

Managing Late Blight in the Organic Tomato Crop

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Some of the information in this fact sheet was provided by Dr. Ruth Genger, University of Wisconsin Plant Pathology, Dr. Dennis Halterman, University of Wisconsin Plant Pathology, Mr. Adrian Barta, Wisconsin Department of Agriculture, and Dr. Margaret Tuttle McGrath, Cornell University Plant Pathology.

Disease Description & Status of Disease in WI: Late blight is a potentially destructive disease of tomatoes (and potatoes) caused by the fungal-like organism, *Phytophthora infestans*. This pathogen is referred to as a ‘water mold’ since it thrives under wet conditions. Symptoms of tomato late blight include leaf lesions beginning as pale green or olive green areas that quickly enlarge to become brown-black, water-soaked, and oily in appearance (Figure 1). Lesions on leaves can also produce pathogen sporulation which looks like white-gray fuzzy growth (Figure 2). Stems can also exhibit dark brown to black lesions with sporulation (Figure 1). Fruit symptoms begin small, but quickly develop into golden to chocolate brown firm lesions or spots that can appear sunken with distinct rings within them (Figure 2); the pathogen can also sporulate on tomato fruit giving the appearance of white, fuzzy growth. The time from first infection to lesion development and sporulation can be as fast as 7 days, depending upon the weather. In Wisconsin, late blight has not been identified on tomatoes or potatoes since 2002. As of today, September 16, 2009, we have confirmed reports of tomato late blight in 19 WI counties: Dane, Rock, Sauk, Racine, Portage, Waukesha, Waupaca, Jefferson, Green, Iowa, Walworth, Lafayette, Marathon, Bayfield, Richland, Dodge, Washington, Kenosha, and Columbia. Reports have come in from home gardeners and larger commercial operations (both organic and conventional). During the month of August, there was an increase in both the severity of tomato late blight and in the geographic area impacted by the disease. However, in the first few weeks of September, we have had very warm and dry weather conditions which have greatly reduced the activity of the late blight pathogen. In some severely infected tomato fields, we are now seeing some new, green, and healthy growth in the upper plant canopy. Although it looks like the plant has overcome the disease, it is likely still present in the plant tissue and under ideal weather conditions (cool and wet) can cause a late blight flare up. It is important to protect this new growth with fungicides if you plan to keep the plants going for several more weeks. We have had isolated reports of late blight on potato in four counties, Columbia, Portage, Dane, and Marathon. We know that the strain of *Phytophthora infestans* isolated from Dane County tomato and Columbia County potato is type US#14 which is known to be aggressive on potato, of the mating type A2, and resistant to the conventional fungicide metalaxyl. Although the late blight pathogen has the potential to infect other plants in the Solanaceae family (which includes tomato, potato, pepper, eggplant, nightshade weeds), we have only seen late blight on tomato and potato in WI at this time.

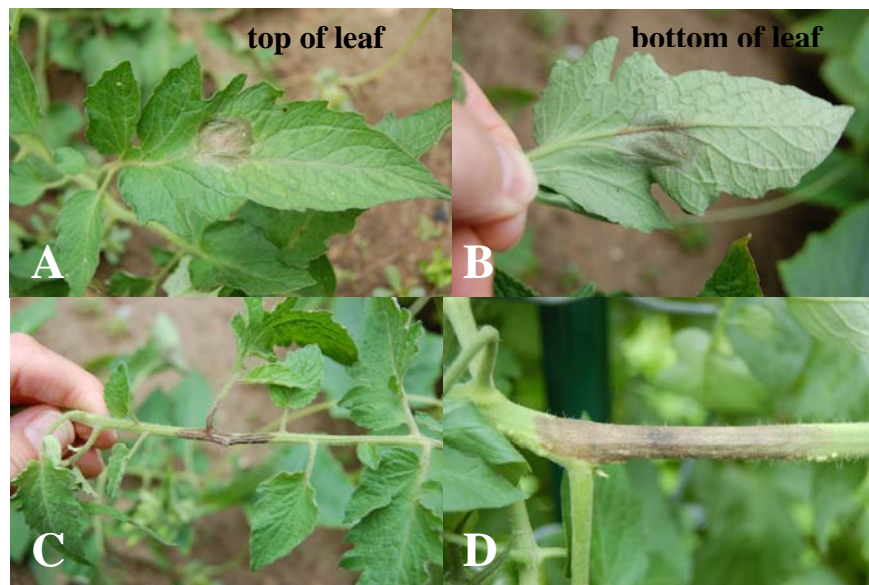


Figure 1. Symptoms of late blight on tomato leaves and stems.

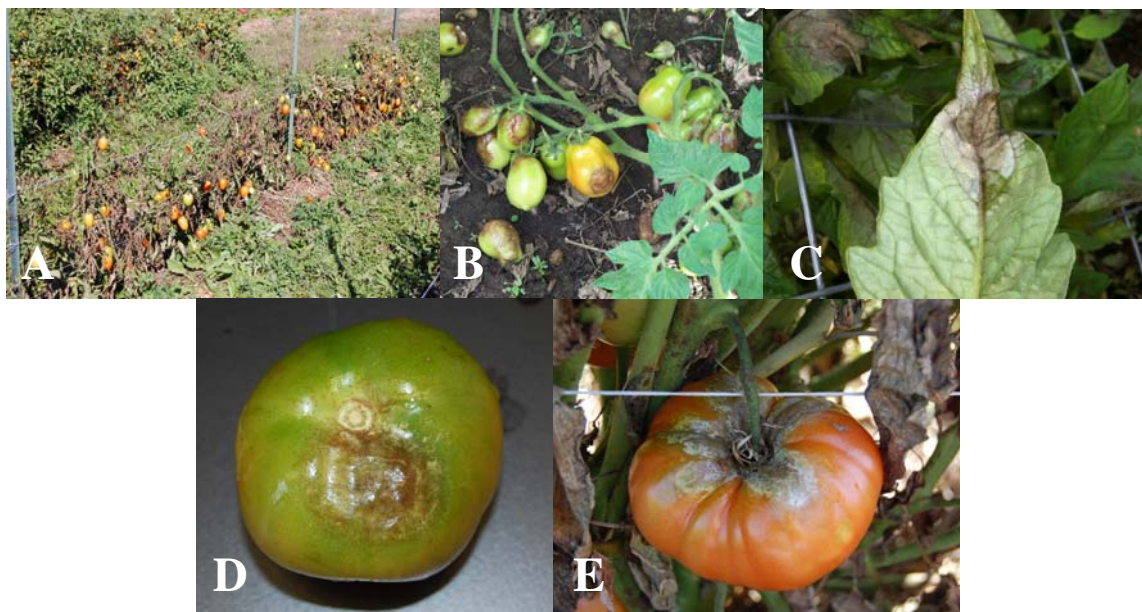


Figure 2. Symptoms of tomato late blight on tomato leaves and fruit. A. Entire row of plum tomatoes with dead foliage due to late blight. B. Brown, firm, late blight lesions on 'Roma' tomato fruits (Photo credit: Dorothy Krause, Marlborough Park Community Gardens, Dane Co.). C. Late blight lesion on tomato leaf. Note brown, water-soaked lesion with white pathogen sporulation (Photo credit: Joe Bollman, UW Extension Columbia Co.). D. Close up of brown, firm, late blight lesion on green tomato fruit. E. Sporulating late blight lesion around

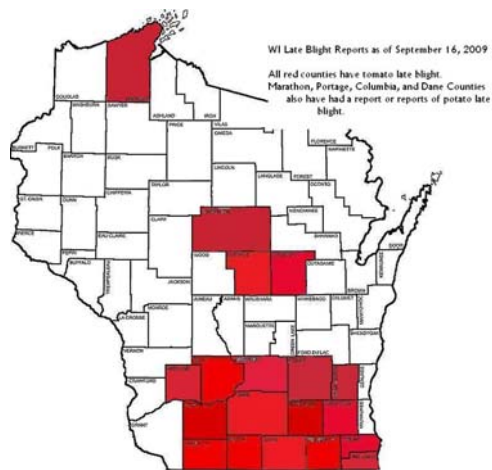


Figure 3. Wisconsin counties with late blight as of September 16, 2009. Red counties indicate presence of late blight on tomato. Marathon, Portage, Columbia, and Dane Counties also have had reports of potato late blight.

Management: Once late blight has moved into a region, it is critical that tomato plants be protected prior to first infection. Although there are several fungicides that are approved for organic use to control tomato late blight, only coppers are most effective if applied before initial infection and applied repeatedly. Copper products must be present on new foliage in order to have a protective, disease-slowng effect, so repeat sprays are necessary. Little disease control can be had when copper applications are made only after disease onset. A recent study compared copper and non-copper containing organic-approved fungicides (such as Sonata, Serenade, and Oxidate) for late blight control on potato. Results from replicated trials showed that the best organic-approved fungicide for potato late blight control was copper (Dorn, et al. 2007. Control of late blight in organic potato production: evaluation of copper-free preparations under field, growth chamber, and laboratory conditions. Eur. Journal of Plant Pathology 119:217-240). OMRI-approved copper products are listed below.

Copper product (OMRI approved)	Manufacturer
Britz Copper Sulfur 15-25 Dust	Britz Fertilizers, Inc.
Champ WG	NuFarm Americas, Inc.
COC WP	Albaugh, Inc.
Concern® Copper Soap Fungicide	Woodstream Corp.
CSC Copper Sulfur Dust Fungicide	Martin Operating Partnership, L.P.
Cueva Fungicide Concentrate	W Neudorff GmbH KG
Cueva Fungicide Ready-To-Use	W Neudorff GmbH KG
Lilly Miller® Cueva™ Copper Soap Fungicide Ready-To-Use	Lilly Miller Brands
Nordox® 75 WG	Nordox AS
Nu Cop® 50 WP	Albaugh, Inc.
PHT Copper Sulfur Dust	J.R. Simplot Company
Ready-To-Use Worry Free® Brand Copper Soap Fungicide	Lilly Miller Brands
Basic Copper 53	Albaugh, Inc.
Copper Sulfate Crystals	Chem One, Ltd.
Quimag Quimicos Aguila Copper Sulfate Crystal	Fabrica de Sulfato El Aguila, S.A. de C.V.

Frequently asked questions

Where did this late blight come from?

Based on symptoms, timing of appearance of symptoms, and spread of this disease in WI, it is likely that inoculum (source of spores for late blight infection) entered the state on air that had moved into WI from other nearby states with reports of late blight on tomato and potato. The late blight pathogen produces a lot of spores on infected plants and spores can move in air up to

40 miles. Many states have experienced late blight epidemics on tomatoes and potatoes this season. Such states include: NY, ME, SC, NC, MD, VA, NJ, PA, OH, MI, IN, IL, WI, and ND.

Where can I find more information on tomato late blight symptoms and management?

<http://www.extension.org/article/18351>

<http://www.extension.org/article/18361>

<http://www.attra.org/attra-pub/lateblight.html>

<http://www.plantpath.wisc.edu/wivegdis/>

How do I destroy and/or dispose of my late blight-infected tomato plants?

There are several methods of destroying infected plants: 1) pull up plants by the roots, bag, leave in the sun for a few days for plant and pathogen to die, and put out for trash pickup. This method is OK for a few plants. 2) For many infected plants, plants can be cut at the base and allowed to die in place. Once plants are dead, you can go in and remove stakes, strings, and plastic and dead plant material can be incorporated into the soil. Shallow incorporation of debris is recommended to avoid creating a warm, sheltered environment which would keep the plant tissue and pathogen alive for extended periods of time beneath the soil surface. 3) Plants can be flame-killed with a propane or other torch; and 4) infected plants can be pulled and placed in a small pile covered over with a dark colored plastic tarp and left in the sun. This will create heat in the pile from the sun beating on the plastic tarp and plants will die within a few days. The winter will provide an excellent freeze kill for exposed infected plants. Do not compost late blight infected plant material, as many piles may have warm centers that can allow plant material and the pathogen to remain viable. The goal is to kill the plants and this will kill the pathogen.

Are tomato fruits from late blight infected tomato plants safe to eat?

Healthy-appearing fruit from late-blight-infected tomato plants are safe for human consumption. If they have been infected, but aren't yet showing symptoms, they won't keep in storage. There are some concerns about canning infected fruit because bacteria can enter late-blight infected fruit and impact quality. UW-Extension food science extension specialist, Dr. Barbara Ingham recommends avoiding canning tomatoes that exhibit late blight infection. Further information can be found at: <http://www.uwex.edu/news/2009/9/tomatoes-and-potatoes-infected-with-late-blight>.

How fast will late blight infected tomato plants die?

This depends upon how many points of infection the plant received, the cultivar (some cultivars are more susceptible than others), the history of use of protectant fungicides (such as copper), and on the weather. Hot, dry, sunny weather typically holds back late blight; whereas cool, rainy, overcast weather will cause late blight to progress rapidly killing the plant in 7 to 10 days.

I have tomato late blight in my garden – will I get it next year if I plant tomatoes again?

The strain of the late blight pathogen that we currently have in WI cannot survive outside of living plant tissue. Our strain or 'type' of late blight is US#14 which is known to be an A2 mating type. What does this mean? Much like we have male and female 'mating types' in humans, the late blight pathogen requires an A1 and A2 mating type to be present together to form persistent, overwintering, long term spores (oospores). Oospores can persist in soil for many years. However, without a compatible mating type in WI (we do not have any A1 strains), there are no oospores produced and there is no risk of this season's late blight residing in the soil over winter. To reiterate, the late blight pathogen that we currently have in WI will not overwinter in the soil on its own. It requires living plants or plant parts to remain viable and

infective. Therefore, it is critical to kill infected tomato plants and plant parts such as fruit. Potato tubers can also serve as a source of overwintering inoculum and should also be destroyed if found to be infected with the late blight pathogen.

Can late blight be seedborne in tomatoes?

Generally, the late blight pathogen is not considered a seedborne pathogen in tomato.