Organic Management of Late Blight in Potato & Tomato

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Late Blight in Kentucky

Published by Michael Bomford at 2:49 pm under Farm Topics, News

University of Kentucky plant pathologist Dr. Kenny Seebold distributed a worrisome announcement to county agents yesterday:

"I had a chance to look around the Lexington area this weekend, and had no trouble (unfortunately) in finding late blight on tomato seedlings. I went to 12 retail outlets, and was able to find the disease on M1-grown plants, as well as those from another supplier. That's just in Fayette, Clark, and Scott Counties! So you know there's a bunch out there, and that many plants have been bought and planted. This could be a big mess, depending on what type of weather we have this summer. The safest thing to do is to advise any and all tomato growers that we have late blight in KY, and that being on spray program is the way to go this season.

I've attached a few images of how late blight might look on a tomato seedling. Please take a look, and let me know if you have any questions.

Late blight is not a common disease for us in KY, and we expect to see it much later in the year. However, this now marks the second year in a row in which this disease has appeared much earlier than usual. Last year, we suffered the most severe outbreak of late blight that we've ever recorded.

Late blight lesion on potato leaf. Photo by Lane Selman, Oregon State University. Click image to visit extension article on organic late blight management.
Late Blight – Why Worry?

• Cause of Irish Potato Famine
  – 1 million starved
  – 2 million left Ireland

• Serious problem before effective fungicides introduced in 1970s

• Became a serious problem again when second mating type appeared in late 1980s
Late blight is not usually a problem in Kentucky…

… until 2009

• Cool
• Wet
• Diseased plants from distant nurseries
• Boom in home gardens

What will 2010 bring?

May 31st, 2010, Lexington, KY
Disease Triangle

Hosts
- Major
  - Potato
  - Tomato
- Minor
  - Eggplant
  - Pepper
  - Hairy nightshade
- Not tobacco

Ideal environment
- Night: 50-60°F with light rain, fog or heavy dew
- Day: 60-75°F and humid
- Wet leaves
Late blight reproductive structures

- *Phytophthora infestans* is an oomycete
  - Used to be considered a fungus; now thought to be more closely related to algae and diatoms
  - Sexual and asexual reproduction
  - Zoospores that swim with flagella

Nicholls H: *Stopping the Rot*. PLoS Biol 2/7/2004: e213. [http://dx.doi.org/10.1371/journal.pbio.0020213](http://dx.doi.org/10.1371/journal.pbio.0020213)
Phytophthora infestans life cycle

Asexual cycle:
- Mycelium
- Parasitic growth
- Sporulation
- Survival
- Chlamydospore (2n)
- Zoospores (2n)
- Sporangium (2n)

Sexual cycle:
- Mating
- Oogonium (1n)
- Antheridium (1n)
- Oospore (2n)
- A1 (2n)
- A2 (2n)

Dispersal and host invasion:
- Encystment
Late blight
- Unusual in Kentucky most years
- Infects leaves, stems, tubers, fruit
- Caused by oomycete, *Phytophthora infestans*
- ‘Water-soaked’ lesions
- Very rapid spread, kills whole plant
- Post-harvest rot

Early blight
- Common in Kentucky most years
- Infects leaves, fruit
- Caused by fungus, *Alternaria solani*
- Lesions with ‘growth rings’
- Causes lower leaves and branches to drop
- Harvested fruit and tubers are OK
Organic Management

• Seed selection
  – Resistant potatoes
    • Defender (russet, brown skin and white flesh)
    • Jacqueline Lee (round, yellow skin and flesh)
    • Ozette (fingerling, white skin and flesh)
  – Less susceptible potatoes
    • Kennebec, Elba, Onaway, Rosa, Sebago
  – Use certified seed

• Resistant tomatoes
  • Stupice, Juliet, Matt’s Wild Cherry
  • Disease not spread by tomato seed
Organic Management

- Site selection
  - Good air movement
  - Not shaded
  - Well-drained
  - Far from last year’s potatoes or tomatoes
  - Far from cull piles
  - Far from hairy nightshade
Organic management

• Avoid wet leaves
  – Use drip irrigation to **water soil, not leaves**
  – Ventilated high tunnels can dramatically reduce leaf wetness (no rain)
  – Row covers can increase leaf wetness by reducing air movement and trapping water between leaf and cover
Organic management

- Encourage air circulation
  - Wide rows, oriented with prevailing winds
  - Intercrop with non-host plants or resistant varieties
  - Stake and sucker tomatoes
  - Manage weeds
  - Avoid excess N
Approved fungicides

• Brand name of product must be in organic farm plan, or certifier must approve plan revision

• Fixed copper
  – Allowed with restrictions
  – Very effective protectant, not eradicant (must apply before infection)
  – Requires complete leaf coverage
  – Washes off in rain
  – General biocide; does not break down in soil; banned in Denmark and the Netherlands

• Other fungicides allowed, not as effective
  – Oxidate (hydrogen dioxide), Sonata (*Bacillus pumilus*), compost teas, Sporan, Sporatec

Data from Oregon State University Participatory Organic Potato Project, 2007 [http://ospud.org/materials_for_late_blight_management](http://ospud.org/materials_for_late_blight_management)
Advice from Dr. Jeanine Davis, NCSU organic specialist, 2009

• “The key to using these products [copper, Serenade, Sporatec, etc.] successfully is they must be applied BEFORE you have an infection…”
• “You need to get excellent coverage of the foliage. A powered mist blower works great…”
• “Spray frequently. If you spray and it rains an hour later and washes it all off, spray again…”
• “The organic growers here who went on a five day spray schedule with a good power mist blower, used copper every other spray, and alternated that with Sporatec, Serenade, and/or Sonata seemed to hold it back pretty good. The amount of control was very variety dependent. Some growers included an Oxidate spray in there, too. At the research station we've been using Serenade + copper for one spray and then Sporatec + Neem in the next. It's done a pretty good job for us…”
• “Remember to read the labels for any product you spray, and pay attention to any restricted entry intervals and preharvest intervals. For example, following copper sprays, you are not to re-enter the field for 24 hours unless wearing the specified protective equipment…”
• “Remember not to work your plants when they are wet, and clean your tools and picking buckets. Do everything you can not to spread disease from plant to plant…”
• If you already have some infection, remove affected leaves and keep spraying…”
Resources

- **eXtension.org**
  - Organic Management of Late Blight of Potato and Tomato (Phytophthora infestans)
  - [http://www.extension.org/article/18361](http://www.extension.org/article/18361)

- **ATTRRA**
  - Organic Alternatives for Late Blight Control in Potatoes

- **KSU Organic Agriculture Working Group**
  - [http://organic.kysu.edu](http://organic.kysu.edu)
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