvest also stimulate lenticel enlargement.

Washing and fluming operations are obvious sources of moisture. Potatoes should be dried completely prior to packaging or shipping unless they will be utilized quickly.

Dr. Bethke is with the U.S. Department of Agriculture and University of Wisconsin-Madison Department of Horticulture. From the ***Badger Common'Tater****, Wisconsin Potato and Vegetable Growers Association, Vol. 74, No. 09, September*

BERRY PRODUCTION

Site and Soil Requirements for Small Fruit Crops

Marvin Pritts

Site selection is a major consideration for berry production. Since berry crops are very perishable and often sold directly to consumers, location can have a major impact on marketing possibilities. For example, Pick-Your-Own (PYO) marketing is common in many areas in the Northeast and Midwest. However, if a site is located away from a major highway or population center, then PYO marketing may not be successful. Even if one has access to a good location for PYO, not all of the land can be planted to berries. A portion of the site must be utilized for parking and crop rotation. Even if one intends to sell the berries through retail outlets, production fields should be close to the outlets or warehouse facilities to minimize the time that strawberries will be in transit. The selection of a site and marketing strategy must be considered together. The Northeast Regional Agricultural Engineering Service [published] a series of production guides for strawberries (NRAES-88), blueberries (NRAES55) and brambles (NRAES-35) that contain detailed information on marketing and site location. [These publications are out of print but are available online at https://blogs.cornell.edu/berries/productions/. PVGA has copies of the blueberry and raspberry/blackberry guides available for purchase – call 717-694-3596.]

Location

Berry crops require a chilling period for breaking of dormancy, but the requirement differs depending on the species and cultivar: strawberries (200-300 hrs), blueberries (650-850), blackberries (700), raspberries (800-1700), currants and gooseberries (800-1500), and cranberries (2000). In the Northeast, all berry crops receive a sufficient number of chilling hours when grown outdoors.

The climate in the Northeast imposes constraints on the production of most berry crops because of winter low temperatures. Although strawberries can be grown throughout the state if winter mulches are applied, highbush blueberries and fall raspberries are only successful south of a line extending from Muskegon, MI to the southern end of Lake Champlain to Portland, ME. The season is not sufficiently long north of this line to consistently ripen fall raspberries, and temperatures below –20F (common in northern New York) will kill blueberry shoot and flower buds. With the proper selection of varieties, summer raspberries can be grown in all but the coldest locations (e.g. Adirondacks) as some hardy varieties tolerate temperatures as low as –25F. Blackberries are usually successful only in the warmest sites (e.g. lakeshores, Long Island) because they are injured at temperatures less than –5 F.

Fluctuating early spring temperatures cause more damage to berry crops than mid-winter low temperatures. Strawberries are particularly susceptible to spring frosts. For these reasons, sites with good air drainage or sites located near large bodies of water are best for berries.

Steep slopes (>5%) should be avoided because they are erodable, and difficult to cultivate and irrigate uniformly. Moderate slopes (3-5%) allow air to drain which reduces the risk of frost injury. South-facing slopes tend to increase the risk of frost injury in spring because plants generally bloom earlier, and west-facing slopes are at the greatest risk for winter injury because they are exposed to persistent desiccating winds in winter.

All berry crops have shallow root systems, so it is essential to select a site with available water for irrigation. Most strawberry growers use trickle irrigation for routine watering and overhead irrigation for frost protection. Detailed information on irrigating berry crops can be found in the NRAES production guides.

Site History

Do not grow strawberries for 5 or more consecutive years on the same site without some type of crop rotation. The longer that strawberries are grown on a site, the greater the risk of black root rot disease. Plan to reserve at least 30% of the available land (preferably 50 - 70%) for rotation in future years because 3 years (minimum) should elapse between plantings on the same site. The same rule applies for blueberries and raspberries. Land not in berries should be planted to soil-improving cover crops or to cash crops in which weeds can be managed easily.

Pay careful attention to herbicide use the year prior to planting berries. Herbicide carryover can impede the establishment of berry plants and can make berries more susceptible to root diseases.

Avoid planting raspberries, especially black raspberries, where solanaceous crops were previously planted within the last 3 years. These can harbor verticillium wilt disease. All sites should be tested for nematodes prior to planting raspberries or strawberries. Some type of fumigation or cover cropping may be required if levels of root lesion or dagger nematodes are high.

Soil Properties

Berry crops cannot tolerate standing water during the growing season or the diseases associated with wet soil conditions. Internal soil drainage, therefore, is a critical component of a good site. If a site is too wet for berry production, then subsoil drainage can be installed to dissipate excess water. Berries often can be grown successfully on wetter sites if they are planted on raised beds.

Strawberries, raspberries, gooseberries, currants and elderberries can tolerate a wide range of soil types, provided that nutrients are available. However, blueberries and cranberries have more exacting soil requirements. These crops grow poorly if the clay and/or silt content is greater than 20%. Planting, cultivating and harvesting is particularly difficult for strawberries if the soil is stony.

For most berry crops, the ideal soil is a well-drained, sandy loam with a pH of 6.2 - 6.8 and a moderate to high organic matter content (>3%). In general, sites that produce good alfalfa crops tend to be good for strawberries and raspberries. For blueberries, the ideal pH is between 4.2 and 4.8 and the ideal soil is a loamy sand with high organic matter (>4%). Blueberries can be grown on muck soils as well. Fertile sites are best for most berries, although blueberries and cranberries thrive in poorer soils with a low cation exchange capacity (20% saturation of the CEC) is detrimental to blueberry plant growth. Blueberries have a low requirement for phosphorus, and can obtain adequate amounts when soil levels are low – especially when conditions are favorable for growth of endomycorrhizal fungi. The presence of wild blueberries in the area is an indication that the soil will support cultivated blueberries.

Site Preparation

Weeds. A major step in site preparation is the elimination of perennial weeds. This is particularly important because few herbicides are labeled for use in berries, and their activity on perennial weeds is limited. Weeds cause a greater economic loss in berry crops than diseases and insects combined. In addition, weeds also encourage the establishment of other pest populations. Eliminating weeds the year before planting is much easier than controlling them later. Too many growers plant directly into a site in which perennial weeds were not eliminated the previous summer, and then spend the next several years trying to find the right combination of herbicides to undo the damage. Starting site preparation 2 or 3 years in advance will be rewarded in future years.

Rotation, coupled with the use of a broad-spectrum post-emergent herbicide the summer before planting, is an effective approach. Repeated cultivation or covering a site with black

BERRY PRODUCTION

plastic for several months are also effective. Ideally, begin site preparation 2 or 3 years before the crop is planted to eliminate perennial weeds, especially if organic methods are to be used.

Fumigation at high rates will suppress weeds, although its use worldwide [has been] restricted because of environmental concerns, availability and expense. In some situations, nematodes, soil diseases, soil insects or intense weed pressure may justify fumigation. The soil should be friable, warm (>50F) and without decomposing plant material for fumigation to work properly. The best time to fumigate is late summer or early fall of the year prior to planting

Nutrient amendments. Test the soil for pH, potassium, phosphorus, magnesium, calcium and boron. Sample soil in a V-shape pattern within the field, collecting from at least 10 locations. The sample should represent the profile of the top 10 - 12 inches. Plow the site, add the recommended amount of nutrients, then disc. Because soil testing procedures are not standardized across the region, follow the recommendations from the laboratory where the samples were analyzed. Do not use the test results from one laboratory and the sufficiency ranges from another.

Our recommended strategy is to apply sufficient potassium, phosphorus, magnesium and calcium prior to planting to sustain the planting for its productive life, and supplement with other nutrients as required. It is difficult to make these nutrients available to plants when they are applied after planting.

It takes one year for lime to raise, and for sulfur to lower the soil pH, so it is necessary to apply these one year in advance of planting. Sulfur is effective at lowering soil pH, but time is required for bacteria to oxidize the sulfur into a usable form. Sulfur comes as a wettable powder or prills, with the former reacting faster top lower the soil pH. Aluminum sulfate is sometimes recommended for acidification because it provides an already oxidized form of sulfur, but it is expensive and six times as much is required to do the same job as sulfur. Also, aluminum toxicity can occur with large amounts of aluminum sulfate, so we do not recommend it.

Certain nutrients, like phosphorus, are very insoluble in water and move very slowly through the soil. It may take years for phosphorus applied to the soil surface to reach the root zone of the plant and be taken up. For this reason it is imperative to apply a sufficient amount prior to planting and mix it into the root zone. Animal manures and legumes offer a good source of slow-release nitrogen when incorporated prior to planting.

Animal manures also contain significant amounts of potassium, phosphorus and calcium, but little magnesium and are a potential source of weed seeds. Manure applied to fields should be well-composted and worked into the soil prior to planting to minimize any risk of fruit contamination from pathogenic bacteria and to reduce weed seed germination. Supplemental magnesium may be required if manures are used to provide nutrients.

Irrigation. Transplants will require immediate watering to settle soil around roots and prevent dessication. Any preemergent herbicide applied after transplanting will likely need to be watered in by rain or irrigation to be effective. For these reasons, the irrigation system should be operational prior to planting. Also, in early spring, the irrigation system may be a necessary tool for frost protection.

Preplant cover crops. Seeding a cover crop on the site the year before planting is an excellent way to improve soil structure, suppress weeds, and if the proper cover crop is grown, suppress nematode populations. Benefits of a cover crop are greatest when the soil is sandy and/or the soil organic matter content is low. Most cover crops grow under the same soil conditions as strawberries. Except for additional nitrogen (40 lb/A prior to seeding) and perhaps phosphorus, other amendments are not likely to be required.

Minimum seeding rates are used when the objective is to supply an acceptable stand for harvesting the grain or straw. But when a vigorous, dense stand is desired for weed suppression and organic matter, higher seeding rates are recommended.

Preplant cover crops are usually plowed under in the late fall or early spring prior to planting. Those with low nitrogen contents (grains and grasses) should be plowed under early in the fall to allow adequate time for decomposition, unless the soil and site are prone to erosion. Legumes contain more nitrogen and decompose quickly, so they can be turned under within a month of planting. The NRAES production guides contain detailed descriptions of cover crops suitable for berry producers.

Dr. Pritts is Professor and Director of Undergraduate Studies in the Plant Sciences Major of the School of Integrative Plant Science Horticulture Section and Professor in the Department of Global Development at Cornell Univ. From Cornell Cooperative Extension, https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/0/7265/files/2016/12/sitesoireqsm-fru.rev-xacczf.pdf

GREENHOUSE PRODUCTION

Time for Greenhouse Weed Control

David Owens

Now is the time to wipe out all weeds growing in and immediately around greenhouses. Weeds in the greenhouse and winter annuals such as chickweed, henbit, dead nettle, and speedwell serve as spider mite hosts and provide shelter for spider mites to overwinter. Going into winter with a clean greenhouses and foundation edge will reduce the possibility of having early season mite activity on transplants. A couple of ounces of caution in the form of herbicide can prevent pounds of active ingredient 'cure' in the form of miticides to fields that have been planted with infested transplants.

*Dr. Owens is the Extension Entomologist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware Extension, Vol. 30, No. 28, September 30, 2022.*

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