UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Crop conditions

It remains "abnormally dry" out there, e.g. not technically a drought but still unpleasantly dry, which is good for one thing…killing weeds! We are really looking forward to learning about some new weed control techniques from NYSIPM's Integrated Weed Management Specialist Bryan Brown at our on-line meeting next Wednesday from 6-7pm. Bryan will be talking about using mulches economically, setting up cultivators to maximize efficacy and more, so sign-up now and come with all your weed questions! Other than cultivating, growers are busy trying to keep crops irrigated while the planting and harvest lists continue to grow, with zucchini and summer squash starting to come in, peas, broccoli, scapes and so many greens. PYO season is off and running and so far the strawberries are bountiful and the customers are happy and largely respectful of the COVID-19 safety procedures folks have put in place. We continue to be so impressed with all of you for your commitment to caring for your land and your communities and making the MA food system so robust and resilient!

We report pest alerts, but we should also have a 'Beneficials Alerts' column! Ladybeetles, lacewings, parasitic wasps, and other beneficial insects are out and about along with the pests they control. This ladybeetle larva has found a buffet of bean aphids. Photo: G. Higgins

Pest alerts

Alliums:

Garlic bloat nematode was confirmed in Maine this week. The nematode feeds on root and bulb tissue and causes stunting, distortion, yellowing, wilting, and premature dieback of leaves in the field. Bulbs may be swollen or distorted, lightweight and shrunken, dark brown, and soft. Roots may be partially or completely absent from part of the basal plate. The nematodes are introduced and spread via infected plants so get suspected plants diagnosed and do not save seed from infested fields.

Onion thrips numbers are still increasing with the warm, dry weather. Controlling thrips can reduce diseases found later in onion bulbs, even bulbs in storage.

Beans:

Potato leafhoppers have arrived and are being seen in beans, shellbeans, potatoes, and eggplants. For details and current control recommendations see article this issue.

Beets, Swiss Chard:

Cercospora leaf spot reports are pouring in from around the region. We were surprised to hear this because of how dry it has been, but Ann Hazelrigg from the UVM Plant Diagnostic Clinic pointed out that the cool nights are probably causing enough overnight dew to provide the long periods of leaf wetness needed for the pathogen to infect and grow. Increasing plant spacing and planting in full sun can reduce disease severity by helping foliage to dry out more

quickly, and crop rotation can reduce the amount of initial inoculum. For fungicide recommendations, see 'leaf spots and blights' in the beet and Swiss chard disease section of 'the Guide'.

Brassicas:

Imported cabbageworms were out of control in one field scouted this week (my home garden!), where they were squished by hand with zeal! Scout 25 plants and use the recommended thresholds for treatment (see Table 1).

Table 1. Treatment thresholds for brassica caterpillars.

Crop	Stage	% Infested Plants
Cabbage & Broccoli, Cauliflower	pre-cupping (before head formation begins)	35%
Cabbage & broccoli	head formation to maturity	15%
Cauliflower	after heading	10%
Kale, collards & other greens	all stages	10-15%

Bt products XenTari (*Bt aizawai*) and Dipel (*Bt kurstaki*) work well against all caterpillar pests, will not kill your beneficial insects, and are OMRI-approved. Both must be ingested by the pest. Coverage and efficacy will improve with use of an approved spreader-sticker. Use high rate at cool temperatures. For resistance management, use XenTari and Dipel in rotation with each other.

Powdery mildew on the underside of a winter squash leaf. PM will also develop on the tops of leaves. Photo: UMass Vegetable Program

Bacterial wilt. Photo: UMass Vegetable Program

Cucurbits:

Powdery mildew was observed this week on zucchini grown in a high tunnel. This is a first report of cucurbit powdery mildew in the region, and the indoor environment could be providing the right, humid conditions for this pathogen to get an early start. Start scouting fields now and see article last issue for current control recommendations.

Table 2. Squash Vine Borer (SVB) trap captures June 11-18

Location	SVB
Massachusetts	
Belchertown	-
Deerfield	0
North Easton	1
Westhampton	-
Sharon	
Leominster	0
New Hampshire	
Hollis	1
Litchfield	0
Mason	0

Squash bugs are active, feeding on foliage and laying eggs. Scout plants from seedling to vining/flowering stage to detect adults, eggs, and nymphs, checking upper and lower leaf surfaces. The population level that will be damaging to the crop will vary with the crop and its stage of growth. Controls are warranted if you see more than one egg mass per plant, especially early in the season. In watermelon, a threshold of 1 adult per plant was determined to be effective.

Squash vine borer (SVB) flight has begun in MA and NH, with trap captures reported at several locations throughout the two states this week (see Table 2). Pheromone traps attract male moths, which begin flying 1-2 weeks before females emerge; once females arrive, mating and egg-laying occurs. For growers planning on excluding SVB using row cover, row cover should be going on now if it's not on already to protect plants before this egg-laying starts. Threshold for spraying is 5 moths/trap for crowning cucurbits and 12 moths/trap for vining cucurbits.

Striped cucumber beetle numbers are going down and we are starting to see the first signs of bacterial wilt. Bacterial wilt is spread from plant to plant by beetle feeding and frass left in the flowers. Continue scouting and control when you find 1 beetle per every 2 plants.

Solanaceous:

Colorado potato beetle eggs are hatching and **first and second instar** larvae are present now in MA. Targeting these

small larvae is most effective, since a smaller dose can kill them and they do less feeding damage than larger larvae. For recommended insecticides please consult the potato section of the New England Vegetable Management Guide. CPB are famous for developing resistance to multiple classes of insecticides so please take care to rotate classes, and never use the same class on two successive generations of CPB. Products used to control CPB should also control **Solanaceous flea beetles**, which are also still being reported widely.

Sweet Corn:

Corn earworm: Some traps in MA and around the region are capturing CEW already, and at levels high enough to trigger a spray, indicating that an overwintering population of CEW may be present. Therefore, early corn on plastic that may be in silk or silking soon could be at risk for damage.

European corn borer numbers are still fairly low in MA (0-8 per week) but it's very important to scout fields for damage—pre-tassel fields that are being scouted now are showing low to moderate damage (small pinholes in leaves or frass in tassel if pre-tassel), with some fields over the 15% infestation threshold.

For the latest sweet corn insecticide recommendations click here.

Various:

Yellow nutsedge is bad this year, maybe because dry weather reduced efficacy of pre-emergence herbicide applications. Now is a good time to attack nutsedge again, before it starts to add new tubers, which will lead to additional weed problems in future years. In general, between-row cultivation will not control emerged nutsedge well, but will only move the plants down the row with the cultivator and spread it in the field. However, in fallow fields, regular tillage during the season can manage this weed well for future crops. There are several post-emergence herbicide options available to manage yellow nutsedge. For management recommendations, please see the article in the June 7, 2018 issue of *Veg Notes*.

Table 2. Sweet corn trap captures June 11 – 18, 2020

Location	GDD (base 50)*	ECB-NY	ECB-IA
Western MA			
Sheffield		-	-
Whately	610	4	2
Central MA			
Bolton	535	2	1
Leominster	545	6	0
Eastern MA			
Millis	613	0	0
Sharon		3	0
Seekonk	623	2	0
Swansea		5	3
Southern NH			
Hollis, NH	502	2	
Litchfield, NH		15	
Mason, NH		0	
Eastern NY			
Hurley, NY	638	37	13

- 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

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.

UMass Extension Services Suspension

The following on-campus services are suspended until further notice, due to the COVID-19 pandemic: Soil & Plant Nutrient Testing, Plant Disease Diagnostics, Hot Water Seed Treatment, Nematode Analysis, Weed, Insect, Turfgrass, and Invasive Plant Identification, Public access to all farm properties.

Until further notice, please do not send or deliver samples to campus, as we cannot process them.

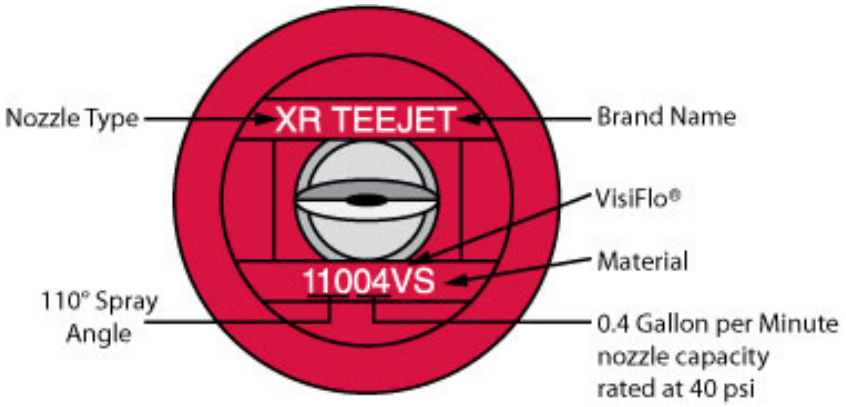
Boom sprayer calibration

Calibration, or the process of measuring and adjusting the amount of product being put out by a sprayer over a given area, is a crucial part of applying pesticides. If you don't know exactly how much pesticide is coming out of your sprayer, you can over- or under-apply, leading to unreliable or uneven pest control in your fields or levels of pesticide that are toxic to plants and to the applicator. Two weeks ago we covered the principles of calibration for small area applications in an article about calibrating backpack sprayers. For larger areas, the same principles apply while some of the equipment and techniques might be different. Below are ten tips for making sure your boom sprayer is functioning as expected (with thanks to George Hamilton from the University of New Hampshire Extension, who described and demonstrated these concepts at a 2018 twilight meeting), followed by instructions for calibrating your boom sprayer.

George Hamilton, University of New Hampshire Extension, presenting a boom sprayer calibration workshop in 2018. Photo: UMass Vegetable Program

1. **Every time you fill the tank with water, clean the screens and filters.**
2. **Use a compressed air can**—the kind you use to clean a computer keyboard—to clean out your nozzles. Don't try to blow out dirt or residue with your mouth, and don't use a metal implement, like a paper clip, as this can distort the nozzle opening.
3. **Air induction nozzles reduce drift relative to flat fan nozzles.** Air induction (AI) nozzles incorporate air bubbles into the water droplets, which make the droplets larger. The larger droplets have more mass and won't get blown off course as easily as the smaller droplets produced by flat fan nozzles.
4. **Don't rely on your tractor's speedometer reading to determine your speed.** Instead, time how long it takes you to travel a measured distance. Things you may not have thought of can change the speed of the tractor, for example, tire tread heights for the same tire size differ between brands. This will change the distance the tractor travels in a given time.
5. **Re-measure fields periodically.** Fields can get bigger and smaller over time as edges encroach or you plow a little farther out each year. Just because your grandfather said the field was 12 acres, it may not be 12 acres now! If you calculate sprays for 600 foot beds, but the beds are actually 540 feet, this will lead to a large over-application of product over a large area.
6. **Change your starting point and the direction in which you spray** to avoid running out of product in the same spot every time or over- or under-applying in any spot. If you spray up a given row this time, spray down that row next time.
7. **Small errors add up over a large area.** Even just a 10% error—for example, trusting that your tank holds 100 gallons when it actually holds 110 gallons—will lead to much larger errors when applied over acres, or compounded with other small errors. This is especially important now as pesticides become more effective at lower rates and are more frequently labeled for use in ounces rather than pounds per acre.
8. **Pressure gauges are often off and should be checked regularly.** Buy two, make sure they read the same pressure, then use one for your sprayer and check them against each other occasionally.
9. **Boom height will impact your spray pattern.** To find the ideal distance between a given nozzle type and your target, check the information from the manufacturer for that nozzle.
10. **Put sprayer calibration info in every tractor** so that every applicator can make sure they're using the correct settings. This should include what gear and pressure to use, the distance from the boom to the target, and any other relevant information.

There are many different types of sprayer nozzles, with different flow rates, spray angles, droplet sizes, and patterns. Each nozzle is labeled with some of this information, as shown in the following diagram:



Nozzle nomenclature. Diagrom: Teejet

Use the steps below, adapted from the New England Vegetable Management Guide and the Agricultural Pocket Pesticide Calibration Guide, to calibrate your boom sprayer:

1. Before calibrating, review and complete the following checklist:
    - Thoroughly clean all nozzles, screens, etc., to ensure proper operation.
    - Check to be sure that all nozzles are the same, are made by one manufacturer, and have the same part number.
    - Check the spray patterns of all nozzles for uniformity by spraying onto pavement or bare ground and watching the drying pattern. The output from each nozzle should dry at the same rate. If you have strips that dry more quickly or slowly, replace the corresponding nozzles as one is likely worn out.
    - Select an operating speed. Note the tachometer reading or mark the throttle setting. When spraying, be sure to use the same speed as used for calibrating.
    - Select an operating pressure. Adjust pressure to desired psi according to the nozzle manufacturer. Do this while the pump is operating at normal speed and water is actually flowing through the nozzles. This pressure should be the same during calibration and field spraying.
2. Measure a course on the same type of surface (sod, plowed, etc.) and same type of terrain (hilly, level, etc.) as that to be sprayed, according to nozzle spacing as shown in the table below. This distance is equivalent to 1/128th of an acre.

Nozzle spacing (in)	16	20	24	28	32	36	40
Course length (ft)	255	204	170	146	127	113	102

3. Time the seconds it takes the sprayer to cover the measured distance at the desired speed in the same field conditions that you are spraying. Average several runs. This is the time required to cover 1/128 acre.
4. With the sprayer standing still, operate at selected pressure and pump speed/engine RPM. Catch the water from each nozzle for the number of seconds measured in step 3. Any 1-quart or larger container, such as a mason jar or measuring cup, if calibrated in fluid ounces, can be used. You can also use a specially designed calibration jar; if you buy one, follow the manufacturer's instructions. Make accurate speed and pressure readings and jar measurements. Make several checks. Keep in mind that you are collecting less than a quart of liquid to measure an application rate of several gallons per acre for many acres.
5. Determine the average output per nozzle in ounces. If the output from any particular nozzle is more than 5 percent higher or lower than the average, check for clogs, clean the nozzle (with compressed air!), or replace the nozzle. Replace all nozzles if the average output is more than 15% more than a new nozzle's output (from the manufacturer's chart or discharge test). Repeat steps 4 and 5 after cleaning or replacing any nozzles.

The average ounces of output per nozzle equals the application rate in gallons per acre.
For example, 1 oz. output = 1 gallon per acre.

If you need to change the output rate, you can do any of the following:

a. For small adjustments, change the sprayer pressure. Lowering the pressure will reduce the spray delivered and increasing the pressure will increase the spray delivered. However, it takes a large increase or decrease in pressure to change nozzle output. For example, a 4X increase in pressure will only double the output. Do not operate outside of the pressure range recommended for the nozzles that you use. Keep in mind that increasing pressure can create finer spray droplets that will drift off-target more easily.

b. Large adjustments can be made by changing the travel speed. Changing speed inversely affects the application rate. For example, decreasing the speed by ½ will double the application rate, and doubling the speed will decrease the application rate by ½.

c. If either of these changes do not produce the desired application rate, then you need to select a different size nozzle tip that will meet your needs.

--Compiled by Lisa McKeag and Genevieve Higgins, UMass Extension, and George Hamilton, UNH Extension

FUNGAL LEAF DISEASES OF TOMATO

Tomato disease season is upon us, with field tomatoes starting to flower and high tunnel tomato harvests beginning soon. The combination of warmer weather and higher relative humidity around large, lush plants is a perfect environment for fungal pathogens that attack tomato foliage every year. Most of the diseases caused by these pathogens can occur in both field and high tunnel tomatoes, but Botrytis, leaf mold, and powdery mildew are most commonly seen in high tunnels and Septoria and early blight are most commonly seen in the field. Late blight, which occurs sporadically, is often seen as the scariest tomato disease because of its ability to rapidly wipe out a crop; however, the diseases outlined below, which we can expect to see every year, can also have significant effects on fruit quality and yield. Late blight has not been observed yet this year and conditions are not favorable (too dry), so we don't expect to see it anytime soon, but in order to distinguish them from symptoms of the other diseases included in this article we will list some **key characteristics of late blight below**,

Late blight. Photo: UMass Vegetable Program

- Leaf lesions are dark-green to gray, and appear water-soaked or greasy
- No leaf yellowing occurs
- Stem lesions are brown and can occur anywhere on stems or petioles
- White sporulation may be seen within or on the edges of lesions on leaves or stems
- Lesions can occur anywhere on the leaf and anywhere on the plant, meaning that they don't necessarily start at leaf margins or at the base of the plant but are distributed throughout the canopy

Management practices are similar for all of these diseases, but it is still helpful to know what diseases you are seeing in your crop so you know where it is coming from and how to stop its spread. The UMass Plant Diagnostic Lab is not currently open, but we can help with disease diagnosis while we're working from home: send photos for ID to us at umassveg@umass.edu!

Botrytis gray mold: Development of conentric rings (left) can make this disease look like early blight, but the presence of fuzzy gray sporulation (right) is characteristic of botrytis. Photos: Left, S.B. Scheufele; Right, G. Higgins

Botrytis Gray Mold & Ghost Spot (*Botrytis cinerea*): *Botrytis cinerea* causes leaf spots, stem cankers, fruit rot, and ghost spot on fruit. The pathogen thrives in the greenhouse, but it has been observed in field tomatoes where humidity is very high. Leaf lesions are dark gray and have no yellow halo, and therefore are often mistaken for late blight lesions. Under conditions of alternating heat and humidity, like in a high tunnel, the pathogen grows in such a way as to form concentric rings, and for this reason can also be confused with early blight. The way to distinguish Botrytis from early blight is by its characteristic fuzzy, brownish-gray sporulation. If you hold the leaf up and look across the lesion you will see fine mycelia sticking up with little tuftlets on the ends that resemble grape clusters. *B. cinerea* primarily feeds on dead tissue and is only weakly pathogenic, therefore, you will likely see this sporulation on senescing tissue including flowers or leaf tips and margins where nutritional disorders have caused tip burn. Spores that land on fruit cause ghost spot, which appears as pale white haloes or ring spots on the green fruit. On ripe fruit, the ringspots may be yellow. Ghost spot develops when the fungus initiates infection, but disease progress is stopped by dry environmental conditions. This spotting may adversely affect market quality. Under more humid conditions, ghost spot may lead to fruit rot.

Leaf Mold (*Passalora fulva*, previously *Fulvia fulva*): This disease is quite common in tunnels and greenhouses, in both soilless and hydroponic systems. Leaf mold infections begin on older leaves and cause pale-green to yellow spots visible on the upper leaf surface, with olive-green to grayish-brown fuzzy sporulation on the underside of the leaf. Heavily infected leaves turn yellow, then brown, and may wither and drop. Occasionally petioles, stems, and fruit may be affected. Infected flowers wither without setting fruit and infected fruit has leathery, black, irregularly shaped lesions. The fungus overwinters in soil on crop residue and as sclerotia (hard, black, long-lived resting structures) and may be introduced on infested seed. Disease development is favored by warm, moist conditions with relative humidity over 85%. The fungus can survive and reproduce between 50-95°F, with optimal infection and growth between 71-75°F. The disease can spread rapidly as spores disperse throughout a greenhouse on air currents, water, rainsplash, insects, and workers.

Leaf mold: Yellow spots appear on the tops of leaves (left) and produce fuzzy olive green sporulation on undersides of leaves (right). Photos: Cornell Coop. Extension

Powdery mildew (*Oidium neolycopersici*) of tomato has emerged as an important disease of greenhouse and high tunnel tomatoes. Look for white, powdery, circular lesions on the upper and lower leaf surfaces. Unlike other powdery mildews, affected leaves may rapidly wither and die, but remain attached to the stem. There are no symptoms on fruit or stems, but loss of foliage may result in sunscald. The pathogen does not require leaf wetness to germinate and cause disease but it does thrive under humid conditions and a range of temperatures (50-86°F). This pathogen can be very aggressive and lead to reduced yield and poor fruit flavor if untreated.

Powdery mildew. Photo: S.B. Scheufele

Botrytis, Leaf Mold, and Powdery Mildew Management:

- Control weeds and remove infected plant debris.
- Reduce humidity within the canopy, improve air circulation, and reduce leaf wetness by using wider plant spacing, removing suckers, pruning lower leaves, and watering early in the day or using drip irrigation. In the greenhouse, improve horizontal air flow with fans, and reduce humidity by a combination of heating and venting in the evening, particularly when warm days are followed by cool nights.
- Provide sufficient nutrients to avoid tip burn from nutrient deficiencies. Avoid excessive nitrogen fertilization. For updated high tunnel tomato fertility recommendations, see the New England Vegetable Management Guide.
- Remove and destroy all diseased plant residue; disinfest the entire greenhouse after pruning and harvest.

- Choose resistant varieties. This is especially effective for leaf mold management. You can find a list of resistant tomato varieties here: http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm
- See the New England Vegetable Management Guide for current chemical control recommendations. Always alternate fungicide applications between materials with different modes of action to prevent resistance development. Check labels to ensure using indoors (in tunnels and greenhouses) is not prohibited.

Septoria leaf spot. Photo: B. Watt

Septoria leaf spot (*Septoria lycopersici*) usually occurs in the field and is one of the most destructive diseases of tomato foliage, resulting in considerable leaf drop that can cause sunscald, failure of fruit to mature properly, and reduced yields. Once infections begin, the disease can spread rapidly from lower leaves to the upper canopy.

Symptoms consist of small, circular, tan to grey lesions with dark brown margins that appear on lower leaves first, after the first fruit set. If conditions are favorable, lesions can enlarge rapidly, turning infected leaves yellow, then brown. *S. lycopersici* forms pycnidia (structures that produce asexual spores) in the center of expanding lesions, which can be seen with a 10X hand lens as tiny black dots. The presence of pycnidia, plus the generally smaller size of the lesions and the absence of target-like circular bands within the lesion, distinguish this disease from early blight.

The pathogen overwinters on infected tomato debris or infected solanaceous weed hosts (jimsonweed, horsenettle, groundcherry, and black nightshade), and can also survive on stakes and other equipment. The pathogen can also bee seed-borne. Once established, *Septoria* is spread by splashing water, insects, workers, and equipment. High humidity, long periods of leaf wetness, and temperatures of 60-80°F are conducive to disease development.

Early blight (*Alternaria solani*) occurs on the foliage, stem, and fruit of tomato, as well as on potato foliage and tubers. In tomato, the disease first appears as small brown to black lesions with yellow haloes on older foliage. Under conducive conditions, numerous lesions may occur on each leaf causing entire leaves to turn yellow. As the lesions enlarge, they often develop concentric rings giving them a 'bull's eye' or 'target-spot' appearance. As the disease progresses, plants can become defoliated, reducing both fruit quantity and quality. Fruit can become infected either in the green or ripe stage. Infections usually occur through the stem attachment. Fruit lesions appear leathery and may have the same characteristic concentric rings as the foliage. Fruit lesions can become quite large, encompassing the whole fruit.

Early blight: Note concentric rings in lesions. Photo: Clemson University, USDA Cooperative Extension

On potato, foliar symptoms are quite similar, though complete defoliation rarely results. Tuber lesions are dark, sunken, and circular often bordered by a purple to gray raised tissue. The underlying flesh is dry, leathery, and brown. Lesions can increase in size during storage and tubers become shriveled.

The fungus overwinters on infected crop debris in the soil and can survive there for several years. High humidity and warm temperatures (75-85°F) favor infection and disease development. Production of spores requires long periods of leaf wetness but can occur during alternating periods of wet and dry. Spores are dispersed mainly by wind but also by splashing water or overhead irrigation.

Septoria and Early Blight Management:

- Some tomato and potato varieties with early blight resistance or tolerance are available. However, most tomato culti-

vars are susceptible to Septoria leaf spot.

- Adequate nitrogen fertility throughout the season can help delay onset of early blight; lower leaves become more susceptible as the nitrogen demand increases with fruit production and nitrogen is pulled from older leaves.
- Protectant fungicide sprays at regular intervals (depending on weather conditions and disease pressure) will delay the onset of disease.
- Reduce overwintering inoculum by rotating out of tomato crops for at least two years, controlling solanaceous weeds, and incorporating crop debris after harvest.
- Reduce the length of time that tomato foliage is wet by using drip irrigation, using wider plant spacing, and staking. Keep workers and equipment out of wet fields where possible.
- Many fungicides are registered and effective against both early blight and Septoria. Please see the New England Vegetable Guide for recommendations. Use the TOMCAST forecasting model to help with the timing of fungicide applications for early blight and Septoria.

--Written by Bess Dicklow and Susan B. Scheufele, UMass Extension

Potato leafhopper active in potato, eggplant, beans

Potato leafhopper (PLH) adults have arrived and are now being observed across MA on potatoes, eggplants, and beans. Damage is high now in shell-beans, since they often do not get insecticide seed-treatments as other beans do. In about 7-10 days we should begin seeing the immature "nymph" stage crawling side-to-side on the undersides of leaves. Because low numbers of adults or nymphs cause injury and reduce yield, it is important to protect plants before adult numbers are high and before nymphs build up. Left uncontrolled, PLH populations will continue to grow rapidly. Plant injury and yield loss can be significant. In potato, yield loss occurs even before the development of obvious symptoms. Green beans are very susceptible, especially when they are infested prior to flowering.

Potato leafhopper adult on ptoato. Photo: D. Ferro

Identification. Adults are about 1/4 inch long, light yellow-green, and fly up from foliage when it is disturbed or shaken—they look like tiny green sparks flying away from the plants. PLH overwinters in the southern US and the adults move north annually. Once adults arrive, lay eggs, and nymphs hatch after 10 days. Nymphs hang out on the underside of leaves; they are tiny, light green, wedge-shaped and very fast-moving. They tend to move sidewise, crab-like, on the bottom of the leaf. Presence of nymphs indicates an established population.

Damage. Adults and nymphs feed by inserting a needle-like beak into the plant and sucking out sap. They also inject a toxin into the plant, which causes yellowing, browning, and curling of leaves. In potato, leaf margins turn brown and brittle first, followed by death of entire leaves, a condition known as 'hopperburn.' In eggplant, leaf margins and tips turn yellow and curl up. Feeding can reduce yield before damage is visible. Damage can be severe on early-season and red varieties of potato, as well as in green beans, eggplant and raspberries. Long-season cultivars tend to be more tolerant (see Table 1 on the next page for resistant and more tolerant potato varieties). Beans are more susceptible when they are young than at later stages. Field crops such as alfalfa, clover, soybean, sunflower and tobacco are also hosts.

Hopperburn on bean. Photo: UMass Vegetable Program

Scouting and thresholds. It is difficult to count adults since they fly quickly when foliage is shaken or disturbed. Sweep nets can be used to detect adults—treat if more than 1 adult is found per sweep. If you see one adult per plant when you shake the foliage, you are in that range. Once nymphs develop, they can be monitored by visually inspecting lower leaf surfaces on lower-canopy leaves. Treat if more than 15 nymphs are found per 50 leaves. Use a threshold of 1.5 leafhoppers per leaf in eggplant.

Table 1. Resistance of potato varieties to potato leafhopper

Resistant	Tolerant	Susceptible
Elba: Very late, white	Green Mountain: Late, white	Superior
Kin Harry: Early, white	Snowden: Very late, white	Red Norland
	Ontario: Very late, white	
	Katahdin: Late, white	
	Marcy: Late, white	
	Keuka Gold: Medium-late, yellow	
	Red Maria: Late, red	

Conventional products. In potato and eggplant, some materials registered for Colorado potato beetle (CPB) adults will also control leafhopper, including neonicotinoid foliar sprays such as Admire Pro or Assail. These and several other carbamate, synthetic pyrethroid and organophosphate products are also registered for leafhopper in potato, eggplant and snap beans. Refer to the New England Vegetable Management Guide for registered products. While the classes of insecticides listed above generally have high toxicity to bees, there are variations within classes; for example, Assail (acetamiprid) has a lower toxicity to bees (rated as 'medium') while most neonics are rated as highly toxic to bees. Sivanto (flupyradifurone) is a new product in a novel class of chemistries, the butenolides, that works against sucking pests, including PLH. It is also labeled for CPB control. This new active ingredient is being touted as an alternative to neonicotinoids, and has been given a bee toxicity rating of Low.

Organic products. PyGanic EC5.0 (Pyrethrin) has been shown to be the most effective product for reducing leafhopper numbers and damage. Good coverage is important, especially of the leaf underside where nymphs are found. Pyganic breaks down quickly in sunlight, so the residual period is short. Spraying late in the day or in the evening may provide better control than spraying early in the morning. Products containing azadiractin have also demonstrated efficacy against leafhoppers (especially in fruit systems) and could be used in tank-mixes or in rotation with Pyganic EC5.0. Don't wait for numbers to build up. Row cover can be used to delay PLH infestation in snap beans until flowering, when plants are less susceptible to damage. Using row cover is recommended on young eggplant, as it protects from flea beetles, CPB and PLH.

Pollinators and other beneficials. Although bees do not forage extensively in beans or potatoes, they may be active in the field when these crops or the weeds within the crop fields are flowering. During that time, selection of products with lower toxicity to bees is advised. Look for toxicity information on the label, and also in the New England Vegetable Management Guide Table 26, and in the products listed for each crop & pest.

For conservation of both native pollinators and honeybees, control weeds in the crop and avoid drift onto flowering borders or crops. However, encouraging some flowering areas in the margins is good for supporting pollinators before and after crops bloom. These can also be a nursery and refuge for beneficial predators and parasites of insect pests.

—UMass Extension Vegetable Program

IMPROVING HANDWASHING STATIONS

Andy Chamberlain and Chris Callahan at UVM Extension recently put together and trialed two new handwashing station models meant to improve upon other DIY designs. Their designs add a foot pedal in order to minimize contact with users' hands and also include closed collection containers for waste water. Each station is made with easily sourced parts and can be put together for between $100-$200.

Parts lists and assembly instructions for both designs can be found at the **UVM Extension Ag Engineering blog** and in a **downloadable pdf**. You can also watch Andy and Chris talk about and demonstrate their designs on the UVM Extension

television program, **Across the Fence**.

The following excerpt from the blog post describes some key components of a functional design:

Handwashing has been shown to be one of the most effective ways to reduce the risk of transmission of human pathogens between people. But, sometimes we are inconveniently far from the closest wash room and sink. Hand washing stations provide a portable means of washing hands on farms, at farmers' markets, and at recreational sites.

The key design features of a handwashing station include:

- Clean supply water that is safe and of adequate sanitary quality.
- Hands free operation of water which allows thorough washing of hands with full attention and also prevents cross contamination via faucet handle and other surfaces.

Build plans for the two hadnwashing stations shown above are outlined in the UVM Extesnion Ag Engineering blog post.
Photos; UVM Extension

- Gray water collection for controlled disposal to prevent direct discharge of used water on the ground in order to minimize cross contamination and pollution.
- Hands free dispensing of soap to avoid cross contamination.
- Touchless or low contact paper towel dispenser to prevent cross contamination.
- Paper towel receptacle with a liner and a closing lid to ensure waste is contained.
- Sturdy construction leading to durable use over a long lifetime. Consider weather resistant materials or paint to prolong the life of the unit.
- Stable design that won't tip over and which keeps parts intact.
- Portable so that it can be easily moved to where it is needed.
- Easy to maintain so that it remains useful and pleasant to use.
- Cleanable so that the handwashing station itself can be kept in hygienic condition. Surfaces should be smooth and cleanable and materials should be compatible with water and soap.

News

Note on Coronavirus Food Assistance Program (CFAP) for Vegetable Growers

The applicability of the Coronavirus Food Assistance Program (CFAP) is very limited for vegetable producers. However, producers of the following crops may be eligible for a payment if they marketed any of the following crops between January 15, 2020 through April 15, 2020 (payment rates per pound are in parentheses):

- Cabbage (4 cents)
- Carrots (2 cents)
- Onions (1 cent)
- Squash (72 cents)

There also may be some other limited cases in which a vegetable producer could qualify for a CFAP payment. Interested producers are encouraged to contact their county USDA-Farm Service Agency (FSA) Office that serves their farming operation. Click here to go to the FSA county offices directory.

MA Food Security Infrastructure Grant Program Announced

The Commonwealth of Massachusetts has launched a grant program to support farms and other food businesses and institutions that have been affected by the COVID-19 crisis. The RFR has a long list of examples of the kinds of projects that are eligible, and broadly states: "Projects will support the immediate and projected needs of the Commonwealth's local food system, including (i) information technology needs; (ii) facility adaptation to new safety guidelines; (iii) storage, processing, and delivery equipment to adapt to supply chain disruptions and to serve food insecure residents, and (iv) other strategies that connect local food production with food insecure communities and residents and increase food equity for all residents."

The full application and instructions are available here. Some key details:

- Projects will be funded on a rolling basis through September 15.
- Funding is available for a range of sized projects, from very small to as much as $500,000.
- Applicants may submit up to three proposals.
- Evaluation criteria include demonstrated evidence of impact and need, a commitment to equity, sustainability and scalability of the project, and other factors.
- Funding is on a reimbursement basis, so funds will be distributed only after costs have been incurred and receipts submitted.
- Funding is for capital infrastructure and equipment purchased must be new.
- Funding may not be spent on labor or food.
- There is no match requirement.

More information about this program is available here: https://www.mass.gov/service-details/food-security-infrastructure-grant-program.

Notice of Opportunity to Add New HIP Farms - Responses Due July 1

The Department of Transitional Assistance has released a Notice of Opportunity to strategically onboard new agricultural vendors and access points for the Healthy Incentives Program (HIP). This opportunity is available to both new and existing HIP vendors. All interested farmers must apply regardless of whether or not you have contacted either DTA or MDAR in the past. Applicants will be evaluated on the ability to respond to the needs of communities and populations impacted by COVID-19, establish HIP access points in areas with limited existing HIP access points or other food access barriers, distribute food in ways that limit the transmission of the novel coronavirus while reaching vulnerable populations, and a demonstrated capacity and commitment to serve SNAP clients in culturally appropriate ways. To find out more about the HIP Notice of Opportunity, please use the following link: www.mass.gov/healthy-incentives-program-hip-notice-of-opportunity-noo.

Events

Mini-Twilight Meetings for Commercial Vegetable Growers

Join us Wednesdays at 6pm for virtual mini-Twilight Meetings! On each call, we will have a topic lined up for demonstration and discussion, with a presentation of new information on crop, pest, and farm management topics followed by plenty of time for Q&A about the topic at hand and farmer-to-farmer discussion of the issues of the week. Farmers can join by phone or by computer—those who join by computer will be able to see some shared photos and presentations.

Upcoming Topics:

- **June 24, 6pm: Weed Management for Vegetable Crops with Bryan Brown, New York State IPM Program**
  Stop drowning in weeds! Use their biology against them. Setup a cultivator to maximize effectiveness. Find low-cost ways to integrate mulch. We will cover these topics and more plus plenty of time for your questions.
  1 pesticide recertification credit is available for this webinar.

How to join: Click here to register and receive the sign-in information.

Recordings of Past Calls:

April 22: Early-season pest scouting

April 29: COVID-19 business relief programs

May 6: Organic pest management

May 27: Cleaning, Sanitizing, & Disinfecting on the Farm: COVID-19 and Beyond

June 10: Greenhouse Fertigation with Judson Reid of Cornell Cooperative Extension

UNH Webinar: Disease Management for Giant Pumpkin Growers

When: Tuesday, July 7, 2020, 6-8pm

Registration: https://extension.unh.edu/events/disease-management-webinar-giant-pumpkin-growers

University of New Hampshire Extension is hosting a webinar on disease management for giant pumpkin growers. Dr. Margaret T. McGrath (Associate Professor, Cornell University, Department of Plant, Pathology) will join for a zoom webinar to discuss cucurbit yellow vine decline (CYVD) affecting pumpkin. This webinar will cover how to identify and manage this disease within your IPM system.

Dr. Anna Wallingford (UNH) will discuss the biology and management of squash bug, which vectors the pathogen responsible for the disease.

While this webinar was designed with giant pumpkin growers in mind, this webinar is open to all and may be of interest to any grower of pumpkins, squashes, and gourds. (2 PACs pending, must attend the live event to earn credit).

National Young Farmer Coalition Produce Safety Focus Groups

Throughout the summer the National Young Farmer Coalition will be hosting a series of focus groups with farmers to discuss on-farm produce safety practices and how they can be integrated into farming operations. We have some coming up that are specific to CSA farmers, specifically, Produce Safety for CSA/Farmshare Distribution during COVID-19 and Produce Safety for Multi-farm/Aggregated CSAs during COVID-19, one around Produce Safety for Hydroponic and Aquaponic Operation and one about rotational grazing (soon to be added!).

More information and signups can be found on our website: youngfarmers.org/focusgroups. Each focus group will be one hour long, via Zoom, and all farmers will be compensated for their time and energy and receive a copy of our food safety guidebook: A Small Farmer's Practical Guide to Food Safety.

Pesticide Applicator Training Workshops available online

The 2020 Pesticide Recertification workshops scheduled for this spring were rescheduled due to concerns about the spread of COVID-19. These workshops have been converted to a remote/online format so that everyone can obtain information and continuing education contact hours in a safe manner. You can now register for our online Zoom workshops. Workshop registration fee is $40/person/workshop by credit or $10 discount if paid by check. To see the whole list of workshops offered, go to: https://www.umass.edu/pested/recertification/current_workshops.htm

Thank you to our sponsors!

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