



Stone Fruit IPM for Beginners

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Chapter 14

Phytophthora crown and root rot

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Phytophthora root and crown rot

Hosts

Tart and sweet cherry, peach, apricot. Plum is relatively resistant. Rootstock choice will affect susceptibility in the planting.

Time of concern

Spring and fall when soil conditions are saturated or wet. When soils are wet and cool or there is puddled water in the orchard, the lack of oxygen for roots makes the fruit more susceptible to infection. Wet conditions stimulate the pathogen to produce infective zoospores that actively swim towards the soil surface or towards host tissue to which they are chemically attracted. The zoospores germinate and infect susceptible roots, crowns or stems and the infection expands into healthy tissue from the infection site. Phytophthora infections and their spread are favored by wet and rainy weather. During the winter dormant season, the pathogen is not active and host susceptibility is low.

Symptoms, damage and pest cycle

Infected trees will appear unthrifty: internode lengths will be shorter; leaves will be small, few and off-color; and trees may wilt, collapse and die. Trees may limp along for a few years or collapse and die within one growing season. Phytophthora root and crown rot infections may be seen as reddish brown to brown areas of dead inner bark on roots, crowns and trunks. Sometimes this is visible without removing the outer bark. However, the discolored inner bark can be readily seen if a layer of bark is cut off to reveal the dead tissue underneath. Healthy inner bark will be white to greenish until it begins to oxidize. By comparison, Phytophthora-infected tissue will typically be reddish brown with a distinct border between diseased and healthy tissue. Infections may be impossible to detect without digging out the area around the tree crown to a depth of 6-12 inches (12-30 centimeters) and examining the rootstock for the typical reddish brown, discolored inner bark.



Wayne F. Wilcox, NYSAES, Cornell University.

Diseased trees will most likely be found in heavy, wet soils or sections of the orchard where water collects or is slow to drain (healthy tree in foreground).



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A diagnostic reddish brown discoloration of inner bark can be seen by removing several inches of soil around the base of declining trees and cutting away the outer bark layer on the exposed crowns. The knife shows the level of the soil surface before digging down to expose the diseased crown.

Because zoospores are motile, they are able to swim in films of water or be splashed onto the aboveground portions of the tree. Scion infection can occur in this way without rootstock infection in trees with resistant rootstocks and highly susceptible scions.

There are 10 or more *Phytophthora* species that can cause Phytophthora root and crown rot. This group of plant pathogens, the Oomycetes, produce dormant oospores (sexual) and chlamydospores (asexual) to survive unfavorable conditions in soil or in dead plant tissues or they survive as actively growing hyphal strands along the leading edge of infections. The dormant, resting spores or the hyphal strands can give rise to sporangia when soils are moist, wet or puddled. Sporangia fill with zoospores and expel them into the water-saturated environment. The zoospores actively swim to the soil surface or root tissues to disperse and cause infections.

The pathogen is inactive during winter. Water run-off, eroding soil, contaminated soil on boots, tractors and other equipment, and contaminated planting stock can all aid in spreading Phytophthora.

IPM steps for beginners

The most important step in managing Phytophthora root and crown rot is to provide the orchard with optimal soil drainage for growing stone fruit. Avoid sites with heavy, poorly drained soils or those that are subject to flooding. Improve marginal sites by using drainage tiles, diversion ditches or ripping underlying hard pans before planting. Planting tree rows on a raised ridge or berm helps by placing roots above the saturated soil zone where zoospores production and dispersal is favored.

Select rootstocks and scions with some degree of resistance to Phytophthora. Research the rootstock choices available for tart cherry, sweet cherry, peach and apricot cultivars being planted and match the rootstock to the site's risk for Phytophthora. Keep records of the rootstocks used and where they are planted in the orchard.

Place irrigation emitters so the emitted water doesn't directly spray or drench the tree trunk and crown. Avoid over-irrigation by using an irrigation model that will calculate the optimum amount of water to deliver for the soil type in the orchard.

Fungicides are registered to manage Phytophthora in tree fruit. However, trees showing severe symptoms of Phytophthora root and crown rot rarely recover when treated. Treatments prove effective mainly on trees without obvious, severe symptoms. Therefore,

have Phytophthora root and crown rot confirmed in the orchard before undertaking the expense of treating the orchard to protect healthy or asymptomatic trees from infection.