

MANAGING LATE BLIGHT IN ORGANICALLY PRODUCED TOMATO

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Late blight is a potentially very destructive disease that fortunately occurs very sporadically in most areas of the northeastern US most growing seasons. Typically potato is the main crop affected because infested tubers are the main source of initial inoculum. Infected tomato transplants are another potential source. Late blight can destroy a crop if unmanaged. The pathogen is well named: 'Phytophthora' in Latin means 'plant destroyer'. Affected foliage tissue is quickly killed. Impact is especially great when stems are infected because all tissue above this point will die. Additionally fruit at any stage are susceptible. This disease can be explosive especially under favorable conditions because the pathogen can produce a lot of wind-dispersed spores and it can cycle very quickly, progressing from infection to new lesion (spot) producing spores in 6 to 7 days. Many images of symptoms are available on the internet to assist with identification. Mine are posted at:

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

Steps for managing late blight in organically produced tomato:

1. Use transplants produced in an area where late blight is not developing on plants inside or near the greenhouse. Some strains of the late blight pathogen can infect petunia and some solanaceous weeds such as bittersweet nightshade. Inspect transplants carefully before planting to ensure none have symptoms of late blight. The pathogen cannot survive on tomato seed.
2. Select varieties with resistance. Mountain Magic is one of several varieties with resistance to early blight and Septoria leaf spot as well as late blight. Seed is expected to begin to be marketed perhaps as soon as 2010.
3. Control volunteer tomato and potato plants as well as solanaceous weeds, in particular hairy nightshade and bittersweet nightshade, which are also susceptible.
4. Regularly inspect tomato as well as potato crops, which are also susceptible, for symptoms of late blight. Most extension offices provide diagnostic services.
5. Check local extension newsletters each week for information about late blight occurrence. Note that during cloudy conditions spores of the late blight pathogen can survive being dispersed in wind currents long distances (miles!) because they are protected from the killing effects of UV radiation. Rain can bring these spores down on to plants far from the affected plants that were their source.
6. When there is a risk of late blight occurring and fungicide applications are going to be used as a component of management, apply approved copper fungicides on a regular preventive schedule. Late blight is difficult to control, especially when fungicides are not applied before

disease onset. Thorough spray coverage is critical since copper is a contact fungicide. See section at end if any fungicide will be used.

7. If symptoms of late blight are found in isolated areas in a planting, it may be possible to save the crop. Success depends on how early in disease development symptoms are found, how many infections are present that have not yet resulted in symptoms (spore germination to symptom takes about 1 week), how quickly and thoroughly diseased tissue will be removed, environmental conditions, proximity to other gardens or farms where late blight is developing, and what management steps will be taken. Immediately remove affected plant tissue. It is best to do this in the middle of a sunny day after the leaves have dried when there will be fewer spores and those dislodged in the process will likely be exposed to UV radiation. Put affected tissue in garbage bags, dig a hole and bury it, or put it in a pile and cover with a tarp. Heat that develops from sunlight hitting the tarp will quicken death of plant tissue and the pathogen. Inspect plants daily thereafter for a week in order to find any additional affected plants that develop symptoms, then return to inspecting at least once a week. Apply copper fungicides every 7 days as indicated on the label until final harvest or the crop is destroyed. It is not possible to control late blight by solely relying on removing affected tissue. Even when rain is not occurring, dew over night can provide a sufficient leaf wetness period for infection. Especially when conditions are favorable it may not be possible to control late blight with copper. Monitor disease development and be prepared to jump to step 9 below.
8. Work in affected fields last. Clean equipment between fields.
9. When late blight starts to become severe the foliage should be destroyed to eliminate the planting being a source of spores for other tomato or potato plantings on the farm or other farms. Propane flamers are a good way to quickly kill foliage, but are not suitable where tomatoes are grown with straw or plastic mulch or trellised. This is an obligate pathogen that needs living host tissue to survive. To initiate plant death with trellised tomatoes, go through the planting and cut all main stems at the base, then come back through and cut stems further up in the canopy. Disturb foliage as little as possible to minimize the amount of spores dislodged. It is best to do this work in the middle of a sunny, preferably calm day after any moisture on leaves has dried to minimize the quantity of spores and also their likelihood of survival in the process. Next remove trellising line and stakes, then flail chop. Bagging affected tissue or burying is recommended where feasible with small plantings.

The late blight pathogen is not thought to be able to survive in plant debris, therefore it is not necessary to physically remove affected plant tissue from a field.

The late blight pathogen cannot survive on stakes, therefore it is not necessary to trash or even disinfect the stakes to manage this disease. Stakes should be disinfected however, especially if bacterial diseases also developed in the planting.

10. Fruit from an affected field can develop symptoms after harvest and thus should be inspected just before marketing. Customers should be aware of the potential that fruit could have a shortened shelf life. It may be wise to recommend that any fruit that rot be put in the trash rather than on a compost pile since there is a possibility that the pathogen could produce spores before the fruit completely rotted.

Additional Information About Copper and Other Fungicides.

OMRI-listed fungicides labeled for late blight include Sporatec, Serenade, Sonata, OxiDate, and copper. Regalia* and Companion meet NOP guidelines and are in review with OMRI (*registration pending in NY and PA). Check with local organic certifying agency to determine what products are approved. There is limited data from replicated experiments on efficacy for late blight of products approved for organic production. Copper has provided some control where other products have failed. However, copper is not considered very effective because it has provided poor control in efficacy experiments where excellent control was achieved with conventional fungicides. Poor efficacy, combined with the fact that established spots, being uncontrollable with copper, will continue to produce spores, plus the explosive nature of late blight, is why a preventive spray program is recommended including by organic growers in areas where late blight occurs regularly.

Before using any fungicides read the label. Note that the ‘signal word’ for copper fungicides is ‘danger’. The signal word assigned to a pesticide is based on how harmful it might be if swallowed, inhaled, or exposed to skin or eyes of the person handling it. Danger is assigned when the pesticide is highly hazardous by at least one of these routes of entry into a person. The other signal words used for pesticides are ‘warning’ for moderately hazardous chemicals and ‘caution’ for slightly hazardous chemicals. In the precautionary statement on pesticide labels is a section on ‘hazards to humans’, which explains how the product could affect someone exposed to it. This is followed by the ‘personal protective equipment’ (PPE) that is needed when mixing and applying the pesticide. Hazards for copper fungicides are: “Corrosive. Causes irreversible eye damage. May cause skin sensitization reactions in certain individuals. Do not get in eyes or on clothing. Harmful if swallowed or absorbed through the skin. Avoid contact with skin.’ Also ‘avoid breathing dust.’ for some formulations. PPE that applicators and other handlers must wear when using copper is: long-sleeved shirt and long pants, chemical-resistant and waterproof gloves, shoes plus socks, and protective eyewear. First aid information is also provided on labels for accidental exposure; know this in advance to avoid delay in treatment. There are also important ‘Agricultural Use Requirements’ described on labels. This includes the ‘restricted-entry interval’ (REI), which is 24 hours for copper, what PPE is required for anyone who enters and will contact anything treated before the end of this interval, which for copper is the same as for applicators, and what precautions must be followed after an application, which for copper includes having an eye flush container at the WPS decontamination site for workers entering the field for 7 days after treatment. Note that fruit cannot be harvested during the REI. EPA’s Worker Protection Standard for Agricultural Pesticides (WPS) is a regulation that must be complied with on farms where any pesticide is used, including those approved for organic production. Under this regulation, all agricultural workers on the farm must receive pesticide safety training, decontamination supplies, notification of pesticide applications, access in a central location to a log of pesticide applications plus information about these pesticides, any required personal protective equipment, and emergency medical assistance when needed. Restricted-entry intervals must be adhered to. Also, pesticide safety posters must be displayed.

Labels also specify how often the product can be applied. At this time, most copper fungicides are labeled for use every 5 or 7 to 10 days or ‘as needed depending on disease severity’. This is interpreted (by state pesticide regulators, company regulators, and organic certifiers) to mean these fungicides can be applied more frequently than every 5 or 7 days since these labels do not

have restrictive statements about a minimum interval or maximum amount that can be applied to a crop. Copper fungicides are exempt from tolerances. However, more frequent applications generally are not considered necessary, even following rain, because these products are formulated with adjuvants that help keep them on foliage. More explicit description with a defined minimum retreatment interval of 3 days and maximum annual rate of 17.4 lbs metallic copper per acre for tomato will be on future labels following re-registration (these limits are specified in EPA Reregistration Eligibility Decision (RED) for coppers). It is recommended that these limits be followed now. Labels need to be checked on new product containers for changes such as this before using. It is especially critical where copper is being applied frequently to test soil regularly to ensure this is not resulting in an unacceptable accumulation of copper. Before applying copper more frequently than every 5 or 7 days it is advisable to confirm with the certifier that this is permissible.

When using any pesticide note that it is a violation of Federal law to use the product in a manner inconsistent with its labeling.

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Confirm state registration and organic approval with certifier. Any reference to commercial products, trade or brand names, is for information only; no endorsement is intended.

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