UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Crop conditions

It looks like just about everyone got at least 1 inch of rain this week, but some locations got over 2 inches in this week's storm. These large rain events and warm weather can favor spread of many splashing diseases like bacterial spot in tomato and pepper, black rot in brassicas, and early blight and Septoria leaf spot in tomatoes. The soaking rains also promote germination of sporangia of *Phytophthora capsici* which causes crown and fruit rot in cucurbits and peppers—see the article in this issue for management strategies for that disease which has become prevalent in the Connecticut River Valley. The rains also brought a much-welcomed break from irrigating, allowing more time for planting of fall brassicas and other direct-seeded staples like beets, carrots and lettuces.

Sue Scheufele presented ongoing brassica pest management research, including this trial that is looking at using beneficial nematodes to control the soil-dwelling life stage of flea beetles, to the 2019 Northeast SARE summer tour this week. Photo: G. Higgins

The corn crop is coming in nicely now, garlic harvest is well underway (see the article in this issue for tips on curing and storing bulbs), tomatoes are coming in full swing, and early melons are being thrown into bins. It's a bountiful time of year and things are looking really good out there!

Folks from SARE came out to tour the UMass Research Farm as part of their Northeast farms tour this week, with perfect timing to see our cabbage aphid insectary trial in full bloom! Our research season is in full-swing—we'll have research reports this fall for several brassica pest management trials and cucumber downy mildew variety trials.

Pest alerts

Bean:

White mold, caused by the fungus *Sclerotinia sclerotiorum*, was observed in a bean field in NH this week, and in high tunnel tomatoes in MA a few weeks ago. This pathogen produces sclerotia—hardened masses of fungal tissue—that survive in the soil for many, many years. Sclerotia will germinate in the spring and infect host roots and crowns. Sclerotia will also produce fungal fruiting bodies that produce spores that can infect senescing tissue and bean or tomato flowers; the disease can then spread from that infected tissue. White mold has many other vegetable hosts including tomato, potato, and brassicas. Remove infected plant debris from the field and destroy. Plant severely infested fields into grasses or cereals for up to 8 years. The commercially available fungus *Coniothyrium minitans* (Contans) parasitizes and reduces viability of white mold sclerotia. For best control, apply in the fall.

Mexican bean beetle eggs are beginning to hatch now. If you are using the biocontrol *Pediobius*, the wasps should be released to target the larvae. Control is most successful with 2-3 releases, 7-10 days apart. See the New England Vegetable Management Guide for chemical control recommendations. We're seeing lots of leafhoppers and hopperburn in beans also: if you are using chemical control for leafhopper *and* releasing *Pediobius*, consider waiting a few weeks before spraying after releasing the biocontrol. Pyrethrins will kill the wasps on contact; azadirachtin products will likely not affect the wasps.

Brassicas:

Black rot was diagnosed on several brassica crops in New Hampshire this week and is likely showing up now across the region. The bacteria that cause black rot clog the water-conducting tissue of brassica plants, and often enter plants through hydathodes on leaf margins, creating large V-shaped lesions (wide at the leaf margin, tapering towards the base of the leaf). This pathogen is most commonly introduced into a field via seed. Once infected plants are out in the field, the bacteria can be spread by splashing rain or irrigation water, equipment, workers, and insects, and the pathogen can survive on crop residues for up to 2 years. If you're using brassica seed that is not certified black rot-free, you can hot water treat your seed. Incorporate diseased plant residue quickly to speed up decomposition.

Alternaria leaf spot: We are continuing to see Alternaria leaf spot developing in brassica fields, especially with the recent wet weather. Control is difficult for certified organic growers—DoubleNickel can be effective against *Alternaria* in other crops but significant control has not been documented in research trials. Azoxystrobin (e.g. Quadris) is commonly used for control in conventional production—resistance to azoxystrobin is widespread in New York. See the New England Vegetable Management Guide for other labeled fungicides.

Cabbage aphid is being found in brassica fields across the region. Preventative control is essential for managing this pest, especially in long-term crops like Brussels sprouts, where aphids can get into the marketed sprouts. Treatment threshold is 10% of plants infested. Effective conventional products include pyrethroids, organophosphates and neonicotinoids, as well as more selective materials like flonicamid (Beleaf) and pymetrozine (Fulfill). Resistance can develop, so follow label instructions and rotate between IRAC groups. For organic control, azadirachtin and inecticidal soap are most effective on these aphids—a University of New Hampshire research trial reported good control from alternating applications of M-Pede and Azera. Mixing an oil and a soap together has also been found to be more effective than applying either one alone. Always use a spreader/sticker when spraying brassicas. For more control recommendations, see this Brassica Pest Collaborative fact sheet.

Cucurbits:

Squash vine borer numbers are continuing to rise on some farms and remain at zero on others. It is a good idea to trap for this pest yourself, since it varies so widely from farm to farm. On farms where SVB is a problem, this is the highest pressure we have seen in the past 15 years of monitoring. Since adults are still flying, egg laying is likely still happening and follow-up sprays may be warranted.

Fusarium wilt is being reported in pumpkin and squash around the region. Symptoms observed are wilting plants with rotting tissue at the crown area extending downward into the main root. Removing affected plants when there are just a few can be helpful in slowing the spread of this disease. Proline is labeled for diseases caused by Fusarium as well as for powdery mildew. It can be applied once to soil, using ground application equipment, drip irrigation, or other chemigation equipment, and twice to foliage.

Yellowing of lower eggplant leaves, caused by Verticillium wilt. Photo: A.Radin

Eggplant: **Verticillium wilt** is appearing throughout the region. This disease is caused by a fungus that can survive in the soil for many years. The fungus invades the water-conducting tissue of the plant, often causing half of a leaf (or many leaves) to wilt and turn yellow. There is no effective chemical control for this disease. Rotate out of solanaceous crops for 4-5 years to reduce soil inoculum and avoid disease.

Pepper: With ripening peppers and hot, sunny weather, we've begun seeing **sunscald** and **blossom end rot** on pepper fruit. This dead tissue is often colonized by *Alternaria alternata*, a saprophytic (not pathogenic) fungus that is always present in the soil. Thick, black sporulation will develop on the already dead tissue, but this won't spread to healthy fruit. Sunscald can be avoided by promoting vigorous foliage by controlling fungal and bacterial foliar diseases. Blossom end rot is caused by calcium deficiency in fruit tips. Calcium is taken up into plants with water; when blossom end rot develops, there is usually sufficient calcium in the soil but plants can't access it due to dry soils. Maintaining even, adequate soil moisture can help avoid the development of blossom end rot.

Alternaria on pepper, taking advantage of tissue killed by either blossom end rot or sunscald. Photo: C. Radon

Potato: Late blight was confirmed on potato this week in Erie Co., PA. This is not close enough to warrant targeted late blight sprays for MA growers. We'll continue providing late blight updates here in Pest Alerts if and when the disease moves closer.

ECB in garlic.
Photo: S.B. Scheufele

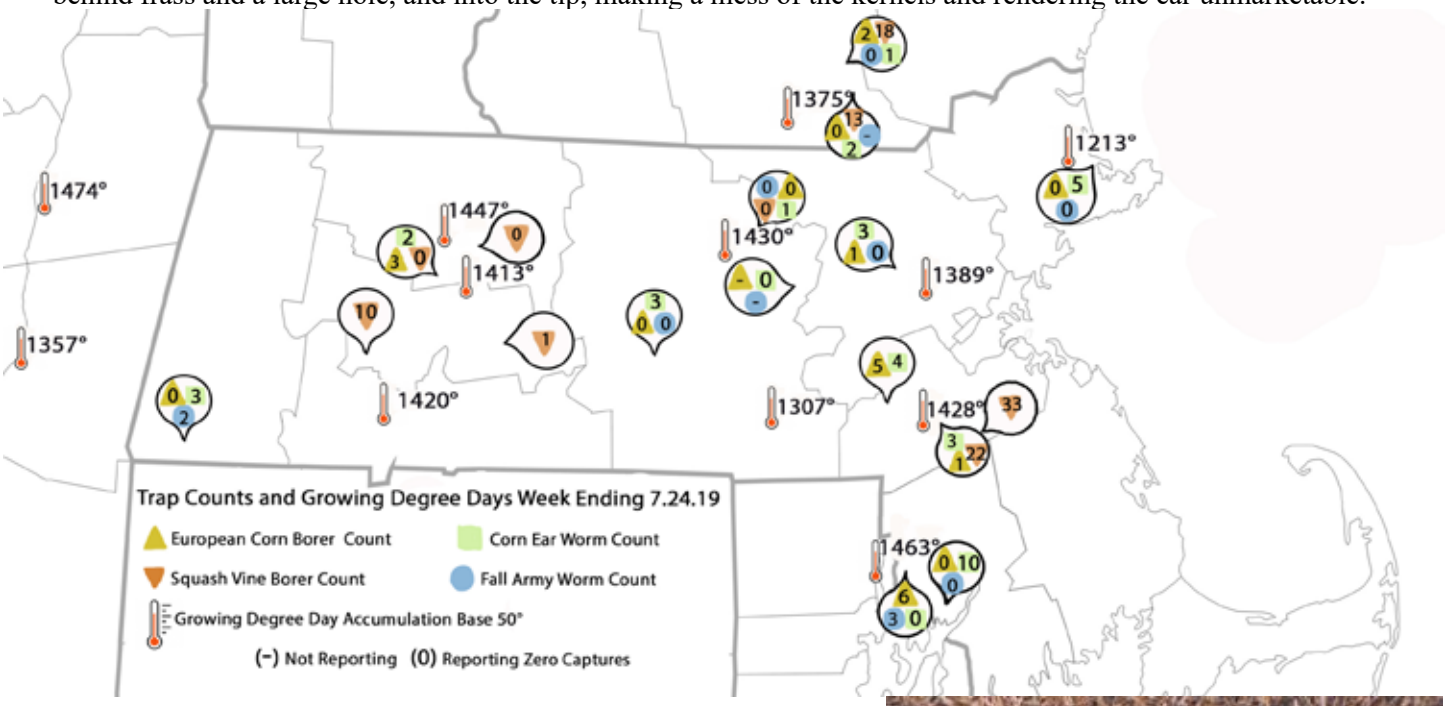
Sweet Corn:

Corn earworm adult moth numbers are still low, and a 5-6 day spray schedule is recommended for most of MA, except for one trapping location in Southeastern MA where 10 moths were captured and the interval should be tightened to 4 days. Some traps were loaded with Gypsy moths this week; word of warning to those who are trapping to make sure you have the proper ID. One feature that distinguishes the two moths are the antennae, which are quite hairy for gypsy moth, but are smooth for European corn borers.

CEW (left) and gypsy moth (right). Note the fuzzy antennae on the gypsy moth.

European corn borer**:** Second generation flight just beginning to appear in traps. Caterpillars are still active, causing damage to corn but also other crops including potato and garlic; they were seen this week boring into necks of garlic being harvested.

Fall armyworm**:** A few FAW were captured this week and are also being seen in NY. FAW flights are sporadic and unpredictable, and do not necessarily correspond with corn earworm flights, so monitoring with pheromone traps in whorl stage corn is very useful. Feeding damage from caterpillars occurs first in whorl stage corn, deep within the whorl, on leaves and in the newly forming green tassel. In whorl stage corn, caterpillars produce ragged feeding damage to leaves and masses of sawdust-like excrement. As corn matures, larvae burrow into the side of corn ears, leaving behind frass and a large hole, and into the tip, making a mess of the kernels and rendering the ear unmarketable.



Garlic harvest, curing and storage

Many farmers are beginning to harvest garlic, a big task that usually occurs around mid-late July. Timing the harvest can be tricky—heads should be left in the ground as long as possible to attain maximum bulb size (which doubles in the last stage of growth), but not so long that the cloves begin to separate, as overripe bulbs sell and store poorly. Harvest when leaves begin to turn yellow, but when about 60% are still green. Check bulbs by cutting through the head sideways to see how well de-

veloped the cloves are. Cloves should fill the wrappers—if they seem a little loose, the garlic has a little ways to grow. A little of the outermost wrapper may have started to discolor at this point. Harvest before the bulbs pop, which can happen relatively quickly, especially in a wet year. Remember that it is better to harvest too early than too late.

Use hand tools to loosen soil under the bulbs or a mechanical harvester to undercut the bed. Pulling bulbs out when they are tight in the ground can open wounds at the stem-bulb junction and allow for fungal infections. Fresh bulbs bruise easily and these wounds can also encourage infection. Don't knock off dirt by banging bulbs against boots, shovels, or buckets—shake or rub gently, and leave the rest to dry out during curing.

Curing is important for successful bulb storage and finding the ideal conditions for curing can be a challenge. Curing in the field runs the risk of sunscald, while curing in poorly ventilated barns can result in yield loss from disease. Avoid high temperatures (over 90°F) and bright sunlight. Rapid curing can be achieved by placing bulbs roots up on 1" wire mesh in a hoophouse covered with a shade cloth, and with the sides and ends open. A well-ventilated barn will also work, but be sure that bulbs are hung with adequate air circulation or on open racks up off the floor. Curing takes 10-14 days. Stems may be cut before or after curing. Curing is complete when the outer skins are dry and crispy, the neck is constricted, and the center of the cut stem is hard.

Storing Bulbs. After curing, garlic can be kept in good condition for 1 to 2 months at ambient temperatures of 68 to 86°F under low relative humidity (< 75%). However, under these conditions, bulbs will eventually become soft, spongy and shriveled due to water loss. For long-term storage, garlic is best maintained at temperatures of 30 to 32°F with low RH (60 to 70%). Good airflow throughout storage containers is necessary to prevent any moisture accumulation. Under these conditions, well-cured garlic can be stored for 6-7 months. Storage at higher temperatures (60 °F) may be adequate for the short term, but it is important to select a place with low relative humidity and good air flow. As with onions, relative humidity needs to be lower than for most vegetables because high humidity causes root and mold growth; on the other hand, if it is too dry the bulbs will dry out.

Storing Seed. Garlic bulbs that are to be used as seed for fall planting of next years' crop should be stored at 50 °F and at relative humidity of 65-70%. Garlic cloves break dormancy most rapidly between 40 to 50 °F, hence prolonged storage at this temperature range should be avoided. Storage of planting stock at temperatures below 40°F results in rough bulbs, side-shoot sprouting (witch's-brooms) and early maturity, while storage above 65°F results in delayed sprouting and late maturity.

Garlic cloves used for seed should be of the highest quality, with no disease infections, as these can be spread to new fields and to next years' crop. Be on the lookout for garlic blight nematode which may have been distributed around New England on infested seed garlic. This nematode, which is also known as a bulb and stem nematode, causes bloated, twisted, swollen leaves, and distorted and cracked bulbs with dark rings. Infestation with this nematode can weaken plants, causing them to be susceptible to secondary infections. The UMass Plant Disease Diagnostic Lab can make a positive identification; for submission instructions and contact info visit http://ag.umass.edu/services/plant-diagnostics-laboratory.

--Written by R Hazzard. Resources: New England Vegetable Managemet Guide, Oregon State, ATTRA, Wishingstone Farm, Astarte Farm, USDA Handbook 66.

PETS & SERVICE ANIMALS ON YOUR FARM

--Written by Wes Kline and Meredith Melendez, Rutgers Cooperative Extension

An increasing number of customers are bringing animals with them when they visit farm markets, pick your own farms, or agritainment activities. Animals can pose a food safety risk to produce, introduce disease to farm animals, frighten or upset farm animals. With the new food safety regulations requiring that farms have a plan for mitigating the food safety risks that pets and service animals pose, many farmers have asked for clarity around what animals are and aren't legally allowed on their farm. The Americans with Disabilities Act (ADA) governs what you are legally allowed to do in regards to customers with service animals visiting your market or on your farm. This fact sheet will cover the specifics of the ADA, animals that are not protected by the ADA regulations, and how to reduce potential risk on your farm from outside animals. States often have regulations that go beyond the federal ADA regulation, information represented in this fact sheet is

specific to New Jersey. If you farm in another state please consult the state by state guide linked at the end of this article.

What do the ADA regulations cover?

While many types of animals can provide comfort and emotional support to their owners, only service animals are protected by the ADA, specifically Title II and III. The ADA regulations define "service animal" as dogs, and less commonly miniature ponies, that are individually trained to do work or perform tasks for people with disabilities such as guiding a blind person, alerting people who are deaf, assisting a person in a wheelchair, alerting and protecting a person who is having a seizure, reminding a person with mental illness to take prescribed medications, calming a person with Post Traumatic Stress Disorder (PTSD) during an anxiety attack, or other duties. The work or task that a service animal has been trained to perform must be directly related to the persons disability. Some of these disabilities are obvious, others are not.

What questions can you legally ask?

When it is not obvious to you that an animal is a service animal you may ask just two questions to determine if the animal is a service animal.

1. Is the service animal required because of a disability?
2. What work or task has the service animal been trained to perform?

The service animal must have been trained to perform a specific task or work for a person with a disability in order to qualify for protection under the ADA regulations. Note that service animals do not always wear vests or harnesses, and there is no paperwork or ID Card carried by anyone with a service animal.

What questions are you legally prevented from asking?

1. You may not ask about the persons disability.
2. You may not ask for proof of the persons disability.
3. You may not ask for documentation or proof that the service animal is trained.
4. You may not ask for an animal health certificate.

What should you do once you are satisfied the animal is a service animal?

1. Inform the handler which areas of the farm are open to the service animal and handler.
2. Inform the handler where the handwashing areas are located, and that they should wash their hands before han dling and consuming produce.
3. Inform the handler of the proper area for the service animal to relieve themselves.
4. Inform the handler of where plastic bags and trash cans are available to them to dispose of fecal material.
5. Inform the handler of any farm policies specific to service animals.

Are comfort or emotional support animals protected by regulations?

Neither comfort nor emotional support animals are covered by the ADA regulations. Without the ADA regulatory protection these animals can be refused entry to your farm without fear of legal ramifications based on risk to your crops, your animals, farm employees or other farm customers.

What risks do outside animals pose for farm livestock and other farm animals?

When outside animals are present on your farm there are diseases that can be spread to and by your farm animals and livestock. Zoonotic diseases are diseases spread between humans and animals and include *E. coli* O157:H7, salmonella, and others. The most common way for these diseases to spread is through direct contact, indirect contact, vectors, and contaminated food. It has been estimated that six out of ten known infectious diseases impacting humans are spread also by animals. For more information on zoonotic disease risks and preventive controls visit the CDC Zoonotic Diseases webpage: https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html

Can you deny entry to animals on the farm?

In general the ADA regulations state that service animals may be present where the public is normally permitted. You may restrict service animals from specific areas such as produce handling areas used for washing, packing, and storage (risk of food contamination), or livestock areas (natural predator/prey relationships that can upset farm animals or

potentially be a source of disease transmission).

What is appropriate behavior for a service animal and their handler?

Service animals should always be under the control of their handler. Service animals must be harnessed, leashed, or tethered, unless these devices interfere with the service animal's work or the individual's disability prevents using these devices. Service animals have been trained on how to perform a service to their handler and should be focused on that task.

Can you ask someone with a service animal to leave the farm?

If the service animal is behaving in a way that indicates they are not under the control of their handler, or if the handler is unable to control the animal, you may ask them to leave. Examples of this type of behavior would be: consumption of produce, urination, marking, or defecation in the production areas, excessive barking, or aggressive behavior.

Can service animals go into you-pick areas?

You should consider your production practices and the risk involved with having an animal in your fields when determining what parts of the farm service animals can access . Crops grown in close proximity to the ground are inherently higher risk crops for contamination when compared to crops growing farther from the ground. Crops typically consumed raw are also higher risk, and in many pick-your-own settings the customers are eating produce in the fields as they pick. Contact with animals can increase the risk of contamination of that produce. Handwashing stations should be provided to give the customers an opportunity to clean their hands after touching the service animal.

Can service animals go into farm stores?

Service animals may be given access to store areas that are generally open to the public. Service animals would be prohibited from food processing areas, such as a store kitchen, due to contamination risk.

What should you provide to help reduce risk when service animals are on the farm?

While the presence of service animals on your farm is likely to be a rare event, you should be prepared by having a designated area for service animals to relieve themselves, complete with pick-up bags and a trash can to dispose of fecal material. Handwashing facilities should be available for the handler.

What if I let my customers bring animals onto my farm, without restrictions?

- Should you allow animals other than service animals onto your farm be prepared to deal with customers with animals frequently. At minimum you should consider the following:
- Where will these animals urinate and defecate?
- What supplies will you provide to allow proper clean up of defecation? (i.e. plastic bags and a trash can)
- Who will be trained to properly monitor this area to ensure that it does not become a contamination risk or an eyesore for your farm?
- Where will the customer handwashing station be so that their hands can be washed after handling their animal and after managing a defecation event?
- What signage will you need to instruct customers on your expectation for animal behavior and handling at the farm?
- How will you handle a situation when the animal and/or the handler is behaving inappropriately?

What are the steps to enforce your policies when someone wants to bring an animal on the farm?

Your own policies regarding service animals on your farm will dictate the conversation you have with a member of the public who wishes to bring an animal onto your property. We recommend clearly posting your policies so that people are aware of them when they arrive on your farm.

What do you need to do to comply with the Food Safety Modernization Act/Produce Safety Rule or a buyer required third party audit?

Produce safety inspectors and auditors will focus on the potential risk of contamination with animals on your farm. You can expect questioning to focus on the production areas where the animals are permitted access, the areas that the animals are allowed to relieve themselves, how those areas are maintained, availability of handwashing facilities for the handler, and relevance and prominence of appropriate signage for the handler. Signage should indicate your expectations for the animal handler, locations of areas to support proper handwashing and trash disposal, and appro-

priate areas for the animal to urinate and defecate.

Where can I learn more about the ADA regulations on service animals?

ADA 2010 Revised Requirements – Service Animals https://www.ada.gov/service_animals_2010.htm

Frequently Asked Questions about Service Animals and the ADA https://www.ada.gov/regs2010/service_animal_qa.html

State Specific Regulatory Table https://www.animallaw.info/topic/table-state-assistance-animal-laws

Rutgers Cooperative Extension would like to thank The Seeing Eye, Inc., the New Jersey State Board of Agriculture, New Jersey Farm Bureau and the New Jersey Department of Agriculture for their assistance in developing this fact sheet.

Managing Phytophthora Blight

This disease, caused by the soil-dwelling oomycete *Phytophthora capsici*, has a wide host range including all cucurbits, tomato, eggplant, pepper, beans, and some weeds (purslane, Eastern black nightshade, Carolina geranium). Warm, wet conditions with frequent rainstorms, like the recent weather, favor disease development. Symptoms vary by crop and may be easily confused with other diseases like bacterial wilt or issues such as water-logging. Be on the lookout for the symptoms described below and submit suspect plants or fruit to the diagnostic lab in order to get a proper ID. This will prevent you from moving the pathogen around your farm and from planting susceptible crops in infested fields in future years. There is also a lot you can do now to manage the disease on your farm.

Symptoms. Many of you are probably all too familiar with the symptoms of Phytophthora blight on cucurbit fruit but you may not know that many other vegetable crops are also susceptible, though they may exhibit different symptoms. Symptoms of *P. capsici* on squash fruit are firm, round, water-soaked lesions that develop white mycelial growth that resembles powdered sugar under warm, moist conditions. Cucurbit plants, especially non-vining varieties, can also develop symptoms of crown rot where whole plants or vines wilt suddenly and eventually the whole plant collapses. Symptoms on pepper are distinctly different, as plants become infected with *P. capsici* via their roots and develop a crown rot that causes darkening of roots and stems and permanent wilt of foliage, while stems remain rigid. Pepper fruit remains attached to the upright stems but may eventually develop dark, water-soaked lesions that can spread to the whole fruit, giving it a soft, wrinkled appearance. On tomato, *P. capsici* causes 'buckeye rot' on fruit where it comes in contact with the ground. Small brown spots on fruit grow into large, round or oblong lesions with alternating rings of light- and dark-brown discoloration. The lesions are firm, with smooth margins but eventually become soft. In recent years, Phytophthora blight has been confirmed on lima and snap beans in the field and on soybean under lab conditions. These crops had previously been considered non-hosts. Bean pods develop water-soaked lesions that develop diffuse, white sporulation. Bean stems and crowns can also be affected; plant collapse in low-lying areas of fields is common.

Phytophthora lesion on pumpkin.
Photo: M.T. McGrath

Phytophthora blight has wiped out the entire front section of these squash beds.
Photo: UMass Vegetable Program

Disease Cycle. *P. capsici* persists in soil for many years as thick-walled resting spores called oospores. These long-lived oospores can be spread throughout the field during tillage or cultivation, and they can be spread between fields or farms on infested soil clinging to tractor or truck tires, harvest buckets, workers' boots, or even discarded infected fruits. Oospores germinate and produce asexual, short-lived sporangia that contain 20-40 zoospores. Zoospores are motile spores that swim towards host roots or fruit and infect. The resulting lesion will then produce more sporangia and zoospores that can be spread by

surface water, rain, or splashing water. One infected spaghetti squash is estimated to produce 44 million sporangia with the potential to release 840 million zoospores (Hausbeck and Lamour, 2004). This accounts for the rapid, above-ground spread of disease within a field or a season. Outbreaks often start in low-lying or poorly drained areas of fields, where oospores are triggered to germinate and swimming zoospores are able to find hosts. Growers often assume that stunting or death of plants in these areas of the field is caused by waterlogging, but infection with *P. capsici* may be the real cause. Importantly, water run-off from an infested field may contaminate surface water sources used for irrigation. This has been well-documented in irrigation ponds and rivers in NY and MI (Hausbeck and Lamour, 2004).

If you do have *P. capsici* present on your farm, there are cultural practices that can be effective in helping to manage the disease:

- **Crop rotation**: A minimum crop rotation of 3-4 years is recommended, although fields that have been out of susceptible crops for >5 years have had outbreaks in recent years. Planting non-hosts into infested fields for any number of years is useful—each year an infested field is planted with a non-host, the number of surviving oospores will be reduced. The host range of *P. capsici* is broad but the list of non-hosts includes brassicas, carrots, onions, and small grains. Tolerant pepper varieties are available if crop rotation is impossible. Similarly, pumpkin varieites with hard shells, such as 'Lil Ironsides' or 'Apprentice' have been shown to be significantly less susceptible to disease than similar varieties with conventional, soft rinds.
- **Cover crops** can be used to help mitigate the effects of *P. capsici*, as the addition of soil organic matter stimulates beneficial microbes. A healthy soil microbial community can reduce plant pathogen activity by outcompeting them for space and nutrients, by direct parasitism of plant pathogens, by producing antibiotic compounds that slow pathogen growth, and by stimulating the plants' natural defense systems.

Biofumigation: Research has shown that brassica cover crops (especially mustards) release glucosinolates and other compounds as they break down that are toxic to microorganisms, including plant pathogens. Plant pathogens are not always great soil competitors, so this "biofumigation" allows beneficial microorganisms to repopulate the soil. In order to get the highest release of glucosinolates, the brassica cover crop should be fertilized. At termination, incorporate the brassica residues by chopping and rototilling, followed by cultipacking and irrigating just before the crop is planted. Allelopathy can be a concern for some sensitive crops when using this system. For more detailed info check out this factsheet from Cornell University.

In-season management steps. Plan on harvesting from clean fields before you go into infested fields with tractors, trucks, workers, and bins. Take time to wash equipment when moving between fields to remove soil or crop residues that may contain sporangia or oospores. Ideally, do not leave infected fruit in fields or in cull piles. If the infested area is large and plant material cannot be removed from the field, make sure to till it under deeply. Remember that there is a 2-6 day lag period between infection and symptom expression so if you suspect *P. capsici* is present, hold fruit for a few days before sending large wholesale shipments out to avoid their being returned due to rot.

Chemical control. Fungicides can be used effectively and economically to reduce the impact of disease on yield, though none will provide sufficient protection to be used as the sole management strategy—they must be part of an integrated program including cultural controls. For many row crops, applying fungicides through trickle irrigation (if allowed by product label) can help control crown rot, but in vining crops, foliar applications will be needed later to protect developing fruit, which may be resting on infested soil. Foliar applications can be difficult to make because of dense canopy. Air-assisted nozzles may help improve coverage. *P. capsici* has the ability to develop resistance to targeted fungicides, so resistance management strategies like mixing targeted fungicides with protectant fungicides and rotating modes of action with every application, are extremely important. Some populations of *P. capsici* have become resistant to Ridomil (mefenoxam), which was often used to drench plants in the early season. Thus, Ridomil may no longer be effective in fields where it has been used repeatedly. Instead, you can treat transplants or seedlings with a drench treatment of a phosphorous acid fungicide such as ProPhyt, K-phite or Fosphite, which have been shown to be effective as soil or foliar applications. Other effective, targeted materials include:

- **Orondis:** Oxathiapiprolin is a **new active ingredient** which has demonstrated **excellent efficacy** against oomycete pathogens including *P. capsici*. Two formulations are labeled for Phytophthora blight: Orondis Gold 200 and Orondis Ultra. Orondis Opti is not labeled for Phytophthora blight.
    - **Orondis Gold 200** (oxathiapiprolin): *FRAC 49, PHI 0d, REI 4 hrs.*

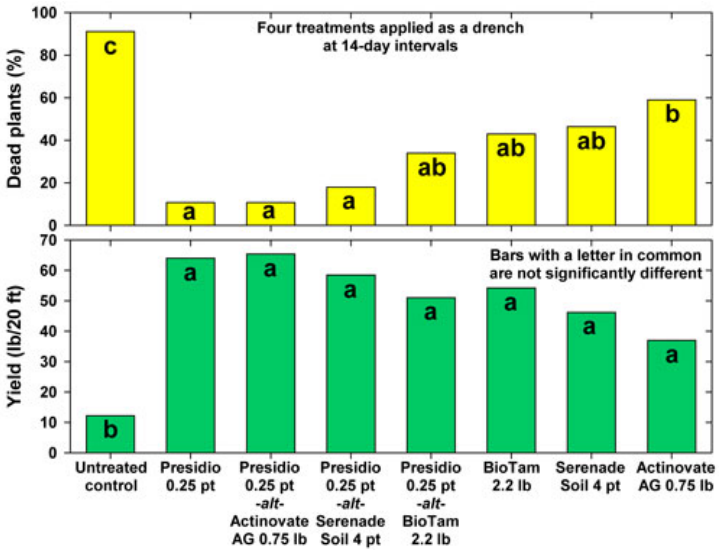
At-planting soil applications only for Phytophthora blight. Foliar applications of other FRAC-49 containing products is prohibited after soil applications.

- **Orondis Ultra** (oxathiapiprolin + mandipropamid): *FRAC 49+40, PHI 0d, REI 4 hrs.* Also labeled for cucurbit downy mildew. Make no more than 2 consecutive applications. See label for further restrictions.

- **Ranman** *FRAC 21, PHI 0d and REI 12hrs.*
  Can be used beginning before symptoms occur for a maximum of 6 applications.
- **Omega** FRAC 29, *PHI 7 days (squash, cucumber), 30 days (melon, pepper) REI 12 hrs.*
  Apply no more than 7.5 pts/A to a crop or 4 applications if applied at highest label rate of 1.5 pts/A. Omega is more expensive than other fungicides.
- **Forum** *FRAC 40, PHI 0d, REI 12 hrs.*
  Can be used on all cucurbit crops at 6 oz/A every 5 to 10 days, depending on disease pressure, beginning when plants are 4-6 inches high for a maximum of 30 oz or 5 applications. It must be used in a tank mix with an effective fungicide that has a different mode of action (non-Group 40 fungicide).
- **Tanos** *FRAC 11+27, PHI 3d, REI 12hrs.*
  Labeled at 8-10 oz/A for a maximum of 4 applications. Tanos must be tank-mixed with a protectant fungicide like copper, chlorothalonil or mancozeb. Follow a strict alternation with no consecutive applications of Tanos.
- **Gavel** *FRAC 22+M3, PHI 5d, REI 48 hrs.*
  Labeled for use at 1.5–2.0 lb/A every 7 to 10 days or when conditions are favorable for disease for a maximum of 8 applications.

Presidio and **Revus** are other materials that would make good choices for managing Phytophthora blight in cucurbit crops. Be aware, though, that while Phytophthora blight and cucurbit downy mildew are both caused by the same type of pathogen and thus are sensitive to similar targeted fungicides, Presidio and Revus are no longer recommended for downy mildew because that pathogen has developed resistance. These materials do still work for Pytophthora blight and are also labeled for pepper and eggplant.

For organic growers, there are several soil-applied materials labeled for use in controlling *Phytophthora* species including *P. capsici*, and while they may not work as well as targeted synthetic fungicides, they can reduce disease severity and improve yield. Dr. Mary Hausbeck at Michigan State University is a Pytophthora blight expert who has done field trials looking at efficacy of various fungicides. In 2013 she evaluated some OMRI-approved biofungicides and the results were published in the MSU Extension News for Agriculture newsletter and can be found online here. She found BioTam, Serenade Soil, and Actinovate Ag all significantly reduced plant death and increased yield relative to the untreated control Each was applied as a soil drench at the base of yellow squash plants grown on black plastic. When she used these biofungicides in rotation with a synthetic fungicide, Presidio, she got even better control, indicating these materials could be used as rotational tools in conventional spray programs.



Management of *Phytophthora* begins with prevention. Be aware, informed, and proactive. If infections occur, a program that includes multiple control strategies can reduce the pathogen population size over time.

--Written by Susan B. Scheufele, UMass Vegetable Extension.

Information from:

- Hausbeck, M.K. & K.H. Lamour. 2004. *Phytophthora capsici* on vegetable crops: research progress and management

challenges. Plant Disease. 88(12:1292-1303).

- Hausbeck, M.K., and Krasnow, C. 2014. "Watch for Phytophthora on vine crops." July 18, 2014.
- McGrath, M.T. "New Developments in Managing Phytophthora Blight in Cucurbit Crops." Vegetable MD Online, Cornell Univeristy.

Events

Save the Date! UMass Farm Tour for 4H and Families!

Join us for an evening learning about the research being conducted this year at the UMass Crop and Animal Research Farm. We will learn about activities happening on the farm including tasting vegetable crops like cucumbers and melons, learning about honeybee health, and our herd of Belted Galloway cattle. There will also be 4H education activities and a poultry demonstration. Come out and see the farm!

When: Tuesday, August 6, 2019, 3-5:30 pm, weather permitting!

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

Save the Date! 2019 UMass Vegetable Program Research Tour

Join us for an evening learning about the research being conducted this year at the UMass Research Farm, followed by dinner. Stay posted for an agenda in a few weeks!

When: Tuesday, August 20, 2019, 4-7pm

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

REGISTRATION: Please RSVP for food ordering. Click here to register for this event.

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