

44. Verticillium Wilt of Maple, Catalpa, and Elm

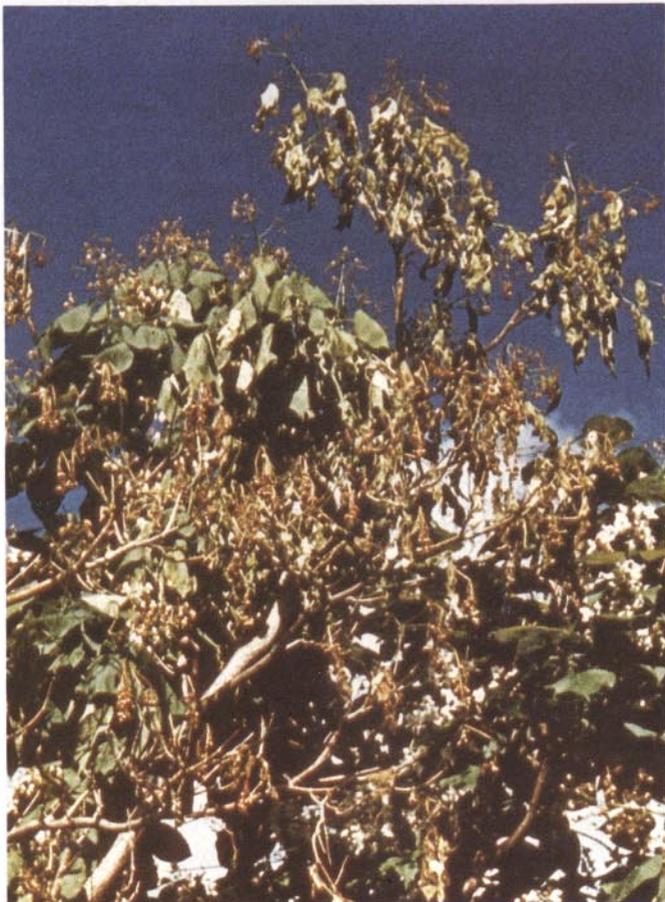
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Two closely related (perhaps identical) species of fungi belonging in the genus *Verticillium* are associated with Verticillium wilt: *V. albo-atrum* and *V. dahliae*. It is sufficient for our purpose to consider the two as one in relationship to the disease caused.

Hosts and Distribution

Verticillium wilt affects more than 300 kinds of plants, including food and fiber crops, annual and perennial ornamentals, and landscape trees. The disease may occur in forest stands, but it is far more destructive in landscape plantings. Valuable ornamental trees may be killed, or damaged to the extent that they must be replaced. The disease occurs in every country in the world, and in every State in the United States.

Figure 44-1. Foliage wilt of catalpa infected by *Verticillium albo-atrum*.



Symptoms and Signs

General symptoms of Verticillium wilt in trees are similar to those caused by other wilt diseases, but specific symptoms are often dependent on the host. Rapid wilting and dying of leaves on individual limbs is typical in many tree species. In maple, elm, and catalpa a general yellowing precedes wilting (fig. 44-1); in elm partial defoliation may also occur. Trees may first show leaf symptoms as early as March or as late as November. When early wilting of leaves on individual branches goes unnoticed, sudden wilting of the entire crown may be the first symptom seen by the homeowner. Other external symptoms include reduction in current twig growth, dieback of twigs, and sparseness in crowns. Some trees such as maple may have elongated areas of dead bark on branches and trunks. Elms are considered tolerant to infection, and commonly show stunting caused by chronically reduced growth. In these cases, trees may decline slowly over several years, and may eventually die.

Vascular streaking is another symptom of Verticillium-infected trees. In branches with advanced stages of wilt, the sapwood will discolor in the form of bands or streaks that run with the grain of the wood (fig. 44-2). Discoloration occurs most frequently in the springwood of the current season's growth. In trees that wilt in early summer, the discoloration may not be noticeable when the branch is examined in cross section. However, it is usually conspicuous as fine streaks on the surface of the sapwood when the bark is carefully peeled from a wilted branch. In branch cross sections, the discoloration appears as a series of dots in a single wood ring; in some cases, the dots are so abundant that the entire wood ring appears discolored (fig. 44-3).

In severely wilted trees the discoloration in the sapwood may be abundant and extend to the tips of wilted branches; in others the discoloration may be limited to the trunk sapwood or it may extend only a few inches into the basal portions of wilted branches. Diseased wood is light to dark brown in many species of trees, including elms. In maple it is light to dark green, and in catalpa, purplish pink changing to bluish brown upon drying. Ash wood shows no streaking, even when severely infected.

Disease Cycle

Verticillium is a soil-borne fungus that, once established in host tissue, is restricted to the water-conducting vessels. Invasion often occurs through the root system. The fungus usually enters through wounds, although

wounds are not necessary for infection. After colonization, the fungus can spread throughout the plant either by spores transported with the sap stream or by direct extension of vegetative mycelium. Optimum temperature for growth of the fungus in plants is 65° – 72°F. If the plant is killed by *Verticillium*, the pathogen survives in the roots and trunk and can remain viable for several years.

In addition to asexual spores (conidia), the fungus also produces resting structures called microsclerotia, which allow the fungus to persist in the soil for long periods separate from its parasitized host. Conidia do not survive for more than a few weeks in soils. Microsclerotia are produced readily at 70° – 85°F and are most abundant in the top 12 inches of soil of all types.

The dispersal of resting structures is a major deterrent to control of *Verticillium* wilt. One of the most important means of dispersal is by movement of soil, such as when trees are transplanted from nurseries to landscape sites. Microsclerotia are carried in root balls or on bare roots of infected trees, and contaminate the soil where the trees are planted. In nursery fields the microsclerotia can be spread by normal tillage operations. They may also spread in soil that adheres to equipment used in an infested field.

Damage

Damage due to infection by *Verticillium* is variable, and depends upon age of the host and species affected. It is not uncommon for trees with trunk diameters of 1 to 2 inches to be killed within 1 year of infection. Older trees may live several to many years following infection, but typically they gradually deteriorate over time. The disease has a greater impact on nursery seedlings and trees in landscape situations than on trees in forest stands.

Control

The best method of controlling *Verticillium* wilt in trees and shrubs is prevention. Avoid planting susceptible trees in soil where other plants are known to have died from the disease. Fertilization may help prevent the disease in landscape planting, or in some cases, help affected trees recover. Wilt severity is increased by “high nitrogen” fertilizers. “Balanced” fertilizers such as 10-10-10 (N-P-K) are recommended. Infected trees should also be watered every 10 – 14 days with the equivalent of 2 inches of rainfall. Low soil moisture sometimes causes the wilt symptoms to be more severe.

Dead branches showing severe wilt symptoms should be removed or pruned back to wood showing no vascular streaking. Sterilize pruning tools with rubbing alcohol or sodium hypochlorite after each use while pruning to avoid transmitting the fungus. Pruning diseased branches will not eliminate the fungus from the trunk or roots, however. All dead branches or dead wood should be burned, not buried. A note of caution on pruning: branches showing slight wilting of leaves should not be

removed immediately; they may recover in response to water and fertilizer treatments.

Because *Verticillium* is a vascular wilt pathogen, commonly used fungicides applied to topical surfaces are not effective. A systemic fungicide (one that is absorbed and translocated within the host plant) is necessary to reach the site where the pathogen is active. Mertect (thiabendazole) and Benlate (benomyl) gave some degree of protection to Russian-olive and sugar maple seedlings when applied as a soil drench two weeks after soil infestation. In the same study, foliar applications of these fungicides did not control the disease. The conclusion of this study was that chemical control of *Verticillium* wilt, even with systemic fungicides, is not practical when treating established trees.

Selected References

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- Himelick, Eugene B.; Neely, Dan. *Verticillium* wilt. In: Stipes, R. Jay; Campana, Richard J., eds. St. Paul, MN: Compendium of elm diseases. American Phytopathological Society; 1981: 22–24.
- Smith, Larry D. *Verticillium* wilt of landscape trees. Journal of Arboriculture. 5(9): 193–197; 1979.



Figure 44-2. Bark removed from maple stem to reveal vascular discoloration caused by *V. albo-atrum*.

Figure 44-3. Brown streaking of elm infected with *V. albo-atrum*.

