UMass Extension

Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975

Volume 31, Number 5 April 25, 2019

In This Issue:

Thank You to Our Sponsors!

Donations and sponsorships from our readers allow us to cover the state, collecting scouting data from over 30 farms each year, and spend the time to write articles summarizing research results from our trials and others in the region to support vegetable production in Massachusetts. This year, our sponsors donated over $7,000 and our readers donated over $1,200. Thank you all for your generous support! Here are our sponsors:

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Crop conditions

Despite a cold and wet start to the spring, folks have been on a mad-dash planting spree, planting as much as they can in fields that are dry enough. Onions, swiss chard, and collards are in the ground in the cold, mountainous Berkshires, so the fear of a hard frost must have passed for the season. Seed potatoes are ready to plant, though some growers are waiting until June to plant this year, in order to avoid the first generation of Colorado potato beetle. As garlic emerges, some are wondering…to sidedress, or not to sidedress? When garlic first emerges in the spring, it can rapidly take up nitrogen and is done with its nitrogen needs by late-May. Research recently conducted by Christie Hoepting and Crystal Stewart of Cornell Cooperative Extension has shown that garlic needs no more than 50 lbs N/A as a spring sidedress. In Hoepting's research, no fall nitrogen was applied at all, only phosphorus and potassium according to soil test needs, and any nitrogen applications greater than 50 lbs/A in the spring left nitrates in the soil after harvest, indicating that excess was applied. Rapidly available forms of N should be used in the spring such as ammonium nitrate, urea, ammonium sulfate, Chilean nitrate, or other soluble N sources. Nitrogen has low availability at soil temperatures below 50°F, medium availability at 50-70°F, and becomes rapidly available at 70°F and above. Growers relying on organic sources of N applied in the fall may see slow mineralization in the spring, and might consider applying 25-50lb/A of a soluble form of N now.

The UMass Extension Vegetable Team has begun IPM planning with growers and scouting on farms, and will report our findings here in the Pest Alerts section below.

Pest alerts

Allium leafminer: We scouted for signs (oviposition scars - see photo at right) of this new invasive pest this week in the Berkshires, and thankfully, did not find any. The pest is being seen now in New Jersey, so we will continue to scout over the next few weeks.

Seedcorn Maggot: Seedcorn maggot flight has begun and peak flight will be approaching soon, at 360 GDD base 40°F—see article this issue for more information on scouting and control.

Cabbage root maggot: Root maggot flight is just barely beginning now and is expected to peak during the first week of May. Track progress of this pest using the NEWA Cabbage Maggot forecast here: http://newa.cornell.edu/index.php?page=cabbage-magot. See article this issue for more tips and control recommendations.

Flea beetles: We have not observed flea beetles yet but we expect that they are starting to emerge right around now, and will soon be seen wherever tender young brassicas are planted. Looking for some new ideas to try this year? Check out this video on flea beetle biology and management from the Brassica Pest Collaborative: https://ag.umass.edu/vegetable/resources/brassica-pest-collaborative

Spring time is maggot time

There are three maggot fly pests that are active on Massachusetts vegetable farms in early spring: cabbage maggot, onion maggot, and seed corn maggot. The emergence of adult flies from pupae that overwintered in the soil can be predicted using growing degree days[1] (GDDs) with a base temperature of 40°F. The base temperature for monitoring the emergence of maggot flies is lower than the base temperature for many other vegetable pests because they are active at fairly cool temperatures early in the spring. These three maggot fly pests emerge at different times throughout the spring (Table 1) and infest different crops. Seed corn maggot reaches peak flight earliest in the spring and has a host range of over 30 crops (including alliums and brassicas). This maggot is a common cause of poor stands of peas or small plantings of sweet corn. Cabbage and onion maggots are host specific, attacking brassicas and alliums, respectively.

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[1]Growing degrees days (GDD) are the number of degrees that the average daily temperature exceeds a base temperature at which a particular organism is dormant. GDD = ((Tmax + Tmin)/2) - Tbase. If the average temperature for a day is lower than the base temperature, then no GDD accumulate. GDD accumulate daily, starting on a specific date, by adding each day's total GDD to the previous tally.

Seed corn, cabbage, and onion maggots share many characteristics. There are three to four generations of each of these pests per year. They prefer cooler temperatures – therefore the spring and fall generations are typically worse than the mid-summer generation(s). All three maggot flies emerge from pupae that overwintered in fields where a host crop was the previous fall. Adults emerge from the soil, mate, and then search for a host plant. Eggs are laid at the bases of host plants or on emerging seedlings. The larvae will then feed on host roots, causing the plants to collapse, or, in the case of seed corn maggot, kill seedlings before they emerge. All three flies are attracted to decomposing organic matter, and infestations can be worse in manured, cover-cropped, or composted fields where organic matter is still breaking down. Soil temperatures above 95°F can kill the larvae. All three maggot fly adults are similar in appearance (small, gray, humpbacked, housefly-like) and size (5-7mm).

Cabbage root maggot fly.

One way to monitor for maggot flies is to put sticky cards out in a "field of concern". When more than 10 flies per card are found in a week and/or GDDs indicate emergence (Table 1), begin to scout at the base of plants for eggs. Eggs are bright white, bullet-shaped, and ~⅛ inch long. They look very similar to a fleck of vermiculite – don't get tricked!

Cabbage root maggot egg, pictured on the entip of a pencil.

Below is more information about each maggot pest, including management recommendations:

Seed corn maggot (*Delia platura*): Most locations in Massachusetts re approaching peak flight for this pest this past week and may surpass 360 GDD next week. Where possible, delay planting for several weeks in the spring after a cover crop is incorporated to allow for organic matter to break down. Warmer soils with more decomposed organic matter will mean fewer problems with seed corn maggot. Floating row cover is not as effective in managing seed corn maggot because seed corn maggot has many hosts and could have overwintered in virtually any field on your farm. If you cover plants in an infested field, the adults will emerge under the row cover. Organic fertilizers containing seed meals can attract this pest. Other pests and diseases can also prevent seedlings from emerging, including wireworms and damping off; check for maggots and feeding tunnels inside seeds or stems to confirm what pest you're dealing with. Plant shallowly to promote rapid seed emergence. Among bean varieties, those with a dark seed coat sustain less injury than white varieties. Preventive chemical treatments include commercially applied systemic seed treatments and in-furrow applications of insecticides. See the New England

Table 1. Comparison of Maggot Fly Biology

	Seed Corn	Cabbage	Onion
Host	40 different plants, large germinating seeds, seedlings (including allium and brassica!)	Brassicas	Alliums
First peak flight	360 GDD base 40°F	452 GDD base 40°F	735 GDD base 40°F
Adult	Small: ~ 3mm, 3 stripes on the thorax	Medium: ~5mm, 2 stripes on the thorax.	Large: ~6mm.
Eggs	Hatch in 2-4 days	Hatch in 7-10 days	Hatch in 2-5 days
Larvae (maggot)	Active for 3 wks	Active for 2-4 wks	Active for 2-3 wks
Pupae	In soil for 1-2 wks before next gen adults emerge (last gen pupae overwinter)	In soil for 2-3 wks before next gen adults emerge (last gen pupae overwinter)	In soil for 3-4 wks before next gen adults emerge (last gen pupae overwinter)
Notes	Short, 21-day lifecycle. 3 gen per year. Usually only spring gen is damaging.	Long, 60-day lifecycle. 4 gen per year. Spring and Fall gen most damaging.	Medium, 30-day lifecycle. 3 gen per year. Usually only spring gen is damaging.

Vegetable Management Guide for insecticide recommendations. Rescue treatments are not effective. If there is enough damage to warrant replanting, wait at least 5 days if maggots are a quarter inch long; if they are smaller than that, wait at least 10 days to make sure they have pupated and will not damage the new seeds.

*Yellow rocket (*Barbarea vulgaris*).*
Photo: UMass Weed Herbarium

Cabbage maggot (*Delia radicum*): Growing degree days are used to predict emergence and peak flight of this pest, though another good indicator of the first cabbage maggot peak flight is blooming of the common roadside weed yellow rocket or wintercress (*Barbarea vulgaris*). There is a model for tracking the emergence of cabbage maggot on the Network for Environmental and Weather Applications (NEWA) website: NEWA Cabbage Maggot Model. On the left-hand side of the page, choose a weather station that is close to you. After egg hatch in an infested crop, upon inspection of the root area you may find the legless white maggots feeding, the small brown, oblong pupae, or tunnels from maggot feeding. In brassica root crops such as turnips, radishes, and rutabaga, maggot feeding tunnels make the crop unmarketable. When GDDs indicate peak flight, or when adult flies are found on sticky cards placed in the field, begin scouting every 3-5 days. A pencil point or knife helps stir the soil to look for eggs. Check 25 plants, in groups of 2-5 plants, randomly throughout the field. Eggs may be more abundant in wetter areas of the field. Apply a soil drench 2 to 3 days after finding an average of one egg per plant. Available products can be found in the New England Vegetable Management Guide. Some materials are approved for use as a transplant drench and it may be prudent to treat transplants before putting them out in the field. Other management tips include:

- **Delay planting** until after first flight is done (usually mid-May, depending on GDDs) or when soil temperatures are high enough to kill eggs (95°F). Planting in late-May into June is generally safer than in the first half of May.
- **Floating row covers** can be used to cover recently seeded or transplanted crops with floating row covers as a barrier against cabbage root maggot flies. Place the cover as soon as the transplants are set, but do not use where brassicas were grown last year, as overwintered flies could emerge under the cover.
- **Cultivate** brassica crops vigorously so that soil is brought up around the stem to encourage adventitious root formation. This can help compensate for root loss even if maggots are present.
- **Natural enemies.** Soil-dwelling beetles, including carabid ground beetles and staphylinid beetles, feed on cabbage maggot eggs, larvae, and pupae and can cause high levels of mortality. One staphylinid species, *Aleochara bilineata*, also parasitizes maggot larvae and has been shown to respond to chemicals given off by plants that suffer maggot damage. Because these soil-inhabiting beetles are susceptible to insecticides, broadcast soil insecticide treatments should be avoided. Other natural enemies include parasitic wasps and predatory mites.
- **Nematodes for biological control.** Soil application of the entomopathogenic nematode *Steinernema feltiae* has shown efficacy against cabbage maggot in trials even at low soil temperatures (50°F/10°C). Apply by suspending juvenile nematodes in water and treating transplants prior to setting in the field (as a spray or soaking drench), or in transplant water used in a water wheel transplanter, or a combination of pre-plant and post-plant applications. Post-plant treatments are likely necessary if maggot flight begins >1 week after transplanting. Rates of 100,000 to 125,000 infective juveniles per transplant have been shown to be needed to achieve reduction in damage. Nematodes need a moist soil environment to survive.

Onion Maggot (*Delia antiqua*): This pest begins its flight when cabbage maggots are at peak flight; yellow rocket bloom is an indicator of the beginning of onion maggot flight. Delaying planting is not a practical method of avoiding this pest because onions are typically planted very early in the spring and are in the ground about a month before the onion maggot becomes a problem. In onions, newly hatched larvae crawl behind the leaf sheath, enter the bulb, and feed on the roots, stem, and developing bulb. Feeding damage also allows for entry of soft rot pathogens. Some tips specific to managing onion maggot include:

- Minimize mechanical and chemical damage to onions throughout the season.

- Gather culled bulbs and remove from the field promptly as opposed to deep plowing or harrowing after harvest. This will limit fly reproduction.
- Soil drenches can be an effective control. See the New England Vegetable Management Guide for recommendations.

--Compiled by Katie Campbell-Nelson, 2019

Seed potato considerations

Folks are beginning to start thinking about planting potatoes, pulling seed from storage. Seed should be stored at 38°F to 40°F with relative humidity maintained at 95%. Seven to 14 days prior to cutting or planting, tubers should be warmed gradually to 50°F to 55°F. Good ventilation and 90% relative humidity should be maintained during this process. Cut seed pieces should be blocky, have at least one eye, and weigh 1.5 to 2 oz.

Fusarium dry rot was confirmed on seed potatoes in MA this spring. Inspect seed for diseases before planting and submit suspect tubers to the UMass Diagnostic Lab. Photo: C. Averre

Seed should be inspected before planting to ensure a quality crop. Only certified or foundation seed should be planted, because it has met specific conditions for production practices and disease tolerances. One new disease of concern which can be seed-borne is the bacterial disease known as Dickeya. This blackleg-like disease is caused by the bacterium, *Dickeya dianthicola*, an aggressive pathogen that has the potential to cause more severe losses than species of *Pectobacterium* (aka *Erwinia*) that cause typical blackleg symptoms. Other seed-borne diseases include Potato virus Y, ring rot (caused by a bacterium), and Fusarium dry rot (caused by a fungus). If you suspect your seed is contaminated with a disease, you should consider submitting samples to the UMass Diagnostic Lab. So far this year in Massachusetts, Fusarium dry rot and *Pectobacterium* were diagnosed on seed potato from a distributor in Wisconsin; *Dickeya* was not present in this sample. Tubers with Fusarium dry rot are susceptible to infection by secondary soft rot bacteria which may invade the wounded potato.

Planting

The ideal seedbed for planting potatoes is warm, medium field capacity in moisture content, and of uniform texture allowing good soil air movement. Soil temperatures should be 50°F to 60°F in order to encourage cut seed wound healing and rapid growth (most of the state is over 50 now, except for the eastern coastal areas—see soil temperature map here). Do not plant cut seed in soil below 45°F as seed piece decay will be encouraged.

A well-prepared seedbed is desirable and will facilitate accurate planting. Over-preparation of the seedbed should be avoided because of crusting and compaction problems.

Close spacing in the row (6" to 8") aids in reducing tuber size and increases the number of tubers set. Using close spacing can reduce the occurrence of hollow heart and growth cracks. Seed pieces should be planted 2" to 4" below the soil level; this will reduce problems with sunburned tubers. For rapid emergence, no more than 2" of soil should cover the seed piece after planting. Where seed is planted deeper than 2", drag-off, or the removal of the excess soil from the top of the hill, may be employed to encourage rapid emergence. Rapid emergence should be encouraged to reduce problems with soil-borne diseases such as Rhizoctonia.

The practice of pre-sprouting seed potatoes is called green sprouting or chitting. This practice accelerates plant emergence and speeds the development of marketable tubers. Many times it gains the producer as much as 7 to 10 days in having marketable tubers. This practice is often combined with close plant spacing (about 6"). The tubers are harvested when small and often sold in quart baskets. Consumers usually cook the tubers in their skins.

The basic technique is rather simple: About 6 weeks prior to planting, spread the seed tubers in open-top crates, boxes or flats, 1 layer deep with the eyes up. Egg cartons for small seed lots work great. The flats are then kept in a warm place (approximately 70°F) where light levels are medium intensity (bright shade). Direct sunlight is not recommended. The warmth stimulates the development of strong sprouts, which, in the presence of light, will remain short and stout and will not easily be broken off during the planting process. Ideally, the sprouts will be about 1” in length. Do not cut the seed before green sprouting. Cutting seed pieces prior to green sprouting will encourage desiccation and reduce seed quality.

--New England Vegetable Management Guide

Calibrating your backpack sprayer

Growers with diverse crops and small plantings often need to apply pesticide to beds or plots of only several hundred square feet, and backpack sprayers are the best tool for the job. John Grande and Jack Rabin of Rutgers made an excellent series of short videos on selecting, upgrading, and calibrating backpack sprayers (http://snyderfarm.rutgers.edu/Backpack-Sprayers-Video.html). Watch the videos and read the accompanying handouts in the resources section below for tips on upgrading your backpack sprayer. If you don’t have time for all that now, follow the steps bellow for calibrating your back pack sprayer so that you can get out there and spray… after scouting, correctly identifying the pest, and selecting the appropriate materials, of course!

Backpack Sprayer Video 2

CLICK PHOTO FOR VIDEO LINK

John Grande at Rutgers University installs a barbed swivel with a pinch clamp. This very clear video includes all the parts and instructions to upgrade your backpack sprayer for improved comfort and efficacy.

First, check your sprayer coverage and operation. Select the spray tip or boom setup that provides the desired coverage. Add water, and spray the ground or dry pavement as if you were spraying your field. Check fittings and hoses for leaks. Check the spray pattern for uniformity to make sure none of the nozzles are clogged and that you are achieving proper spray pattern overlap (about 1-2”) with the boom. You can also check it over the crop to see if you are getting good coverage by attaching water-sensitive cards to a piece of foliage and inspecting your spray coverage. (These cards are available from suppliers of spray equipment and pesticides.) Adjust nozzle spacing and/or height until you achieve the desired pattern. For insecticides and fungicides, your goal is to use sufficient water to cover the foliage with small droplets, but only until the point of drip off of leaf surfaces. Be certain you’re getting uniform coverage before you proceed!

Here’s how to calibrate your backpack sprayer:

Calculate what portion of an acre is being sprayed. Determine the square feet of area to be sprayed (multiply canopy width x row length x number of rows). Calculate how much of an acre this is (this may be a small fraction of an acre):

Example:

4 ft canopy width x 250 ft bed length x 5 rows = 5,000 ft^2

5.000 ft^2 / 43,560 ft^2 per acre = 0.115 acres

Acres to be sprayed = 0.115 acres

Calculate how much pesticide to use. Multiply the rate per acre for the crop and pest (from the label) by the proportion of an acre to be sprayed.

Example:

Pyganic 5.0EC at 10 fl. oz. per acre x 0.115 acres

Amount of Pyganic needed = 1.15 fl. oz.

Measure water needed per sq ft of crop. Add a known amount of water (eg 1 or 2 gallons) to the tank. Spray the water as if you were actually spraying your field and watch that your crop gets adequate coverage until water drips off the leaves, but not to drench the soil. When making a soil drench application, target the base of the plant and check if enough water is applied to percolate 2 inches deep. When making soil drenches for root pests, some growers remove the nozzles entirely, because soil drenching usually requires more water per acre in order to carry the product into the soil in a narrow band along the row. Maintain constant pressure, constant walking speed, and consistent nozzle height and boom setup or wand motion to achieve the coverage you need. This amount will change with different crops and size of crop canopy. When the water is gone, stop and mark the spot. Measure the area you sprayed and calculate the square feet (length of swath x width). Calculate how many gallons needed per sq ft.:

Example:

2 gallons used / 1000 ft^2 tested

Gallon per ft^2 = 0.002 gallons

Determine total water needed:

0.002 gallons x 5,000 ft^2 (from step 1 above)

Gallons of water needed = 10 gallons

Mix the required amount of pesticide in the required amount of water. It is best to add half the water, add the pesticide/s, agitate, then add the remaining water. Spray, using the walking speed, pressure, nozzle and boom setup or wand motion that you used for calibrating. When making tank mixes, add materials in the following order, agitating the tank between each addition: • Water Conditioners/Acidifiers • Wettable/Dispersible Powders • WDG's (Dry Dispersible granules) • Oil dispersions • Flowables (Suspension conc.) • EC's (Emulsifiable concentrates) • Emulsions (Micro and Suspension Emulsions) • Water Soluble concentrates (Soluble powers and liquids) • Adjuvants.

To speed up your mixing process, see the table below for commonly used labeled rates of organic insecticides converted into amounts per 100 and 1,000 sq. ft.

Product	Amount per 100 sq ft	Amount per 1000 sq ft	Rate per acre
Pyganic 5.0EC	0.02 oz or 0.67 ml	0.23 oz or 6.7 ml	10 fl. oz
Entrust	0.014 fl. oz. or 0.4 ml	0.14 fl. oz. or 4.0 ml	6 fl. oz.
Surround WP	1 ½ - 3 cups	4.5 - 9 cups	50 lb

Note that the measure used for Entrust must be accurate to 1/10 ml! For Entrust, do not use more than 3 gallons of water per 1,000 sq ft. For many insect pests, the label requires no more than 2 consecutive applications and no more than a specific label allowable amount of Entrust per year, for resistance management.

You are now prepared to tackle your pest problems with an upgraded spray wand and an accurate calibration! Happy spraying, and don't forget your personal protective equipment (PPE).

Resources:

Grande, J. and Rabin, J. Rutgers University, NJ. "Backpack Sprayer Modification Website: https://sustainable-farming.rutgers.edu/backpack-sprayer-modification/

Grande, J. and Rabin, J. Rutgers University, NJ. "Companion Handouts for the Back Sprayer Videos": https://sustainable-farming.rutgers.edu/companion-handouts-for-the-backpack-sprayer-videos/

--UMass Extension Vegetable Program

News

Invitation to Participate: Local Food Distribution Survey

The University of New Hampshire Department of Natural Resources is conducting a survey on local food distribution and is inviting commercial fruit and vegetable growers in New England to respond. Your responses to this survey will help distributors, producer cooperatives, food hubs, and other organizations understand your distribution needs, and better evaluate potential approaches for addressing the regional needs of growers throughout Northern New England.

This survey should take fifteen to twenty-five minutes to complete. If you are 18 years or older, please click on the link below to begin the survey.

Survey link: https://unh.az1.qualtrics.com/jfe/form/SV_6QoNagKPXFQCs0B

Your participation in this survey is entirely voluntary and all of your responses will be kept confidential. The link is used to estimate a response rate. No personally identifiable information will be associated with your responses in any reports of this data. Should you have any further questions or comments, please feel free to contact Julia Jones at jws47@wildcats.unh.edu or Dr. Alberto Manalo at alberto.manalo@unh.edu or 603-862-3917.

We appreciate your time and consideration in completing the survey! It is only through the help of growers like you that we can provide information to help businesses and organizations strengthen New England's local food distribution system in a way that truly works for growers!

Open Application Period for MDAR Grant Programs

The Massachusetts Department of Agricultural Resources (MDAR) is now accepting applications from agricultural operations who wish to participate in the Department's grant programs. Grants are available to help agricultural operations make farm improvements that enhance their economic viability, help prevent negative impacts to environmental resource, adapt to and mitigate climate change, improve energy efficiency, adopt renewable energy, and improve on-farm produce safety. Interested farm operators are encouraged to review the information and applications on each program's webpage. If interested in applying, applications must be submitted with any supporting documentation by the program's deadline.

Below is a list of programs, with more information (including applications) available at each program's website.

Applications for the following programs are due Friday, May 31, 2019:

- Agricultural Climate Resiliency & Efficiencies (ACRE) Program
- Agricultural Energy Program (ENER)
- Agricultural Food Safety Improvement Program (AFSIP)
- Agricultural Environmental Enhancement Program (AEEP)

Applications will be opening soon for the following programs:

- APR Improvement Program (AIP)
- Farm Viability Enhancement Program (FVEP)
- Matching Enterprise Grants Program (MEGA)

Events

Worker Protection Standard Train-the-Trainer

There is one remaining WPS Train-the-Trainer workshop date, offered by the UMass Pesticide Education office. United States Department of Agriculture cooperating. UMass Extension provides equal opportunity in programs and employment. All farmworkers must be trained under the EPA Worker Protection Standard (WPS) if a farm uses any pesticides, including, those approved for organic production and other general use pesticides. The agricultural worker employer is responsible for complying with all components of WPS including the training of farmworkers. This training can only be provided by an individual who has a pesticide certification license or has attended an approved EPA WPS Train-the-Trainer workshop.

When: Thursday, May 2, 8am-12:30pm

Where: UMass Cranberry Station, 1 State Bog Rd., East Wareham, MA

REGISTRATION: $40/person. Pre-registration required. For registration information, visit the UMass Pesticide Education website.

Sponsored by the UMass Extension Risk Management Crop Insurance Education Program.

Creating Pollinator Forage in the Landscape

Tom Sullivan of Pollinators Welcome will present strategies for improving bee forage. He will cover bee-friendly flowers, bloom phenology, and how to choose plants that meet site conditions and increase pollinator diversity and abundance. Along the way, he will identify threats to pollinator health and explain how we can help bees by creating pollinator havens on farms, in gardens, and within conservation areas. He will also cover native bee biology and nesting needs, and explore the basics of meadow making for beekeepers and other pollinator-positive stewards. We will go outside if weather permits, and ample resources will be provided via email after the workshop. Coffee and light refreshments will be provided.

When: Sunday, June 2, 8:30am-12:30pm

Where: Agricultural Learning Center, UMass Amherst

Registration: $25. Pay with cash or check at the door. Click here to register for this event.

This workshop is partially supported by a grant from the USDA.

Vegetable Notes. Katie Campbell-Nelson, Genevieve Higgins, Lisa McKeag, Susan Scheufele, co-editors.