

Late Blight (*Phytophthora infestans*)

It is the most important pathogen of potatoes and tomatoes worldwide.



Initial symptoms of late blight of tomato on tomato leaves:

- **Leaves, stems and fruits are attacked**
- A rapidly expanding, grayish-brown blight of leaves, petioles and stems.
- Blighted areas on leaves may have irregular shapes.
- Disease onset and progression are usually very rapid.
- Blighted leaves turn yellow and may become curled and deformed within days of becoming infected.



Elongated, blackened lesions appear on tomato branches and stems. Stems, petioles and leaves may collapse. The pathogen may produce a sheen of white mycelium and spores on the surface of these blighted tissues (right).



A young tomato seedling with leaf, petiole and stem symptoms of late blight. The leaf and petioles collapsed, and the stem of the plant is blackened by the disease.

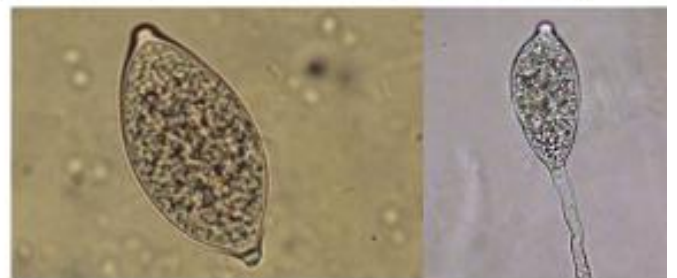


Infected tomato fruits turn greasy, olivaceous-brown, decay, and can shrivel up and fall off the plant and never ripen. Such infected fruits are not fit for human consumption. The fruit damage can occur in a few days or less under the right weather conditions.

A garden planting destroyed by late blight. Nearly all of the tomato plant leaves in a garden can be destroyed within a week's time during weather that is favorable for late blight disease development



Sporangia and sporangiophores of *Phytophthora infestans*. These lemon-shaped sporangia may germinate directly or release swimming zoospores that can infect host tissues. It is very important to understand that this disease can kill plants in matter of a few days.



Environmental conditions:

Daytime temperatures between 16 and 21°C, night temperatures between 10 and 16 °C, and relative humidity near 100% are the ideal conditions for infection and spread of late blight disease.

Dispersal:

Sporangia or mycelial fragments are dispersed from infected plant organs by winds and/or splashing raindrops or wind- driven rain and or human assisted via movement of infested or infected materials such as seed or tools.

Inoculation:

Sporangia or mycelial fragments land on susceptible host organ(s).

Survivals:

P. infestans survives in plant debris or on volunteer tomato plants and on perennial weeds.

Integrated pest management practices (IPM)

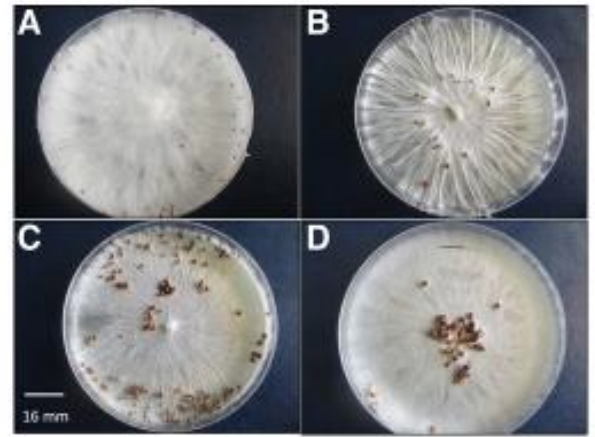
- Plant resistant tomato varieties.
- Intercrop tomato with non-susceptible host plants, preferably non-solanaceous plants.
- Use wide plant spacing.
- Practice good crop sanitation; inspect the plants regularly, remove diseased material from the plot or garden.
- Use disease-free tomato transplants.
- Destroy volunteer tomato plants.
- Protect seedlings with fungicide sprays before transplanting.
- Avoid moving through the tomato garden or field when plant foliage is wet.
- Do not plant potatoes near tomatoes.
- Time irrigation to water plants early in the day, rather than late in the day. This allows foliage and soil to dry out before evening.
- Control solanaceous weeds around the tomato garden.
- Protect seedlings from nutritional stress and other pests.
- apply fungicides (It is best to rotate different products to avoid fungicide resistance).

Southern Blight (*Sclerotium rolfsii*)

The species was first described in 1911 by Italian mycologist Pier Andrea Saccardo. cause of tomato blight in Florida in 1892

Host range

At least 500 species in 100 families are susceptible. The most common hosts are the legumes, crucifers, and cucurbits. The fungus persists in many weed hosts as well.



Symptom:

- Hot weather disease.
- Mature plants are attacked just below the soil surface
- The tops wilt and die rapidly.
- Mycelium often grows over the diseased tissue and surrounding soil forming a white mat of mycelial threads with the typical tan-to brown, at the crown mustard-seed-sized sclerotia.
- Often the entire root system is destroyed.



Gridled surface

Mycelium growth



Symp.

S. rolfsii primarily attacks host stems, although it may infect any part of a plant under favourable environmental conditions including roots, fruits, petioles, leaves, and flowers.

The first visible symptoms are progressive yellowing and wilting of the leaves.

Seedlings are very susceptible and die quickly once they become infected.



Identification of pathogen:

Fungus:

- Fungus is exceedingly destructive on ground crops and attacks the fruit where they contact the soil.
- Slightly sunken, yellow spots develop on invaded fruit, which rapidly decay, collapse, and become covered by a white fungal mass with numerous sclerotia.

Spread & Survival:

- Spreads to uninfected areas by wind, water, machinery, animals, and soil.
- Survives in soil and on numerous weed and crop hosts.



Yield loss:

S. rolfsii have been recorded with yield depletion ranging from 1 – 60 % in fields.

Favourable condition:

Growth is possible within a broad pH range, though best on acidic soils. The optimum pH range for mycelia growth is 3.0 to 5.0, and sclerotia germination occurs between 2.0 and 5.0.

Germination is inhibited at a pH above 7.0.

Maximum mycelia growth occurs in wet periods and between 25 and 35° C with little or none at 10 or 40° C.

Management:

- Resistance cultivars
- Crop rotations of two years or more to a non-host crop like corn or small grains will help to prevent build-up of inoculum and disease problems
- Close plant spacing and over-irrigation promote disease development and should be avoided
- Remove diseased plants
- Soil treatment
- Spray chemicals
- Heat (solarisation)
- Cultural practices

Bacterial Soft Rot and Stem Rot :*Erwinia carotovora* pv. *carotovora* (*Pectobacterium carotovora*)

It is very common

Symptom:

- Fruit -soft watery decay of fruit, starting at one or more points, as very small spots.
- Enlarge-very rapidly until the entire fruit -soft watery mass.
- Pathogen liquefies fruit tissue by breaking down the pectate "glue" that holds plant cells together
- leakage-internal collapse resembling a shriveled water balloon.
- Stem rot is first noticed when plants wilt at the time of first harvest or after that.



Oozed liquid



Infected tomato



The fruits affected by soft rot shows water-soaked lesions which leads to the collapse of the affected fruits. The bacterium can reside in soil for many years.



The bacterium can be easily transmitted during pruning operations, splashing of infested soil on to plants with wounds and movement by chewing insects and larvae.



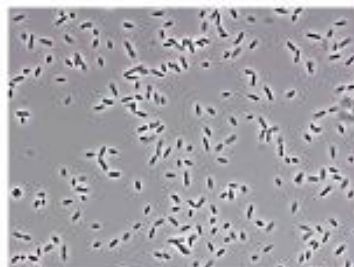
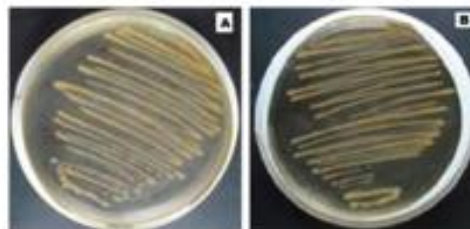
Severely infected plants and fruits emanate a foul odor due to rotting of the tissues by the bacterial organism and could be an issue in post-harvest storage

Identification of pathogen:

Bacteria:

Pectobacterium carotovorum is

- a gram negative
- rod-shaped
- non-sporulating
- facultatively anaerobic bacterium.
- The bacteria are typically 0.5-1.0 x 1.0-3.0 μm
- are single-celled
- motile with flagella



Favourable condition:

- High humidity is required for disease development.
- Heavy rain fall or irrigation
- Warm temperatures in the (20 - 30 $^{\circ}\text{C}$)

Spread and survival:

- Infects plants through fresh wounds, for example pruning wounds.
- They can be spread by rainstorms, insects, harvest crews, picking containers, and packinghouse equipment.
- Soft rot bacteria can even pass from one fiber-board shipping carton to an adjacent carton when the cartons become soaked with the rotten material of decayed fruit.
- These bacteria readily disperse from rotten fruit by direct contact or movement of juices or water.
- The bacterium is prevalent on dead plant material and can be carried on windblown dust, non sterilized tools, and the hands of workers. It spreads readily in water
- It can survive on various plants or in the soil in low densities. It has also been found in the gut of insects

Management:

- Prevent high humidity
- Use sanitation to prevent spread within the crop
- Clean tools and equipment
- Remove infected plant debris and destroy
- Promote rapid closing of wounds
- Disinfect recirculating irrigation water
- Seed treatment- carbendazim 2g/kg
- Spray fungicides

Other diseases:

Phoma Rot (*Phoma destructiva*)

Fusarium rot: *Fusarium oxysporum* f. sp. *Lycopersici*

Anthracnose: *Colletotrichum coccoides*, *C. gloeosporoides*, *C. dematium*

T. A.