UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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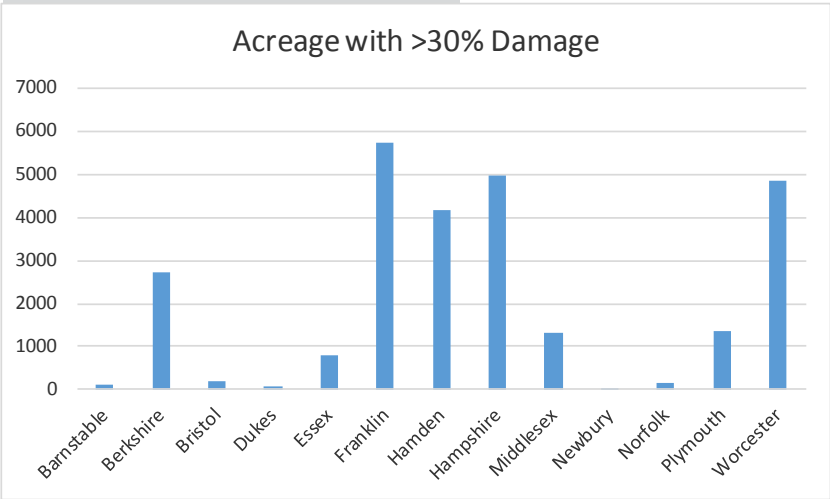
In this issue:

Crop conditions

The air is getting colder, the dew is hanging on a little longer in the morning, and the murmurs of back to school are in the air. Folks are beginning to look at winter squash fields for harvesting soon, and curing of onions and garlic is well underway. No one told the tomatoes though! They're rolling in and the still pretty dry weather means excellent flavor, and foliage is staying pretty healthy—though the first reports of fungal disease are beginning to come in (see article this issue). Though late blight has still not been reported nearby, fungicides may be useful in protecting crops from these other foliar blights and extending the harvest a bit longer. Late blight was reported this week on potatoes in Maine, but most potatoes here in MA have already been vine-killed or mowed down and are not at risk. Sweet corn is still being picked, but harvests are irregular due to the uneven germination and watering that occurred earlier this summer. The difficult weather this summer that was caused by the weather phenomenon known as "el niño" is predicted to continue causing above normal temperatures and below average rain through October, according to the NH State Climatologist. These are good conditions for curing crops and establishing cover crops if planting is well timed with occasional rainstorms. We are still awaiting news from the Farm Service Agency about disaster relief for farmers affected by drought (we'll keep you posted!). Pictured at left you can see the results from our survey on which counties were hardest hit. In addition to vegetables growers, cranberry and hay (dairy) farmers were very hard hit by drought conditions this year.



Pest alerts

Alliums: Fusarium basal rot of harvested garlic is being widely reported across New England. The pathogen causes red to purple discoloration of bulb exterior and sometimes a white fluffy mycelial growth at the base may be observed. If the bulb is cut open, one or several cloves may appear brown and watery. Later, the stem plate becomes pitted and a dry rot develops. The disease continues to develop in storage. Do not use infested cloves for seed garlic. See article this issue for more on garlic diseases.

Brassicas: Cabbage root maggot (CRM) fourth generation has exceeded peak emergence (50% emergence at 3014 GDD base 40F) in many locations around the state (see Table 2). This fall generation of CRM can be damaging to direct-seeded and transplanted brassicas. It may be too late to use row covers--non-heating row covers like ProtekNet are best this time of year--but you can place yellow sticky cards in the field now to monitor adult flight, and scout for the small, white eggs at the bases of plants. Most insecticide options are for at-plant or seeding applications; chlorpyrifos (Lorsban) can be soil-applied shortly after transplanting and alpha-cypermethrin (Fastac EC) is labeled for control

of adult flies, but controlling adults has not been shown to be an effective method, since flies are very mobile. Use preplant drench or furrow treatments if damaging populations are expected.

Cross-striped cabbage worm damage has been high in several counties in MA this summer and have been found infesting broccoli heads in untreated crops in Hampshire Co., MA. Inspect crops carefully for pests before marketing. Use a 5% infestation threshold for treatment. *Bacillus thurengiensis* aizawi or kurstaki are effective active ingredients for all the brassica caterpillars.

Cucurbits: The second generation of squash vine borer moths are starting to emerge now in New Hampshire locations. In fields with high levels of SVB present, larvae will bore into pumpkin fruit in the field. Five to seven grubs per plant have been found in fields where SVB was not treated and where trap captures were high this season in NH.

Cucurbit downy mildew is spreading through susceptible cucumber crops but still not been reported on resistant varieties. Downy mildew specific materials should be applied now, rotating among active ingredients. See here for recommended spray rotations: February 2016 issue of Vegetable Notes. Monitor spread of the disease and its forecast here: http://cdm.ipmpipe.org/current-forecast.

Phytophthora blight was confirmed in a field of kabocha-type winter squash about ready to be harvested in Worcester Co., MA this week. Symptoms include collapse of plants and fruit rot showing characteristic white powdery sporulation, starting in low-lying areas of the field where soil drainage is poor. When symptoms are localized in a small area, disking the area may be worthwhile, though care should be taken not to spread the pathogen to uninfested parts of the farm on tractors or harvest equipment.

Solanaceous: Early blight (*Alternaria solani*) and **Gray leaf spot** (*Stemphylium solani*)—not to be confused with Gray mold

Location	ECB Weekly Total	FAW Weekly Total	WBC Weekly Total	CEW Weekly Total	Spray Interval for CEW
Western, MA					
Sheffield	1	6	0	23	*4 days*
South Deerfield	2	0	0	1	*No spray*
Whately	0	3	-	43	*3 days*
Central, MA					
Bolton	0	0	-	6	*5 days*
Leominster	0	-	-	56	*3 days*
Eastern, MA					
Concord	1	0	-	24	*4 days*
Haverhill	7	1	-	5	*5 days*
Ipswich	0	0	-	31	*4 days*
Swansea	1	2	-	16	*4 days*
Tyngsboro	10	0	-	1	*No spray*
NH					
Litchfield	0	38	0	30	*4 days*
Hollis	0	60	0	43	*4 days*
Mason	0	5	0	39	*4 days*
Cortland Co., NY	0	19	3	0	*No spray*

Table 1. European corn borer (ECB), Fall armyworm (FAW), Western bean cutworm (WBC), Corn earwom (CEW)

Table 3. Spray Intervals for Corn Earworm based on moth captures in Heliothis net traps.

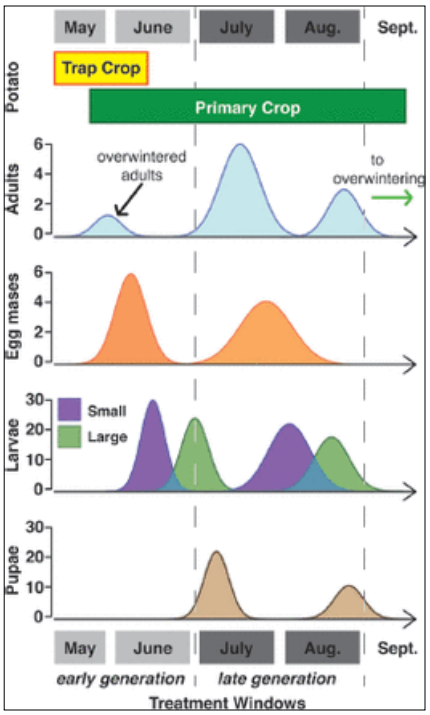
Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	no spray
0.2 -0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 – 7	5 days
1 - 13	7 – 91	4 days
Over 13	Over 91	3 days

Table 2. Accumulated Growing Degree Days: 1/1/16 - 8/24/16

Location	GDD (Base 40°F)	GDD (Base 50°F)
Western, MA		
Ashfield	3235.8	1859.8
South Deerfield	3549.6	2110.8
Pittsfield	3173.9	1783.9
Central, MA		
Bolton	3594.6	2149
Northbridge	3478.6	1996.2
Phillipston	3225.7	1865.4
Eastern, MA		
Ipswich	3394.3	1957.5
Sharon	3772.3	2242.7
Waltham	3724.5	2202.5
Seekonk	3849.8	2275.4
Hollis, NH	3473.8	2040.1
Burlington, VT	3513.4	2179.9
Newport, RI	3585.9	2060.9

(*Botrytis cinerea*)—were diagnosed this week on outdoor tomatoes in Franklin and Bristol Cos., MA. In both cases, leaf samples with small gray spots from the upper canopy, similar to symptoms of bacterial infection were submitted to the diagnostic lab for identification. In Bristol Co., symptoms were first noticed on Grandma's Pick, Speckled Roman, German Johnson and "Golden Jubilee" (BHN871). In a year without late blight (yet), *Alternaria solani* has caused damage, weakening plants and when combined with other infections like **Fulvia leaf mold** (found in Hampshire Co., MA on outdoor tomatoes this week) plants can go down quickly. Read the article this issue on tomato leaf spots for more information and recommendations for managing these diseases in the future.

Colorado potato beetle third generation larvae have now hatched in Worcester Co., MA where eggs, adults and small larvae were found on jiló eggplant. With most potato crops down for the season, we are not noticing as many CPB since they must walk to their hosts, but this later season crop was severely affected. Also, as the season progresses, CPB generations overlap more and finding a good treatment window can be difficult for this pest (see graph at right).



Beets and Swiss Chard: **Cercospora leaf spot** was diagnosed on both beets and Swiss chard this week and is spreading quickly no with longer periods of leaf wetness due to overnight dew. On beets, Cercospora has a characteristic reddish-pink halo but on green chard foliage appears gray to brown (see photos at right). As lesions age the centers fall out giving them a shot-hole appearance. Practice a two-year crop rotation and be careful to manage weeds in this family (*Chenopodiaceae*) such as lamb's quarters, which are also susceptible.

Cercospora leaf spot on beets (left) and green chard (right)

Sweet corn: Corn earworm numbers have increased in most trapping locations since last week, while flight of the second generation of European corn borer is over in most fields (Table 1). Continue scouting for ECB larvae in corn with newly emerging tassels and treat if more than 15% of the plants have one or more larvae present. For CEW, control depends upon maintaining insecticide coverage on the silks. Directed sprays to the ear zone provide the best coverage. Repeat applications to silk every three to six days depending on trap captures according to Table 3. If maximum daily temperature is below 85°F for 2-3 days, spray intervals may be extended by one day. Continue treatments until five to seven days before final harvest or until silk is completely dry and brown.

CULLING GARLIC: DON'T PLANT OR STORE INFECTED BULBS

There are several opportunities to inspect garlic cloves for symptoms of nematode and disease infection. Perhaps you've already culled at harvest, and maybe as you put them in the barn or greenhouse to cure, but as you begin deciding which bulbs to sell off versus store or use for seed, I encourage you to take a careful look to avoid disease spreading through a storage crop or contaminating another field or next years' crop by planting infected bulbs this fall. Most disease symptoms we see on garlic bulbs or cloves result from infections that occurred in the field, so identifying them now will tell you which fields to avoid planting garlic into in years ahead, as most of these pathogens persist for many years in the soil. Below are listed the symptoms of the most common diseases that will affect garlic seed and storage crops.

Fusarium basal rot. Oregon State Univ.

White Rot (*Sclerotium cepivorum*) causes white fluffy growth around the stem plate and bulb and small sclerotia—hardy resting structures that allow the pathogen to persist for years—about the size of poppy seeds form on the bulb, often around the neck. This disease will continue to grow and spread in storage if humidity is not kept low.

Fusarium Basal Rot (*Fusarium oxysporum* f. sp. *cepae*) causes red to purple discoloration of bulb exterior and sometimes a white fluffy mycelial growth at the base may be observed. If the bulb is cut open, one or several cloves may appear brown and watery. Later, the stem plate becomes pitted and a dry rot develops. The disease continues to develop in storage.

Stem and bulb nematode. B.Watts UMaine.

Stem and Bulb Nematode (*Ditylenchus dipsaci*) damage can be mistaken for Fusarium basal plate rot, with bulb decay occurring both at the neck and the basal plate of the bulbs. The bulb tissue begins softening at the neck and gradually proceeds downward; the scales appear pale gray to dark brown, and the bulbs become shrunken, soft, and light in weight. Under moist conditions, secondary invaders such as bacteria, fungi, and onion maggots induce soft rot and decay of the bulbs. Affected bulbs may still be sold as food, but be clear with customers that garlic infested with stem and bulb nematode should not be planted, this is how it gets introduced to new fields and once present it cannot be eradicated.

Downy Mildew (*Peronospora destructor*) Affected bulbs may be smaller and shriveled, with a blackened neck, and outer scales will become water-soaked. Some bulbs may sprout prematurely.

Bortytis bulb rot with sclerotia present. Oregon

Botrytis Neck and Bulb Rot (*Botrytis porri* and *B. allii*, respectively) infections start in the fields but symptoms usually do not develop until the bulbs have been moved into storage—a good reason to check your curing garlic periodically! Affected neck or bulb tissue is initially water soaked, but later turns dry and necrotic. Sclerotia—those hardy black resting structures—form in the neck or adhere to the rotten outer scales of the bulb.

Penicillium Decay (*Penicillium* spp.) is a major cause of decay of bulbs in storage and can spread to healthy bulbs via airborne spores. The fungus causes fuzzy, blue-green growth on diseased cloves, usually starting at the base.

Penicillium decay. Oregon State Univ.

Disease Prevention Tips for Harvest and Storage

Do not irrigate within 10 to 14 days of lifting. Avoid harvest after heavy rains.

Avoid mechanical injury and bruising of bulbs during production and harvest. Avoid banging cloves together to remove mud and dirt from roots.

Properly cure bulbs. Cure in a well-ventilated area at 70-80˚F. Practices that hasten curing include undercutting bulbs to sever all roots, avoiding nitrogen fertilization later than two months after seeding, and proper plant spacing. Under wet conditions when bulbs cannot be cured adequately, artificial drying with forced hot air followed by normal storage should be considered.

For long-term storage, garlic is best maintained at temperatures of 30 to 32 °F with low RH (60 to 70%). Good airflow throughout the vented bins or other storage containers is necessary to prevent any moisture accumulation. Under these conditions garlic can be stored for more than 9 months.

-Susan B. Scheufele

Cover crop mixtures for fertility and weed control

Julie Stultz-Fine is conducting research on cover crop mixes including peas, oats, and forage radish.

The more we learn about soil biology, the more appealing cover crops become. Good yields are inextricably linked to healthy soil, and healthy soil is created by growing plants. Plants, be they cash crops or cover crops, provide soil protection from damaging effects of rain and wind. Living roots feed soil organisms, which in turn release nutrients to crops. So how do we cultivate living plants during the off season? We have about six months of the year to use cover crops to enhance soil health and subsequent crop health.

There are many cover crops to choose from, each with different benefits, from erosion control to nitrogen scavenging. But if you want to maximize the paybacks provided by cover crops, plant a mixture! Cover crop functions and benefits are multiplied and diversified by a mixture of species.

My research has looked at low-residue cover crop mixtures, including forage radish, which provide the advantages of a warmer soil in the spring and an accessible seedbed as compared to a traditional rye cover crop. The goal of my research is to develop a sustainable production system for early sweet corn in the Northeast by integrating the benefits of forage radish cover crops and no-till production.

Fall-planted forage radish (aka tillage radish) efficiently scavenges residual nitrate from the soil after a main season cash crop. The fleshy taproot rapidly depletes soluble soil nitrogen at depths from 150 to 180 cm, exceeding the capability of the more commonly used rye. Large root channels created by the radish provide excellent water infiltration and warmer soil temperature for early planting. The seedbed following forage radish is relatively weed-free and residue-free, therefore optimal for direct seeding in a no-till system.

One of the disadvantages of forage radish is that it has a low Carbon to Nitrogen ratio (C/N ratio), and as a result it decomposes quickly in the spring. If the Nitrogen released by decomposition is not synchronized with the N demand of the corn, then it is lost and is money down the drain. Planting a mixture of cover crop species will adjust the carbon to nitrogen ratio, increasing biomass.

In this study, two mixtures of forage radish cover crop were selected to compare the effects of forage radish and cover crop mixtures on weed suppression and synchrony of decomposition to meet crop demand for N. No cover crop and 100% forage radish were planted for controls. All of the species in these cover crop mixes are winter-killed in New England, which was intentional to simplify spring management.

Complete fall weed suppression by forage radish cover crop in October (foreground).

Treatments:

- **Forage radish:** 7 lbs/acre
- **Oat/Forage radish:** 50 lbs/acre oats + 3 lbs/acre radish
- **Pea/Oat/Forage radish:** 45 lbs/acre peas + 30 lbs/acre oats + 2 lbs/acre radish
- No cover crop.

Cover crops were seeded on August 23, 2014. The above rates were based on the following ratios: 100% forage radish, 70% oats/30% forage radish, and 30% peas/40% oats/30% forage radish by weight. Forage radish is a highly competitive crop, so smaller percentages were used in mixes to assure growth of the other species. Peas are known

to be weak competitors, so the proportion of peas was increased.

Cover crop biomass was measured just prior to winter-kill in mid-November 2014. Soil samples were taken at regular intervals from fall 2014 through summer 2015. Fall and spring weed biomass were measured. Sweet corn tissue samples were taken when plants were 12 inches tall, and at post-harvest to analyze the nutritional status of plants according to the the cover crop treatment.

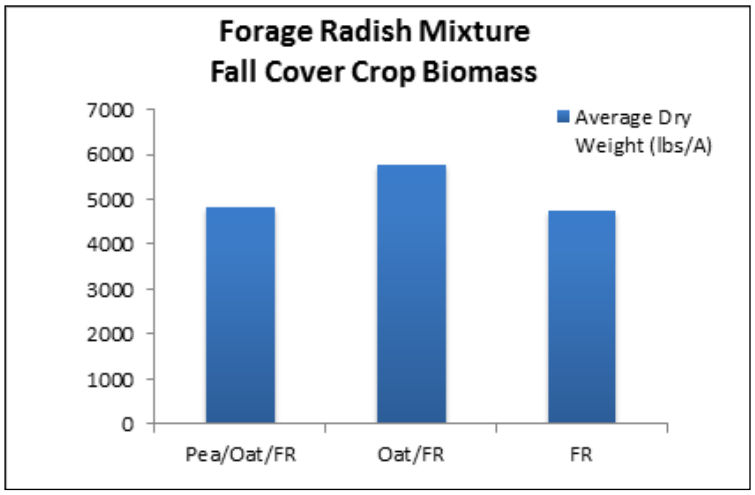


Figure 1. Fall cover crop biomass

Results: Cover crop biomass was measured in mid-November 2014. Forage radish (FR) and Pea/Oat/FR had similar biomass yields around 4800 lbs/acre of dry weight. Oat/FR had the highest yield of 5700 lbs/acre of dry weight (Fig. 1). If you're looking to increase organic matter, this high yield of biomass is a great payoff when you consider that the cover crop seed is relatively inexpensive at $29/acre. See Figure 3, next page, for seed cost estimates.

Forage radish is generally known to have a low C/N ratio, but in this experiment there weren't significant differences between cover crop treatments. The C/N ratio of forage radish was 24:1, while oat/FR was 25:1 and pea/oat/FR mixes were 22:1. Overall, these cover crop mixtures had low nitrogen content (between 1.5 to 2.2% N by weight), which raises the C:N ratio. Pea/Oat/FR mixes did not show significant benefit from nitrogen fixation by the peas.

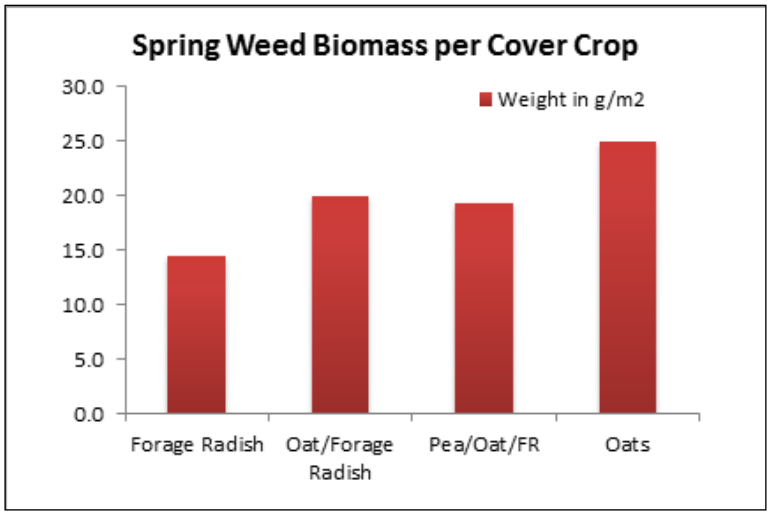


Figure 2. Weed biomass by cover crop

Soil tests showed what much prior research has revealed: in late November all cover crop treatments had scavenged significant soil nitrate compared to the no cover crop plots. All three cover crop treatments showed 2 ppm remaining nitrate, while the no cover crop treatments indicated 25 ppm nitrate. In mid-May 2015 the FR plots had 30% more available soil nitrate than the Pea/Oat/FR and Oat/FR plots, and 70% more nitrate than no cover crop plots. However, by mid-June soil tests indicated that all cover crop treatments had similar levels of soil nitrate.

Weed suppression was best achieved by forage radish alone in both fall and spring (see Fig. 2). In mid-November 2014, forage radish achieved almost total weed suppression while both Pea/Oat/FR and Oat/FR had 3 times the weight of weeds. However, the no cover crop treatment had 54 times the weed biomass compared with FR.

In late April 2015, FR still has the least weed biomass, followed by Pea/Oat/FR , then Oat/FR, with Oat alone being the least weed suppressive.

Forage radish residue and weed suppression in mid-April 2015.

Seeding and Cost benefits: Calculating seeding rates for cover crop mixtures is not an exact science, but there are some really good guidelines out there. An excellent resource was recently published on extension.org, entitled "Making the Most of Mixtures: Considerations for Winter Cover Crops in Temperate Climates" (White, C. et al, 2015). It provides a step-by-step approach to selecting species, evaluating their benefits and competitiveness, and determining seeding rates. A link to the article is provided at the end. An additional resource is a free cover crop calculator available at https://greencoverseed.com/smartmix. In general, you want to use at least half the seeding rate of the recommended monoculture rate, and even less if you have two similar species (for example, two

grasses). Use a minimum of 30 lbs/ acre of total seed.

Cover crop mixtures can be a cost-effective and productive way to fine tune and increase the benefits of your cover cropping practices (Table 1) in order to build soil health, provide weed control, and cycle nutrients for next season's crop!

--By Julie Stultz Fine, Graduate Student, Stockbridge School of Agriculture

Figure 3. Cover crop species	**Seeding rate-drilled (lbs/ac)**	**Seed price ($/lb)**	**Seed cost per acre**
Oats	100	$0.40	**$40**
Rye	90	$0.25	**$23**
Vetch/ Rye	20/ 60	$2.00/ $0.25	**$55**
Forage radish	7	$3.00	**$21**
Oat/Forage radish	50/3	$0.40/ $3.00	**$29**
Pea/ Oat/ Forage radish	40/30/2	$1.20/ $0.40/ $3.00	**$66**

Resources:

Clark, A. 2007. Managing cover crops profitably, 3rd edition. Sustainable Agriculture Network, Beltsville, MD. (Available online at: http://www.sare.org/SARE-Nationwide/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition)

White, C., et al, 2015. Making the Most of Mixtures: Considerations for Winter Cover Crops in Temperate Climates. [Online]. Available at: http://www.extension.org/pages/72973/making-the-most-of-mixtures:-considerations-for-winter-cover-crops-in-temperate-climates#conclusions

Green cover seed smart mix calculator. [Online]. An online tool to create custom seeding rate blends of many different species. Available at: https://greencoverseed.com/smartmix

THE 'OTHER BLIGHTS' OF TOMATO

While late blight has become the dominant force in tomato disease management, it is certainly not the only foliar leaf blight around. We have not seen any late blight so far this year due the hot temperatures and dry conditions, but recent rains and warm, humid weather with cool nights have given us the long periods of dew needed for fungal diseases of tomato to begin to take off. There are several fungi and a few bacteria that cause leaf spots and defoliation as well, a few key fungal diseases are described below.

Septoria leaf spot (*Septoria lycopersici*) 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 tomato canopy.

Symptoms consist of circular, tan to grey lesions with a dark brown margin 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 where asexual spores are formed) 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.

Septoria leaf spot with tan centers and black pycnidia sometimes present (left) and early blight with characteristic concentric rings (right). Photos by SB Scheufele and D Ingram.

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. Tomato seed may be coated in spores. 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 potato. 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 become chlorotic (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.

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 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 cultivars 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 onset. Rotate out of tomato crops for at least two years, control susceptible weeds, and incorporate 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.

Botrytis Grey 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 where humidity is very high, but it has been observed in field tomatoes as well. 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, the pathogen grows in such a way as to form concentric rings, and for this reason can be confused with early blight. The way to tell it apart 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 end that resemble grape clusters. *B. cinerea* primarily feeds on dead tissue and is only weakly pathogenic, therefore, you will likely see this sporulation on senescent 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 tomato 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 favorable conditions ghost spot may lead to fruit rot.

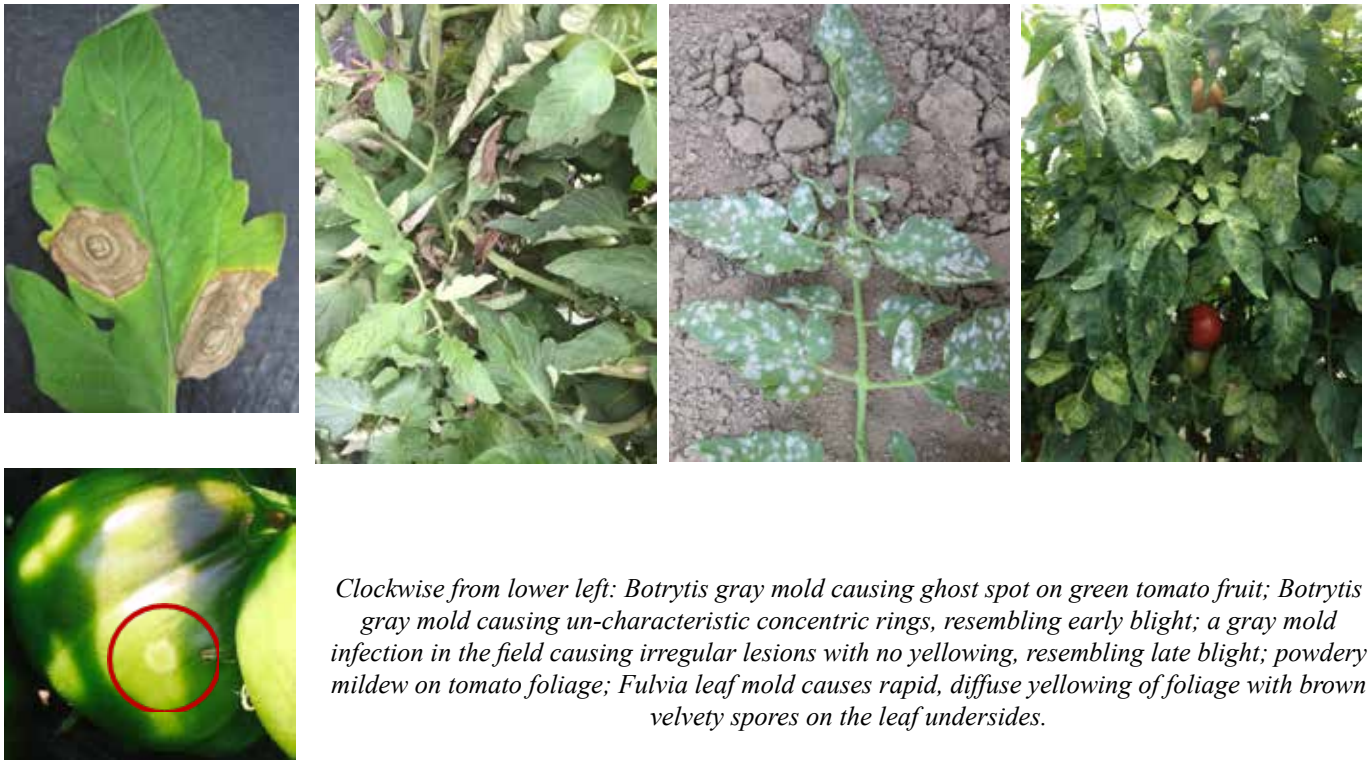
Leaf Mold (*Fulvia fulva*). This disease can occur in the field, but is most common in greenhouses, in both soilless and hydroponic systems. Leaf mold infections begin on older leaves and cause pale-green to yellow spots visible on the upper leaf surface, with olive-green to grayish-purple fuzzy growth on the underside of the leaf where the fungus is producing spores. 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.

Powdery mildew (*Oidium neolycopersici*) of tomato is emerging as an important disease of greenhouse and high-tunnel tomatoes, and is occasionally seen in field 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 free water 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.

Botrytis, Leaf Mold and Powdery Mildew Management

Control weeds and remove plant debris. Space plants and sucker them or remove lower leaves to allow good air circulation, reduce humidity within the canopy, and minimize leaf wetness by watering with drip irrigation or early in the day. 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. Avoid excessive nitrogen fertilization. Remove all diseased plant residue and destroy them; disinfest the entire greenhouse after harvest. Practice hot water seed treatment for tomatoes as a general rule. For Fulvia in particular, start with certified disease free seed as there are there are a few products labeled for use on indoor tomato to control this disease.



Clockwise from lower left: Botrytis gray mold causing ghost spot on green tomato fruit; Botrytis gray mold causing un-characteristic concentric rings, resembling early blight; a gray mold infection in the field causing irregular lesions with no yellowing, resembling late blight; powdery mildew on tomato foliage; Fulvia leaf mold causes rapid, diffuse yellowing of foliage with brown velvety spores on the leaf undersides.

Please see the New England Vegetable Management Guide (www.nevegetable.org) for current management recommendations. Always alternate fungicide applications between materials with different modes of action to prevent resistance development.

-Bess Dicklow and Susan B. Scheufele, UMass Extension

Events

SARE Grant Webinars

Writing a Northeast SARE Partnership Grant Application Webinar

When: Sep 01, 2016 11:00 AM EDT

Register at: https://attendee.gotowebinar.com/register/3512176966032896002

In this 60-minute webinar, Carol Delaney, Northeast SARE Farmer Grant specialist, will review the Partnership Grant program, including its purpose, allowable expenses, and funded project examples. She will also provide tips to writing a compelling application. The webinar is open to the public, especially to non-profit organization staff and others interested in applying.

Northeast SARE Farmer Grant Program: Tips for Writing a Compelling Application

When: Sep 01, 2016 12:30 PM EDT

Register at: https://attendee.gotowebinar.com/register/3376350996119085058

In this 60-minute webinar, Carol Delaney, Northeast SARE Farmer Grant specialist, will review the Farmer Grant program, including its purpose, allowable expenses, and funded project examples. She will also provide tips to writing a compelling application. The webinar is open to farmers, agricultural service providers, and others interested in learning about Northeast Farmer grants.

Twilight Meeting: UMass Vegetable Research

When: Wednesday, September 14, 2016, 4pm to 6pm

Where: UMass Research and Educational Farm, South Deerfield, MA

Come join us at the UMass Research Farm to hear about current applied research projects being conducted by UMass Extension faculty, students, and staff and with the UMass Student Farm Enterprise. Topics will include:

- Best management practices for on-farm food safety (Standard Operating Procedure for sanatizing a Produce Brush Washer, The development of a triple wash leafy green SOP, Development of an on-farm food safety plan, DIY Mobile Wash Station, Produce Wash Efficacy in a Hydrocooler unit) Amanda Kinchla & Amanda Brown
- Cucurbit downy mildew management using resistant cucumber varieties, Susan B. Scheufele
- Alternative Management Strategies for Cabbage Aphids, Susan B. Scheufele
- Tomato variety trials, Levi Lilly

Managing Phosphorus in Organic Residuals Applied to Soils

When: Wednesday, November 2, 2016 from 8:45-4pm

Where: Holiday Inn, 265 Lakeside Ave.Marlborough, MA 01752

How do we develop a balanced system for use of organic residuals, with all their benefits, without adding to negative environmental impacts caused by phosphorus (P) leaching and runoff? This symposium will provide technical, research-based information and dialogue on the presence, forms, dynamics, transport, and fates of P applied to soils in organic residuals such as composts, biosolids, manures, and digestates from anaerobic digestion. This symposium is intended to help in developing guidelines for the use of P-containing organic residuals in accordance with nutrient management regulations.

Approval has been requested for the following professional certifications: CGCS, CSFM, MCH, MCLP, and AOLCP.

Event Website: https://www.regonline.com/phosphorus

Sponsors

Vegetable Notes. Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.