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Late Blight is a serious disease caused by the fungal-like pathogen *Phytophthora infestans*, which affects both tomatoes and potatoes. It occurs commonly throughout the world and may cause severe damage up to total crop loss when an epidemic occurs — the most notable epidemic was the Irish Potato famine of 1848. In recent years, the pathogen has evolved in the United States to become a regular threat to tomato and potato growers in many regions — particularly for organic growers due to limited control options.

Since late blight has the potential to spread rapidly and be devastating under the right conditions, it is important for anyone growing tomatoes or potatoes to be aware of this disease and the methods to identify, contain, and report it. It is often referred to as a “community disease” because of the required cooperation to prevent its spread.

DESCRIPTION:

Phytophthora infestans has several lineages, also known as “isolates”, present in the United States. The presence of various isolates can impact the effectiveness of disease management options a grower might use. A particular isolate may be more aggressive on certain hosts, have developed insensitivity to certain fungicides, or react differently to different sources of host resistance.

The current predominant isolate is US-23, which aggressively attacks both tomato and potato hosts. However, US-8, US-11, US-20, US-21, US-22, and US-24 have also occurred in recent years.

DISEASE CONDITIONS:

Cool, cloudy, and wet or humid conditions are most favorable for pathogen reproduction and disease development, so growers should be especially vigilant when these conditions occur. Warm days followed by cool nights and periods of heavy dew can encourage spread.

PATHOGEN REPRODUCTION:

In the United States, the isolates primarily reproduce asexually, and require living host tissue to survive, such as plants or culls. Sexual reproduction is not common, unlike in other parts of the world, but could occur over time, leading to evolution of new isolates, and production of spores that can survive long-term without a living host.

SYMPTOMS:

Initial infections usually result from infested potato tubers or tomato transplants, volunteer plants, and wind-dispersed spores. The classic symptoms are nickel-sized olive-green to brown spots on leaves,

with white fuzzy fungal growth on the underside that appear during moist conditions favorable for spore reproduction. In some cases the lesion edges have a yellowish, water-soaked appearance. Blackish-brown lesions may also appear on stems. Tomato fruit infested with late blight have firm, brown spots. Infested potato tubers have a dry, brown colored appearance inside.

For images of infected plants, please see Cornell's photo gallery: <http://blogs.cornell.edu/liveqpath/gallery/tomato/tomato-late-blight/>

MONITORING:

Since late blight is a fast-moving, destructive disease, monitoring programs are important to growers of all sizes. Knowing where the disease is present, when it was confirmed, and what isolates are present can help in develop a plan to prevent outbreaks in your own region.

The nationwide monitoring website usablight.org/ provides information regarding the disease including which isolates are most common in a region and confirmed outbreak locations. Many Cooperative Extension Service agencies and organic certifiers maintain a disease- forecasting service that growers can subscribe to through email.

PREVENTION:

When conditions are favorable for disease development, and the pathogen has been confirmed in the region, a proactive approach can prevent further spread.

A regular schedule of fungicide applications can protect your crops from infestation. Recommended fungicides, spray intervals, and rates for both organic and conventional growers can be obtained through your local Cooperative Extension Service.

In addition to a fungicide regiment, there are a number of things you can do to reduce the risk of disease development.

1. Select resistant varieties to grow.
2. Purchase only certified disease-free potato seed; do **not** use saved seed pieces from previous seasons.
3. Grow or purchase tomato seedlings that are healthy; do **not** plant any seedling with late blight symptoms.

4. Keep plants healthy with recommended cultural practices.
5. Treat plants with preventative fungicide applications when conditions are favorable for disease development. Johnny's preferred fungicides to combat late blight are Nu-Cop® 50DF Copper Fungicide and a hydrogen dioxide based fungicide, such as Oxidate®.
6. Report outbreaks to your local Cooperative Extension and your neighbors.
7. Destroy any infected plants, preferably by placing them in bags and trashing them.

Unlike for many other diseases, practicing a crop rotation will not help in the prevention of late blight, as the disease does not persist in the soil.

VARIETY RESISTANCE:

While there is no variety with total immunity to late blight, there are some tomato varieties that resist infection longer and can significantly slow a disease epidemic. At this time, there are no commercially-available potato varieties with late blight resistance. Resistant tomato varieties can be very effective at disease control when deployed in conjunction with other management tools.

To choose a suitable resistant variety for your region, identify which isolates might be present in your area and the genetic source of late blight resistance that is present in a resistant variety, if it is known. This is helpful information because not all sources of resistance are equally effective against different isolates.

The most effective defense against the isolate US-23 is to grow varieties with both resistance genes Ph-2 and Ph-3, or, less ideally, Ph-3 only. Varieties with Ph-2 only are still effective against older isolates such as US-8 and US-11, but only provide partial resistance to newer isolates. It should be noted that several varieties with useful resistance, but unknown genetics also exist, but it is necessary to know which isolates they've been tested against to know how effective they will be.

The following table contains information that is currently known about the late blight resistant tomatoes offered by Johnny's.

Variety	Habit	Type	Resistance Source	Resistance Notes
Mountain Magic	Indeterminate	Red Cocktail	Ph-2 & Ph-3	Effective against US-23
Defiant PhR	Determinate	Red Slicer	Ph-2 & Ph-3	Effective against US-23
Mountain Merit	Determinate	Red Slicer	Ph-2 & Ph-3	Effective against US-23
Matt's Wild Cherry	Indeterminate	Red Cherry	Unknown	Effective against US-23
Jasper	Indeterminate	Red Cherry	Unknown	Effective against US-23
Cherry Bomb	Indeterminate	Red Cherry	Unknown	Effective against US-23
Juliet	Indeterminate	Red Mini-Plum	Unknown	Not effective against US-23
Plum Regal	Determinate	Red Plum	Ph-3	Effective against US-23
Damsel	Compact Indeterminate	Pink Slicer	Ph-2 & Ph-3	Effective against US-23

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