

# **Late Blight of Tomato and Potato: Frequently Asked Questions**

## **By Gardeners, Growers, & Consumers (2009)**

*Prepared by:* Margaret Tuttle McGrath, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, Long Island

It is more likely possible to save plants in a garden if when the first symptoms are found:

1. There are very few.
2. They are on the leaves and not stems.
3. The garden has been inspected very thoroughly on a freque



### **13. What should be done with affected plants when late blight cannot be controlled?**

Affected plants should be promptly destroyed to minimize the potential for them being a source of spores for other plantings. Growers can kill them with a very fast-acting herbicide like diquat (glyphosate is too slow). Plants can be pulled out and put in a garbage bag (suitable for small plantings) or either piled and covered with a tarp or buried deeply. The best time to pull plants is a sunny day because UV radiation can kill spores dislodged in the process, but don't wait several days for this to occur. Leave the bagged plants for a few days in a sunny spot so heat will build up inside and kill the plants before they are put out with trash. Heating will also occur under a tarp. The late blight pathogen cannot survive in dead plant tissue, unless oospores are formed. Oospores are unlikely to be present because formation requires interaction between individuals of the pathogen (aka isolates) of opposite mating type (equivalent of male and female). All isolates tested so far have been the same mating type. The pathogen can survive in potato tubers because these are living; therefore, destroying affected tubers is extremely important.

### **14. Can plants with late blight be disposed of by composting?**

Yes if done correctly. Considering the potential impact of not composting correctly, especially with potato plants that have tubers, it is prudent for home gardeners to bag and trash the plants (see previous question). Plants should not just be dumped on a compost pile. Either cover with a tarp or bury them so that there is not an opportunity for spore production and dispersal by wind to another planting or farm before the plant tissue completely dies. Based on results from a laboratory study, temperatures above 115 F, which commonly occur in proper compost piles, are adequate to kill even the pathogen's most durable type of spore (oospore) within 2 hours. Oospores are unlikely to be present because formation requires interaction between individuals of the pathogen (aka isolates) of opposite mating type (equivalent of male and female). All isolates tested so far have been the same mating type.

Guidelines have been developed on composting cull potato tubers for commercial operations:  
<http://www.umaine.edu/umext/potatoprogram/Fact%20Sheets/Composting%20Cull%20Potatoes.pdf>.

### **15. Are there any health issues from breathing spores of the late blight pathogen such as could happen when pulling up affected plants?**

None known. There is one scientist who has been studying late blight for many years and is a good test case for health issues since he is allergic (asthmatic) by inhalation to flour, as well as components of livestock feed and hay. He has not experienced any health issues from inhaling large quantities of spores over more than 30 years (1973 to 2007), nor has anyone who has worked with him during all those years. No published scientific study has been conducted on this specific issue, however. Anyone concerned about breathing spores could wear a dust mask to reduce exposure.

### **16. Could the late blight pathogen survive on tomato cages and stakes between seasons?**

No. Therefore it is not necessary to discard or even disinfect the cages or stakes to manage this disease. Stakes and cages should be disinfected however, especially if bacterial diseases also developed in the planting.

### **17. Could the late blight pathogen survive in soil between seasons?**

Unlikely except in affected potato tubers. This is an obligate pathogen that is thought to only be able to survive in living plant tissue in the northeastern U.S. It can produce a specialized structure (oospore) that would enable it to survive without living plant tissue, but this requires that the pathogen reproduce sexually which it is not thought to be able to do in the northeastern U.S. So far only one "mating type" has been found in the northeast. This is the term used for the pathogen's equivalent of male/female. Thus the pathogen has only been able to reproduce asexually. The characteristic white growth that develops on late blight affected tissue contains many asexually-produced spores. Both mating types have been found in Florida.

### **18. Could the late blight pathogen survive between seasons on perennial weeds that it is able to infect (e.g. bittersweet nightshade and hairy nightshade)?**

No. This is an obligate pathogen that needs living plant tissue to survive. It only infects foliar tissue of weeds. Since the pathogen cannot infect roots, it cannot survive on weeds in areas where foliage is killed by cold temperatures. In the Northeast, potato tuber is the only plant tissue it is able to survive in.

### **19. Could the late blight pathogen survive in or on tomato seed?**

No. Fortunately this pathogen is not able to get inside seed and it does not produce a type of spore that is able to survive the dry conditions on the outside of a seed. Thus there is no concern that late blight will develop as a result of growing plants next year from seed that were in tomato fruit affected by late blight. There are other pathogens that can be in or on seed, however, thus there are other reasons to use seed from healthy plants.

## **20. Could tomatoes and potatoes become affected by blight after they are harvested?**

Yes. Tomatoes and potatoes can be infected but appear healthy. Additionally, the pathogen can spread in a moist environment from affected to healthy tomatoes and potatoes. Produce from affected plants should be checked regularly and not kept long to avoid losses. Consumers should be aware that the shelf life may be shortened.

## **21. Could marketing affected tomatoes and potatoes be a means of spreading the late blight pathogen?**

Yes, especially if the affected produce is discarded on a compost or cull pile near tomato or potato plants. This is primarily a concern with potatoes. Consumers should be instructed to put affected tissue into the trash rather than the compost.

## **22. Are the unaffected parts of blighted tomatoes and potatoes safe to eat?**

Yes the unaffected parts probably are safe to eat. Tomato sections without blight symptoms likely do not pose a health risk to the consumer. They may not look appetizing and will have an off flavor. However, no published scientific study on this specific issue was found to confirm this conclusion. On the other hand, there also have been no reports of a health problem possibly associated with consuming tomatoes or potatoes affected by late blight to warrant such a study. One study documented no association with birth defects. Late blight has been affecting tomato and potato plants for a long time, and there have been years when several crops were affected due to lack of adequately effective control measures. Thus there might have been enough consumption over the years for any problem to be revealed. Additionally, there is a story that someone ate blighted potatoes many years ago to dispel the myth that blight was associated with typhoid.

The conclusion that unaffected tissue is safe to consume if diseased sections are adequately removed is based on several points. This pathogen does not produce a toxin that can make people sick, as a few plant pathogens can do. Plant pathogens cannot infect people. No food safety issues have been found with other diseases that affect tomato fruit or potato tubers. Late blight appears to be like other more common diseases, e.g. anthracnose on tomato fruit and pink rot of potato (which incidentally is caused by *Phytophthora erythroseptica*, a pathogen related to that causing late blight), in that these do not appear to affect plant tissue beyond the area of infection. Many home gardeners likely often cut off diseased tissue rather than throw out the entire fruit or tuber having found the healthy appearing part of these to taste fine. To date, this practice has not been associated with any human health issues. Diseases like late blight and anthracnose are not considered a health concern for commercial tomato processing. Fruit are sorted to remove affected ones, but this is because of the impact on fruit quality. For home canning, only

determining human toxicity and the amount of residue present when a product is applied the maximum amount according to the label (highest rate and maximum number of applications). Product efficacy is not a component of the decision.

#### **24. Why is there residue on organic tomatoes? Is it safe?**

Growers producing organically also need to protect their crops from late blight this year for which there are fungicides that have been approved for organic production. Yes tomatoes with residue are safe. See also previous question.

Copper probably is the main fungicide being used for managing late blight organically. The residue is often bluish. This reportedly is one of the easiest fungicide residues to remove from produce. Additionally, it is only on the fruit surface since it is strictly a contact fungicide and cannot get inside of the fruit as can occur with some conventional fungicides. Copper fungicides are now undergoing the routine re-registration process with EPA that occurs every 15 years for all pesticides. There are no human toxicity concerns associated with produce treated with copper fungicides and, while there is a defined concentration range for these fungicides that can be used for an application, there are no restrictions on the total amount that can be applied to a crop over a season.

Copper is a natural element that is an essential trace mineral for humans and all other organisms that need oxygen (aka aerobic). Many vital human bodily functions are dependent upon copper. It is needed for development and performance of several human systems (nervous, cardiovascular, immune, and reproductive systems plus skin and bone). It plays a role in protecting against cancer and heart disease. The National Research Council recommends 1.5 to 3 mg of copper per day for adults to avoid copper deficiency; an RDA has not been established. There are few toxic effects from copper. Daily intake of copper exceeding 20 milligrams can cause vomiting. However, individuals with Wilson's disease, an inherited genetic disorder, need to watch their copper consumption because their bodies are unable to properly excrete copper and it can accumulate to levels that lead to liver disease and mental retardation.

#### **25. What crops can be grown immediately after tomatoes or potatoes are lost to late blight?**

The only crops you wouldn't want to plant are tomatoes or potatoes, which typically it will be too late for anyway. Since the pathogen has a limited host range and cannot survive as a saprophyte on dead plant tissue, it does not matter what is planted immediately after crops lost to late blight. Crops most likely to be successful planted in mid to late summer are those that quickly produce something edible and grow well in cool, fall weather. Spinach, lettuce and other leafy greens are good options. Where harvesting of individual leaves can be done, these crops can begin yielding produce quite quickly. Peas also do well under cool temperatures, but might not produce many pods before a killing frost.

#### **26. Are there resistant varieties?**

There are some potato varieties described as having some resistance. These , these crops g lude Elba, Kenneodi, Alleg(. Si), Sebago,r