

Managing Oak Wilt Disease in Texas

Drew Zwart, PhD, Plant Physiology

Oak wilt is one of the most damaging plant diseases of oak trees. The disease is caused by the fungus, *Ceratocystis fagacearum*, which colonizes the vascular system of many oak species causing wilting, branch dieback and death of affected trees (Figure 1).

Table 1: Red and white oak groups (*Quercus* spp.)

Red oak group
Red oak, <i>Q. rubra</i>
Black oak, <i>Q. velutina</i>
Spanish oak, <i>Q. falcata</i>
Shumard oak, <i>Q. shumardii</i>
Live oak, <i>Q. virginiana</i>
White oak group
Post oak, <i>Q. stellata</i>
Bur oak, <i>Q. macrocarpa</i>
Japanese white oak, <i>Q. polymorpha</i>

Symptoms

Species in the red oak group are highly susceptible to oak wilt disease. Symptoms first appear as bronzing and wilting of the leaves in the upper canopy. Leaves then turn brown along the margins and often appear water-soaked. On live oak, yellowing occurs along the vein of the leaf. This is followed by abscission of most of the leaves. Many leaves drop when they are still green. Trees can die within a few weeks of the onset of symptoms although recovery occasionally occurs.

Species within the white oak group exhibit some resistance to oak wilt. Affected portions of the crown exhibit leaf bronzing, browning, wilting and defoliation. The disease progresses slowly through the crown. Branch dieback and decline may occur over a

Figure 1: Decline and defoliation from oak wilt



period of years. Recovery of affected trees occurs more frequently than in the red oak group. Brown streaks may be present in the xylem of affected oaks (Figure 2).

Disease Transmission

Insects are responsible for transmitting the oak wilt fungus long distances to establish new infection centers. Once a new infection is established, the

Figure 2: Brown streaks within sapwood of oak wilt-affected branches



Figure 3: Typical symptoms of oak wilt infected escarpment live oak (*Quercus fusiformis*)



fungus moves rapidly from tree to tree through root grafts that occur between oaks of the same species group.

Long distance spread: The oak wilt fungus produces spore mats beneath the bark on diseased oaks in spring following the year that they died. As these spore mats mature, they exert pressure on the bark tissues that provide openings for insects to access the fungal pathogen. The mats emit a fruity odor that attracts certain species of sap beetles (Nitidulids). These beetles become contaminated with spores of the oak wilt fungus when they visit the mats. Nitidulids then transmit the fungus when they feed on sap from wounds on healthy oak trees.

Most new infections from Nitidulids occur in February through early June when spore mats form on dead oaks and wounds are most receptive to infection by the pathogen.

Oak bark beetles can also vector the oak wilt fungus. These insects breed in the inner bark and sapwood of dying and recently killed oaks. Bark beetles transmit the fungus when broods emerge from infested diseased trees and bore into healthy oaks.

Local Spread: Once new infections occur, localized spread occurs through root grafts that form between oaks within the species group. Root grafts can occur between oaks growing within 100 feet of one another and are responsible for rapid expansion of the infection center. Root grafts seldom occur between oaks of different species groups.

Disease Diagnosis

Oak wilt may be confirmed through laboratory cultures from diseased branches. Branch samples should be collected from portions of the crown exhibiting early stages of wilt. Since the oak wilt fungus is sensitive to heat, samples should be packed in ice (“cold packs”) and overnighted to the Bartlett Diagnostic Clinic. Since the isolation/confirmation of the disease through cultures is not always successful and requires 10 to 14 days of incubation, the Bartlett Diagnostic Clinic runs a concurrent molecular test to help in diagnosis.

Disease Management

Identify Infection Centers: Surveys to identify the extent of the disease and to identify new infection centers are first steps to disease management. Aerial surveys can be utilized to identify suspected infection centers. Confirmation of the infection centers must then be undertaken by a ground survey.

In urban and suburban landscapes, educating homeowners about identification and management of oak wilt will aid in early detection and treatment of the disease. Information can be disseminated through bulletins in water or electric bills, newspaper articles and websites.

Cultural Practices

Sanitation: Infected trees in the red oak group should be removed and destroyed by chipping, burning or burial. Red oak species that have died from oak wilt should be removed before the spring following their death to avoid possible disease transmission. Diseased wood should not be stored as firewood through the winter. Spore mats do not form on species in the white oak group so immediate removal and destruction of diseased white oaks is not necessary.

Pruning/Wounding: Maintenance pruning for oaks should be scheduled for October through March. Oaks should not be pruned or wounded from April through September to prevent possible transmission of the oak wilt fungus by Nitidulid beetles. If oaks are wounded during this time, a thin coating of asphalt based tree paint should be applied to reduce potential for disease transmission.

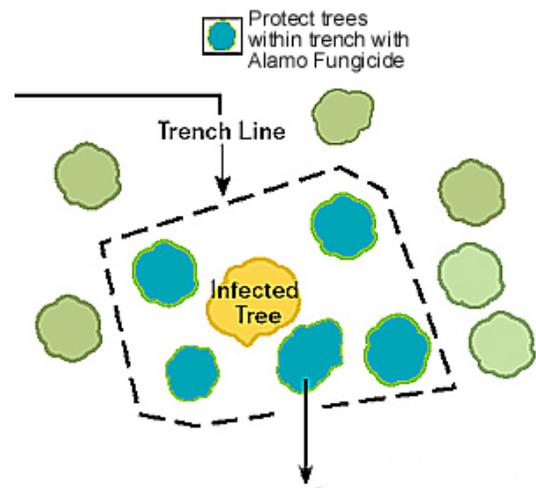
Root Graft Prevention: Trenches should be installed between diseased and healthy trees of the same oak species group to help reduce root graft transmission of

Figure 4: Vascular staining (outer black ring) typical of oak wilt infection in red oak



the oak wilt fungus (Figure 5). Primary trenches should be installed approximately 100 feet from the diseased tree using a vibratory plow, trencher or backhoe. Trenches should be installed to a depth of at least three feet. Secondary trenches can be installed immediately between the diseased and

Figure 5: Diagram showing installation of trenches in relation to diseased trees. Courtesy of Rainbow Treecare Scientific Advancements



healthy trees to further reduce the potential for spread. If secondary trenches are not installed, removal of symptomless oaks within the primary trench line should be considered. Stumps should be treated with certain herbicides to kill the roots. If symptomless trees are not removed, treatment with a systemic fungicide is the other option.

A soil fumigant, Metam-Sodium (Vapam®) was once registered for application to the soil to sever root grafts to prevent oak wilt. This product is no longer registered by the United States EPA for this use. No chemical treatment is currently available to sever root grafts.

Chemotherapy: There are systemic fungicides registered for root flare injection to prevent oak wilt disease. These fungicides can also aid in recovery of diseased white oaks but is not effective as a therapeutic treatment in diseased red oaks.

Oaks growing between diseased trees and the primary trench should be treated with fungicide injections. High value oaks just beyond the primary trench also should be treated.

