

What a Greenhouse Grower Needs to Know About Vegetable Diseases

Margaret Tuttle McGrath

Plant Pathology and Plant-Microbe Biology Section, SIPS, Cornell University
Long Island Horticultural Research and Extension Center
3059 Sound Avenue, Riverhead, NY 11901; mtm3@cornell.edu

The most important fact greenhouse growers producing vegetable seedlings for outdoor production need to know is that diseases developing on these plants can impact vegetable growers, even when the plants are sold to gardeners. This is because some pathogens, notably the one causing late blight, are very destructive and produce large quantities of spores capable of being dispersed long distances. Some others, notably TSWV (tomato spotted wilt virus), can infect many ornamental crops and are moved by insects. Late blight and viruses are notoriously difficult to manage. Additionally, gardeners do not have the tools to manage diseases and insects as effectively as growers, which increases the potential for problems for growers. Two recent epidemics of late blight on Long Island started with infected tomato plants in gardens (2009 and 2011).

Potential sources of pathogens of vegetable plants are seed, previous affected plantings in the greenhouse, ornamental plants, and near-by field-grown vegetable crops. Important diseases caused by pathogens that can be seed-borne include bacterial spot, bacterial speck, bacterial canker, and Septoria leaf spot of tomato; bacterial spot of pepper; and black rot of kale and other brassica crops. These pathogens are among those able to survive on planting materials (e.g. seeding trays) and/or in plant debris. Ornamental plants grown in a greenhouse with vegetables can be a source of viruses. Some viruses, notably TSWV, have large host ranges. Other ornamental plants are also susceptible to the same pathogen as some vegetables. Powdery mildew that develops on cucurbit crops such as squash is caused by the same pathogen that affects verbena. There is concern that Solanaceous ornamental plants imported from Latin American countries could harbor the late blight pathogen. In addition to infected plants being a concern, there is potential for seed of susceptible plants produced there to be contaminated because their pathogen population can produce oospores, which form from sexual reproduction. In the northeast, potato is the field-grown vegetable crop of concern for greenhouse growers. During the spring when tomato and other vegetable seedlings are being grown in greenhouses, potato is the only crop growing outdoors in the northeast that could be affected with a pathogen able to be wind-dispersed into a greenhouse (late blight). The late blight pathogen survives in potato tubers. Additional concerns are potatoes growing from unharvested tubers, cull potatoes in a compost pile, and potatoes in gardens planted with table-stock potatoes purchased at a grocery store. There are several more diseases also of concern with vegetable seedlings grown in greenhouses in the south where winter is the field vegetable production period.

While late blight is a disease that greenhouse growers need to aggressively avoid having in their tomatoes, it also provides a marketing opportunity! Late blight has occurred on garden

tomatoes in the northeast every summer since 2009. Where it will occur is difficult to predict. Gardeners who know about the destructive potential of this disease, especially if they witnessed their tomato plants die in a few days, are looking for resistant varieties. Based on evaluations conducted at LIHREC since 2012, there are several good tomato varieties available that produce quality fruit and exhibit a high level of resistance. While seed of these is being marketed by seed companies, gardeners want to buy plants. I have seen one variety for sale at a farm stand; none to be found at chain garden centers. Jasper produces cherry-type fruit that resist cracking better than others and thus can be left on the vine longer after they ripen, plus the fruit have exceptional flavor. Mountain Magic is a campari type that also has been rated highly in fruit evaluations. Mountain Merit is the best choice among red slicing types. Defiant PhR is a more compact plant. These varieties produce fruit with better taste than Iron Lady. Plum Regal is a Roma-type tomato with resistance. Other varieties worth considering that produce quality fruit are Lemon Drop (large yellow cherry), Pruden's Purple, and Wapsipinicon Peach (novelty type producing small, sweet, yellow-orange, fuzzy fruit). There are 'resistant' varieties that provide limited (Legend) or no (New Yorker and Juliet) suppression of the late blight pathogen genotype (strain) now dominant in the USA. More information is at: <http://www.extension.org/pages/72678/late-blight-management-in-tomato-with-resistant-varieties#.VRNfGkZwfsM>.

Black rot and TSWV are two diseases that have occurred on vegetable plants in greenhouses on Long Island. Black rot was observed in ornamental kale. It is caused by bacteria that can be in seed. Using seed that has been tested for the pathogen and/or treated with hot water is an important management practice. Precision equipment for hot water seed treatment is at LIHREC. Bacteria in seed can move through plants systemically. Affected plants should be discarded because they cannot be cured and will continue to develop symptoms and inoculum for healthy plants. Bacteria are moved to healthy plants in splashing water and on workers' hands and tools when plants are wet. Provide water directly to soil to avoid wetting leaves. Copper fungicides provide limited control because bacteria are difficult to control and there are copper-resistant strains. TSWV has been moved from infected ornamental plants via its vector (thrips) to tomato and pepper seedlings growing in the greenhouse. These affected plants cannot be cured. If they survive, the few fruit produced that ripen on the plant (often they drop when green) will be unmarketable due to symptoms. And these plants will be a source of TSWV for healthy plants. The best approach to take in managing TSWV and other viruses is to grow vegetable seedlings in a separate greenhouse from ornamentals, and aggressively manage viruses and insects in the ornamentals. When TSWV occurs on vegetables, discard all plants. Those without symptoms may be infected but asymptomatic and/or they may be harboring thrips with TSWV.

When growing tomato seedlings, it is especially important to be proactive and aggressive about managing late blight. Late blight is the most destructive disease of vegetable crops. This was demonstrated during the Irish Potato Famine. This disease affects tomato and potato, two important crops for conventional and organic vegetable growers, thus an outbreak can have major economic impact. The pathogen produces an abundance of wind-dispersed spores, so only a few infected plants at the start of a season can be the source for a major epidemic, as

occurred on Long Island in 2009 and 2011. Late blight is considered a “community disease” because of its highly contagious, destructive potential; therefore everyone needs to be involved in preventing epidemics. Spores typically move up to 30 miles. It takes as few as four days after infection for a new lesion to appear and spore production to start. Due to the importance of having current information about where late blight is occurring for field-grown crops, there is a monitoring program (usablight.org).

Below are steps that those producing plants for gardeners should take to protect their tomato plants. There is NO tolerance for late blight in plants for gardeners because infected tomato plants in home gardens have been important initial sources of the pathogen, leading to major epidemics for commercial producers nearby. Some gardeners do not know about late blight and many do not use fungicides. They do not have the knowledge, experience, nor tools of commercial vegetable growers.

1. Produce tomato plants where the chance of exposure to the late blight pathogen is essentially non-existent.

In areas where tomato and potato plants are killed by cold temperatures during winter, infested potato tubers continue to be the most important initial source of the pathogen each season. The pathogen is not yet able to produce a dormant spore (oospore) that can survive in the absence of living plant tissue.

Do not grow potato plants in a greenhouse complex with tomato plants. Even certified potato seed could harbor the pathogen.

Do not grow tomato plants near potatoes. There should be no potato fields or potato cull piles near a greenhouse producing tomato plants. Potato crops are planted very early in the season when tomato plants are being produced in greenhouses. Potato sprouts can become infected as they grow from a tuber harboring the pathogen. Spores produced on these plants could be dispersed by wind to nearby greenhouses.

2. Examine tomato plants regularly for symptoms.

Large brown area on stem tissue may be the first symptom on tomato plants produced in a greenhouse. The pathogen also causes leaf spots. Images are available on line at: <http://www.hort.cornell.edu/lateblight>

3. Do not grow Solanaceous ornamental plants in the same greenhouse as tomato.

There is concern they could harbor the late blight pathogen if from Latin America. This has not been documented.

4. Examine petunia and other Solanaceous ornamental plants.

A strain of the late blight pathogen able to infect petunia as well as tomato and potato was detected in a northern greenhouse several years ago. Symptoms of late blight on petunia include dead brown patches on leaves; these may develop a white growth of the pathogen under highly humid conditions. While the chance is small, there always will be the possibility that a new strain of the pathogen appears able to infect petunia or other Solanaceous ornamental plants.

5. Submit plant tissue with suspect symptoms to a plant diagnostic clinic.
6. When late blight is confirmed, destroy ALL tomato plants.

A previous attempt to save symptom-less plants was a disastrous failure. Symptoms began to develop after the retailer had sold some plants, which initiated a major epidemic.

7. Apply fungicides effective against late blight routinely as a preventive practice.

Do not use fungicides in an effort to stop an outbreak of late blight or to protect plants being grown near a potential source of the pathogen as described in Step 1.

There are no targeted fungicides for late blight specifically labeled for use in greenhouses. There is no restrictive statement preventing this use on labels of Ranman, Revus, Revus Top, Curzate, and Gavel. Dithane is a protectant fungicide that can be used with these; not needed with Gavel which is formulated with mancozeb. Forum, Presidio, and Ridomil Gold fungicides are prohibited from use in greenhouses.

8. Help educate gardeners purchasing tomato plants by providing information about late blight.

They should understand that it is important to detect and destroy infected plants. An information pamphlet for distribution to gardeners is available at LIHREC and at: <http://usablight.org/node/50>

Updated February 2015