

## **Managing late blight in the organic tomato or potato crop**

*Report June 21, 2010*

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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 & 3). Lesions on leaves can also produce pathogen sporulation which looks like white-gray fuzzy growth (Figure 2&3). 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.

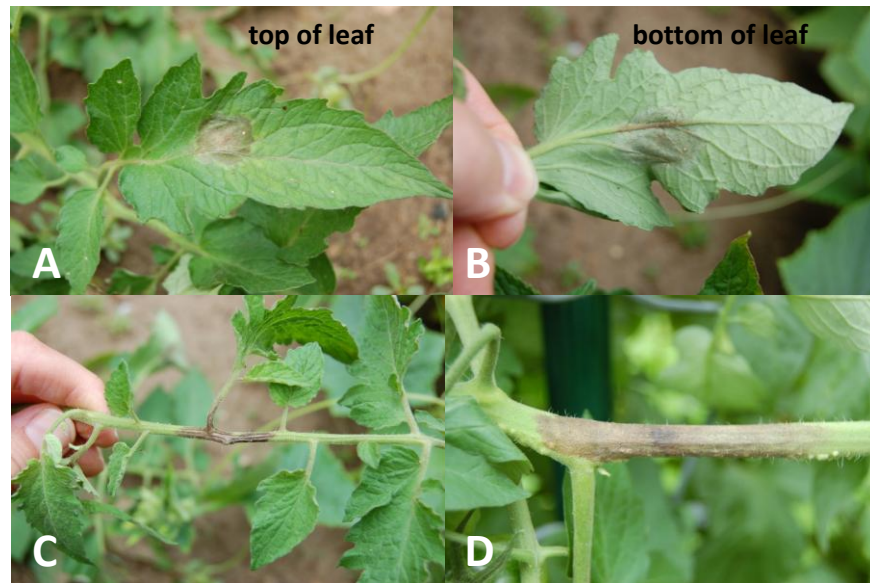
As of June 21, 2010, late blight has not been identified on tomatoes or potatoes in Wisconsin. However, confirmed late blight reports have emerged from LA, MD, PA, KY, southern Manitoba, Canada, and most recently NY and CT. All reports, to date, have been on tomato. Our recent wet weather encourages the infection and spread of late blight, should inoculum (spores of the pathogen) be present.

We started the 2010 growing season with a moderate risk of late blight. Following the 2009 season in which late blight was present, we had a winter with early snow cover, providing protection to potatoes remaining in the field, and an early season with volunteer potatoes growing in fields where potatoes were grown last year. Growers have been very careful to plant disease-free seed, to destroy cull potatoes prior to new crop emergence, and to control volunteers. Other potential sources of late blight in WI come from overwintered infected tomato plants, and inadvertent planting of infected seed saved from 2009.

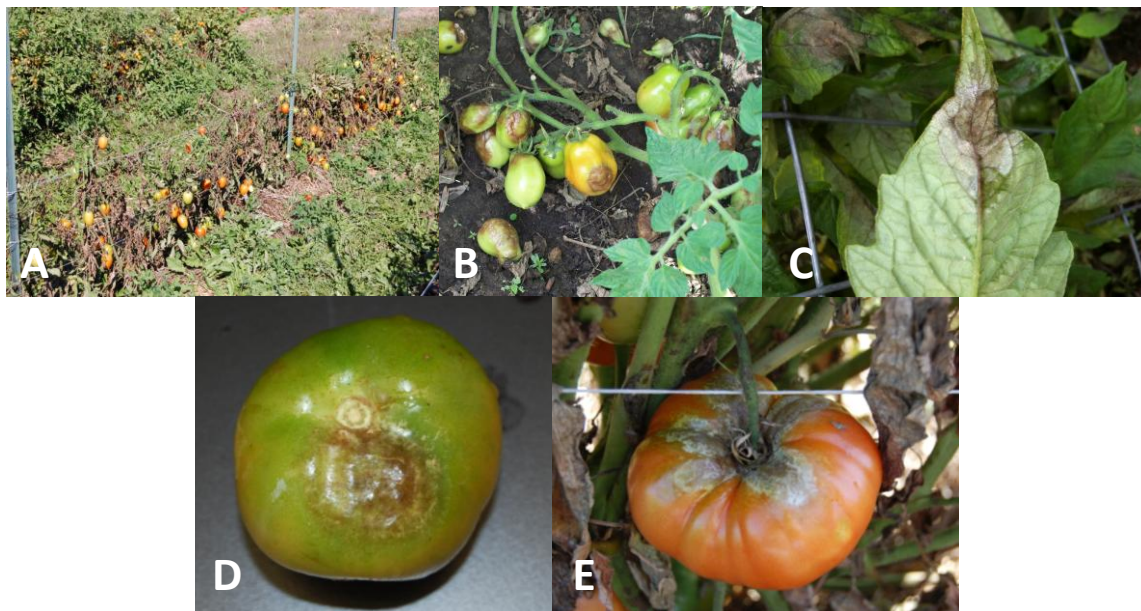
We know that the strain of *Phytophthora infestans* isolated from tomatoes and potatoes in 2009 was type US#22 which was new in 2009, and was aggressive on tomato. US#22 can also infect potato. This winter, we learned that the isolates were sensitive to the fungicide active ingredients mefenoxam and metalaxyl (Ridomil products), and that one of the isolates did not cause disease on pepper, eggplant, or tomatillo. We do not yet know what types of late blight have been identified in the U.S. this season, but all finds have been, so far, on tomato.

Disease severity values or DSVs are used to determine environmental risk for disease development and are based on minimum/maximum air temperatures and the duration of relative humidity periods above 90% for each 24 hour period. A field begins to accrue DSVs at time of

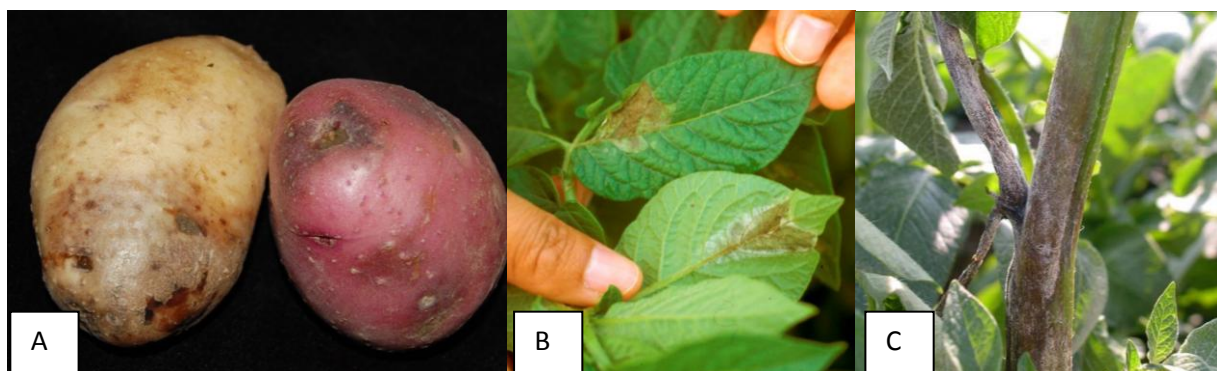
emergence or transplant and an individual day can accrue up to 4 DSVs. When 18 DSVs have accumulated, research has shown that environmental conditions will favor late blight. We compute DSVs for several potato and tomato locations in Wisconsin, and at this time all but late emerging potato fields in southern WI have accumulated 18 DSVs or greater. This threshold indicates a critical time for the application of protectant fungicides.



**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. C. Late blight lesion on tomato leaf. Note brown, water-soaked lesion with white pathogen sporulation. D. Close up of brown, firm, late blight lesion on green tomato fruit. E. Sporulating late blight lesion around the stem and shoulders of a ripening tomato fruit.



**Figure 3.** Symptoms of potato late blight. A. dark brown to purple discoloration on tubers, B. brown water-soaked sprulation on leaves with white pathogen sporulation, and C. brown water-soaked lesions on stems with prolific white pathogen sporulation.

**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-slowing 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 (list compiled by Dr. Ruth Genger, Plant Pathology, University of Wisconsin on May 21, 2010 - Highlighted products have been available in previous years from Wisconsin agricultural product suppliers).

Company	Product (active ingredient)	Company contact details
Albaugh, Inc.	Basic Copper 53 (Copper Sulfate)* <b>COC WP (Coppers – fixed)**</b> <b>Nu Cop® 50 WP (Coppers – fixed)**</b>	Mr. Mark Blume Phone: (515) 964-9444
Britz Fertilizers, Inc.	Britz Copper Sulfur 15-25 Dust (Coppers – fixed)**	Mr. Tim Brown www.britzfertilizers.com timb@britzinc.com
Chem One, Ltd.	Copper Sulfate Crystals (Copper Sulfate)*	Dr. Sue Palmer-Koleman www.chemone.com sue@chemone.com
Fabrica de Sulfato El Aguila, S.A. de C.V.	Quimag Quimicos Aguila Copper Sulfate Crystal (Copper Sulfate)**	Julie Horton jhorton@landisintl.com Phone: (229) 247-6472 Fax: (229) 242-1562
Isagro USA	Badge® X2 (Coppers – fixed)**	Dr. Dennis Krass dkrass@isagro-usa.com
J.R. Simplot	PHT Copper Sulfur Dust (Coppers – fixed)**	Mr. Richard Nelson

Company		www.simplot.com rknelson@simplot.com Phone: (208) 672-2871
Lilly Miller Brands	Ready-To-Use Worry Free® Brand Copper Soap Fungicide (Coppers – fixed)**	Mr. Chuck Yeager lillymiller.com cyeager@central.com Phone: (925) 948-3900
Martin Operating Partnership, L.P.	CSC Copper Sulfur Dust Fungicide (Coppers – fixed)**	Ms. Christi Cooley www.martinmidstream.com christi.cooley@martinmlp.com TollFree: (800) 231-4595 Phone: (903) 983-6287
Nordox AS	NORDOX 30/30 WG (Coppers – fixed)** Nordox® 75 WG (Coppers – fixed)**	Mr. Asbjørn Strømberg www.nordox.no marketing@nordox.no Phone: +-472-297-5018
NuFarm Americas, Inc.	<b>Champ WG (Coppers – fixed)**</b>	Ms. Mary Beth Endres www.ag.us.nufarm.com maryb.endres@us.nufarm.com TollFree: (866) 241-0611 Phone: (630) 455-2000
The Ortho Group	Ortho® ecosense™ brand garden disease control (Coppers – fixed)**	Liz Sonnenberg liz.sonnenberg@scotts.com Phone: (937) 578-5644
W Neudorff GmbH KG	Cueva Fungicide Concentrate (Coppers – fixed)** Cueva Fungicide Ready-To-Use (Coppers – fixed)**	Mr. Cameron Wilson www.neudorff.com cam@neudorff.ca Phone: (250) 652-5888
Woodstream Corporation	Concern® Copper Soap Fungicide (Coppers – fixed)**	Mr. Mark Mongiovi www.woodstream.com mmongiovi@woodstream.com TollFree: (800) 800-1819 Phone: (717) 626-2125 x 219

*\*For use as an algicide in aquatic rice systems and for tadpole shrimp control in aquatic rice systems; use is not to exceed one application per field during any 24-month period. Application rates are limited to those which do not increase baseline soil test values for copper over a time frame agreed upon by the producer and accredited certifying agent. When used for plant disease control must be used in a manner that minimizes accumulation of copper in the soil. May be used as an algicide, insecticide, or disease control if the requirements of 205.206(e) are met, which requires the use of preventative, mechanical, physical, and other pest, weed, and disease management practices.*

*\*\*May be used for plant disease control if the requirements of 205.206(e) are met, which requires the use of preventative, mechanical, physical, and other pest, weed, and disease management practices. Must be used in a manner that minimizes copper accumulation in the soil and shall not be used as herbicides.*