UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Scouting at Riquezas del Campo Farm in Hatfield. Timely use of row cover meant summer squash with no striped cucumber beetle damage! Photo: L. McKeag

Crop conditions

This week's heat wave has finally broken, with storms bringing up to an inch of rain to most locations in the state. The storms skirted some areas, though; the northwest corner of the state and Cape Cod are currently classified as "Abnormally Dry" by the Northesat Drought Monitor, and the eastern half of Barnstable County is in a moderate drought. In locations that got rain this past week, foliar diseases can be expected to spread – Alternaria leaf spot and black rot in brassicas, early blight and Septoria leaf spots in tomatoes and potatoes, etc. It can be hard to know whether or not it makes sense to spray a fungicide just prior to forecasted rain: on one hand, we are always telling you that foliar diseases often spread via splashing water and thrive when leaves are wet, but on the other hand, won't the rain just wash the materials off of the leaves? The answer to whether or not to spray during rainy weather depends on the product. It may be effective to spray materials with translaminar activity (aka materials that move into the leaves) if you can get them on with enough time before the rain hits. It's probably not worth it to spray something like copper, a material that remains on the surface of the leaf and must contact spores or bacterial cells to kill them, if significant rain is forecasted. Dan Egel of Purdue University discusses this in more depth in his Fungicide Applications During Rainy Weather article. Another consideration is that heavy rains may cause materials to run off into waterways or non-target crops.

Other crop news is largely similar to last week. We are getting into the summer grind, when crops keep maturing, weeds keep germinating, and customers keep buying!

Pest alerts

Alliums

Onion thrips are building up in allium crops at this point in the season, especially with the recent hot weather. Crops grown on reflective silver plastic may have slightly lower thrips populations than those on bare ground or black plastic, but populations can still explode on silver plastic. The silver plastic can deter the thrips early in the season but will not totally prevent them from finding the crop, and once the thrips are in the onions the are largely unaffected by the plastic. Insecticide applications are likely necessary even for allium crops on silver plastic. This is a good example of the meaning of Integrated Pest Management, where a cultural control can delay the need for a pesticide application but you may still need to use several management strategies. Insecticide sprays are warranted for onion thrips when 1-3 thrips are found per leaf – organic growers should use the lower 1 thrips/leaf threshold. Spinosad (e.g. Entrust) is the most effective OMRI-approved control. It can be applied with insecticidal soap (e.g. M-Pede at the 1.5% v:v rate) to increase efficacy. For an example of a conventional insecticide rotation plan, see the 2020 Guidelines for Onion Thrips Management from Cornell University.

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.

Brassicas

Symptoms of **heat stress** are being reported in broccoli – uneven bead development, brown beading, and hollow stem. Broccoli is a cool season crop and temperatures above 86°F during flower bud development cause head deformities. Plant breeders working with the Eastern Broccoli Project have been identifying heat-tolerant varieties for summer production; their recommendations are available here. See our Managing Heat-Related Disorders in Brassicas article in the August 6, 2020 issue of Vegetable Notes for more information. And for more photos of the effects of heat on broccoli heads, see this article from 2017 by Gordon Johnson at the University of Delaware Extension.

Uneven bead development caused by heat stress. Photo: G. Johnson, UDel

Cucurbits

Powdery mildew (PM) was reported in RI this week. If PM is not yet present in your crop, spraying protectant fungicides can delay infection. Protectant materials for PM include sulfur, oils, chlorothalonil (e.g. Bravo), and copper—chlorothalonil and copper will also protect against cucurbit downy mildew. Once you find PM in your crop, add a targeted PM material and rotate between fungicide classes with each spray. Examples of trade names of targeted PM materials include Switch, Luna Experience, Rhyme, and Procure. Quintec, Endura, and Torino are also labeled but resistance to these fungicides has been recorded so only 1 should be used in a rotation. Targeted PM materials are not effective against cucurbit downy mildew.

Cucurbit powdery mildew on leaf underside

Table 1. Squash Vine Borer trap captures, week ending June 30, 2021

Location	SVB
Deerfield	1
North Easton	36
Westhampton	8
Whately	1
Sharon	11
Leominster	36

Downy mildew (DM): Southern New England, including most of MA, is forecasted to be at low risk for downy mildew development as of yesterday, based on occurrences of DM in NJ and MD and forecasted weather patterns. Winter squash, pumpkins, and watermelon are not currently at risk but begin scouting cucumber and cantaloupe crops for symptoms of DM now and consider applying protectant DM materials, which include chlorothalonil and copper (both also effective protectants for PM) and mancozeb. Report any suspected DM occurrences to us at umassveg@umass.edu so we can track this disease.

Squash vine borer is being caught now at all of our trapping locations. The highest trap count for the week is 36 moths/trap, in two locations in eastern MA. Spray weekly, targeting the base of plants, for as many weeks as traps are capturing more than 5 moths (for bush-type crops) or 12 moths (for vining types).

Solanaceous

Two-spotted spider mite damage was seen in high tunnel tomatoes in Bristol Co. this week. Spider mite feeding causes speckling of foliage and when heavy infestations occur, webbing is often visible on the undersides of the leaves. Adult mites are tiny (~½ mm long) – they are visible with the naked eye but easier to see with a 10X hand lens. Controlling spider mite populations early is crucial for control. Use selective products 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 products include insecticidal soap (e.g. M-Pede) and horticultural oils (e.g. Trilogy, Suffoil X, Golden Pest Spray Oil)—use early and regularly and take measures to ensure good leaf coverage.

Spider mite damage on eggplant. Photo: J. Boucher

Aphids were reported in field tomatoes this week, likely stemming from infested transplants. In some cases, natural predators and parasitoids of aphids will control populations when infested transplants are planted out into the field. Scout to determine if numbers are increasing after they are first noticed. Treatment with an insecticide is recommended if there are more than 6 aphids per leaf – check lower, middle, and upper leaves at sites across the field. Broad-spectrum insecticides will kill beneficial insects, causing aphid populations to increase. For a list of labeled products, see the field tomato insect control section of the New England Vegetable Management Guide.

Colorado potato beetle larvae are growing bigger as they chow through potato and eggplant foliage where control has not been successful. A voracious CPB population on one farm in Norfolk Co. is feeding on tomatoes this year after the grower cut potato and eggplant from the crop plan due to the pest. If potatoes and eggplant are present, CPB will not likely damage tomato but in the absence of their preferred hosts, they will move in. When larvae are at their largest and getting ready to pupate, effective control is difficult. If you are in this situation, make a note to plan ahead to use cultural controls to prevent adults from finding your crops next spring (crop rotation, trench traps, mulching – see the CPB section of the potato insect management section of the NE Veg Mgmt Guide for more info). Make sure you have multiple spray materials on hand next spring and scout your crop regularly to observe egg hatch so that you can target the smallest larvae.

Table 2. Sweetcorn pest trap captures for week ending June 30, 2021

Location	GDD (base 50°F)	ECB NY	ECB IA	CEW	CEW Spray Interval
Western MA					
Deerfield	1001	-	-	-	-
Sheffield	767	-	-	-	-
Southwick	955	0	0	1	*no spray*
Whately	1040	0	2	0.5	*no spray*
Central MA					
Bolton	989	1	0	0	*no spray*
Leominster	983	2	0	-	-
Northbridge	887	0	1	2	*6 days*
Spencer	970	1	0	0	*no spray*
Eastern MA					
Ipswich	932	0	0	2	*6 days*
Concord	983	2	0	0	*no spray*
Millis	-	6	0	-	-
North Easton	976	1	4	-	-
Sharon		0	1	-	-
Seekonk	1091	4	0	1	*no spray*
Swansea		1	0	2	*6 days*

- 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

Sweet corn

Corn earworm: A few more CEW traps were set out this week, so a few more locations across the state are reporting captures and trap counts at a few locations are warranting 6 day spray schedules. If CEW trap counts are less than 1.4 moths/week/trap, continue scouting weekly for European corn borer and sap beetle damage to determine if sprays are needed. Some CEW populations have developed resistance to synthetic pyrethroids, so do not use pyrethroids alone for CEW management.

European corn borer numbers are remaining fairly low and field infestation rates are dropping.

Sap beetles are continuing to be found, driving sprays in some cases as levels of ECB infestation drop. See the article in this issue for more information.

Various crops

Celery leaf curl, aka **celery anthracnose** was suspected this week in Berkshire Co. This fungal disease, caused by

Colletotrichum species, causes leaf and petiole twisting, plant stunting, brown-to-black heart rot, and lesions on petioles. The pathogen thrives in warm, wet conditions. It is not yet known how *Colletotrichum* arrives on farms and overwinters. Some varieties have shown tolerance to this disease. See the article in the June 20, 2019 issue of Veg Notes for variety and chemical control information.

Celery anthracnose. Photo: K. Campbell-Nelson

Spotted wing drosophila adults are active in fruit crops now. Spray timing and coverage is essential for effective control. The addition of sugar (2-3 lbs. per 100 gallons of water) can increase the effectiveness of the insecticide sprays because sugar is a feeding stimulant for SWD. Materials ranked as providng "excellent" control in 2020 Extension trials include Cormoran, Asana, Brigade, Danitol, Mustang Maxx, Warrior, Hero, Delegate, Radiant, Lannate, Malathion, Imidan, Diazinon, Verdepryn, Exirel, and Sivanto. For information about this pest, see the SWD fact sheet from the UMass Extension Fruit Program.

White mold was found in potatoes in MA and in beans in ME this week. White mold is caused by the fungus *Sclerotinia sclerotiorum*, which produces prominent, white, fluffy mycelium on infected plants and sclerotia (masses of fungal tissue surrounded by a hard, black 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 tunnel or field can limit soil contamination. For labeled materials, see the appropriate crop section of the New England Vegetable Management Guide.

White mold sclerotia in a tomato stem. Photo: P. Flynn

Foliar diseases of onion

With onions sizing up and the recent hot, humid weather, it's time to start looking for foliar diseases of onion. This article gives an overview of the three most common foliar fungal onion diseases in Massachusetts–botrytis leaf blight, purple blotch, and downy mildew. We also included a for-now less common disease—Stemphylium leaf spot. These diseases are similar in that they are favored by warm, humid temperatures, they overwinter in crop residues and cull piles, and spores are spread by wind and splashing water. Although these diseases occur on onion leaves, they can indirectly affect yields by reducing bulb sizes and directly lead to losses by causing bulb rots in storage. If you plan on using fungicides to control these diseases, catching the diseases early is crucial. If you don't plan on spraying, identifying infected vs. clean varieties or fields can help you decide what to sell quickly and what to store through the winter.

Botrytis leaf blight (*Botrytis squamosa*) causes small, white lesions, 1-5 mm long, surrounded by green-white halos. As the disease progresses, lesions become sunken and tan and may split down the middle. Symptoms often begin in older leaves. Botrytis overwinters in onion cull piles, on crop debris, or as sclerotia (small, dense masses of fungal tissue with a dark rind) in the soil. In the spring, sclerotia produce spores that are spread by wind and cause infection in onion crops if foliage is wet for long enough and temperatures are warm. Botrytis, along with downy mildew, does not like hot weather – the pathogen thrives in cool to warm temperatures and shuts down when it gets too hot. Severely affected fields will appear blighted with most leaves dead and desiccated. Losses in yield occur because of smaller bulb size resulting from premature leaf senescence. The *Botrytis* that causes leaf blight in onion is a different pathogen than the one that causes botrytis neck rot in alliums and gray mold in many crops.

Botrytis leaf blight. Photo: C. Hoepting

Downy mildew (*Pernospora destructor*) causes 1-2-inch long, pale-green, oval-to-

round spots that expand and coalesce, girdling leaves and causing them to collapse. As the pathogen progresses, it produces fuzzy gray sporulation that becomes purple. Spores are produced at night and disseminated by wind the following day. Symptoms are first seen on older leaves when dew is present. Downy mildew and purple blotch often occur together. Similarly to purple blotch and botrytis leaf blight, downy mildew infection can limit bulb growth and cause bulb rots. Infection occurs when leaves are wet and usually when temperatures are below 75°F. Like purple blotch, downy mildew shuts down at high temperatures. The pathogen over-winters in fall-planted overwintering onions or volunteer onion plants as oospores (thick-walled survival spores), or as mycelium in stored bulbs, seed, or crop residue. Infected bulbs become soft and shriveled, some sprouting prematurely. The pathogen directly infects roots of new plants in the spring, which become systemically infected and produce spores that spread to other plantings. Downy mildew of onion affects only alliums and is a different pathogen than the downy mildews of cucurbits, basil, and spinach.

Downy mildew of onion. Photo: H. F. Schwartz, Colorado State Univ., Bugwood.org

Purple blotch (*Alternaria porri*) causes boat-shaped lesions (aka a birds-eye-view of a canoe) with distinctive purple-brown sporulation. Lesions are initially water-soaked with white centers; as the pathogen expands within the leaf, the lesion may develop concentric rings. Leaves with large spots turn yellow and blow over in wind. Purple blotch and Stemphylium (described below) both continue to infect at high temperatures (into the 90s), making them the prominent mid-summer diseases of onion where present. Like other species of *Alternaria*, the purple blotch pathogen overwinters in infected crop debris and can be carried on seed. Spores are produced when temperatures are warm (optimum temperatures are 77 to 81°F) and humidity is high, and are spread by wind and splashing rain or irrigation water. Older leaves and leaves with heavy thrips damage are most susceptible, as purple blotch can easily infect dead leaf tissue and move from there to healthy tissue. Unlike botrytis and downy mildew, purple blotch remains active at high temperatures (into the 90s), and almost no infection occurs below 55°F. Bulbs may become infected at harvest through the neck or wounds; bulb decay shows first as a watery rot around the neck causing yellowish to wine-red discoloration. As it moves through the scales, tissue dries to a papery texture.


Purple blotch. Photo: G. Higgins

Stemphylium leaf spot (*Stemphylium vesicarium*) is a major disease of onions in the large-scale onion producing areas of NY state but is not common in areas where onion production is on a smaller scale. Initially in reports from NY, *Stemphylium* was found only infecting dead onion leaf tissue, but over time it was found infecting healthy tissue as well. It commonly infects plants following infection by another disease, first infecting the dead tissue and then moving to healthy tissue. Spots are water-soaked and light-yellow to brown. They elongate and can coalesce into large lesions and develop concentric rings. Spots can be purple and produce dark brown sporulation – they are virtually impossible to distinguish from purple blotch spots without using microscopy. In areas where Stemphylium leaf spot is widespread, the pathogen has developed resistance to FRAC group 7 and 11 fungicides and signs of resistance development to group 3 are starting to appear. The species of *Stemphylium* that causes leaf spot on onions is a different species than the one that infects spinach.


Stemphylium leaf spot. Photo: M. McGrath

Disease forecasting models are available for botrytis leaf blight, purple blotch, and downy mildew, through the Network for Environment and Weather Applications (NEWA). The models use crop maturity stages and environmental data to forecast if conditions are favorable for disease development in order to inform fungicide spray decisions. The models are designed to be used in combination with regular crop scouting, because the models do not take into account whether or

not any of the pathogens are present in your crop already – if conditions are favorable for disease development but disease has not started in your crop, a spray is not warranted. The NEWA page provides detailed information about each model, but generally explains that to make an informed pesticide decision, you need to ask yourself these questions about the past and forecasted environmental conditions and the presence of disease in your field:

If the disease is present [in your field]:

- *How favorable were the conditions for the past 7 days?*
  - If extremely or moderately favorable, choose a fungicide effective against that disease.
- *How favorable are current and forecast conditions?*
  - If the disease is forecast to be over threshold for more than three days, be sure fungicide coverage is maintained
  - If the disease is not forecast to be over threshold, you may be able to delay fungicide applications. Do not extend spray intervals for more than 10 days and continue to monitor forecasts. Be sure to apply a fungicide before very favorable weather occurs.

If the disease is not present, but conditions have been favorable, scout carefully to determine if the disease has appeared in your field. As new diseases are detected, adjust fungicide programs to include products that are effective against the mix of diseases that are present.

Management practices are similar for all four of these foliar fungal pathogens.

- Destroy cull piles, where the pathogens can overwinter on residues and volunteer plants.
- Practice a 3-year crop rotation out of alliums.
- Till under crop residues promptly after harvest and bury residues deeply.
- Use drip irrigation where possible. If using overhead irrigation, irrigate in the morning on sunny days to minimize the amount of time that foliage is wet.
- Control weeds to maximize air circulation and reduce leaf wetness times.
- Provide proper nutrients. Over-application of nitrogen can cause plants to produce unnecessarily lush foliage, increasing humidity in the canopy. Senescent leaves due to nutrient deficiencies will be more susceptible to pathogens.
- Control onion thrips, as feeding damage can make plants more susceptible to disease. Scout crops beginning in early May and treat at a threshold of 1-3 thrips/leaf (organic growers should use the lower threshold). For recommendations for organic onions, see the article in the June 25, 2020 issue of Vegetable Notes. For all labeled products, see the onions, scallions, and shallots insect control section of the New England Vegetable Management Guide.
- Chemical control: Lists of labeled products for all four of these diseases are available in the New England Vegetable Management Guide. Cornell Cooperative Extension also provides in-depth fungicide program recommendations, but resistance to certain FRAC groups may be more widespread in NY than in other states because onions are grown on a much larger scale in NY than in other states. 2021 recommendations for Botrytis leaf blight, Stemphylium leaf spot, and downy mildew are available here.

--Written by Genevieve Higgins

Managing Heat Stress in Vegetable Crops

This article is compiled from several blog posts written by Gordon Johnson, University of Delaware Extension Vegetable & Fruit Specialist; gcjohn@udel.edu or Gordon Johnson & Emmalea Ernest, University of Delaware Associate Scientist – Vegetable Crops; emmalea@udel.edu. Links to the original posts are at the end of the article.

Climate change has the potential to affect fruit and vegetable production as temperatures increase. Climate data from the region has shown a steady increase in average temperatures over the last 100 years with average night temperatures in summer months increasing the most. Record high temperatures have occurred throughout the past decade and many vegetable crops have had losses due to the heat. Providing adequate moisture through irrigation is critical in high heat periods. However, maintaining soil moisture cannot completely compensate for extreme heat.

Heat injury in plants includes scalding and scorching of leaves and stems, sunburn on fruits and stems, leaf drop, rapid leaf death, and reduction in growth. Wilting is the major sign of water loss which can lead to heat damage. Plants often will drop leaves or in severe cases will "dry in place" where death is so rapid, abscission layers have not had time to form. Normally, plant temperature is just above air temperature, but, plant temperature can rise to a critical level under certain conditions. The plant temperature at which tissue dies is around 115°F.

Heat necrosis on pepper stem from excessive temperatures from black plastic mulch. Photo: G. Johnson

Photosynthesis rapidly decreases at temperatures above 94°F, so high temperatures will limit yields in many vegetables and fruits. Plant stomates will close earlier in the day, thus limiting gas exchange and thereby photosynthesis. Respiration increases with temperature. While daytime temperatures can cause major heat related problems in plants, high night temperatures can also have great effects on vegetables, especially fruiting vegetables. Hot night temperatures (nights above 75 °F) will lead to greater cell respiration. This limits the amount of sugars and other storage products that can go into fruits and developing seeds. Because of this increased respiration the plant expends stored photosynthates and they do not contribute to yield.


Sunscald in chard. Photo: G. Higgins

High air temperatures may result in high leaf temperatures, especially where water is deficient. High leaf temperatures result in heat damage to the proteins which allow the plant to photosynthesize and carry out metabolic processes. Very high leaf temperatures result in visible, physical damage to leaves in the form of sunburn and scorching. Sunscald of fruits will increase, especially where leaves wilt and reduce fruit cover.

In flowering and fruiting crops, high heat will affect pollen production [and pollinator activity], often reducing viable pollen numbers. Reproductive parts in plants (anthers, stigmas) may not form properly or function properly. If pollen is transferred to stigmas, pollen germination may be reduced or halted due to heat and desiccation. Reduced pollination can result in smaller fruit or misshapen fruit.

Increasingly deformed cucumbers, caused by high heat. Photo: G. Johnson

If pollination is successful, early fruit abortion may occur due to lack of photosynthates or heat damage. In heat-stressed plants, the hormone balance is affected and there is an increase in abscisic acid that is involved in these abortions.

High soil temperatures can damage surface roots, limiting water and nutrient uptake, especially potassium. This is particularly an issue in crops grown on black plastic mulch, a common cultural practice. On black plastic mulch, surface temperatures can exceed 150°F. This heat can be radiated and reflected onto vegetables causing tremendous heat loading. This is particularly a problem in young plants that provide limited shading of the plastic. Vegetable transplants are exposed to these high soil temperatures at the soil line around the transplant hole. The stem tissue just at or above the level of the plastic may be killed at these high temperatures and the transplants will then collapse and die. Small transplants do not have the ability to dissipate heat around the stem as roots are not yet grown out into the soil and water uptake is limited. High bed temperatures under plastic mulch can also lead to reduced root function limiting nutrient uptake. This can lead to increased fruit disorders such as white tissue, yellow shoulders, and blotchy ripening in tomato fruits where not enough potassium reaches the fruit, or to blossom end rot in tomatoes or peppers due to a lack of calcium uptake.

Strategies for managing heat stress

Transplants*:* Control stem heat necrosis by hardening off transplants and using larger transplants with thicker stem diameters and more leaves. Make a larger hole when transplanting and water sufficiently in the hole to reduce heat load. Plant in the evening or early in the morning and avoid planting on very hot days or when long stretches of hot weather are forecast. Switch to white plastic mulch for later spring plantings; this can reduce losses significantly (white plastic will be 10-20 °F cooler than black plastic mulch). White particle films (clay or lime based) sprayed at the base of plants over the mulch can also reduce plant losses to heat necrosis. Putting a small mound of clean sand around the plant stem will also eliminate this problem.

Irrigation

Overhead irrigation over black plastic mulch can help to reduce heat loads until plants have sufficient canopies to shade over the mulch.

Fixing drip irrigation leaks and clogs. Issues with drip can include plugged emitters; leaks due to insect or animal chewing; leaky connections reducing flow; tape twisting and binding; improper tape selection or improper irrigation timing; limited well capacity; emitter spacing that is too wide for the crop or soil; and beds that are too wide for a single tape (with double rows). Any of these could lead to inadequate water being applied to the crop.

Whether using overhead or drip irrigation to water your crops, monitor fields closely and consider using soil moisture monitoring devices to better understand crop needs and to aid in detecting problems.

Mulching. Increase reflection and dissipation of radiative heat by using reflective mulches or low-density, organic mulches such as straw to reduce surface radiation and conserve moisture.

Shading. Commonly, shade cloth or netting is used for this purpose. This netting comes in black, green, white, and reflective aluminum colors and is commonly used at the 20-30% shade levels. Shading is applied during the hottest periods or periods when the plant is most sensitive to heat (such as tomato fruit development). Research at the University of Maryland by Jerry Brust showed that shading tomatoes during fruiting can improve fruit quality and reduce culls. Research at the University of Georgia on peppers showed similar results with improvement in the number of marketable fruits. Kansas research showed that lettuce production was improved where white shade cloth was used.

University of Delaware research with shading of strawberries for summer production showed mixed effects with shading benefiting in some years but not in others. In 2018 and 2019 University of Delaware vegetable researchers studied the effect of shade cloth on tomato and pepper marketable yield. Treatments were no shade, 30% black, 30% Aluminet, 30% red, 22% white, 40% white. In 2018, shade treatment did not have a significant effect on pepper quality or marketable yield. In contrast, in 2019, shade treatments, especially 30% black shaded plots, produced more marketable peppers than the unshaded plots. Yield of marketable first harvest (early Aug) for 30% black was 18x higher than unshaded. Yield of marketable second harvest (Sep) was 2x unshaded. Shade did not reduce internal white tissue in tomatoes to the point of achieving marketability in the 2018 or 2019 trial. Lettuce trials were conducted with no shade, 30% black, 30% Aluminet, 30% red, 30% blue, 22% white, and 40% white. Shade cloth reduced soil temperatures by 3°C/37.4°F. Shaded lettuce treatments had reduced bitterness in both the 2018 and 2019 trials. For lettuce the combination of a heat tolerant variety with shade had the greatest effect on reducing bitterness.

To summarize, there is good evidence that 30% black shade cloth applied during the hottest time period (early June through early August) improves bell pepper yield and quality. There is also good evidence that shade cloth reduces bitterness in lettuce, especially when used with a heat tolerant variety. There is some evidence that 30% black shade cloth increases tomato quality.

Original Blog Posts

G. Johnson, How High Heat Affects Vegetables and Other Crop Plants, June 17, 2011. https://sites.udel.edu/weeklycropupdate/?p=3203

G. Johnson & E. Ernest, Heat Stress and Shading for Heat Stress Mitigation in Vegetables and Small Fruits, June 19, 2020. https://sites.udel.edu/weeklycropupdate/?p=15224

G. Johnson, Heat Necrosis in Transplants, June 15, 2018. https://sites.udel.edu/weeklycropupdate/?p=12037

G. Johnson, Stem Heat Necrosis, June 12, 2020. https://sites.udel.edu/weeklycropupdate/?p=15151

G. Johnson, Stress in Vegetables, July 15, 2011. https://sites.udel.edu/weeklycropupdate/?p=3359

Sap beetles in sweet corn

Sap beetle larvae in a corn tip. Photo: E. E. Nelson, Bugwood.org

Sap beetles have generally been thought of as secondary pests of sweet corn, usually associated with damage caused by caterpillars, but on some farms they are a regular and troublesome pest in early sweet corn plantings – even where caterpillars have been non-existent! Early sweet corn varieties tend to have poor tip cover, allowing sap beetle adults to lay eggs near the tip, where tiny larvae burrow into the kernels, and make the ears unmarketable (see photo at right). Sap beetle adults have already been observed in early corn plantings in MA, so now is the time to be scouting if this pest has been a problem on your farm in past years. Sap beetles can also be pests of strawberry and other fruits, so they tend to be more of a problem on farms that grow both fruit and corn. The beetles are attracted to decaying plant material, particularly fruit. Growers with sweet corn plantings that are close to peach or apple orchards, where over-ripe dropped fruit can attract adult beetles, are vulnerable to invasions into corn, and should pay particular attention for this pest when scouting. Sap beetle infestations tend to be worse in hot, dry years.

Life Cycle and Damage. Sap beetles overwinter as adults, often in the woods near previous feeding sites. Early sweet corn silk is an attractive early-season feeding and egg-laying site, especially when fruits and other hosts are rare. There are several generations per year. The most common sap beetles in corn are the dusky sap beetle (*Carpophilus lugubris*), which is all black (3.5-4.5 mm long), and the four-spotted sap beetle (also known as picnic beetle, *Glischrochilus quadrisignatus*) which is black with four irregular yellow spots (5-6 mm long). The most common species in strawberries is the strawberry sap beetle (*Stelidota geminate*).

Four-spotted sap beetle, or picnic beetle, adult. Photo: A. Hazelrigg

Adults are first noticeable about the time that tassels and silk appear. Males have an aggregation pheromone that attracts other beetles, both male and female. Adults move to corn at full tassel to feed on pollen, and build up as corn matures and silk turns brown. There are 2 to 4 generations per year with peak infestations in July (larvae) and late July and August (adults).

Beetles may invade corn borer tunnels or areas with other insect or bird damage, but are also found in corn that is free of caterpillar damage. They lay eggs in silks and the tip of ears. Eggs are milky white and resemble tiny grains of rice. The larvae are small, pinkish-white or creamy colored grubs about ¼ inch long. They may hollow out kernels of the upper half of the ear, making ears unmarketable. Adults may also hide between the layers of the husk. The problem can easily be overlooked until harvest, when adults show up in harvest bins and larvae are found in the ears. Full-grown larvae drop to the ground and pupate in the soil.

Cultural practices. Cultural controls are essential to managing sap beetles. Ears with exposed tips, especially super sweet and *Bt* varieties, are more susceptible to infestation. Research has shown that both the length and tightness of the tip cover is important to reduce infestations. Some varieties with long, tight tip cover include: Accord, Argent, Avalon, Awesome, Bon Jour, Cuppa-Joe, Easy Money, Fantasia, Ka-Ching, Precious Gem, Prime Plus, Profit, Providence, and Renaissance. To prevent or reduce damage, select varieties that have good tip cover, use clean cultivation, and control birds and ear-infesting caterpillars. Eliminate or bury deeply any cull piles or other areas with decaying vegetables or fruit, included infested ears. Do not leave infested blocks standing; mow aggressively to chop ears as soon as the block is finished. Deep plowing may be necessary after harvest if infestations are high, to bury ears at least 4” deep.

Monitoring and sprays. Scout blocks at full tassel and early silk to determine if beetles are present. Unfortunately, there are no specific thresholds based on scouting. Insecticides may be warranted in fields with a previous history of at least 10% ear damage. Research in Maryland showed that ear infestation begins just after silk emerges and that 1 or 2 applications made 3 and 6-7 days after silking is more effective than later or more applications. Later sprays did not improve control. Insecticides will reduce the number of damaged kernels and ears but will not completely control heavy infestations. Sap beetle adults and larvae are not susceptible to the *Bt* toxin that is present in *Bt* corn. Efficacy trials have shown that

carbaryl (Sevin), lambda-cyhalothrin (Warrior II), bifenthrin (Bifenture), and methomyl (Lannate) are more effective than most other insecticides. However, carbaryl cannot be used during the early silk period while corn is shedding pollen and does not allow for hand harvesting after use. All of the materials listed in the New England Vegetable Management Guide for use against sap beetles are highly toxic to bees. When spraying for sap beetle, consult the label and spray in such a way as to protect bees.

--UMass Vegetable Program

News

Let us know how you use the New England Vegetable Management Guide!

Do you use the New England Vegetable Management Guide as a resource? If so, we want to hear from you!

The authors of the New England Vegetable Management Guide want to learn more about how the guide is used, so that we can make it as useful as possible. While we are revising the guide, we have designed a short survey to better understand what YOU value in the guide. Please consider taking 5 minutes to provide your feedback and suggestions here: https://unh.az1.qualtrics.com/jfe/form/SV_9Ag68WJ1uyjreE6.

Survey: How Can Extension Better Serve Growers with Video and Audio Resources?

Extension educators from UVM are seeking survey responses from growers about how Northeast agricultural service providers can provide support with video and audio resources. The information from this survey will support a proposal for a SARE Professional Development grant aimed at funding educational opportunities for agricultural service providers. This survey should take less than 2 minutes and we'd greatly appreciate your response!

Survey link: https://qualtrics.uvm.edu/jfe/form/SV_2oB3ROWvwWSCJoi

Hemp pest research priorities survey

A group of hemp researchers and Extension faculty from across the US and Canada are collecting information from growers and agricultural service providers in efforts to determine the types and distributions of major disease and insect pests of hemp. Their aim is to map pests and pathogens by region and to set research priorities moving forward.

Grower survey: https://uky.az1.qualtrics.com/jfe/form/SV_6Du84alnDmH587I

Agricultural service provider survey: https://uky.az1.qualtrics.com/jfe/form/SV_eCIdn6y4UHsLVpI

APR Program Accepting Applications - Application Deadline Extended to July 23rd

MDAR is currently accepting applications for the Agricultural Preservation Restriction (APR) Program. The Program purchases the non-agricultural value of the farmland in exchange for a permanent deed restriction which prevents uses and activities that may impact the present or future agricultural use and viability of the property.

Through purchases of Agricultural Preservation Restrictions, the APR Program preserves and protects agricultural land, including designated farmland soils, which are a finite natural resource, from being built upon for non- agricultural purposes or used for any activity detrimental to agriculture. It is a voluntary program which offers a non-development alternative to farmers and other owners of "prime" and "state important" agricultural land who are faced with a decision regarding future use and disposition of their farms. To date, the program has protected over 930 farm properties across the Commonwealth.

Applications will be considered for funding through the APR Program and the federal USDA Agricultural Lands Easement (ALE) Program. The program accepts applications on a rolling basis. In order to be considered a priority for the next funding cycle **submit an application no later than July 23rd deadline.**

Applications must be received by 4:00 P.M. on July 23, 2021. Applications may be mailed, hand-delivered or sent electronically. Those sent by fax will NOT be accepted, and postmarks will NOT be considered.

To learn more about the APR program and for program eligibility go online to APR Program Details:

If you are interested in applying to the APR program, please go to Additional Resources section online, and:

1. Review the Application Instructions.
2. Review and download the APR Application.
3. Contact the APR Program if you have any questions or to discuss the next steps in the application process.
   - Ashley Davies - Eastern Massachusetts - 617-645-6772 - Ashley.Davies@mass.gov
   - Ron Hall – Hampshire County - 413-726-2002 - Ronald.Hall@mass.gov
   - Barbara Hopson - Berkshire and Hampden Counties - 413-726-2003 - Barbara.Hopson@mass.gov
   - Michele Padula – Worcester and Franklin Counties - 617-626-1758 - Michele.Padula@mass.gov

MDAR Seeks Responses for the Specialty Crop Block Grant Program – Round II

The purpose of the Specialty Crop Block Grant Program (SCBGP) is to enhance the competitiveness of specialty crops. Specialty crops are defined as "fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)." Additional specialty crop categories and details here.

For details and how to apply, click here - **Applications are due by Tuesday, August 10, 2021 at 5:00pm.**

An informational webinar where questions may be asked will be held for interested applicants. **Please contact Rebecca Davidson at Rebecca.Davidson@mass.gov to request access to the webinar: Tuesday, July 20th, 2021 at 9:30am.** Note, webinar will be recorded.

Events

UNH North Country Lunch and Learn

UNH Extension is offering this online series, open to all but focused on growing vegetables commercially. So, grab your lunch and let's learn!

This event is free, but registration is required. Register once for all days.

- **July 7, 12-1pm:** Onions: Over Wintering and Direct Seeded
- **August 4, 12-1pm:** Brussels Sprouts: Growing and Storage

Registration: Click here to register for these workshops.

Questions? Contact nicholas.rowley@unh.edu or heather.bryant@unh.edu or call 603-788-4961 ext. 207

Successful Food Product Development for New Food Businesses: Managing Quality & Safety

Are you an entrepreneur developing new and exciting products? Do you have questions about ensuring the safety of your product? If so, this is the program for you! This course is a program designed specifically to address product development and food safety issues faced by small processors. Throughout the course, we will introduce the food science basics, important considerations when developing a new food product, share key elements required for product labeling, and provide an overview of key regulatory requirements for small and emerging food businesses, such as entrepreneurs and local food processors.

This is an online course that takes place over **6 sessions on Monday evenings in July and August.** This program is sponsored by a USDA-NIFA grant and there is no fee to participate.

For course details and registration information click here.

Save the Date! In-Person UMass Summer Field Day

When: Tuesday, July 27, 2021, 3-7pm. Dinner at 7pm (Rain date: Thursday July 29)

Where: UMass Crop & Livestock Research & Education Farm, 91 River Rd, South Deerfield, MA

Come to see the newly purchased no-till transplanter in action. Also, learn about several new innovative research projects on a wide range of topics including soil health, cover crop termination strategies, summer and fall cover crop mixtures, vegetables, forages, and more. The field day includes a four-hour tour by the Vegetable and Crops, Dairy, Livestock extension teams. Dinner will be provided at the end of the tours. More details about the projects, researchers, and tours will be available in early July.

This event will be made possible by UMass Center for Agriculture, Food, and the Environment, MDAR, Northeast SARE, the UMass Stockbridge School of Agriculture, and American Farmland Trust.

THANK YOU TO OUR 2021 SPONSORS!

Become a sponsor!

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

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