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WILT DISEASES OF ELMS IN TEXAS

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INTRODUCTION

The tree genus *Ulmus* contains many valued elm species growing throughout all of Texas. Elms are well suited to a variety of habitats ranging from natural woodlands and rangelands, to flooded and riparian sites. Also, certain species of elms are widely planted in urban environments. The stately American elm (*U. americana*) can reach heights of 75 feet with large trunks when growing on wet sites with well-drained soils. In contrast, the smaller cedar elms (*U. crassifolia*) can tolerate a wider range of sites, from riparian to droughty limestone hillsides. There are several other species of elms, all with their unique properties and contributions to Texas landscapes.

Although elms are among the most highly prized of all shade trees, they are susceptible to some serious wilt diseases. One is Dutch elm disease (DED), the most damaging disease of urban trees in North America, caused by an introduced invasive pathogen (Fig. 1). Dutch elm disease is most serious on American elms because they cannot resist infection by the fungal pathogen *Ophiostoma novo-ulmi*. Another fungal pathogen, *Dothiorella ulmi*, causes a different disease common on cedar elm, called native elm wilt. These two diseases are the focus of this factsheet and will be discussed separately below.

DUTCH ELM DISEASE

Background

Dutch elm disease has been known to occur in Texas since the 1970s. Outbreaks of DED may be found in East Texas around Lufkin, in the Dallas/Fort Worth areas, and in Waco, Texas. Many elm species are susceptible to *O. novo-ulmi*, but the majority of cases in Texas have been in American elm.

Figure 1. An American elm exhibiting symptoms of infection by the Dutch elm disease pathogen, *Ophiostoma novo-ulmi*.
Source: Steven Katovich, Bugwood.org.

More rarely, DED has been detected in cedar elm, but that species is considered to be the most resistant of the native elms to the disease.

Introduced into the United States (U.S.) in the 1920s, *O. novo-ulmi* ravaged the extensive urban plantings of elms in cities and towns throughout the Eastern and Midwestern

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U.S. As a classic example of the threat an invasive fungus can pose to valuable natural resources, American elm had no defense against this new pathogen, which was believed to have originated in Asia. Slippery elm (*U. rubra*) is another susceptible elm species, while the widely planted exotic Chinese elm (*U. parivifolia*) and Siberian elm (*U. pumila*) are highly resistant.

Biology and Spread of the Pathogen

The spread of *O. novo-ulmi* occurs in two ways. First, the pathogen is carried over long distances by two different species of elm bark beetles. They are the native elm bark beetle (*Hylurgopinus rufipes)* and the introduced, smaller, European elm bark beetle (*Scolytus multistriatus;* Fig. 2).

Figure 2. The smaller European elm bark beetle (*Scolytus multistriatus)*, one of the principal vectors of the Dutch elm disease pathogen, *Ophiostoma novo-ulmi*.
Source: Pest and Diseases Image Library, Bugwood.org.

Figure 3. Beetle galleries in wood of a tree killed by Dutch elm disease.
Source: Texas A&M AgriLife Extension Service.

These beetles acquire the pathogen during breeding cycles that occur in the wood of diseased trees. Adults lay their eggs under the bark, which then hatch into larvae and proceed to feed in the wood. As they mature and pupate, the beetles become contaminated with the fungus that proliferates in the pupal galleries (Figs. 3 and 4). When the adult beetle emerges from the dead tree, it then proceeds to feed in the twig crotches, branches, and trunks of healthy trees in the early spring, thus infecting the doomed tree with the pathogen.

Since *O. novo-ulmi* is a vascular pathogen, the second means of transmission is from tree to tree through root grafts (root connections formed between two elms growing adjacent to one another). When these functional connections have formed between two elm trees, *O. novo-ulmi* is able to grow from a diseased tree to a connected healthy tree through the roots.

Symptoms

Dutch elm disease creates recognizable symptoms in diseased elm trees that are often used for field diagnostics. Within weeks of infection, individual limbs and branches rapidly wilt and die (Fig. 5). In American elms, the wilting rapidly spreads from a few infected branches to quickly affect the entire crown. Branch tips form dead, necrotic "shepherd's crooks" due to the wilting of the younger tissues, also known as "flags." A key diagnostic criterion is discolored vascular streaking just beneath the bark of infected twigs, branches, and limbs (Fig. 6). Dutch elm disease can also be recognized as patches of dying trees in woodlands or rows of street trees growing in urban areas. Clinical confirmation of the disease by proven methods such as isolation of the pathogen in a laboratory is often recommended.

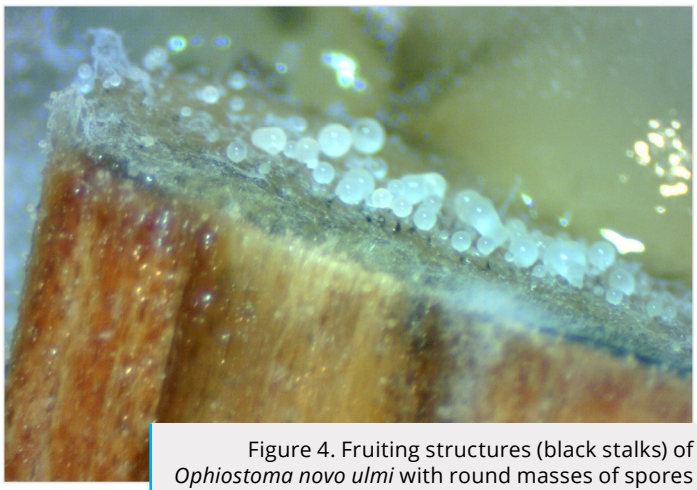

Figure 4. Fruiting structures (black stalks) of *Ophiostoma novo ulmi* with round masses of spores growing out of xylem on a branch from a tree killed by Dutch elm disease.
Source: Sheila McBride.

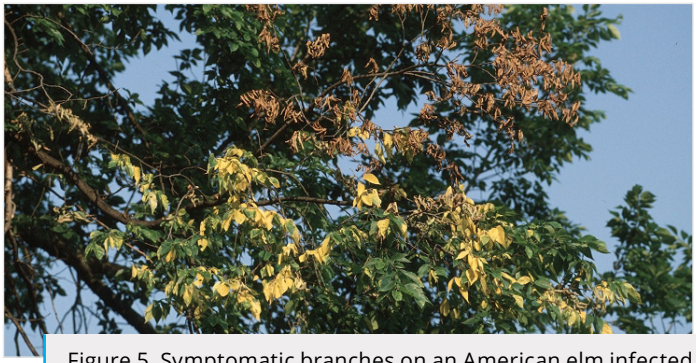

Figure 5. Symptomatic branches on an American elm infected by *Ophiostoma novo ulm*i, sometimes referred to as "flags."
Source: Joseph Obrien, USDA Forest Service, Bugwood.org.

Management

Despite the extreme virulence of the pathogen, DED has proven to be a controllable disease. The key in an affected community relies on a combination of practices. They include:

- regular survey and detection,
- removal and destruction of diseased trees,
- applications of insecticides,
- elimination of root grafts,
- intravascular injection of trees, and
- planting resistant trees.

Figure 6. Discolored sapwood, called streaking, on a small branch from a tree infected by Dutch elm disease with the bark peeled back.
Source: George Hudler, Cornell University, Bugwood.org.

The success of DED control depends on the timely and proper application of these methods and are best applied by trained, experienced arborists. Diligent detection and removal of diseased trees are critical in eliminating spores and contaminated beetles. Spraying with approved insecticides must be done in the spring, so that the tree tissues will be protected from feeding by emerging, contaminated bark beetles. Root grafts are eliminated by trenching to break the roots before the pathogen spreads from the diseased tree to the healthy tree. Tree injections with approved fungicides involve knowledge of the various techniques available and proper treatment details. For example, therapeutic injections are effective for trees in the early stages of colonization but should not be attempted if more than 5 to 10 percent of the crown is symptomatic. Remedial pruning may be useful but should only be done by a certified arborist with experience in DED control. Finally, there are DED-resistant cultivars available, such as Homestead (Ulmus 'Homestead'), Regal (Ulmus 'Regal'), and Commendation™ (Ulmus 'Morton Stalwart'). These and other cultivars should be chosen to match the characteristics of the tree with the site and conditions where they will be planted.

NATIVE ELM WILT

Background

Native elm wilt (NEW), also known as Dothiorella wilt, may be confused with DED or other maladies of elm in Texas. However, NEW is more widely distributed and has very different symptoms and impacts than the more notorious DED (Fig. 7). The cause of Dothiorella wilt, *Dothiorella. ulmi*, mostly infects cedar elm, and is more prevalent when environmental conditions are extreme.

Figure 7. A cedar elm exhibiting symptoms of infection by the native elm wilt pathogen, *Dothiorella ulmi.*
Source: Sheila McBride

Biology and Spread of the Pathogen

D. ulmi reproduces in tiny structures on the surface of recently killed twigs and bark. Spores exude from those structures, called pycnidia, and are disseminated by wind and splashing rain. Insects may also play a role in the spread of the pathogen, but Dothiorella wilt has not been studied to the same extent as DED, and there are aspects of the disease that are poorly understood. Infection occurs through wounds on the youngest tissues of the twigs, probably made by insects, hail damage, or other agents such as freeze cracks. The fungus invades the vascular tissue of the twigs and branches, usually spreading for a few inches up to a few feet along the branch.

The prevalence of the disease in cedar elm is probably due to the tendency for that species to grow on marginal, droughty sites. Lack of water, for example, predisposes elms

to enhanced infection by *D. ulmi*, so that the disease is more prevalent during periods of extended drought.

Symptoms

Although all elm species are susceptible to Dothiorella wilt, cedar elm is most often observed with the disease. The symptoms first appear as wilting and yellowing leaves on isolated, individual branches ranging from small to a few feet. The symptomatic leaves rapidly turn brown, followed by death of the affected tissues (Fig. 8). Close examination of the branch will sometimes reveal a sunken, discrete lesion, known as a canker, at the margin of the healthy tissue and the diseased twig or branch. A careful excision of the bark with a knife in the cankered area will reveal a brownish discoloration in the outer sapwood, which would normally be white. Unlike the streaking with DED, the discoloration caused by NEW is more localized to the region where the canker is present. If the infections persist, the disease can eventually lead to a decline and death of the tree.

Figure 8. Symptomatic branches on a cedar elm infected by *Dothiorella ulmi*. *Source: Sheila McBride.*

Management

The first step in controlling Dothiorella wilt is to prune infected branches from the tree. Pruning cuts should be made at least 6 to 8 inches up to several feet below the cankered tissue, depending on the extent of the symptoms in the tree. Between cuts, pruning tools should be cleaned with alcohol, 10 percent sodium hypochlorite, or some other disinfectant to avoid spreading the pathogen into new wood. Measures should be taken to ensure the tree is vigorous, such as proper fertilization and watering practices, and not exposed to environmental stresses.

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