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4 PLANT PATHOLOGY NO. 23

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Verticillium Wilt of Trees and Shrubs

Verticillium wilt, caused by the fungus, *Verticillium albo-atrum*, is increasingly common among plantings of ornamental trees and shrubs. Persons unfamiliar with symptoms of Verticillium wilt frequently attribute losses from this disease to other causes, such as transplanting shock and winter injury. *Verticillium albo-atrum* can affect many species of woody ornamentals; it is difficult to estimate the economic loss it causes nursery and home owners.

Because of its ability to spread internally or systemically throughout the host plant, Verticillium wilt is considered a serious disease. Compared with Dutch elm disease or Oak wilt, Verticillium wilt is less severe and some infected trees have survived several years after infection. Sometimes simulated growth may seal the infected areas beneath a layer of thick sapwood. Forest stands do not seem to be affected by Verticillium wilt, but the disease is common in ornamentals. Maple species are probably the most susceptible shade tree host, yet new trees and shrubs are constantly being added to the list (table 1).

Verticillium wilt may appear in mild, chronic, or lethal forms. Its external symptoms include decline in twig growth, die-back of individual twigs and branches, and a general yellowing of the foliage. Large trees usually die slowly, while small trees may die quickly. Usually the first external symptom is a sudden wilting of the foliage on one or several twigs of a branch (figure 1). The first wilting stage may not be detected until the entire branch or crown of the tree has wilted. Sometimes a general yellowing of the foliage may precede wilting. Leaf symptoms generally appear in early July although symptoms may be evident during the entire growing season.

Table 1. Trees and shrubs susceptible to Verticillium wilt

Ash (black, blue, European, green, and white)	Linden, American, and Little Leaf
Azalea (<i>Rhododendron molle</i>)	Locust, Black
Barberry, Japanese	Maple, Amur, Norway and varieties: Red, Silver & Sugar
Boxwood, Korean	
Catalpa	Oak, Pin, and Red
Coffee tree, Kentucky	Pagoda tree
Elm, American, and varieties: Moline Chinese (<i>Ulmus parvifolia</i>) Slippery	Russian olive
	Sumac, Fragrant, Smooth, and Staghorn

Trees and shrubs showing partial wilt during a growing season may wilt further and die the following year. Yet, others may recover and not wilt in succeeding years. It depends on the extent of root infection. When most of the roots are infected, the tree may wilt and die before the end of the first summer.

Internal symptoms should be observed to determine if wilt infection is involved or whether another source causes wilting. The Verticillium wilt fungus lives in the water-conducting tissue of a tree. Note that this discolors the outer sapwood rings and infected branches (figure 2). Discoloration patterns vary from individual spots to partial or complete rings in one or more annual growth rings. In maple species, the discoloration is light green to olive green and may be difficult to find. Elm discoloration is generally brown; however, positive confirmation of Verticillium wilt infection can be made by isolating the fungus from the tree.



Figure 1

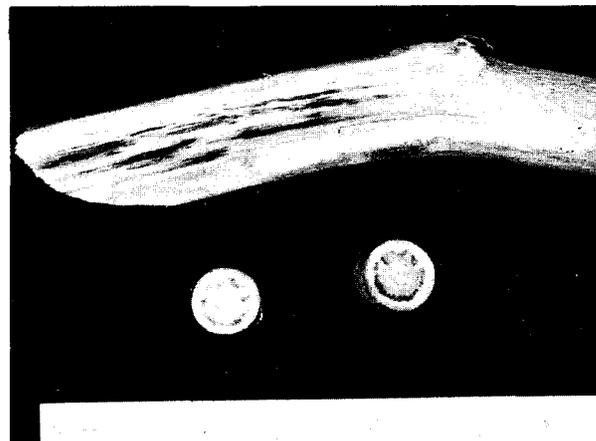


Figure 2.



Verticillium wilt is caused by a soil-borne fungus, parasitic on living tissue of many different plants and surviving on dead organic matter in the soil. The fungus is thought to enter the vascular system of plants through wounds in the roots or root tips, then to spread upward through the sapwood, interfering with water movement and other plant functions. The Verticillium spores move in the vascular system of the outer rings of sapwood. After infection, a protein-like material is produced in the vascular system: it can cause foliage to yellow and wilt. How this fungus travels is not known, but it is likely that it can survive for a number of years in soil, and roots of dead and dying trees. Movement of nursery stock from one region to another contributes to the distribution of all the virulent strains of this fungus. This suggests shrub and tree losses from Verticillium wilt will increase.

Once a tree is suspected of having Verticillium wilt, prune out all dead branches. It is usually not advisable to remove live branches immediately as some branches that are wilting may recover or produce new leaves 3 or 4 weeks after wilt first appears. Pruning does not eliminate the wilt fungus from the tree, but removes weakened limbs, which may be infected by other fungi. Trees suspected of having Verticillium wilt should be fertilized and watered. Trees occasionally wilt following transplanting and drought conditions may accentuate wilting symptoms in infected trees. During dry periods in summer, watering affected trees may improve or even save a tree suspected of being infected. Fertilizing may stimulate trees so that they will appear to recover and live several years after the first wilt. Fertilizers should be placed in the soil. See Soils Fact Sheet 7, Fertilizing the Home Lawn and Landscape Materials. (It will be available in the fall.)

No fungicides or any other chemical materials have shown promise in treating trees infected with Verticillium wilt. However, soil fumigants placed at the site where an infected tree is removed may reduce the danger of infection in a replacement tree.

When replacing trees or shrubs that have succumbed to wilt, select plants not susceptible to this disease. If a tree has been lost to Verticillium wilt, it is undesirable, unless absolutely necessary, to replant a susceptible tree in the same location. It appears that evergreen shrubs may be considered safe replacements since none has been affected with this disease.

The following list of trees and shrubs might serve well as replacements for any trees the fungus kills:

Arborvitae	Hawthorn	Larch	Poplar
Birch	Hickory	Mountain ash	Serviceberry
Fir	Honey locust	Mulberry	Spruce
Ginkgo	Hop hornbeam	Oak, white & bur	Willow
Hackberry	Juniper	Pine	

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