



UMass  
Extension

# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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## CROP CONDITIONS

It's been muggy and sticky out there with mostly small afternoon rainstorms, although scattered locations throughout the state got up to 3" over the last few days. The Berkshires and the Cape were in a mild drought last week, so the 1-2" of rain that fell in both of those regions should definitely help!

Central and Western MA are under another air quality alert today with the wildfires continuing to burn across Canada sending smoke down into the US. People who are particularly sensitive, including those with asthma, heart or lung disease, as well as older adults and children and teenagers, are advised to avoid too much exertion outside while the alert is in effect.

Crops continue to roll in – summer squash, zucchini, and now cucumbers; strawberries and snap peas; early broccoli and cauliflower; bunches of carrots and beets. Tomatoes, peppers, and eggplants are flowering now.

As the list of crops on the harvest list continues to grow, so too does the list of pests to manage, as you can see from the long list of Pest Alerts below. In particular, we are starting to see more signs of disease with the recent increase in showers and humidity.

## PEST ALERTS

### Alliums

**Onion thrips** damage is starting to become evident in untreated fields. Damage includes silvery feeding scars and twisted or kinked leaves.



*Onion thrips*



*Corn is silking at Mountain View Farm in Easthampton.*

Thrips feeding also creates wounds that allow for entry of bacterial pathogens, which can cause bacterial bulb rots (when one or more individual layers of the bulb become watery and rotten) in storage. If controlling with pesticides, treatment is warranted when populations reach 1-3 thrips/leaf. Growers using organic pesticides should use the lower 1 thrip/leaf threshold. Use an adjuvant with all materials to help materials adhere to waxy allium leaves, unless it says otherwise on the label.

### Beans

**Mexican bean beetle** adults are active now. MBB adults and larvae feed on bean foliage and can cause significant defoliation. MBB can be controlled using parasitic wasp *Pediobius faveolatus* that lays its eggs

## CONTACT US:

Contact the UMass Extension Vegetable Program with your farm-related questions, any time of the year. We always do our best to respond to all inquiries. **Office phone:** (413) 577-3976 **Email:** [umassveg@umass.edu](mailto:umassveg@umass.edu)

**Home Gardeners:** Please contact the UMass GreenInfo Help Line with home gardening and homesteading questions, at [greeninfo@umext.umass.edu](mailto:greeninfo@umext.umass.edu).

in MBB larvae. See the article in this issue for more information.

### Cucurbits

**Cucurbit downy mildew** was reported on cucumber this week in 2 locations in southern Quebec. CDM often develops in this area in early summer, possibly due to year-round greenhouse cucumber production, suggesting that it is overwintering there, CDM has also been reported on cucumber in southern NJ. The recent storms may have blown spores up from the South and from NJ, so **it is recommended that growers be applying protectant fungicides now, especially to cucumber and cantaloupe crops which are most susceptible.** Protectants include mancozeb, chlorothalonil (e.g. Bravo), and copper (OMRI-listed options available). DM-targeted materials are not yet recommended. CDM can be controlled in cucumber by using

resistant varieties including Bristol, DMR401, NYS264, Citadel, Chaperon, Gateway, Espirit, and Raceway. If you suspect CDM in your crops, please let us know at (413) 577-3976 or [umassveg@umass.edu](mailto:umassveg@umass.edu)!

**Squash bug** eggs were observed in Hampshire and Franklin Cos. this week. Squash bug adults and nymphs feed with piercing sucking mouthparts on cucurbit foliage and fruit. Their feeding reduces yield and they also inject a toxin when they feed, causing plants to wilt. Watermelon, muskmelon, cucumber, and butternut are less preferred than other cucurbits. Row cover will exclude this pest, but must be removed during flowering to allow for pollination. For young plants, spray thresholds are 1 adult/plant for less-preferred crops or 1 adult/2 plants for preferred crops. Treatments for cucumber beetle may also control squash bug adults. Target adults with broad-spectrum pyrethroids (e.g. Brigade, Warrior, Pounce) or carbaryl, before bees are visiting the crop. Target nymphs with acetamiprid (e.g. Assail) which has lower toxicity to bees than other neonicotinoids. Organic growers can target nymphs with pyrethrin (e.g. Pyganic – a contact toxin) and azadirachtin (many different materials – an insect growth regulator), or Azera which is a pre-mix of both. Take measures to protect pollinators by avoiding spraying flowering crops or by spraying after dusk when pollinators are not visiting flowers.

**Squash vine borer** trap counts have shot up in some locations this week. SVB adults lay eggs at the base of thick-stemmed cucurbit plants (e.g. summer squash, zucchini, some winter squash), and the larvae tunnel inside the stem, causing the plant to wilt and often die. This pest can be monitored using phero-



*Cucurbit downy mildew on the top (left) and bottom (right) of a leaf.  
Photo: G. Higgins*



*Squash bug nymphs and eggs*

Table 1. Squash vine borer trap captures for week ending June 28	
Whately	0
Leominster	0
North Easton	24
Sharon	10
Southampton	1

more traps—see table. When significant moth flight is detected (5 moths/week in bush-type cucurbits and 12 moths/week in vining-type cucurbits), a pesticide spray is recommended. Conventional materials include Assail or pyrethroids (e.g. Brigade, Asana, warrior, Pounce). Make 2-3 applications, 5-7 days apart. Organic growers can use spinosad (e.g. Entrust) and/or Bt (e.g. Dipel). Direct sprays to the base of plants.

## Nightshades

**Early blight** was confirmed this week in greenhouse tomatoes. Early symptoms are brown lesions on the lower leaves, often showing target-like rings, and surrounded by a yellow halo. There are early blight-resistant tomato and potato varieties—see a list of resistant tomato varieties [here](#). Providing adequate nitrogen fertility throughout the growing season can delay onset of early blight. See the [field tomato](#) and [high tunnel tomato](#) sections of the New England Vegetable Management Guide for nutrient recommendations, and see the article in this issue for details on high tunnel tomato fertility.

**Botrytis gray mold**, another fungal pathogen, was also reported in greenhouse tomatoes this week. *Botrytis* primarily affects high tunnel crops where humidity is high, and can also create target-like lesions on leaves, but is distinguished from early blight by its fuzzy gray sporulation that stands up from the surface of infected stem or leaf tissue. *Botrytis* is a weak pathogen and only colonizes dead or dying tissue, so it usually infects flowers, pruning scars, and leaf tips where nutrient deficiencies have caused dieback. It can also cause faint white rings on fruit, called ghost spot. Managing environmental conditions in the greenhouse is key to keeping it at bay, but fungicides used preventively can help—see the [high tunnel tomato disease section](#) of the New England Vegetable Management Guide for labeled materials.

**Potassium deficiency** signs are starting to show up in greenhouse/high tunnel tomatoes. Tomato plants require potassium (K) to produce fruit and will reallocate K from lower leaves when fruiting begins if there aren't sufficient levels in the soil. Fertigating with soluble K is often recommended for high tunnel tomatoes. See the article in this issue for more information on managing nutrients in high tunnels.

**Solanaceous flea beetles** are continuing to feed voraciously in untreated eggplants, setting plants back. This pest will feed on other solanaceous crops and weeds, including tomato, pepper, and horsenettle, but it strongly prefers eggplant (and the weed Eastern black nightshade). These flea beetles are a different species than the flea beetles that feed on brassicas. Conventional controls include pyrethroids (e.g. Asana XL, Baythroid XL, Brigade, Bifenture, Mustang Maxx, Warrior II), neonicotinoids (e.g. Admire Pro, Actara, Platinum), and diamides (e.g. Verimark and Harvanta). Spinosad (e.g. Entrust) is the most effective material for organic growers; rotate with pyrethrin (e.g. Pyganic) after 2 consecutive applications of spinosad for resistance management.

**Colorado potato beetle** adults, eggs, small and large larvae are all present now in untreated and/or uncovered crops. Spray thresholds for potato are: 0.5 adults, 4 small larvae, or 1.5 large larvae per stalk (if plants are smaller than 18" tall) or per plant (if plants are larger than 18" tall). For eggplant: 2 small or 1 large larvae for plants less than 6" tall, and 4 small or 2 large larvae for plants more than 6" tall. Labeled conventional materials include pyrethroids, neonicotinoids, novaluron (e.g. Rimon), cyromazine (e.g. Trigard), spinosyns (e.g. Radiant), and diamides (e.g. Verimark, Exirel). In recent years, we have observed resistance to both neonicotinoids and syn-



*Squash Vine Borer larva.*  
Photo: Jude Boucher



*Botrytis cinerea on tomato.* Photo: S. Scheufele



*Colorado potato beetle small larvae.*  
Photo: M. Ng

thetic spinosyns. For organic growers, spinosad (e.g. Entrust) is the most effective. Azadirachtin (e.g. Azatin O), pyrethrin (e.g. Pyganic), and *Beauveria bassiana* (e.g. Mycotrol O, Botani-gard) can be tank-mixed or rotated. Pesticides are most effective if sprays target small larvae. CPB develops resistance very easily: if you apply a pesticide to this generation of CPB, *do not* apply the same class of insecticide to the next generation. See the article in [last week's issue of Veg Notes](#) for more details.

### Sweet Corn

**European corn borer:** untreated tasseling corn was above the 15% infestation threshold Hampshire Co. this week. When scouting, look for shot-hole type feeding (small round holes) and frass in foliage and tassels.



*European corn borer larva (left). Corn earworm larva (right).  
Photos: M. Ng*

Moths per night	Moths per week	Spray interval
0 - 0.2	0 - 1.4	no spray
0.2 - 0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 - 7	5 days
1 - 13	7 - 91	4 days
Over 13	Over 91	3 days

**Corn earworm** caterpillars were observed feeding in tassels in Hampshire Co. this week. CEW usually only lays eggs in corn silk, and the larvae tunnel into the ear from the silk—they may have been in the tassels in the absence of much silking corn. Most trapping sites are still reporting low captures of CEW this week, with the exception of one site in Worcester Co. reporting 32 moths. We may see CEW numbers spike next week as a result of moths being blown up from the South on this week's storms.

Spray options include Bt, synthetic pyrethroids, spinosyns (including Entrust for organic growers), and diamides (e.g. Coragen). CEW that are blown up from the South often have resistance to Warrior, so synthetic pyrethroids should not be used alone to control corn caterpillars—rotate IRAC groups to achieve good control and prevent resistance development. Besiege is a pre-mix of the active ingredients of Warrior + Coragen and will provide good control.

Location	GDD* (base 50°F)	ECB NY	ECB IA	FAW	CEW	CEW Spray Interval
<b>Western MA</b>						
Feeding Hills	813	0	0	0	12	4 days
Southwick		0	0	0	1	no spray
Granby	764	20	0	0	4	5 days
Whately	826	0	1	-	2.5	6 days
<b>Central MA</b>						
Lancaster	835	3	0	0	6	5 days
Leominster		0	0	0	32	4 days
Grafton	683	1	1	0	1	no spray
Spencer	764	4	0	0	3	6 days
<b>Eastern MA</b>						
Bolton	759	2	0	-	-	-
Concord	720	4	0	0	3	6 days
Haverhill	750	2	0	0	1	no spray
Ipswich	675	3	0	0	2	6 days
Millis	-	2	4	n/a	0	no spray
North Easton	760	0	0	0	14	4 days
Sharon		0	0	n/a	11	4 days
Sherborn	762	1	0	0	3	6 days
Seekonk	707	0	0	0	2	6 days
Swansea		4	0	-	-	-
- no numbers reported for this trap						
N/A this site does not trap for this pest						
*GDDs are reported from the nearest weather station to the trapping site						

## Multiple Crops

**Scarab beetles** are active now. There are four species of scarab beetles in New England. All have larval stages that feed on grass roots and adults feed on foliage. They are generalists but most often cause significant damage on basil and sweet corn. The New England Vegetable Management Guide lists labeled pesticides for Japanese and/or Oriental beetles in [basil](#) and [sweet corn](#).

**Cutworm** damage is being widely reported across the state on a variety of crops, but especially peppers and beans. Cutworms cause the most damage to young seedlings and transplants, and the larvae causing this damage are likely pupating now, so existing crops are not at great risk for more damage later this season. See the article in this issue for more information.

**White mold**—a disease with a wide host range including veg crops like beans, cabbage tomatoes, and potatoes—was confirmed in lettuce in Hampshire Co. this week, and we’ve heard other reports of WM from around the region on multiple crops including high tunnel cucumbers and beans. White mold is caused by the fungus *Sclerotinia sclerotiorum*, which produces fluffy, white mycelium on infected plants and sclerotia (masses of fungal tissue surrounded by a hard, dark rind that act as survival structures) that look like mouse droppings within infected tissue. Sclerotia can survive in the soil for many years. In the spring, sclerotia germinate and produce fruiting bodies that in turn produce spores. The spores infect senescing flowers or leaves and move into healthy tissue from there. If you have a limited infestation, removing plants from the field or tunnel can limit soil contamination. Contans is a biogungicide labeled specifically for white mold control, attacking the sclerotia. It is best applied at the end of the season so that it has all winter to find and destroy sclerotia in the soil. Priaxor Xenium, Luna Sensation, and Cabrio are labelled for disease suppression only.



*Japanese beetle adult*



*White mold. Photo: A. Madeiras*

## CUTWORM DAMAGE IN VEGETABLE CROPS

In the last week, we received several reports of high levels of cutworm damage in a variety of crops. Cutworms are notorious for mysterious feeding damage because large larvae typically come out to feed at night. In summer crops, the black cutworm will cut plants at the base and sometimes pull the plant under the soil to feed, resulting in suddenly missing plants! Most years, we see some cutworm damage here and there, but not enough to cause concern. The good news for this year is that the 1<sup>st</sup> generation black cutworm larvae are now pupating so the period of highest damage in long-season crops is over. Cutworms are most damaging to young seedlings and transplants, so your existing crops should be large enough to withstand damage from subsequent generations. Cutworms do not overwinter in fields in the Northeast, so you may not have high levels of damage in the same fields next year.

### Identification

There are two common species of cutworm in the Northeast – black cutworm (*Agrostis ipsilon*) and variegated cutworm (*Peridroma saucia*). Like all cutworms, the adults of these pests are night-flying moths. Eggs are ribbed and round, and laid in clusters on foliage. The larvae burrow into the soil during the day and emerge at night to feed on plants. They can grow up to 2” long. Pupae are orange-brown, becoming dark brown, and ½ to ¾” long.

**Black cutworm** larvae are dark gray and appear “greasy”, though this appearance is actually caused by the granular

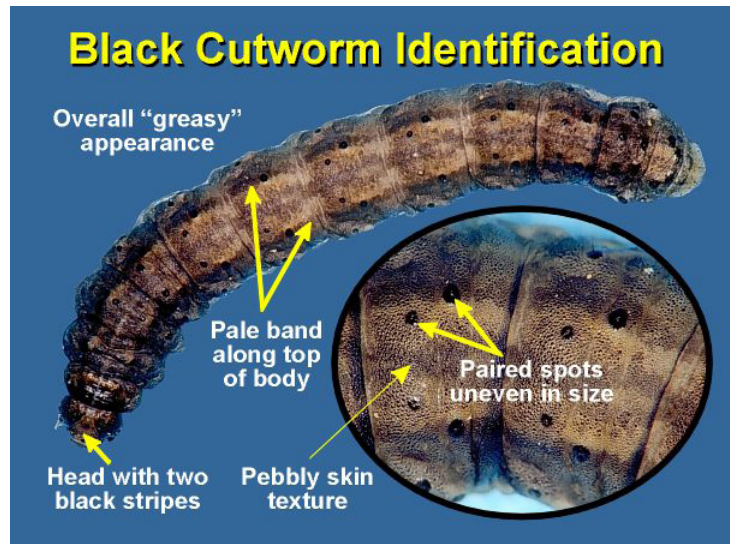


*A black cutworm curled into a characteristic “C” shape after being dug up.*



Above: *Variegated cutworm* (Photo: J. Kalisch, Univ. Nebraska, Bugwood.org)

Right: *Black cutworm identification*. (Photo: University of Nebraska-Lincoln)



texture of their skin. They have a paler band of pairs of unevenly-sized spots (called tubercles) along the backs of their bodies. Larvae remain in the foliage until the 4<sup>th</sup> instar; larger larvae tunnel into the soil during the day and come out to feed at night.

**Variegated cutworm** larvae are brownish-gray, with yellow markings. They have a line of 4 to 7 yellow diamonds down the middle of their back.

When disturbed, cutworms will curl into a characteristic “C” shape. Because they feed at night, it’s rare to see them during the day, but you can often find one just below the soil surface next to a damaged plant.

### Crop Injury

Cutworms are generalists and will feed on most vegetable crops. Young larvae of both species (1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> instars) and large **variegated cutworm** larvae feed on crop foliage; larger **black cutworm** larvae will more often cut plants at the base to feed, sometimes pulling the entire plant underground. Plants will usually grow out of the foliar feeding damage from small larvae but larger larvae can defoliate plants, and stem cutting from heavy infestations can cause significant crop loss. Plants also usually grow out of their susceptibility to damage. Variegated cutworm will also feed on tomato fruit, creating holes that can become quite deep. Cutworms may feed on crop roots but generally do not cause significant root damage. This year we’ve gotten reports of cutworm damage in beans, peas, peppers, and artichoke, and we routinely see damage in brassica transplants also.



*Cutworm damage in bean, and a cutworm discovered nearby.* Photo A. Eaton

### Life Cycle

Black and variegated cutworms generally do not overwinter in locations where topsoil freezes, but they may overwinter in the Northeast in high tunnels. (We’ve seen lots of cutworm damage in winter high tunnel greens over the last several years—this damage could also be caused by winter cutworm, a different, more cold-tolerant species.) Both species overwinter in the South and Mid-Atlantic and adults are blown northward on storm fronts in the spring. Black cutworm moths arrive in the Northeast between March and June, and variegated cutworm moths arrive slightly later, in mid-/late summer. Moths lay eggs on plants, preferring low lying areas or areas that frequently flood and fields with lots of crop residue.



*Black cutworm pupa.* Photo: M. Shepard, G. Carner, and P.A.C. Ooi, Bugwood.org

The resulting larvae feed in crops and go through 5-9 instars (6-7 most common) before pupating in the soil. In the Northeast, there are 2-3 generations of both black and variegated cutworm in a season. The generations overlap, so mid-summer, you may find any stage cutworm in the field.

Black cutworm activity can be predicted using a growing degree day (GDD) model. There is not an established GDD model for variegated cutworm. GDDs are the number of degrees above a base temperature that accumulate each day, and GDD models are based on the fact that insect development is linked to temperature accumulation. See table 1 for the life stages and activity of the 1<sup>st</sup> generation of **black cutworm** based on GDD accumulation.

Table 1. GDD model for the first generation of black cutworm		
GDDs base 50°F	Black cutworm stage	Black cutworm activity
0	Significant moth capture	Egg laying
90	Egg hatch	
91-311	1 <sup>st</sup> – 3 <sup>rd</sup> instar	Leaf feeding
312-364	4 <sup>th</sup> instar	Cutting begins
365-430	5 <sup>th</sup> instar	Cutting
431-640	6 <sup>th</sup> instar	Cutting
641-989	Pupa	No feeding
Source: University of Minnesota Extension, <a href="https://extension.umn.edu/corn-pest-management/black-cutworm#sources-1187610">https://extension.umn.edu/corn-pest-management/black-cutworm#sources-1187610</a>		

### Monitoring & Thresholds

Cutworm populations can be monitored using pheromone traps, which use lab-produced sex pheromones to attract and catch male moths. Yellow and white Unitraps can be used, although they will also trap bees that are attracted to the colors. Sticky wing traps can also be used.

Trapping will inform when to begin scouting fields for cutworm damage, and scouting results will tell you when an insecticide spray may be warranted. Trap for black cutworm from March through May, and for variegated cutworm from July through September. If trap captures exceed 40 moths/week, begin scouting for cutworm feeding damage weekly. The following spray thresholds are recommended:

- Tomato: 1% of plants cut down or with damage
- Pepper: 1-2% of plants cut down or with damage
- Sweet corn: 5% of plants cut down or with damage

### Cultural Controls & Prevention

**Natural enemies** of cutworms include ground beetles and parasitic flies and wasps. In most years and most locations, these natural enemies effectively manage cutworm populations.

**Weed control.** Cutworm moths will lay eggs on weeds, so controlling weeds, especially winter annuals, will reduce egg-laying habitat. However, larvae will also feed on weeds, so if a very weedy field is cultivated after planting, larvae may move to feed on the crop. So, consistent, long-term weed control is important.

**Plasticulture.** Plants grown in plastic beds experience less damage.

In fields that routinely have severe infestations, **fall plowing** can reduce spring egg-laying sites. (Plowing in the fall and leaving bare ground over the winter is not something we usually recommend and would only be recommended if a particular field was very attractive for egg-laying for many years).

In small areas, **hand squishing** can be effective. During the day, cutworms are often just below the soil surface at the



*Cutworm damage on pepper.  
Photo: K. Campbell-Nelson*

base of a cut or damaged plant. Digging up the dirt around the affected plant often reveals the cutworm, curled into a tight “C”, and it can be squished or dropped into a cup of soapy water.

**Row cover or insect netting** will effectively prevent egg-laying in crops if applied in early spring as soon as crops are planted.

### **Chemical Control**

In fields that had lots of cutworm damage this spring, insecticide applications will likely not be helpful at this point. Cutworms are most damaging to young seedlings and plants, so as your existing crops grow larger, they will not be susceptible to significant damage from the subsequent generations of cutworms (with the exception of potential fruit damage in tomato). But insecticide applications can be effective earlier in the spring if you notice significant damage in future years.

Because it can be tricky to predict what fields will have heavy cutworm infestations, preventative insecticide applications are not recommended. Foliar rescue treatments can be very effective, though. Many pyrethroids (e.g. Fastac, Baythroid, Brigade, Delta Gold, Asana, Declare, Warrior II, Pounce, Mustang) are labeled – these are contact insecticides that need to hit the larvae to be effective, so spraying at night, between midnight and dawn when larvae are most actively feeding, is essential. Besiege is a contact pyrethroid pre-mixed with a diamide (chlorantraniliprole), which works by ingestion. Not all the materials listed above are labeled for all vegetable crops so be sure to check labels. Confirm (labeled for tomato, pepper, and eggplant) and Intrepid (brassicas, leafy vegetables, herbs, and root/tuber crops) are also effective against cutworms and work by ingestion, giving you more flexibility as to when you apply. They are also specific to caterpillar pests and are not disruptive to beneficial insects and bees.

Bt products including Dipel and XenTari (both OMRI-listed) should also be effective and can be applied at any time of day because they work by ingestion.

Cutworm is listed under several crops in the [New England Management Guide](#); see the Guide for materials labeled for a specific crop.

### **Other resources:**

[Black cutworm – University of Minnesota Extension](#)

[Black Cutworm](#) – University of Florida Department of Entomology.

New England Vegetable Management Guide – [Outdoor Tomato Insect Control](#), [Pepper Insect Control](#), [Sweet Corn Insect Control](#)

[Cutworms](#) - UMass Extension Turf Program

*--Written by G. Higgins, UMass Extension Vegetable Program*

## **MEXICAN BEAN BEETLE MANAGEMENT**

Adult bean beetles have been spotted on bean plants in western MA. If you plan to use the biological control agent *Pediorhiza* for control this year, start scouting your bean fields now for adults and egg masses, if you haven't already. Mexican bean beetles may be pests on snap beans, lima beans, and, more recently, soybeans. While they are not a pest on every farm, some farms report significant damage from these insects and should take action to prevent crop loss. Populations often build up when beans are grown in the same location every year—often close to the farm stand for PYO customers or CSA members. Using a combination of cultural and biological controls can reduce the need for insecticides in these sensitive areas.

Mexican bean beetle (MBB) adults are coppery brown with black spots. They look very much like large ladybeetles and in fact are closely related. Unlike ladybeetles, which feed on other insects, MBB adults feed on leaves. Adults spend the winter in hedgerows and usually move into fields in June. Shortly after adults arrive in a bean field, they lay yellow-orange egg masses on the underside of leaves in clusters of 40 to 50. These hatch into bright yellow, spiny, oval larvae, which feed, molt several times as they grow, and pupate on the underside of leaves. Feeding damage from adults and larvae can reduce yield and injure pods if numbers are high. There are 2-3 generations per season, usually increasing in numbers with each generation. Populations are usually less abundant on early plantings and may not build to damaging levels until August.



## Cultural Control

- Promptly destroy crop residues after harvest to reduce overwintering populations.
- Maintain wide, clean headlands and brushless wood edges.
- Avoid sequential plantings in close proximity.
- Row covers can be used to exclude beetles until harvest, or for as long as it is practical.
- Reflective metallic and white plastic mulches have been shown to significantly reduce beetle densities and feeding damage relative to black plastic or bare ground.

**Biological Control.** *Pediobius foveolatus* is a commercially available biological control agent for MBB and has a good track record in the mid-Atlantic states and among New England growers who have tried it. *Pediobius* (pronounced “pee-dee-OH-bee-us”) is mass-reared and sold by the New Jersey Department of Agriculture and is also available from other beneficial insect suppliers (see contact information below). This small (1-3 mm), non-stinging, parasitic wasp lays its eggs in MBB larvae. Wasp larvae feed inside the MBB larva, kill it, and pupate inside it, forming a brownish case called a ‘mummy’. About 25 adult wasps emerge from one mummy. The parasitoids are shipped to farms as mummies or as adults. Adult wasps will emerge from mummies within 2-3 days of receipt.

*Pediobius* is suited to our succession-planted snap bean crops. The first bean planting serves as a ‘nurse crop’ to establish the population of *Pediobius* that will be hard at work in successive plantings all summer. Control continues and in fact gets better as the season progresses and successive generations of the wasp emerge and search out new bean beetle larvae. Planning 2-3 releases at 7-10 day intervals will help ensure good timing and coverage on several plantings. After a release in the first planting, it is advisable to leave that planting standing for a while, until the new generation of wasps has emerged from their mummies.

As with any biological control, make releases as soon as the pest is present, not after it has built up to damaging numbers. The New Jersey Dept. of Agriculture Beneficial Insect Rearing Laboratory recommends two releases, two weeks in a row, coinciding with the beginning of Mexican bean beetle egg hatch. Wasps will lay their eggs in larvae of any size, but it is best to target the newly hatched young MBB larvae. This will give control before damage has been done. Thus, timing is important. Scout for egg clusters and time the shipment for when the first eggs hatch into larvae. If in doubt about the timing of the hatch, release as soon as you see the eggs—if you wait for the larvae, you may be playing catch-up. The release rate should be at least 2,000 adult wasps per field for less than an acre, or 3,000 per acre for fields of one acre or more. Mummies are frequently shipped in screen bags. Simply secure the bag to the underside of a bean plant. IPM Laboratories recommends 160 mummies/A, split between 2 releases for light infestations, 640 mummies/A, split between 2 releases for heavy infestations and for the home garden, a minimum of 10 - 15 mummies. Like beans, *Pediobius* wasps are killed by frost so annual releases are necessary.

Plan ahead by contacting a supplier to inform them of your acreage and expected release dates (based on what you’re seeing when scouting).

**Contact information for New Jersey State Dept of Agriculture:** [Philip Alampi Beneficial Insect Rearing Lab.](#) (609) 530-4192. You’ll also get advice on how to use the wasps from this office.

*Pediobius* is also available from the following suppliers:



Clockwise from top left: Mexican bean beetle adult (UMass Vegetable Program), egg mass (J. Baker, North Carolina State Univ., Bugwood.net), larva (UMass Veg Program), and mummies (larvae that have been parasitized by the *Pediobius* wasp (UMass Veg Program).

[IPM Laboratories](#), NY, 315-497-2063. Contact to check availability

[ARBICO Organics](#), 800 -827-2847. Order online; orders ship on Wednesdays ONLY, minimum 7-day processing.

**Chemical control.** Treatment with an insecticide may be warranted to prevent economic losses. A suggested treatment threshold is >20% defoliation during pre-bloom or 10% during pod formation. Several conventional and organic insecticides are labeled for use against MBB, including several products that also effectively control potato leafhopper, which is also a major pest of beans and which may also be feeding in bean fields now. Be sure to get coverage of lower leaf surfaces. Kaolin clay (Surround) may be used on seedlings and young plants to deter feeding and egg laying. For more information on chemical control options, see the [New England Vegetable Management Guide](#) and the [Cornell Resource Guide for Organic Insect and Disease Management](#).

Chemical controls for MBB and potato leafhopper could have harmful effects on *Pediobius*, especially on adult wasps. If releasing *Pediobius*, avoid sprays shortly before or after releases; apply treatments to a succession planting 5 days before release.

--Written by the UMass Vegetable Program

## **HIGH TUNNEL TOMATOES: FERTILITY AND TISSUE TESTING**

As summer days grow longer and warmer, high tunnel tomatoes grow steadily upwards, requiring weekly pruning, trellising, and other maintenance. As the plants continue to grow and fruit begins to ripen, the nutrient demand for calcium and potassium required to produce high quality, marketable fruit increases.

Many growers focus on calcium (Ca) at this stage in order to avoid [blossom end rot](#) (BER) later in the season. However, BER is more an imbalance of Ca within tomato plants themselves rather than lack of Ca availability, and more often than not, it is related to soil moisture fluctuation, heat stress, and sometimes, excessive nitrogen rather than a deficiency of calcium in the soil. Potassium (K) deficiency, in concert with excessive heat, can be an even greater problem for quality fruit production than Ca, resulting in blotchy ripening, yellow shoulders, and grey wall. Indeterminate varieties in tunnels and greenhouses continuously carry heavy loads of fruit, so potassium demand remains high from early summer onward. (See “Abiotic Disorders of Tomato” in the June 15, 2023 Issue of *Vegetable Notes* for more on these and other physiological disorders.)



*Blossom end rot. Photo: K. Campbell Nelson*

### **Soil testing - monitor available AND reserve soil nutrients.**

Taking a high tunnel soil test in the early spring can help guide your soil amendment planning to sustain the heavy nutrient demands of high tunnel tomatoes. We recommend getting both a field soil test and a saturated media test for high tunnels.

A **field soil test** extracts reserve nutrients and reports the nutrient levels that will theoretically become available to plants as the season progresses. However, in the warm, well-watered high tunnel environment, tomato plants will start growing quickly right away, so it's also important to know what nutrients are immediately available to those plants. This is measured using a **saturated media extract (SME) test**, generally used for soilless greenhouse media. Use both the field soil test and the SME to plan nutrient applications in the spring, and then take leaf tissue samples monthly to inform fertigation or side-dressing during the season (more information on tissue testing below). Soil and soilless media tests are both available at the [UMass Plant and Nutrient Testing Lab](#) and the [UMaine Analytical Lab and Maine Soil Testing Service](#). The UMaine Soil Lab offers a Hoop House Special with a package price and recommendations specific to [Hoop House/High Tunnel Soil Management](#).

A survey of 20 high tunnels conducted in 2018 in Massachusetts, New Hampshire, Rhode Island, and Vermont showed that both potassium and nitrogen are removed in large quantities by high tunnel tomatoes. As a result of this study, fer-

tility recommendations provided in the New England Vegetable Management Guide for high tunnel tomatoes are now more closely correlated with expected crop yield. In other words, high-producing hybrid, indeterminate plants, which are in the ground for 6+ months (and may be grafted) have significantly higher nutrient demands than a June-planted, determinate tomato. Intuitively, the more biomass your plant is expected to accumulate, the greater the nutrient demands. Specific yield-based nutrient recommendations can be found in the [Greenhouse and High Tunnel Tomato section of the New England Vegetable Management Guide](#).

### Tissue testing

Tissue testing is one way to understand what nutrients your plants are actually taking up from the soil before you see deficiency symptoms in your plant or even worse, on your fruit. Many tunnels need a mid-season boost of K through fertigation or top-dressing. Aiming for 3% K in the most recently matured leaves, by dry weight, is a good goal. Optimum tissue test values from the University of Delaware Extension for the most recently matured leaves at first flower are listed in Table 1.

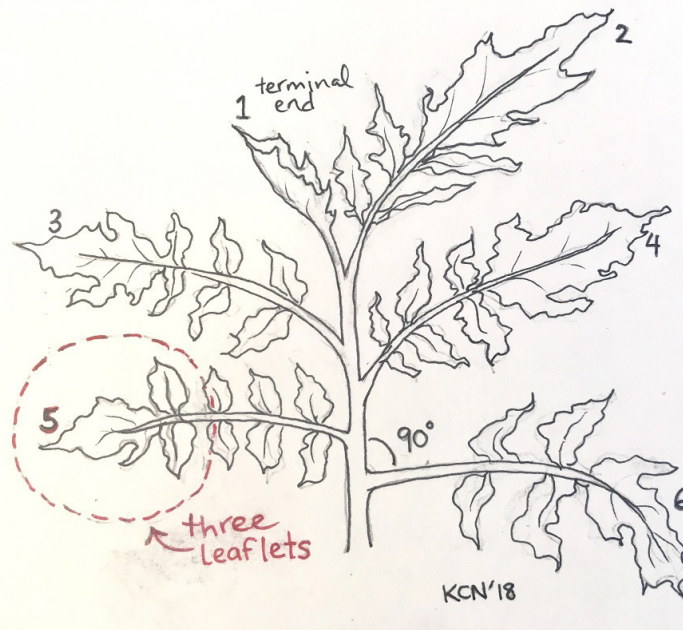
Nitrogen (N)	2.8-4.0%
Phosphorus (P)	0.2-0.4%
Potassium (K)	2.5-4.0%
Calcium (Ca)	1.0-2.0%
Magnesium (Mg)	0.25-0.5%
Sulfur (S)	0.3-0.6%

For conventional growers, soluble fertilizers with a K:N ratio of somewhere around 2:1 can help, according to research from Michigan. More N may be required for season-long production on indeterminate vines.

For organic growers, you can top-dress sulfate of potash, as long as your irrigation moisture is able to reach it so it can dissolve, or potassium sulfate “fines” can be dissolved in hot water for fertigation.

The UMass Soil Testing Lab does not currently accept tissue samples. Other university labs in the region that do are the [UMaine Analytical Lab and Maine Soil Testing Service](#) and the [Penn State Agricultural Analytical Services Laboratory](#).

**How to take a tomato tissue sample:** Tissue testing monthly, or even one or two times early in the season, can help take some of the guess work out of high tunnel growing and make sure that plants are taking up sufficient potassium as well as other nutrients. At the very least, taking a sample at the onset of fruiting is a good time to ensure that nutrients are adjusted for a long and productive season. Below are the steps for taking an accurate tissue sample. (Contact the lab you’re using for submission forms and for their specific sampling and submission information.)



Tomato tissue sample. Graphic: K. Campbell-Nelson

- When sampling tomato leaves, take 3 leaflets from the tips of 30 leaves.
- Take the most expanded leaf below the first blooming flower cluster, which often is about 5 leaves down from the terminal. The 6<sup>th</sup> leaf is usually at a 90° angle to the stem (see diagram, above).
- Sample in the hour before or after noon (this is usually the peak uptake of nutrients for the day).
- Collect a representative sample of the planting from at least 15 plants of a single variety.
- If there is spray residue on the leaves, briefly rinse them with distilled water and pat dry.
- When sending to a lab, pack in paper bags, not plastic, so the material does not begin to rot.
- If you are trying to diagnose a nutrient deficiency on a portion of your plants, send samples of both “healthy looking” plants as well as afflicted ones.

**A few other practices that may help improve yield at this point in the season include:**

**Provide adequate soil moisture.** Install at least 2 drip lines per plant, up to 4 in sandy soil. Mulches may help keep moisture even across the soil surface.

**Keep up with pruning.** Prune side shoots when small. Remove foliage to first cluster.

**Track performance.** Measure harvests, even if simply counting boxes. This is key to assessing management changes.

**Scout and manage pests.** Do not let challenging insects (like aphids) or diseases (like powdery mildew) get ahead of you. Set up a regular scouting schedule and get in touch with us ([umassveg@umass.edu](mailto:umassveg@umass.edu)) for pest ID and management help. Scouting resources including a scouting form and tomato disease guide, are available [here](#).

**Additional resources:**

[University of Delaware Tomato Commodity Recommendations](#)

[Refining Tomato Nutrition for Improved Packouts](#) – Steve Bogash, PennState

*--Original article written by Katie Campbell-Nelson (formerly of the UMass Vegetable Program) and Becky Maden (University of Vermont Extension). Updated by L. McKeag and Maggie Ng for 2023.*

## **NEWS**

### **EPA SEEKING COMMENT ON BILINGUAL LABELING**

The EPA Bilingual Labeling Requirements under the Pesticide Registration Improvement Act of 2022 (PRIA 5) require EPA to solicit all stakeholders on the best methods to make bilingual labeling accessible to farmworkers and increase awareness of the program. PRIA 5 amended the Federal Insecticide, Fungicide, and Rodenticide Act, requiring

Spanish language translation for key health and safety sections of the end-use pesticide product labels. Public input that includes environmental justice perspectives with solutions will be key in helping the Agency develop a strong starting point for addressing historical disadvantages for farmworkers.

Comments must be submitted by **August 21, 2023**.

Federal Register Notice on Open Comment Period: <https://www.regulations.gov/document/EPA-HQOPP-2023-0270-0003>

Bilingual Labeling Docket: <https://www.regulations.gov/docket/EPA-HQ-OPP-2023-0270/document>

## **EVENTS**

### **UNH EXTENSION TWILIGHT MEETINGS**

UNH is hosting a series of meetings on the following topics. There are several meetings next week!

- Food safety and wash and pack sheds
- High tunnel crop production
- Tissue Testing and Soil Fertility

[Click here for a full event list.](#)

### **TWILIGHT MEETING: [IRRIGATION SYSTEMS AND MANAGEMENT AT WARNER FARM](#)**

**When:** Thursday, July 13, 4:00 pm - 6:00 pm

**Where:** Warner Farm, 23 South Main Street, Sunderland, MA, United States

**Registration:** Free! [Click here to register.](#)

Warner Farm, a CSA and wholesale farm as well as the home of Mike's Corn Maze, located in Sunderland, MA, has been developing its irrigation capacity since the late 1970s. The farm's rich sandy loam has been growing fruit and vegetable crops for centuries and as a changing climate brings changing precipitation patterns to New England, Warner Farm is poised to respond effectively in times of drought.

Join CISA, the UMass Extension Vegetable Program, and Dave Wissemann of Warner Farm on July 13th at 4:00pm

for an up close look at how they are optimizing their water resources and water distribution systems to ensure the sustainable production of crops throughout the season and in the face of increasingly uncertain growing conditions. The workshop includes a farm walk to see irrigation equipment and set up and a detailed explanation of how the farm's systems are designed and maintained. Following the farm walk, join us for further discussion and some locally produced drinks and snacks.

#### **TWILIGHT MEETING: [SAWYER FARM REDUCED-TILL PERENNIAL CLOVER TRIALS](#)**

**When:** Thursday, July 20, 4:00 pm - 6:00 pm

**Where:** Sawyer Farm, 19 Sawyer Road, Worthington, MA, United States

**Registration:** Free! [Click here to register.](#)

Over the past several seasons, farmers at Sawyer have been experimenting with different ways to plant row crops into perennial white clover and reduce tillage using a series of innovative practices. Join Sawyer Farm's Lincoln Fishman for a close look at transplanter shoe adaptations designed to reduce soil disturbance and weed competition in perennial clover and cash crop production. Berkshire Conservation District will also display their no-till drill seeder, which is available for rentals and can be used for mixed or single species applications from clovers and orchard grass to rye and soybeans.

This in-person workshop will be followed with an on-farm networking opportunity. The workshop will take a close look at the system and the research underway with UMass through a SARE Partnership Grant, and is part of CISA's 2023 Adapt Your Farm to Climate Change Webinar and Workshop Series: On-farm Climate Change Adaptation Case Studies from western Massachusetts.

*This event is co-sponsored by CISA and the UMass Extension Vegetable Program.*

#### **TWILIGHT MEETING AT PARLEE FARMS**

**When:** Tuesday, August 15

**Where:** Parlee Farms, 95 Farwell Rd, Tyngsborough, MA 01879

Join UMass Extension to hear about pumpkin varieties grown at Parlee Farms, as well as sweet corn IPM and automated irrigation systems.

#### **SOUTH DEERFIELD RESEARCH FARM FIELD DAY**

**When:** Wednesday, August 16

**Where:** UMass Amherst Crop and Animal Research and Education Farm, 91 River Rd., South Deerfield, MA

Come hear about active research going on at the farm, including Vegetable Program trials on heat mitigation strategies, cucumber and basil downy mildew resistant varieties, sprayer technology, and more! We'll also have a presentation on automated irrigation systems from Toro.

#### **TWILIGHT MEETING AT HEART BEETS FARM: SWEET POTATO PRODUCTION AND FALL PEST MANAGEMENT**

**When:** Thursday, September 21, 4-6pm

**Where:** Heart Beets Farm, 181 Bayview Ave, Berkley, MA 02779

Join UMass Extension to hear about sweet potato production at Heart Beets Farm, and to learn timely info about fall pest management.

#### **EASTERN MA CRAFT MEETING: [GEOTHERMAL WATER USE AND GOOD AGRICULTURAL PRACTICES AT FARMER DAVE'S](#)**

**When:** Saturday, October 21, 4-6pm

**Where:** Farmer Dave's, Dracut, MA

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