



Northeast Organic Farming Association of Vermont

An organization of farmers, gardeners, and consumers working to promote an economically viable and ecologically sound Vermont food system

Late Blight: Guidance for next year's garden

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Phytophthora Infestans or late blight, the disease in the 1840's that destroyed the Irish potato crop that led to a terrible famine and mass immigration, infected potatoes and tomatoes in many of Vermont gardens and farms this summer. Late blight doesn't over winter in Vermont. It enters the state by either blowing in on southern storms from infected areas or traveling into the state on infected plants. In 2009, late blight came into the state on infected plants sold at big box stores and on storm fronts. Many people have asked what they can do to help prevent late blight problems next year. An understanding of the disease will help you decide which management practices you can use in your garden.

Late blight is a fungal disease that attacks potato and tomato plants, which are its main hosts, along with a few Solanaceous weeds. Fungal diseases produce spores which can travel many miles. When the spores land on their host, and there is moisture, they germinate, grow, and produce dark-colored, nickel-size lesions on the plant which kills the tissue (see photos 1 to 3 below and photo galleries in resources). If you see white fuzz or a fuzzy cast around the lesion, these are the fruiting structures producing spores that the wind will carry to other plants. One lesion can produce 100,000 to 300,000 spores per day!

Late blight infects potato tubers when the spores are carried through the soil to them by soaking rains. Late blight thrives in the cool, high-moisture conditions we had this summer, which provided long periods of leaf wetness and cool temperatures of between 50-80°F. This fungus requires living tissue to survive and spread. It does not survive on dead tissue, black plastic or stakes—remember this is not true for many other fungal or bacterial diseases!

Late blight spores, and infected tissue and tubers are not known to survive freezing winter temperatures. If infected potatoes do not freeze, they can over-winter in soil or compost piles. When infected potatoes sprout in spring, the diseased plants are ready to produce the spores and spread the disease. Although late blight spores do not over-winter, many other tomato and potato diseases do survive winter. Focus your garden clean-up on good overall disease management centered on late blight.



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Your garden clean-up this fall should ensure that all blighted tissue and tubers are completely destroyed. You can destroy any infected potatoes by the following means: burying them at least 2 feet deep, burning, freezing, chopping them up before you compost them, feeding them to livestock, or turning all dead blighted tomato and potato foliage into the soil to decompose. If you compost any infected tubers, check your compost pile in spring and destroy any volunteers.

If you plan to compost diseased foliage from your garden clean-up, use hot compost techniques to ensure the all disease spores are killed and complete decomposition occurs. If you use cool compost methods or minimalist management, allow your compost pile to sit for 3 years or more before using it in your garden. Plan to use that compost in flower beds instead of on vegetables to help break disease cycles.

Jean-Paul Courtens, a biodynamic farmer at Roxbury Farm in Kinderhook, NY, warns growers to not put blight infected foliage in their compost piles. He leaves the infected material in the field, incorporates it in the soil and maintains a minimum rotation of four years between plant families. (As a side note: all vegetable matter based compost -from culls in the packinghouse- at Roxbury Farm is spread on hayfields while only manure/woodchips based compost is used on vegetable land.) Courtens highly recommends spring and early summer cultivation to kill off any potato vines that voluntarily sprout up next season.

Planting a fall cover crop can stimulate your soil biology to support decomposition and protect soil from battering rains and erosion, but choose a cover crop that supports late blight management. Dr. Vern Grubinger, the University of Vermont Extension Vegetable and Small Fruit Specialist, says “In the Northeast, late blight is not known to overwinter on dead foliage, dead roots, tomato seeds, or in the soil—only in infected potato tubers or other living tissue. Therefore, the focus of our management should be to harvest or destroy all infected tubers, and to then be alert for any 'volunteer potato plants' next spring. Do not grow crops or cover crops like winter rye that may hide potato plants that sprout. Oats would be a better choice since they will winter kill and not hide any tubers that sprout next spring.” Mulching soil that you have turned under will also prevent erosion when it is too late to plant an oat cover crop.

Understanding basic information about the late blight fungus can help prepare us for next year.

Below is a list of practices you can do.

Check Seed Potatoes for Blight before Planting

If you had late blight in your potatoes this year and you save potatoes year-after-year, be vigilant about checking them in storage to ensure your home-grown seed potatoes are free of blight before you plant them. If infected potatoes are cured at temperatures of between 50 and 60°F for at least 10 days before storage, many will show signs of blight. Check them frequently in storage and remove any funky, black sunken, or corky looking potatoes. If you are not sure about them, don't use them. Destroy any infected potatoes

you remove from your root cellar over winter and early spring by burning them, freezing them or feeding them to livestock.

Buy Certified Seed Potatoes

To reduce the chance of using blight infected spuds buy Certified Seed potatoes for next spring. Certified Seed is different from Certified Organic. Certified Seed means the potatoes are inspected by the industry and grown to a quality specifically for planting; these seed potatoes are less likely to have diseases. Certified Organic means the grower used organic growing practices, but the seed is not necessarily certified. Always check all seed potatoes for diseases before planting them.

Buy Local Transplants

Buy tomato transplants from local, organic farmers; know the people growing your plants. Transplants grown in Vermont are less likely to have blight because temperatures outside are too cold for the disease in March, April and May. If you buy transplants from stores that purchase plants from southern distributors, ask where the transplants are from so you can determine if the plants are grown in an area that has late blight present. Check transplants for diseases before you purchase them.

Use Resistant Varieties

Resistant varieties can help slow or prevent the spread of late blight; these can be especially helpful if you live in an area that consistently has the cool temperatures and leaf wetting conditions—a lot of rain, dew and fog—required conditions for late blight. There are some potato varieties that have foliar and/or tuber resistance to blight. When growing your own tomato transplants, use varieties that have some resistance to blight. Below are charts of varieties that show some resistance.

<i>Potato Variety</i>	<i>Type</i>	<i>Late Blight Resistance</i>	<i>Available from:</i>	<i>Source of Recommendation</i>
Ozette	Fingerling potato with white skin and flesh	Complete	Ronniger Potato Farm	Alex Stone, Oregon State U, E-Organic article 18361
Elba	Late maturing round potato with buff skin and white flesh	Some resistance	Many	Margaret McGrath, Cornell University Plant Pathology, 8/26/09
Kennebec	Mid maturing oblong potato with buff skin and white flesh	Some resistance	Many	same
Allegany	Very late maturing round potato with buff skin and white flesh	Some resistance	Many	same
Sebago	Late to very late round-elliptical potato with yellow skin and white flesh.	Some resistance	Many	same
Rosa	No description found	Some resistance	Few	same
<i>Look for these</i>	<i>new varieties in the near</i>	<i>future.</i>		
Defender	Late maturing long russet potato with brown skin spud with white flesh	Complete	Oregon State U breeding program	Alex Stone, Oregon State U, E-Organic article 18361
Jacqueline Lee	Mid to Late maturing round potato with gold skin and flesh, which tastes similar to Yukon Gold	Complete	Michigan State U breeding program	same

<i>Tomato Variety</i>	<i>Type</i>	<i>Late Blight Resistance</i>	<i>Available from:</i>	<i>Source of Recommendation Info Source</i>
Juliet	Indeterminate red grape shaped cherry	Some resistance to foliar infection (some early blight resistance too)	Many	Alex Stone, Oregon State U, E-Organic article 18361
Stupice	Indeterminate small red	Some resistance to foliar infection	Many	same
Matt's Wild Cherry	Indeterminate red cherry	Some resistance to foliar and fruit	Many	same
Plum Regal	Late maturing determinant red plum	Complete (with resistance to Verticillium Wilt, Fusarium wilt 1 and 2,	Bejo Seeds	Ruth Hazzard, University of Massachusetts Extension Vegetable

		TSWV and moderate early blight resistance)		Program 9/09.
Legend	4 to 5" red slicer determinant	Strong resistance	Many	same
Mountain Magic	Semi-determinate large red cherry	Complete (with resistance to Verticillium Wilt, Fusarium wilt 1 and 2, TSWV, moderate early blight and Septoria leaf spot)	Seedway	John Mishanec, Cornell Vegetable IPM Program, Pest Report 8/18/09; Margaret McGrath, Cornell University Plant Pathology; Ruth Hazzard, University of Massachusetts Extension Vegetable Program 9/09.

Rotate Crops

If you haven't been rotating crops in your garden, next spring is the time to start. Crop rotation is the first strategy for good organic management. Rotations can help build soil, increase yields, and break pest cycles. The basic principle is to rotate out of crop families to other crops that do not share pests and diseases. For example, rotate out of potatoes into another non-Solanaceous plant family, which means you will not grow potatoes, tomatoes, peppers, eggplant or petunias in last years potato bed. Choose an open canopy crop so you can see and remove the volunteers and tubers easily. Late blight does not infect tomato seeds, but control these volunteers so your rotation really is a rotation. If you have significant build-up of a disease and it is economically feasible, stop growing susceptible crops for one year to reduce future problems. Many diseases and insects are able to build-up in garden soil when crops are grown in the same place year after year—move them around!

Ensure Plants Get Proper Nutrition

Plants that get proper nutrition are healthier and have more vigor which can help them grow and produce better and resist some pests and diseases. Test your soil so you know if your garden soil pH must be adjusted with lime, has any nutrient deficiencies or low organic matter, or has excessive amounts of nutrients, trace elements, and/or heavy metals. Choose amendments that help you improve your soil's physical, chemical and biological condition without over-applying nutrients. Excessive nitrogen makes crops more susceptible to insects and diseases.

Reduce Leaf Wetness

If you have been crowding plants for years and calling it "intensive gardening" consider spacing crops for more air flow to reduce leaf wetness and prevent diseases. Most fungal disease spores require 6-8 hours of leaf wetness to germinate; wetness can be from

watering, rain, dew, or morning fog. When plants are crowded, the foliage cannot dry out, which extends the number of hours the leaves stay wet. Good spacing helps plant foliage dry out. Pruning suckers off of indeterminate tomatoes will also reduce foliage density and improve air flow. Also, if you need to water using a method that wets the foliage, water in the morning so foliage has all day to dry.

Monitor for Late Blight

So many gardeners and farmers had late blight on tomatoes and potatoes in 2009 that everyone should be especially vigilant looking for it on tomatoes and potatoes in 2010. This is especially true if weather conditions are cool and wet. If you find late blight in your crops, remove and destroy tomato plants, and mow down potato vines to prevent its spread. Wait 2-3 weeks before digging up tubers to allow infected foliage to die; the tubers in the soil develop a tougher skin. Please let NOFA-VT or UVM Extension people know so we can warn others it is in the state as early as possible.

Use a Fungicide

If weather conditions are cool and wet like last year, educate yourself about copper fungicides allowed for use in organic production to see if they are appropriate for you. If you do decide to use copper sprays, read and follow the label, wear recommended protective clothing, and spray according to the directions.

Good management techniques can help us all have a successful gardening season and a bountiful harvest.

Many thanks to Vern Grubinger and Ann Hazelrigg of UVM Extension and Jean-Paul Courtens of Roxbury Farm for their helpful suggestions.

Photo 1: Late blight Lesions on Tomato Leaves



Photo credit: Wendy Sue Harper Ph.D.

Photo2: Late blight Lesions on Tomato Stems



Photo credit: Wendy Sue Harper Ph.D.

Photo 3: Late blight Lesions on Tomato Fruit



Photo credit: Wendy Sue Harper Ph.D.

Resources

Photo Galleries

McGrath, Margaret Tuttle. Late blight on potato. Cornell University Extension.

http://www.hort.cornell.edu/departement/Facilities/lihrec/vegpath/photos/lateblight_potato.htm

McGrath, Margaret Tuttle. Late blight on tomato. Cornell University Extension.

http://www.hort.cornell.edu/departement/Facilities/lihrec/vegpath/photos/lateblight_tomato.htm

The following resources were used to write this article and provide more detailed information on late blight.

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<http://plantclinic.cornell.edu/FactSheets/lateblight/late.htm>

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www.extension.org/article/18361