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For Vegetable Farmers in Massachusetts since 1975

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Moving a CEW trap to fresh silking corn in Whately, MA. Growers are counting on their first sweet corn being ready for 4th of July barbecues this weekend! Photo: L. McKeag

Crop conditions

We're hearing mostly positive reports from growers in the field this week. Crops are looking good and there's a lot of food out there. Salad greens, spring onions, snap peas; cabbages, collards, and cukes; broccoli, beets, and ... big tomatoes. And the first sweet corn looks pretty good for hitting stands in time for the holiday weekend. A few cool nights early last week might have slowed it down, but hot sunny days closing out this week should push it past the finish line.

It's dry, for sure—the US Drought Monitor shows most of Massachusetts is in moderate drought status—but as long as we keep getting *some* rain, it's easier to deal with irrigation equipment than it is to try to get into a saturated field. (We see you, July 2021.)

Don't forget to sign up to get counted in the 2022 Census of Agriculture. The deadline to get on the list is today and any operations that sell at least $1000 worth of fruit, vegetables, or some food animals can participate. Producers who sign up will receive the actual census forms in November. These data are collected every 5 years, and as with the US Census, the information is used to make all kinds of decisions about funding, policy, services and programs that, in this case, affect farmers. The Veg Team often uses Census of Ag data in our grant applications to highlight the number of farmers in our state and justify the funding that supports our work. The form to get on the list just takes a minute to complete so if you don't already receive NASS surveys, sign up!

Pest alerts

Alliums

Leek moth damage was observed in New Hampshire this past week. Leek moths are a relatively new pest of alliums in the region—they were first found in Vermont in 2012, and NH in 2016. Leek moth has not been confirmed in Massachusetts, though its range has been slowly increasing to the south and east. Scott Lewins at UVM, who has been studying and following the trajectory of this pest, said he wouldn't be surprised if we eventually started to see signs of them in Massachusetts, likely starting in the northwest corner of the state. They feed on most alliums but prefer leeks. The larvae feed on the top and inside of leaf tissue, often boring into the center of the plant and leaving pinholes in the leaves (see photos next page). Larvae are pale yellow, with a darker head capsule and 8 small dots on each abdominal segment. To determine whether treatment is warranted, scout 25 plants and spray if more than 1 plant is damaged. For more information about cultural and chemical control options, check out the leek pest section of the New England Vegetable Management Guide. If you find leek moths or leek moth damage in Massachusetts, let us know (umassveg@umass.edu)!

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 *We are currently working remotely but checking these messages daily, so please leave us a message!* **Email:** umassveg@umass.edu

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

Fusarium was recently observed in garlic in Massachusetts. Fusarium, caused by the fungus *Fusarium oxysporum* f. sp. *cepae*, is a soil-borne disease that causes leaves to curve, turn yellow and/or die back, beginning at the tips and developing downward. In later stages, red-brown discoloration and rot will appear at the base of the plant, where the roots meet the bulb, and bulb tissue will appear brown and watery when cut open. Symptoms may not be visible in the field but may develop during storage. The most effective way to prevent fusarium is to plant resistant cultivars and rotate away from alliums for at least 4 years.

Leek moth larva in garlic leaf (left, photo: A. Ivy, Cornell) and damage (right, photo: S. Lewins, UVM)

Wilt caused by fusarium in onion.
Photo: H. Schwartz, Colorado State University

Beans

Mexican bean beetle adults were observed this past week in Massachusetts. Adults look like large copper-colored lady beetles. Unlike lady beetles, they feed on leaves, not other insects, and can reduce crop yield if numbers are high. *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. 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'. 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 rears and sells the wasps and recommends two releases, two weeks in a row, coinciding with the beginning of Mexican bean beetle egg hatch. Timing is important—watch for eggs and time the shipment for the first hatch of eggs into larvae. To order wasps, contact the 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.

Mexican Bean Beetle adult, eggs, and larva.
Photo: University of Maryland extension

Cucurbits

Spotted cucumber beetles were observed this past week in Connecticut. We're all used to keeping an eye out for *striped* cucumber beetles, but it's good to be aware of their spotted relatives. Like striped cucumber beetles, spotted cucumber beetles can transmit bacterial wilt. Unlike striped beetles, spotted ones do not overwinter

in New England and rarely build up to damaging levels in this area. Scout and treat for spotted cucumber beetles the same way you would for striped cucumber beetles (see the cucurbit pest section of the NE Vegetable Management Guide).

Table 1. Squash vine borer trap captures for week ending June 30

Whately	3
Leominster	14
Sharon	11
Southampton	15

Solanaceous

Dickeya dianthicola was recently found on Silver Tin potatoes in Massachusetts, and confirmed by PCR. *D. dianthicola* is a bacterial pathogen that is generally transmitted via infected seed potatoes and is not that common in our region. It causes poor emergence due to rotting seed pieces. Plants that do emerge often wilt and/or have blackened stems that extend upwards. Make sure that you purchase certified seed potatoes that have been inspected for Dickeya. Fields where Dickeya has been confirmed should be avoided for the following year. No pesticides are effective for managing the disease.

Table 2. Spray intervals for corn earworm based on moth captures in Heliothis net traps.

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

Two-spotted spider mites were observed in eggplant in Connecticut. Spider mite feeding causes speckling of foliage and when heavy infestations occur, webbing is often visible on the undersides of leaves. Early control is essential. Use selective materials wherever possible, as broad-spectrum insecticides will kill naturally occurring mite predators which can exacerbate the problem. Selective products which have worked well in the field include Agri-Mek, Acramite, Movento, Oberon 2SC, Kanemite, and Portal XLO. OMRI-listed materials include insecticidal soap (e.g. M-Pede) and horticultural oils (e.g. Trilogy, Suffoil X, Golden Pest Spray Oil—don't use when temperatures are high or plants are drought-stressed). Use early and regularly and take measures to ensure good leaf coverage.

Table 3. Sweetcorn pest trap captures for week ending June 30

Location	GDD[1] (base 50°F)	ECB NY	ECB IA	FAW	CEW	CEW Spray Interval
Western MA						
Deerfield	891	3	0	-	6.5	*5 days*
Feeding Hills	927	0	0	0	1	*no spray*
Granby	903	0	0	0	0	*no spray*
Hatfield	866	0	0	0	5	*5 days*
Whately	917	0	4	-	0	*no spray*
Central MA						
Leominster	846	2	0	-	0	*no spray*
North Grafton	780	4	0	0	0	*no spray*
Sutton		0	0	0	1	*no spray*
Spencer	817	2	0	0	0	*no spray*
Eastern MA						
Bolton	846	1	0	-	0	*no spray*
Concord	860	0	0	0	1	*no spray*
Ipswich	734	0	0	0	9	*4 days*
Littleton	-	20	0	0	1	*no spray*
Millis	-	0	0	n/a	0	*no spray*
Sharon	878	4	1	n/a	3	*6 days*
Sherborn	870	4	0	0	4	*5 days*
Seekonk	972	1	0	-	0	*no spray*
Swansea		0	0	-	0	*no spray*

- no numbers reported for this trap
N/A this site does not trap for this pest

[1]GDDs are reported from the nearest weather station to the trapping site

Sweet Corn

Sap beetles were recently seen in high numbers in Connecticut and were also observed in Massachusetts. Sap beetles are usually a secondary pest in corn and don't tend to drive pesticide sprays. However, if there aren't a lot of other moths around, sap beetles can be more significant, and some years are worse than others. They are especially attracted to peaches or other rotting fruit, so you may notice more sap beetles if your sweet corn is located near an orchard. Sap beetle adults lay eggs in ear tips and larvae feed in the kernels before dropping to the ground to pupate in the soil. Cultivars with exposed ear tips are more susceptible to damage than those with good tip cover. Sap beetles are not susceptible

to the Bt toxin expressed in Bt corn so cultural controls and insecticides are crucial to management. Aggressively mow infested blocks as soon as harvest is complete. Eliminate vegetable cull piles. Control for caterpillars and birds, as damaged ears are more likely to be colonized by sap beetles. See the NE Veg Management Guide for insecticide options.

Sap beetle adult and larvae inside corn kernels. Photo:J. Obermeyer, Purdue

Western bean cutworm was recently observed in New York. This pest was historically limited to the great plains and has only recently moved east into our area. Materials used for corn earworm control will also control western bean cutworm. For photos, check out this Purdue fact sheet.

Corn Earworm are still being detected in pheromone traps around the state. For more information, check out this week's corn pest table, and last week's pest alert.

Fall Armyworm continue to be caught in low numbers in pheromone traps in NY and CT. We just finished putting out our fall armyworm traps in MA, so stay tuned for numbers next week. In general, FAW is the last corn moth to show up in the Northeast, and CEW sprays will also control FAW.

Multiple Crops

Aphids. We're seeing high numbers of aphids across several crops this summer. Aphid infestations often originate from greenhouses, where they can overwinter and infest transplants. Often, aphid populations are controlled by natural populations of beneficial insects (lacewings, lady beetles, syrphid fly larvae, parasitic wasps, etc.) when transplants are planted out into the field, but under the right conditions, populations can increase rapidly. If you're seeing a few aphids just on the undersides of lower leaves of a crop, you probably don't need to spray to control them. If they start infesting the growing tip of plants, consider applying an aphid-targeted material to conserve beneficials. Options include Movento, Admire Pro, Fulfill, Beleaf, Assail. Include a wetting agent per labels. Organic growers can use M-Pede or a horticultural oil (e.g. Suffoil X).

Leaf spots of cucurbits

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

Angular leaf spot: This disease can affect all cucurbits, but cucumbers are most commonly affected. It is caused by the bacterium *Pseudomonas syringae* pv. *lachrymans*. Angular leaf spot is usually among the first of the foliar leaf spots to show up because it's seed-borne—indeed, we've already confirmed angular leaf spot on one farm and received several other suspected reports this year. In past years, we have received multiple reports of angular leaf spot on the same variety of cucurbit, all early in the season, indicating that the seed was infested. Small, round, water-soaked spots appear on leaf tissue, and expand until they are confined by veins, giving them the characteristic angular look. Under moist conditions, a milky white exudate containing bacterial cells may ooze out of the lesion on the lower leaf surface. The wet-looking spots will dry out and turn yellow-brown or the dead tissue may fall out leaving a "shot-hole" appearance. Yellowing of the leaf between lesions may occur where disease severity is high.

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

Similarly, water-soaked spots may appear on stems and petioles, drying out to form a whitish crust. Spots can also appear on fruit, where they begin as tiny and water-soaked, but dry to form whitish, chalky, spots, rendering the fruit unmarketable. The spots on fruit can also develop into internal fruit decay. Fruit that is infected early may be deformed. Affected plants will grow poorly and produce less fruit.

As with other bacterial diseases, outbreaks of angular leaf spot are often initiated from infected seed. Bacteria proliferate in warm, moist weather and are spread from plant to plant by splashing rain or runoff, as well as by insects or workers moving through the field.

Resistant varieties are available. If you catch angular leaf spot early, copper may be effective in reducing its spread.

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

Scab on zucchini. Photo: T.A. Zitter

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

Anthracnose: This disease affects mostly melons, watermelons, and cucumbers; squash and pumpkins are less susceptible. The disease is caused by the fungus *Colletotrichum orbiculare*, which, like other anthracnose fungi, causes characteristic black, sunken lesions on affected fruit. Leaf spots are light-brown or reddish and appear near veins so may cause leaf distortion. These lesions dry out and the dead tissue may fall out, again leaving a "shot-hole" appearance. On stems and petioles, lesions are elongated and tan. Lesions on fruit are large, circular, sunken areas that turn black and may produce a pink ooze under humid or moist conditions.

'Shot-hole' appearance of anthracnose. Photo: R.L. Wick

The fungus can be seed-borne and also survives on crop residue or volunteer plants (maybe in your compost or cull pile). Humid, rainy weather is necessary for disease to occur. There are three races of the fungus that affect different crops. Resistant cucumber and watermelon varieties are available, but there are not resistant cantaloupe varieties.

Alternaria leaf spot: This disease affects all cucurbit crops but is most common on cantaloupe. The disease is caused by the fungus *Alternaria cucumerina*. As with the *Alternaria* species that cause leaf spots in brassicas and early blight in

nightshades, *A. cucumerina* causes a characteristic target-like spot. Usually, leaf spots are small and start out as tan flecks that enlarge and merge together. These larger spots (up to a half-inch) may exhibit the concentric rings common of all *Alternaria* fungi. This disease usually occurs in mid-season and can reduce late-season fruit production. Fruit lesions may also occur as sunken lesions with dark, olive-green, felt-like sporulation present in rings. Spores are spread from plant to plant via splashing rain or overhead irrigation, as well as by insects, workers, and equipment moving through the field.

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

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

Septoria leaf spot of cucumber. Photo: R. Wick

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

Start with quality seed, and/or fungicide treated seed. If saving your own seed, avoid collecting seed from fruit with any defects.

Resistant or tolerant varieties of many cucurbit crops are available for most of these diseases. Meg McGrath of Cornell University has compiled extensive lists of disease-resistant varieties of vegetable crops.

Use a 2-year rotation for cucurbit fields. All of these diseases survive on crop residue in the soil, which can persist for up to 2 years.

Use drip irrigation to reduce the spread of bacteria and fungal spores by overhead irrigation.

Don't work in affected fields when foliage is wet, or work in unaffected sections first and infected sections last to avoid spreading disease to unaffected areas.

Use fungicides or bactericides when you see the first leaf spots to slow the spread of disease. Submit a sample to the UMass Plant Diagnostic Lab so that you can choose an effective pesticide for the disease you have. Consult the cucumber, muskmelon, and watermelon or pumpkin, squash, and gourds disease sections of the New England Vegetable Management Guide for pesticide recommendations.

Till under crop residues promptly after harvest is complete to encourage the quick breakdown of infected tissues.

--Written by Susan B. Scheufele, UMass Extension

Caterpillars in Brassica Crops

We're seeing damage now from imported cabbageworm and diamondback moth in brassicas across the state. Cabbage loopers and cross-striped cabbageworms will start to show up mid- to late summer. Though they may all look alike, these four major brassica caterpillar pests are different species and there are important distinctions among them that can affect your management decisions. They differ in size and feeding habits, as well as how susceptible they are to beneficial para-

sitoid insect species and certain insecticides. Getting acquainted with these pests will help you to know what kind of damage to expect and what to look for when scouting for their different life stages and biocontrols. Feeding damage by any of these caterpillars can reduce yield and marketability of both leafy and heading crops.

Clockwise from top left: Imported cabbageworm egg, larva and pupa (Photos: UMass Veg Program) and adult (Photo: M.C. Legg, Bugwood.org)

Imported cabbageworm or **cabbage butterfly** (*Pieris rapae*) is a very familiar white butterfly that can be seen during the day fluttering around brassica fields. Each forewing has a dark border and one or two round black spots. Eggs are laid singly on the underside of leaves, standing upright. They are bullet-shaped, about 1/8 inch in length, and initially pale white, but turn yellow as they mature. Larvae are gray-green, slightly fuzzy, and sluggish but can be very well camouflaged, especially when they lie along the midrib of a leaf. Feeding and resting occur on the underside of leaves, and larvae feed more heavily in the head of cabbage or broccoli as they develop. The overwintering stage is the chrysalis (pupa), which is green or brown, smooth with three pointed ridges on its back. There are 3-4 generations per year.

Clockwise from above: Diamondback moth pupa, adult (Photo: L. Buss), and larva with characteristic windowpane feeding damage.

Diamondback moth (*Plutella xylostella*) adults are tiny (< ½ inch long), light brown, and rest with their wings folded together like a tent. Historically DBM did not overwinter in the Northeast, but caterpillars have been reported by May in recent years, suggesting that they may be overwintering in high tunnels or other warm spots. Regardless, this pest also blows in every year from warmer areas to our south. Adults are weak fliers, but populations are known to disperse long distances on wind and annually reinvade areas well into Canada. Eggs are laid singly or in small clusters. Caterpillars go through four instars and are small (< ½ inch when fully grown), light green, and appear segmented, with a forked end and pointed shape. When disturbed, they wiggle vigorously and may drop off the plant on a string of silk. Feeding causes small, round holes that don't break through the top layer of leaf tissue, leaving translucent films across holes, called "windowpane" damage (see photo at left). Feeding tends to be spread across the foliage and not necessarily concentrated in the head.

Cabbage looper *(Trichoplusia ni)* usually does not survive the winter in New England and arrives in migratory flights from farther south. Generally, populations of cabbage loopers are not high until late July or August, though some years they are not found at all or earlier flights occur. Adult moths are mottled gray-brown, about ¾ inch long, with a distinct round silver-white mark on each forewing. Since they fly at night, they are rarely seen unless monitored with pheromone traps. If you want to know when moths arrive, use a wing trap baited with *Trichoplusia ni* lure, placed near the canopy. Eggs are round, pale green or yellow, and are laid singly underneath the foliage. The cabbage looper caterpillar is light green, smooth, with wavy white or light yellow lines down the back and sides, and prolegs at the tip of the abdomen. Full-grown larvae reach 1½ to 2 inches. Cabbage loopers of any size move like inchworms—by raising the middle of their body in a characteristic "loop" shape. Feeding tends to create large, ragged holes in foliage, on both frame leaves and heads. Cabbage

Cabbage looper larva (left) and egg (right). Photos: J. Boucher and W. Cranshaw, Colorado State Univ., Bugwood.org

looper also feeds in many non-brassicas including lettuce, celery, spinach, and chard, so when they do arrive, scout those crops as well as brassicas.

Cross-striped cabbageworm (*Evergestis rimosalis*): Formerly restricted to the South, this insect is now a serious problem on brassica crops in southeastern New England. One of the major differences between this insect and the other brassica caterpillars is that the eggs are laid in a cluster, and caterpillars feed in a group on one plant so that it's riddled with big holes like buckshot. CSCW is closely related to European corn borer, and the adults are similar in shape and coloring–straw-colored with a little purple, and crossed by wavy lines. Since the adults fly at night, you will likely only notice the caterpillars and their damage. The clusters of 3 to 25 eggs are yellow, flattened, and attached to the lower leaf surfaces. The caterpillars are light bluish-grey on top and green underneath, with numerous black transverse bands across their backs and a yellow line down each side. Larvae grow to ¾ inch long in 2 to 3 weeks. There are 2 to 3 generations per year, but generally, numbers do not reach damaging levels until late summer. Larvae can produce small holes in leaves until only veins remain, feed in terminal buds and sprouts, or burrow into heads. Plants with larvae are often completely skeletonized while adjacent plants may be left undamaged.

Cross-striped cabbagworm larva (top) and damage (bottom).

Field Scouting and Management. It is especially important to check cabbage or broccoli plantings as they begin forming heads. Greens such as collards and kale should be scouted earlier, since all leaves are marketed. Randomly select 25 plants throughout the field and check for caterpillars or fresh feeding damage on the top or underside of leaves. Feeding damage can be found on the underside of leaves or in the center of the plant where heads are forming. Look for black or green frass and tiny feeding holes, clustered together. Often it is easier to spot the frass and feeding damage first, then find the caterpillar. Classify plants as infested (one or more caterpillars present) or non-infested, and calculate the percent of plants infested. In the Northeast, there is generally no need to treat young plants until at least 35% of them are infested with caterpillars. Once heading crops (cabbage, broccoli, cauliflower) begin to form the head, a lower threshold should be used to protect the marketed head; treat heading crops after head formation if 15-20% or more of the plants are infested. The most critical time to scout and apply controls is just prior to head formation. For leafy crops like kale and collards where all leaves are marketed, a 10-15% threshold should be used. Because cross-striped cabbageworm can be so destructive, a lower threshold should be used—treat when 5% of plants are infested with this pest.

Insecticide applications. Use selective insecticides to protect beneficial insects that keep aphids under control, eat insect eggs and small caterpillars, and parasitize ICW or DBM. Selective products often are most effective when consumed with foliage, so coverage is important. Use at least 50 gallons of spray material per acre; higher volumes provide better coverage. Better coverage of lower leaf surfaces can also be achieved by using drop nozzles. Use a spreader-sticker to prevent sprays from rolling off of waxy leaves. The most effective materials include:

Diamides (Group 28) including chlorantraniliprole (e.g. Coragen), Cyantraniliprole (e.g. Exirel), and cyclaniliprole (e.g. Harvanta)

Spinosyns (Group 5) including spinetoram (e.g. Radiant) and spinosad (e.g. Entrust) - *also effective against flea beetles and onion thrips*

Bacillus thuringiensis (Group 11) including *Bt aizawi* (XenTari) and *Bt kurstaki* (such as Dipel DF and many other products) – *these materials are highly selective and will* ONLY *affect caterpillars*

These materials and the *aizawai* strain of *Bt* will usually provide better control of resistant DBM than older products. See the cabbage insect control section of the New England Vegetable Management Guide for additional synthetic and naturally derived products and more details.

Cultural and biological controls. Incorporate crop residues shortly after harvest to reduce movement to successive plantings and reduce overwintering populations. Populations are suppressed by a wide range of natural enemies, including

several species of parasitic wasps. DBM eggs are parasitized by the ichneumonid wasp, ***Diadegma insulare***, which occurs naturally in eastern North America. *D. insulare* females require sources of nectar, so maintain wildflower stands near brassica fields. ICW eggs are parasitized by the braconid wasp, ***Cotesia rubecula***, which was introduced to New England from China in 1988, and is now established in Massachusetts. You may see their small white cocoons on brassica leaves. The chalcid wasp, ***Trichogramma brassicae***, will lay its eggs in many species of caterpillar, including all of the brassica pests above (as well as non-target caterpillars, so be cautious if you *are* maintaining wildflowers that might attract endangered moths or butterflies). *T. brassicae* wasps are not found in New England, but can be purchased from several biological control companies for release in brassica fields. The wasps arrive as pre-parasitized caterpillar eggs that are glued to cards that can be distributed throughout the crop. As of 2022, each card costs around $20-23, and contains about 100,000 wasps, which is enough for up to 1 acre. According to one source of *T. brassicae* wasps, IPM Labs Inc., some growers will release the wasps in lieu of using any kind of pesticide. Some growers release one card per acre per week for about 4 weeks, while others will release every week for the life of the crop. These biological controls are compatible with many selective and lower impact sprays used for control of caterpillars (*Bt*, oils, soaps), especially because the wasps are protected from sprays when they are inside of host eggs. Another source, Evergreen Growers Supply, notes that *Trichogramma* wasps are more effective against moth species that lay their eggs in clusters, so may be a good option if cross-striped cabbageworm has been a particular problem on your farm. If you're interested in purchasing *Trichogramma* wasps, contact IPM Labs, Evergreen Growers Supply, or another distributor to discuss your particular needs and arrange a shipment schedule.

A pupa of Cotesia rubecula*, a parasitoid of imported cabbageworm. Photo: R. Van Driesche*

--Written by R. Hazzard, S.B. Scheufele, and L. McKeag

Shade cloth for bell peppers

--Written by Emmalea G Ernest, PhD, Scientist, University of Delaware Cooperative Extension Vegetable and Fruit Program. Originally published in Delaware Weekly Crop Update 30:12 *on June 10, 2022.*

[Eds. -- Note that this trial was conducted in Delaware where average temperatures are higher. Some trial and error may be warranted in trying out this practice in Massachusetts.]

Over the past four years I have been testing the practice of using shade cloth in bell pepper production. Shade cloth is a knitted, weather resistant fabric that can be used to block a portion of the sunlight that would otherwise reach plants. It is commonly used in greenhouse and nursery plant production and could be useful in preventing heat stress in some vegetables. Different colors and levels of shade are available. For vegetables, shade cloth that blocks 30% of the sunlight is typically recommended.

In 2018 and 2019, I tested different colors of shade cloth for green bell pepper production on drip irrigated black plastic mulch. In those trials, the 30% black shade cloth treatment produced the highest yields and increased marketable yield to three times the marketable yield of no shade cloth (Fig. 1, right). Shade cloth did not increase the number of peppers produced, rather it increased pepper fruit size and marketability. Shade cloth can prevent heat stress induced quality defects like sunscald and reduces plant heat stress, resulting in larger fruit. In these trials black shade cloth produced significantly higher marketable weight than the other shade cloth colors (white, red and aluminized).

Figure 1. In the 2019 trial, an unshaded plot (foreground) with poor plant growth and fruit sizing compared to a shaded plot (background). Photo: E. Ernest

In the 2018 and 2019 trials the peppers were transplanted in early June and the shade cloth was applied in early July, after the plants had been staked and tied once. Trials conducted in 2020 and 2021 showed a benefit to applying shade immediately after transplanting in early June. Earlier shading protects young plants from girdling that can result from heat damage to the stem soon after transplanting and help transplants to establish successfully (Fig 2, right).

Figure 2. Transplant with stem girdling from heat damage soon after transplanting. Photo: E. Ernest

In the 2021 trial three colored bell varieties (Early Sunsation, Mandarin Perfection, Aristotle) and a sweet Italian variety (Carmen) were used. The bell pepper varieties all had significantly higher yields with shade, but Carmen did not have a significant yield increase from shade, indicating that this variety may be more heat tolerant than the bell pepper varieties. One goal of the 2021 trial was to determine the best timing for shade cloth use in peppers. The treatments with the highest marketable yield were those with shade cloth in both June and July, as opposed to only June or only July. Keeping the shade cloth on for the first two weeks of August increased marketable yield slightly over the June & July shade treatment.

In the 2021 trial I used data loggers to measure air temperatures in the leaf canopy of shaded and unshaded peppers throughout July (Figure 3, below). Average daily temperatures were 2 °F cooler in the shaded plants. Differences in maximum daily temperatures were even larger, with the shaded plants having, on average, 8 °F lower maximum temperatures. The reduction of maximum temperatures may be especially important in avoiding plant stress and fruit damage from sunscald.

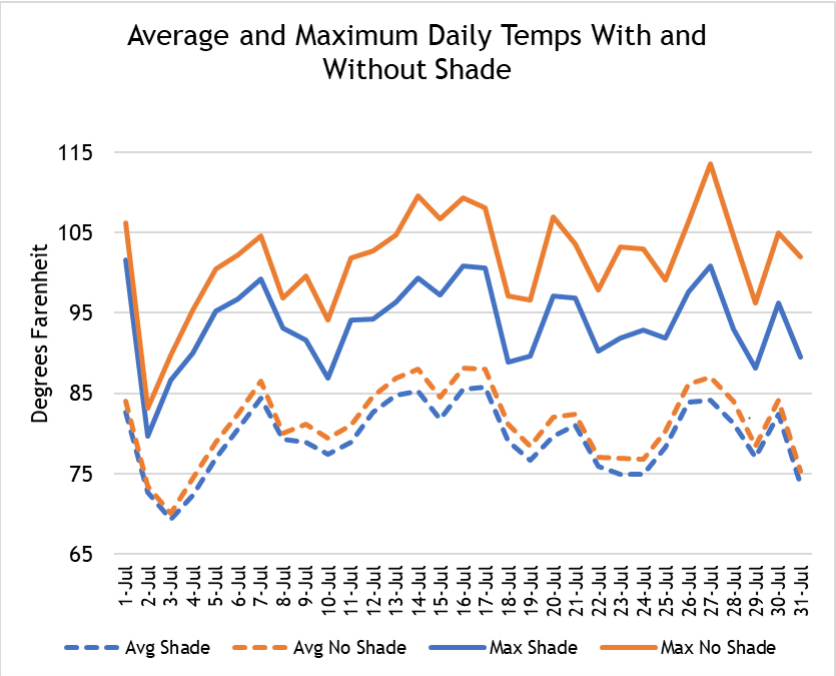

Figure 3. Daily average and maximum temperatures in the plant canopy of shaded and unshaded pepper plants in July 2021. Figure E. Ernest.

You may be wondering how best to implement shade cloth on your farm. Shade cloth is durable and can be reused for many years. In the experiments described the shade cloth was draped over the pepper stakes and secured to the ground with landscape staples or aluminum tent stakes. Shade cloth can also be applied over low tunnels or larger structures to create "shade houses". Shade cloth might also benefit high tunnel grown peppers during the hottest months. In my trials we did not remove the shade cloth for sprays and did not notice differences in disease incidence between shaded and unshaded plots. Unless used with a large structure, shade cloth will have to be moved to access plants for harvest.

I am repeating the 2021 shade cloth timing study this summer. It was planted on June 1 and already there are noticeable differences with less stem girdling from heat stress in shaded plots. With what is likely to be a hot summer ahead I will be interested to see whether shade cloth continues to be a useful tool and think about how it can be efficiently implemented on farms.

New Extension Food Safety Resources: The SCRUB Project

The UVM Extension Ag Engineering Team recently published two new resources as part of their SCRUB Project (Sanitizing and Cleaning Resources for Your Business). This multi-state Extension project focuses on creating and sharing educa-

tional resources to improve produce safety and efficiency on farms. Growers often ask about how to choose a detergent for cleaning food contact surfaces and whether they need to wash everything with soap and water. These two new resources, below, help answer those questions and include information about how to choose an appropriate detergent and when it might be best to dry clean and use an air-dry sanitizer instead. Click the links below to see the articles and here for more about the project and the full list of SCRUB resources.

Detergents for Farm Food Contact Surfaces

Key points:

- An unscented, dye-free dish detergent is generally appropriate for food contact surface cleaning.
- Use just enough to see suds and get the surface visually clean; you know what clean looks like.
- Rinse off detergents unless the instructions say otherwise.
- Not sure about a product? Contact the manufacturer.

"Dry Cleaning" on Produce Farms: Alternatives to Using Water & Detergents

Key points:

- Introducing water to a produce line or other food contact surface that is generally dry can introduce new hazards.
- Not all cleaning needs to include water.
- Handling and packing areas that are generally dry, may benefit from "dry" cleaning.
- Brushes, brooms, & vacuums may be used to complete necessary cleaning.
- Waterless cleaning products may be helpful for cleaning dry zones as well.

News

Census of Agriculture sign-up closes TODAY June 30

Agriculture producers who did not receive the 2017 Census of Agriculture and do not receive other USDA surveys or censuses have until June 30 to sign up to receive the 2022 Census of Agriculture at nass.usda.gov/AgCensus. USDA's National Agricultural Statistics Service (NASS) will mail ag census survey codes for responding securely online to every known U.S. producer this November. Hard copy questionnaires will follow in December.

The ag census, conducted for over 180 years, remains the only source of comprehensive and impartial agricultural data for every state and county in the nation. It includes every operation – large or small, urban or rural – from which $1,000 or more of agricultural products are produced and sold, or would normally be produced and sold, in the ag census year.

"The information provided by the Census of Agriculture is an invaluable source of information, especially for smaller acreage states that may not participate in some national surveys on an annual basis" said Pam Hird, NASS New England State Statistician. "The information gathered from the Census survey is used for a five-year period to tell the story of Agriculture in every state. It highlights agricultural information, production, trends and needs that impact agriculture on every level in the United States as well as around the world."

Some Pesticides Containing Neonicotinoids to Become Restricted Use in MA as of July 1, 2022

On July 1, pesticides containing neonicotinoids that are labeled for turf, trees, shrubs, golf courses, and ornamentals will become state restricted use in Massachusetts. This includes any product that has the above use patterns on the label, even if the product is also labeled for vegetable or fruit use. Products containing neonicotinoids that are labeled for agricultural use only (aka labeled for use on food crops only) will remain general use. You do not need a pesticide license in order to apply general use products, but you do need a license to apply restricted use products. As of July 1, in order to apply these newly restricted use products, you will have to have a Commercial Certification Pesticide License. You can also apply these materials without a license if you are working under the direct supervision of someone with a Commercial Certification.

Click here for a complete list of products that will become restricted use as of July 1.

Click here to begin the process of obtaining a pesticide license. (A helpful guide to the ePLACE Portal is available here). The UMass Pesticide Education Program provides education around pesticide safety and classes to prepare individuals for pesticide license exams.

2022-23 Small Fruit Management Guide - Now Available!

The newly updated New England Small Fruit Management Guide is now available – both online AND in hard copy. This resource is the result of a collaboration between Cooperative Extension systems of all the New England states, and is a valuable resource for any small fruit grower - strawberry, blueberry, raspberry, ribes, and grapes are covered in the guide. The Small Fruit Management Guide is available for purchase through the UMass Extension Bookstore: https://www.umassextensionbookstore.com/products/48

UMass Extension Hiring Urban Agriculture Extension Educator - Extended deadline!

UMass Extension is excited to add some dedicated capacity in the important and growing area of Urban Agriculture with the hire of an Extension Educator to be based at the Mt. Ida campus in Newton, MA. We hope to develop a great pool of candidates who are capable of integrating well with others in Extension while developing and maintaining strong relationships with urban agriculture practitioners and organizations in Greater Boston and beyond. The position was posted without a closing date and will remain open until filled, but we encourage potential candidates to complete their application **by July 5 in order to be considered in the first applicant review round**.

Click here for more details about the position and to apply.

MassDEP's GAP III Energy Grant Program Expanded to Include New Sectors

Nonprofit agricultural/food distribution and small food distribution and processing businesses, among other categories, may now apply for a GAP III Energy Grant. Eligible projects include energy efficiency projects such as HVAC upgrades and clean energy projects such as solar photovoltaic and battery storage systems.

For more examples and for full eligibility and application information, see https://www.mass.gov/info-details/massachusetts-gap-energy-grant-program. The grant application deadline for nonprofits and small businesses is Friday, July 29, 2022.

MA Farm Energy Program (MFEP) - Energy Audits

Remember, MDAR's Farm Energy Program has funds to help farms cover audits, energy efficient projects, and select renewable energy projects. We are still providing these services remotely.

You will need a technical assessment to file an energy grant application whether with MDAR or USDA. Start planning now. If you wait too long you may not be able to have one scheduled in time! MFEP pays 75% of the technical assessment, first come, first served. Our MFEP is providing tele-assessments during this trying time.

Contact MFEP now for more information through the Center for EcoTechnology (CET), our partner carrying out the MFEP: 413-727-3090, info@massfarmenergy.com, or visit www.massfarmenergy.com, submit a Request Form, and then you will be contacted.

Events

Save the Date -- UMass Research Farm Field Day

When: Tuesday, August 2, 2022, afternoon (exact time TBA)

Where: UMass Crop & Livestock Research & Education Farm, 89 River Rd., South Deerfield, MA

Registration: Event is free, but registration will be required

Join us for a tour of our current research projects at the farm. Registration information and more details coming soon!

Twilight Meeting at Harvest Farm

When: Wednesday, August 24, 2022, 4-6pm

Where: Harvest Farm, 125 Long Plain Rd., South Deerfield, MA 01373

Harvest Farm in Whately/South Deerfield will host us for a twilight meeting covering several post-harvest topics, including the vacuum cooler Harvest Farm recently purchased with a MA Food Security Infrastructure Grant. More information coming soon!

MDAR's Agricultural Business Training Program - Offering Fall Classes

Click here for more information on both courses.

Exploring the Small Farm Dream Course

When: Wednesdays, October 5 to November 2, 2022, 6-9pm

Where: TBD

Registration: $100 for up to 2 participants. Visit the website above for application information.

This 5-session course provides guidance to aspiring farmers through the decision-making process of whether to start a farm business. Participants will learn about the many aspects of starting a farm business, assess their own skills and knowledge, and get help finding resources for support, including marketing, financing, and regulations. The Exploring the Small Farm Dream course utilizes the curriculum and workbook developed by the New England Small Farm Institute. Through four guided group sessions and a farmer panel session, participants will analyze the feasibility of their small farm dream and clarify their vision together with other class participants. This course is sponsored and financially supported by MDAR and is intended for new agricultural entrepreneurs intended to start their farm business in Massachusetts.

Plans are for an in-person class with the location to be determined based on interest from those who submit an application and are added to the waiting list.

Growing Your Farm Business Planning Course

When: Tuesdays, October 11 to November 29, 2022, 5:30-8:30pm

Where: MDAR Southborough Office, 225 Turnpike Rd., Southborough, MA 01772

Registration: $150 per farm. Visit the website at the beginning of this event listing for application information.

A hands-on course to help established farmers develop a business plan and financial projections for their farm business. This course covers topics including resource assessment, marketing strategy, financial management, risk management, quality of life, and goal setting. The course is taught by a professional business planner with years of experience working with Massachusetts farms and guest speakers on topics such as succession planning and online marketing. Enrollment is open to farmers who have been operating a farm business in Massachusetts for at least the two prior years.

The Growing Your Farm business planning course has been approved as a certified USDA Farm Service Agency (FSA) borrower training for financial management.

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Vegetable Notes. Genevieve Higgins, Lisa McKeag, Susan Scheufele, Hannah Whitehead co-editors. All photos in this publication are credited to the UMass Extension Vegetable Program unless otherwise noted.