UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Heavy rain, even for short amounts of time, is causing erosion in fields like this one in Franklin Co. Photo: G. Higgins

Crop conditions

Despite the challenges the rain has brought, sweet corn, melons, and eggplant are coming in now, high tunnel tomatoes are cruising, and fresh onions and early potatoes are being harvested. We had another few days of bad air quality from the Canadian forest fires this week, and while the air pollution won't significantly affect crops, it certainly can take a toll on farmworkers. Generally, Air Quality Index readings for $PM_{2.5}$ particulate (particles in the air that are 2.5 micrometers or smaller, which are the most harmful to our respiratory systems) above 150 are considered unhealthy for the general population. N95 masks, sealed well against the face, will protect wearers from air pollution, but cloth masks will not. Working in masks in mid-summer heat has its own challenges, so we encourage you all to take care working when the AQI rises, and to allow workers breaks indoors (air filters can improve the air quality in areas like barns and pack sheds that aren't as airtight as other buildings).

In response to last week's flooding and to assist farmers in evaluating flood-damaged crops to ensure compliance with state and federal law, MDAR's Produce Safety Team released guidance for farms that experienced flooding: Handling Flooded Produce: What Farmers Need to Know and Conducting Risk Assessments.

Between the frost losses this spring, the air quality, and the wet season and flooding, it's been a really difficult season for a lot of farms. Every year, we are so impressed by the resiliency of MA farmers, bringing in gorgeous crops and continuing on despite setbacks. We are here to support you in any way we can – reach out at umassveg@umass.edu or 413-577-3976.

Pest alerts

Alliums

Onion thrips pressure was surprisingly low in one field in Franklin Co. this week. Rain tends to wash onion thrips off of leaves—a small positive of all the rain we're getting!

Basil

Basil downy mildew is present in Suffolk Co. as of last week. This disease arrives in the Northeast mid-summer most years and forms dense, gray sporulation on the undersides of basil leaves, eventually defoliating the plant. Basil downy mildew development can be delayed using resistant varieties. See the Basil section of the New England Vegetable Management Guide for a list of resistant varieties. The disease can be controled by regular fungicide applications, if applications start before the disease arrives in your crop. Phosphite fungicides (e.g. K-Phite, Prophyt,

Contact Us:

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

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

Fungi-phite) are among the most effective chemical controls. Other effective materials include mandipropamid (e.g. Revus), cyazofamid (e.g. Ranman), and azoxystrobin (e.g. Quadris). All of these except Quadris can be used in both the field and greenhouse. Quadris is labeled for field use only. See our article in the June 23, 2022 issue of Vegetable Notes for more information.

Basil downy mildew sporulation on the underside of a basil leaf. Photo: A. Madeiras

Brassicas

Caterpillars are continuing to feed in brassica crops. We've seen imported cabbageworm and diamondback moth larvae ourselves, but cabbae looper is likely present in crops also, and we usually start to see cross-striped cabbageworm in early August too. Use row cover to protect young plants from egg-laying; insect netting will not heat up the plants the way spunbonded covers do. See the appropriate crop insect control section of the New England Vegetable Management Guide for labeled pesticides.




Caterpillars that may be present in brassica crops now. From left: imported cabbageworm, cabbage looper (Photo: J. Boucher), and diamondback moth.

Alternaria leaf spot was seen in broccoli in Franklin Co. this week—no surprise with the wet weather we're having. This pathogen survives in the soil on crop residues and infects plants when there are long periods of leaf wetness. In dry years, we don't see *Alternaria* until late summer/early fall, when cool nights result in long dew periods. *Alternaria* can be effectively controlled with conventional fungicides if applications begin when symptoms are first observed. See our article in the July 21, 2022 issue of Veg Notes for details.


Alternaria leaf spot in broccoli. Photo: M. Ng

Cucurbits

Cucurbit downy mildew: We have still not received any reports of CDM in MA. With confirmed cases on cucumber in southern NH and on Long Island, its fairly likely that it's present in MA. Let us know if you suspect CDM in your cucurbits so that we can monitor this important disease! The crops most at risk for CDM development at this time are cucumber and cantaloupe. Growers should be regularly applying a protectant fungicide and a targeted

fungicide. Rotate between classes of targeted materials to prevent resistance development.

Striped cucumber beetles remain active in cucurbit crops, and **bacterial wilt** is spreading as a result. There is no control for bacterial wilt aside from controlling for striped cucumber beetles. Both the beetles and the wilt are most damaging to young plants, which can be protected with row cover or kaolin clay (e.g. Surround). See the Cucumber, Muskmelon, and Watermelon and Pumpkin, Squash, and Gourds insect control sections of the New England Vegetable Management Guide for labeled pesticides.

Squash bugs are out in force and nymphs are hatching now. Squash bug adults and nymphs cause direct feeding injury and also inject a toxin when they feed, causing "Anasa wilt". They are less attracted to melons, cucumber, and butternut squash than other cucurbits. The threshold for chemical control is 2 adults/plant for the crops listed above, and 1 adult/plant for other cucurbits. Time sprays for when nymphs just hatch. See the Cucumber, Muskmelon, and Watermelon and Pumpkin, Squash, and Gourds insect control sections of the New England Vegetable Management Guide for labeled pesticides.

Squash vine borer adults are still active in some locations. Larvae are feeding within host stems now, causing plant wilt and death. Wilt caused by SVB damage looks similar to bacterial wilt or damage from root and crown diseases. SVB only infests thick-stemmed cucurbits (e.g. summer squash, zucchini, some winter squash). Look for sawdust-like frass at the base of wilting cucurbit stems. Cutting the stem open lengthwise will reveal the large cream-colored larvae. SVB can be monitored using pheromone traps. If you struggle with this pest on your farm, trapping is the best way to time pesticide sprays for effective control. Commercial farmers interested in trapping for SVB next season can contact us at umassveg@umass.edu or (413) 577-3976.

Squash vine borer larva. Photo: J. Boucher

Table 1. Squash vine borer trap captures for week ending July 19

Whately	0
Leominster	4
North Easton	21
Sharon	24
Westhampton	4

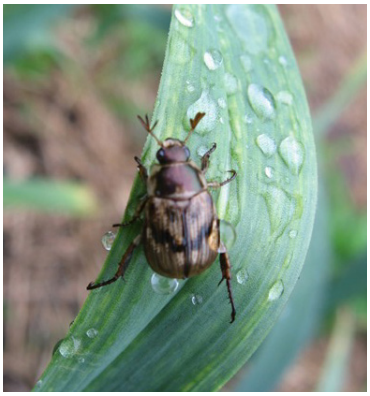
Nightshades

Colorado potato beetle: The second generation of CPB larvae are feeding in potato and eggplant crops now. The adults that result from this generation will burrow into the soil at field edges (and sometimes in the field) in August to overwinter. If you are controlling CPB using pesticides, do not use the same chemical class on successive generations in the same year. That means, if you sprayed for CPB in June and need to spray again, use a material from a different IRAC Group. See our article in the June 22, 2023 issue of Veg Notes for more information, and see the potato and eggplant insect control sections of the New England Vegetable Management Guide for labeled materials.

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

White mold mycelia and sclerotia within a tomato stem. Photo: A. Madieras

Multiple crops



Oriental beetle (left) and Japanese beetle (right).

Scarab beetles are out in force, causing ragged feeding damage in a number of vegetable crops. There are four species of scarab beetles in New England. All have larval stages that feed on grass roots and adults feed on foliage. They are generalists but most often cause significant damage on basil and sweet corn. The New England Vegetable Management Guide lists labeled pesticides for Japanese and/or Oriental beetles in basil and sweet corn. For controls in a crop where these beetles are rarely a pest and therefore not mentioned in the Guide, check the label of commonly used broad spectrum synthetic pyrethroids, carbamates, and neonicotinoids (as foliar spray). Organic options include neem/azadiractin products and pyrethrin.

Sweet Corn

European corn borer is being caught in low numbers at 11/18 sites. These may be second generation adults, as we saw a jump in ECB captures last week, although we are still just below the 1400 GDDs at which the second generation is supposed to emerge.

Corn earworm captures are lower than last week in almost all locations. Most sites are on a 4 day spray schedule. Growers are reporting poor worm control despite regular sprays, because the persistent rain is washing sprays off.

Fall armyworm: With 13 sites reporting, 1 FAW moth was caught this week, right on schedule. Similarly to CEW, FAW does not overwinter in the Northeast. It is blown northward from southern states on storm fronts. CEW is also blown north on storms, but not always on the same storms that carry FAW.

Table 2. Corn earworm spray intervals based on Heliothis trap moth captures

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

Table 3. Sweetcorn pest trap captures for week ending July 19

Location	GDD* (base 50°F)	ECB NY	ECB IA	FAW	CEW	CEW Spray Interval
Western MA						
Feeding Hills	1372	2	0	0	3	6 days
Southwick		0	0	0	8	4 days
Granby	1293	0	0	0	4	5 days
Whately	1365	3	1	-	3.5	5 days
Central MA						
Leominster	1386	2	11	1	12	4 days
Lancaster		5	0	0	2	6 days
North Grafton	1183	3	1	0	17	4 days
Spencer	1249	0	0	0	7	4 days
Eastern MA						
Bolton	1274	1	0	-	3	6 days
Concord	1249	1	0	0	7	4 days
Haverhill*	1291	5	0	0	9	4 days
Ipswich*	1194	0	0	0	17	4 days
Millis		6	4	n/a	16	4 days
North Easton	1314	0	0	0	7.5	4 days
Sharon	1314	0	0	n/a	12	4 days
Sherborn	1308	0	0	0	8	4 days
Seekonk	1229	2	0	0	7	4 days
Swansea		1	0	-	33	4 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

FLOODING, WATERLOGGED SOILS, AND EFFECTS ON VEGETABLE CROPS

With Special Considerations for Plasticulture Vegetables

--Written by Gordon Johnson, University of Delaware Extension Vegetable & Fruit Specialist, gcjohn@udel.edu.
Originally published in the University of Delaware Weekly Crop Update on May 25, 2018: https://sites.udel.edu/weeklycropupdate/?p=11873.

Editor's Note: Most of the state has experienced excessive rainfall this month, and farms in western MA are currently dealing with the fallout from the flooding of the Connecticut, Deerfield, and Mill Rivers. This article discusses the physiological effects of flooded soils on crops, and how to encourage crop recovery afterwards. It's important to note that per state and federal law, if the edible portion of a crop is exposed to flood waters (i.e. waters that have exceeded the banks of rivers, streams, or ponds, and run into fields), that crop is considered adulterated and cannot be sold or donated. This is because of the microbial and chemical contaminants that are often carried in flood waters. See the guidance on what to do with flooded produce from MDAR's Produce Safety Team for more information. ***Pooled*** *water that occurs as a result of excessive rainfall does not pose this same risk and crops exposed to pooled water do not necessarily need to be abandoned. The recommendations for mitigating the effects of flooding on vegetable crops in this article applies to crops exposed to pooled water.*

Climate scientists predict that extreme weather events will become more common in the Northeast over the next several decades [*see this 2015 report for more information on what Northeast farms can anticipate*]. This will present additional challenges for vegetable growers related to flooding, wet weather diseases, nutrient losses, ability to do timely harvests, field compaction, other wet soil issues, and resulting crop losses.

In flooded soils, the oxygen concentration drops to near zero within 24 hours because water replaces most of the air in the soil pore space. Oxygen diffuses much more slowly in water filled pores than in open pores. Roots need oxygen to respire and have normal cell activity. When any remaining oxygen is used up by the roots in flooded or waterlogged soils, they will cease to function normally. Therefore, mineral nutrient uptake and water uptake are reduced or stopped in flooded conditions (plants will often wilt in flooded conditions because roots have shut down). There is also a buildup of ethylene in flooded soils, the plant hormone that in excess amounts can cause leaf drop and premature senescence.

In general, if flooding or waterlogging lasts for less than 48 hours, most vegetable crops can recover. Longer periods will lead to high amounts of root death and lower chances of recovery.

While there has been limited research on flooding effects on vegetables, the following are some physiological effects that have been documented:

- Oxygen starvation to vegetable roots will cause roots to cease to function resulting in plant collapse with limited recovery potential
- Oxygen starvation in root crops such as potatoes will lead to cell death in tubers and storage roots. This will appear as dark or discolored areas in the tubers or roots. In carrots and other crops where the tap root is harvested, the tap root will often die leading to the formation of unmarketable fibrous roots.
- Ethylene buildup in saturated soil conditions can cause leaf drop, flower drop, fruit drop, or early plant decline in many vegetable crops.
- Leaching and denitrification losses of nitrogen and limited nitrogen uptake in flooded soils will lead to nitrogen deficiencies across most vegetable crops.
- In bean crops, flooding or waterlogging has shown to decrease flower production and increase flower and young fruit abscission or abortion.
- Lack of root function and movement of water and calcium in the plant can lead to calcium related disorders in plants. There is a potential for higher incidence of blossom end rot in tomatoes, peppers, watermelons, and other susceptible crops when fruits are forming and soils are saturated.

Low lying areas of fields are most affected by excess rainfall. However, cropping practices can also increase water standing. In vegetables, field compaction will reduce water infiltration leading to increased crop losses in wet weather.

Plasticulture Concerns in Wet Weather

In plasticulture, water can accumulate and persist between rows of plastic mulch because of the impervious surface of the mulch. Because much of the rainfall runs off the plastic, water pooling can be a serious problem in plastic mulched fields, especially where row middles have become compacted. Vining crops that fruit into the row middles can have vines and fruits sitting in water and this produces ideal conditions for diseases of wet conditions to develop. A prime example is *Phytophthora capsici* (a water mold) that needs saturated soils or standing water to infect plants.

Compaction between mulched beds can lead to increased ponding.

Row middles with ponding due to a field depression.

When water overflows the bed tops of plastic mulched crops, whole beds become saturated as water enters the planting holes. This often leads to plant losses as beds take a very long time to dry once saturated in this way and oxygen is very limited in the root zone.

To avoid water accumulation between plastic mulched beds, tilling with a deep shank or a subsoiler in row middles can help improve drainage. Cut drainage channels at row ends to reduce blockage (dams) that can back up water. Where practical, section plasticulture fields and install cross drains to remove extra water to improve drainage and reduce water damage potential. Growers may also choose not to plant lower areas in the field prone to water damage where plastic is laid.

In some crops such as peppers and strawberries, high raised beds will improve drainage significantly and can reduce losses to water standing between plastic rows. Another option in watermelons (and other strongly vining crops) grown on plastic is to reduce plastic bed width and increase distance between rows to limit impervious surfaces.

In some crops in our region (plasticulture strawberries, for example), cover crops such as ryegrass are being grown between beds to reduce erosion. Research on row middle management will be a priority for the future.

When water goes over top of beds they become saturated for long periods leading to plant losses. In this case the water just missed going over the bed (note the trash line).

Identifying Poorly Drained Areas for *Phytophthora capsici* Management

Growers with crops susceptible to *Phytophthora capsici* are encouraged to evaluate fields with susceptible crops (all vine crops, tomatoes, peppers, lima beans) for drainage issues where this disease can proliferate. The primary keys to *P. capsici* management are limiting standing water, the potential for saturated soils, and water movement across the crop. [*See the article in last week's issue of Vegetable Notes for more information on* P. capsici.]

Recovering from Flooding or Waterlogging

One option to aid in vegetable crop recovery after floods or waterlogging is to aerate the soil by cultivating (in crops that can be cultivated) as soon as you can get back into the field. This allows for oxygen to enter the soil more rapidly. To address nitrogen leaching and denitrification losses, sidedress with 40-50 lbs of N where possible depending on the crop and

crop stage.

In vegetable fields that remain wet, consider foliar applications of nutrients. Since nitrogen is the key nutrient to supply, spraying with urea ammonium nitrate (28% N solution) alone can be helpful. These can be sprayed by aerial or ground application. Use 5 to 20 gallons of water per acre. The higher gallons per acre generally provide better coverage. As with all foliar applications, keep total salt concentrations to less than 3% solutions to avoid foliage burn.

Future Considerations

To address excess water challenges in the future, vegetable growers will need to invest in and plan for drainage in every field. Solutions including land levelling, surface drainage, tiles (tile wells, patterned tiling), and pumping may all need to be considered. See the article by James Adkins in this issue on drainage basics.

BACTERIAL DISEASES OF TOMATO (AND PEPPER)

Bacterial diseases thrive and spread in wet weather. After the last few weeks of rain, we are starting to get reports of bacterial diseases in several crop groups, including nightshades.

Three bacterial diseases commonly affect tomato crops: **bacterial leaf spot**, **bacterial speck**, and **bacterial canker**. Bacterial canker is the most devastating of these diseases and is more likely than leaf spot or speck to take out an entire tomato field. However, bacterial leaf spot can be quite damaging as well. **Tomato pith necrosis** is a less common bacterial disease of tomato that can be confused with bacterial canker. These diseases can affect foliage, fruit, and stems and can also increase incidence of sunscald on fruit as foliage is lost.

In general, bacteria do not survive well on their own, outside of a host plant or crop debris. Thus, the most common starting place for any bacterial disease is in the seed itself. Starting with clean seed or hot water treating your seed is very important. If you are buying transplants, ask your supplier about their bacterial disease control strategies; warm, humid greenhouses are ideal places for growing and spreading bacteria. Other sources of bacteria can be infested crop residues in the soil and equipment, especially wooden tomato stakes. If you've had bacterial diseases in past years, do yourself a favor and replace your stakes or invest in metal stakes which are easier to disinfect each year.

Once bacteria are present, they are spread mainly by movement of water or plant sap—this means splashing or driving rain, wind-driven sand, or movement of workers or equipment (tractors, pruning shears etc.) through a wet field, and even aerosols in humid air. Bacteria enter plants through natural openings (e.g. open stomates and hydathodes) or wounds. Bacteria thrive in warm (around 75-90°F), moist or humid conditions.

Management of bacterial diseases is difficult once they are established, so preventing disease from starting by using good sanitation practices is key. Good sanitation practices include buying clean seed, hot water treating seeds, controlling weeds, sanitizing equipment, and rotating crops is essential to preventing disease.

Below, symptoms of the most common bacterial diseases of tomato (and pepper in the case of bacterial leaf spot) are described:

Bacterial leaf spot, caused by *Xanthomonas campestris* pv. *vesicatora* (Xcv), affects both tomato and pepper. There are 11 strains (0-10) of Xcv that vary in their pathogenicity to tomato, pepper, and solanaceous weeds. Some strains infect only pepper, some infect only tomato, and some can infect both pepper and tomato. Pepper cultivars are available with resistance to bacterial leaf spot, however they are usually resistant to specific races of Xcv so controlling this disease with resistant varieties effectively requires knowing what races of the pathogen are likely to be present. X10R varieties provide intermediate resistance to all strains.

On leaves, symptoms start as small yellow-green spots that quickly turn brownish-red and may have a greasy, water-soaked appearance. Bacterial spot lesions do not have concentric rings or a prominent halo. When conditions are optimal for disease development, spots can coalesce to form long, dark streaks. On tomato plants, a general yellowing may appear on foliage with many lesions giving the plants a scorched appearance, and the plants may exhibit severe bending and twisting. On pepper plants, affected flowers, fruits, and leaves drop prematurely. This can reduce yield directly and severe defoliation of plants can lead to sunscald of surviving fruit. On tomato fruit, discrete, minute, slightly raised blisters oc-

cur on green fruit only. Initially, lesions have a yellow halo that resembles the birds-eye spot caused by bacterial canker. As fruit lesions enlarge, they lose their halo and become brown, raised, and scab-like on ripe fruit. On pepper fruit, spots begin as pale-green, water-soaked areas, which eventually become raised, brown, and roughened. Spots may provide entrance points for various fungi and bacteria that cause secondary fruit rots. The bacterial spot pathogen alone does not cause fruit rot.

Bacterial speck on tomato. Photo: M. T. McGrath

Bacterial leaf spot on pepper.

Bacterial speck (*Pseudomonas syringae* pv. *tomato*) causes a fruit spot and foliar blight on tomato only, not pepper. It is found wherever tomatoes are grown. Lesions are indistinguishable from those caused by bacterial spot—small, greasy or water-soaked spots which develop a halo over time. Spots may coalesce, killing large areas of tissue. On fruit, small (1/16 inch), dark spots or specks develop with the tissue around them often more intensely green than unaffected areas. These tiny, dark spots are not raised or scabby at all like those caused by bacterial leaf spot. Only green fruit is susceptible to infection.

Signs of bacterial canker: marginal necrosis (left) and vascular discoloration (right) Photos: S.B.Scheufele (left) and R.L.Wick (right)

Bacterial canker (*Clavibacter michiganensis* pv *michiganensis*) is the most devastating of the bacterial diseases of tomato. Symptoms are different in the greenhouse versus in the field. Infections arising from contaminated seed or seedlings result in systemic spread of the bacteria within the plant, and seedlings can be affected early on in the greenhouse. This type of systemic infection (known as **primary infection**) causes stunting, wilting, vascular discoloration, open stem cankers, and fruit lesions. If an infected stem is cut lengthwise, a light brown discoloration may be present in the vascular tissue, which is just inside the stem skin. The vascular discoloration is most noticeable at nodes (where leaves meet the stem) and just above the soil line. **Secondary infections** occur in the field when bacteria are spread from plant to plant by splashing rain, driving winds, workers and equipment, or in aerosols under humid conditions. Secondary infection often results in marginal scorch where leaf edges are brown to black with a yellow border on the leaf interior. Spots also occur on green fruit and are very characteristic—white to yellow spots, 3-4 mm in diameter, with raised brown centers and white haloes, known as “bird’s eye spots”.

Symptoms of 3 bacterial diseases on fruit. Clockwise from upper left- bacterial canker, spot, and speck on tomato fruit. Photo: R. L. Wick

Tomato pith necrosis is caused by *Pseudomonas corrugata* and other soil-borne species of *Pseudomonas*. It is a disease that primarily affects young tomatoes that are growing too fast, which is a scenario most often seen in high tunnel and greenhouse crops. Other conditions conducive to pith necrosis infection are cool night temperatures, high humidity, excessive soil nitrogen levels, and prolonged periods of cloudy, cool weather. The initial symptoms of pith necrosis are yellowing and wilting of young leaves; this often appears just as the first fruit clusters reach the mature green stage. Serious infections can result in yellowing and wilting of upper portions of plants, with brown to black lesions forming on infected stems and petioles. When stems are cut longitudinally, the center of the stem (pith) may be extensively discolored, hollow, and/or degraded. Stems may be swollen, numerous adventitious roots can form, and infected stems may shrink, crack, or collapse. The epidemiology of this disease is not well understood; it is possible that the bacteria are seed-borne and most certainly survive in the soil in association with infected tomato debris.

Signs of pith necrosis: stem lesion (left) and adventitious roots and hollow stem (right). Photos: S.B. Scheufele

There is no effective treatment for pith necrosis. Affected plants may recover if environmental conditions improve (warm, sunny weather) but if not, affected plants should be removed from the field to prevent spread of the disease. Chemical control is not effective as the pathogen is soil-borne and contained within the stem. Therefore, preventive measures are essential to minimizing the occurrence of **pith necrosis** in high tunnels.

- **Provide adequate ventilation** to avoid high humidity levels (especially during cloudy weather).
- **Avoid excessive nitrogen** levels to prevent unnecessarily vigorous plant growth. The current nutrient recommendations for high tunnel tomatoes in the New England Vegetable Management Guide take into consideration your expected yield. See the Greenhouse and High Tunnel Tomato section for more information.
- **Incorporate crop debris** promptly after harvest is finished to speed up decomposition of residue and associated bacteria.
- **Practice crop rotations** out of solanaceous crops when possible.

Preventing losses to bacterial diseases:

- **Start with certified, disease-free seed or treat seed with hot water.** See our Hot Water Seed Treatment service page for more information.
- **Resistant varieties:** Pepper varieties are available with resistance to various strains of bacterial leaf spot. X10R varieties provide intermediate resistance to all strains. There are a few tomato varieties with resistance to bacterial speck, but none with resistance to spot, canker, or pith necrosis. Cornell Cooperative Extension has compiled lists of resistant varieties here.
- **Rotate** out of tomatoes (and peppers, for bacterial leaf spot) for at least 2 years. Control for solanaceous weeds (including horsenettle, jimsonweed, climbing nightshade, and Eastern black nightshade) to prevent the pathogens from surviving on weed hosts.
- **Use new tomato stakes every year or sterilize stakes before reusing.** See the article How to Disinfect Stakes Before Reuse from University of Delaware Extension for more info.

- **Reduce moisture and increase airflow in the crop.** In high tunnels, heat and vent to reduce moisture and remove lower leaves to increase airflow. In the field, increasing spacing can increase air flow. Control weeds in both settings.
- **Control bacterial diseases in transplant production.** Inspect transplants before planting out into the field or high tunnel and do not plant suspect transplants. But be aware that young infected transplants may be asymptomatic.
- **Use drip instead of overhead irrigation.** If you must use overhead irrigation, irrigate at midday on sunny days so foliage dries out before going into an overnight dew period.
- **Sanitize shears and/or change gloves** at the end of each row if pruning.
- **Avoid working in fields when bacterial diseases are present and foliage is wet.**
- **Promptly incorporate crop debris after harvest.** If you have confirmed, widespread bacterial disease in a high tunnel, removing the crop residue from the tunnel may be more effective.

Chemical control: In general, bacterial diseases of field crops are difficult to control with pesticides. If chemical control is going to be effective, it must be implemented early on, when symptoms first appear. When a significant amount of disease is present, pesticides are usually not effective. Copper products are most effective, and the addition of mancozeb products (e.g. Penncozeb, Manzate, Dithane, Roper) can increase their efficacy. ManKocide is a pre-mix of mancozeb and copperStreptomycin (e.g. Agri-mycin 17) is effective but only labeled for use on transplants while in the greenhouse before transplanting to the field. Biological disease control products that have shown efficacy in some trials on bacterial diseases in tomato include Actigard or Regalia (both plant defense activators). Do not use air blast sprayers to apply fungicides as they can spread the bacteria through the field.

--UMass Vegetable Program

Sap beetles in sweet corn

We have received several reports of high sap beetle pressure so far this summer. Sap beetles have generally been thought of as secondary pests of sweet corn, usually associated with damage caused by caterpillars, but on some farms and in some years 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 beetles can also be pests of strawberry and other fruits, so they tend to be more of a recurring 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, although pressure happens to be high during this wet season.

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

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*).

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.

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

Cultural controls are essential to managing sap beetles.

- **Grow varieties with long, tight tip cover.** Ears with exposed tips, especially super sweet and *Bt* varieties, are more susceptible to infestation. Some varieties with good tip cover are: *Accord*, *Argent*, *Avalon*, *Awesome*, *Bon Jour*, *Cuppa-Joe*, *Easy Money*, *Fantasia*, *Ka-Ching*, *Precious Gem*, *Prime Plus*, *Profit*, *Providence*, and *Renaissance*.
- **Use clean cultivation.** 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 for severe infestations; bury ears at least 4" deep.
- **Control birds and ear-infesting caterpillars.** See our articles Preventing Bird Damage in Sweet Corn, Identifying Caterpillars in Sweet Corn, and Corn Earworm Management for more information.
- **Eliminate or bury deeply any cull piles** or other areas with decaying vegetables or fruit, including infested ears.

Monitoring and Chemical Control. The most effective time to spray for sap beetles is in early silk, so 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 (e.g. Sevin), lambda-cyhalothrin (e.g. Warrior II), bifenthrin (e.g. Bifenture), and methomyl (e.g. 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

USDA Announces NEW Resilient Food Systems Infrastructure (RFSI) Grant Program

USDA has announced the Resilient Food System Infrastructure (RFSI) grant program, a program created to work with states and tribal governments across the US with the goal of developing and administering coordinated initiatives to build resilience across the middle-of-the-food-supply-chain within the states. MDAR will work in partnership with USDA to make competitive subawards to support infrastructure in the middle-of-the-supply-chain for domestic food and farm businesses and other eligible entities.

MDAR is currently seeking input from agricultural stakeholders to determine funding priority areas for the RFSI grant program in Massachusetts. MDAR will be holding a Listening Session to gather stakeholder feedback. This Listening Session will be held on Monday July 24th from 6:00 pm – 8:00 pm. Here is the link to register for the Listening Session.

Additionally, MDAR is soliciting feedback for RFSI funding priorities through an online survey, which can be found here.

For more information, please visit MDAR's Resilient Food Systems Infrastructure (RFSI) webpage. MDAR is currently in the planning process for this grant program. MDAR expects to release a Request for Response (RFR) for competitive Infrastructure Grant proposals in Fall 2023. More information will be provided including project requirements, allowable and unallowable costs, evaluation criteria, and project submission when the RFR is released. If you have any questions about the RFSI program, please contact Keri.Cornman@mass.gov.

Document Your Losses in the Massachusetts Freeze Event Impacts Survey!

The freeze events of February 3-4 and May 18, 2023, had significant impacts on agricultural sectors including tree fruits, berries, vegetables, ornamentals, and others. Now that losses are evident for most crops, UMass Extension and our partners* hope to generate timely reporting on losses at the state and regional levels. If you produce agricultural crops (including nursery stock) and you experienced crop losses due to the February 3-4 deep freeze and/or the May 18th freeze, please report them by filling out this survey. **SURVEY DEADLINE: July 31.**

This data will help document the extent of crop and economic losses and will inform the public and decision-makers who may be considering actions that would provide emergency funds to Massachusetts producers. Some growers may also receive insurance payments or be eligible for low-interest FSA loans or other USDA disaster programs. However, data from these programs will take many months to report, and may under-report losses in some sectors. Producers should also report losses to their local FSA office as soon as the extent of the damage can be assessed--this survey is not intended to take the place of reporting to FSA.

Your Data and Privacy will be protected. Please see details in the opening page of the survey and on the final page, where you may choose to provide and share contact information if you wish. No crop loss data at the individual farm level will be shared.

*Partners include: USDA Farm Services Agency, USDA Risk Management Agency, MA Department of Agricultural Resources, MA Farm Bureau Federation, MA Food System Collaborative, MA Fruit Growers' Association, New England Vegetable and Berry Growers Association, Community Involved in Sustaining Agriculture (CISA), Southeast MA Agricultural Partnership (SEMAP), and Berkshire Grown.

If you have questions about this survey, please contact cclay@umext.umass.edu.

Events

Twilight Meeting: Sawyer Farm Reduced-Till Perennial Clover Trials

When: THIS EVENING! Thursday, July 20, 4:00 pm - 6:00 pm

Where: Sawyer Farm, 42 Old North Rd, Worthington, MA, 01098

Registration: Free! Click here to register.

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

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

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

Twilight Meeting at Parlee Farms

When: Tuesday, August 15

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

Join UMass Extension to hear about pumpkin varieties grown at Parlee Farms, as well as sweet corn IPM and automated irrigation systems. 1 pesticide credit available.

South Deerfield Research Farm Field Day and Vegetable Twlight Meeting

When: Wednesday, August 16, 3-5 pm

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

Come hear about active research going on at the farm, including Vegetable Program trials on heat mitigation strategies, cucumber and basil downy mildew resistant varieties, sprayer technology, and more! We'll also have a presentation on automated irrigation systems from Toro. Up to 2 pesticide credits available.

Twilight Meeting at Heart Beets Farm: Sweet potato production and fall pest management

When: Thursday, September 21, 4-6pm

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

Join UMass Extension to hear about sweet potato production at Heart Beets Farm, and to learn timely info about fall pest management. 1.5 pesticide credits.

Eastern MA CRAFT Meeting: Geothermal Water Use and Good Agricultural Practices at Farmer Dave's

When: Saturday, October 21, 4-6pm

Where: Farmer Dave's, Dracut, MA

We will take a tour of their solar and geothermal systems and the reuse of the geothermal water for hoop house irrigation. Lisa McKeag from UMass Extension will share about a project the farm is involved in to assess pre- and post-harvest agricultural water quality for food safety. She'll talk about the results of water samples taken at the farm in 2022-23 and give an update on current food safety regulations related to agricultural water.

THANK YOU TO OUR 2023 SPONSORS!

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

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