

PLANT DISEASE CONTROL NOTES

EXTENSION DIVISION • VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

DISEASES OF SHADE TREES

VERTICILLIUM WILT OF SHADE TREES

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Vascular wilt pathogens of shade trees are of 2 types; those that infect through the roots (causing Verticillium and Fusarium wilts) and the stem-infecting fungi (such as Ceratocystis ulmi which causes Dutch elm disease). Verticillium wilt is a serious disease of shade trees because of its systemic nature in spreading internally throughout the tree. In comparison with Dutch elm disease, however, it is often less severe, and in some cases, amenable to treatment after infection occurs.

The disease may appear in mild, chronic, or lethal form, and is caused by the soil fungus, Verticillium albo-atrum and possibly by related species. Once gaining entrance to the tree through the root system, the fungus generally spreads upward from the roots through the sapwood and interferes with water movement and other plant functions. It causes a variety of symptoms that may be accentuated by drought, inadequate nutrition, poor drainage or other conditions reducing tree vigor. The control of Verticillium wilt is difficult because the fungus is soil-borne and has a wide host range. It is capable of attacking some 130 different species of shade and ornamental trees, food and fiber crops, and annual and perennial ornamentals.

SHADE TREE HOSTS:

Maple (Acer) species are probably the best known shade tree hosts of Verticillium. Silver (A. saccharinum), Norway (A. platanoides), red (A. rubrum) and sugar (A. saccharum) maples are commonly infected. The following lists include some reported susceptible and resistant species:

Susceptible:

<u>Acer</u> spp. (maple)	<u>Liriodendron tulipifera</u> (tulip tree)
<u>Aesculus hippocastanum</u> (horsechestnut)	<u>Populus tremula</u> (European aspen)
<u>Ailanthus altissima</u> (tree-of-heaven)	<u>Robinia pseudo-acacia</u> (black locust)
<u>Catalpa bignonioides</u> (southern catalpa)	<u>Sassafras variifolium</u> (sassafras)
<u>C. speciosa</u> (northern catalpa)	<u>Tilia americana</u> (linden)
<u>Cercis canadensis</u> (redbud)	<u>Ulmus americana</u> (American elm)
<u>C. siliquastrum</u> (Judas tree)	<u>U. campestris</u> (English elm)
<u>Cornus florida</u> (dogwood)	<u>U. glabra</u> (Scotch elm)
<u>Cotinus coggygria</u> (smoketree)	<u>U. pumila</u> (Siberian elm)
<u>Cydonia oblonga</u> (quince)	<u>U. fulva</u> (slippery elm)
<u>Diospyros virginiana</u> (persimmon)	
<u>Fagus</u> spp. (beech)	
<u>Fraxinus pennsylvanica</u> (ash)	
<u>Juglans regia</u> (English walnut)	
<u>Koeleruteria paniculata</u> (goldenrain tree)	

Resistant

<u>Castanea mollissima</u> (Chinese chestnut)	<u>Taxus</u> (yew)
<u>Ginkgo biloba</u> (maidenhair tree)	conifers
<u>Quercus</u> species (oak)	

The resistance of many hardwood species is unknown.

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SYMPTOMS: Wilting, interveinal browning, and falling of leaves usually begin on one branch and progress through the tree. Dead and dying branches, sparseness of the crown and reduced twig growth are frequently observed (Figure 1).

Verticillium wilt causes discolorations in the form of streaks in the sapwood running with the grain and commonly extending from the roots to the branches. In a slant cut, it appears as spots or partial to complete rings in one or more growth rings (Figure 2). The discoloration varies with the tree species. In maples, it is grayish-green to olive-green; in black locust, brown to black; in elm, brown; and in northern catalpa, purple to bluish brown. Streaking may or may not be found in affected branches, and observation of the wood at or near the root system may be required. Positive confirmation can be made only by laboratory culture of symptomatic wood samples.

TRANSMISSION AND CONTROL: Precise knowledge concerning mechanisms of transmission is not well documented. It is known, however, that the fungus is well distributed in soils over wide geographic areas in the temperate zone. This is due, in part, to its ability to parasitize so many different hosts, including shade trees. Although Verticillium is believed to enter roots and stems only through injuries, infection may occur through young, uninjured roots. It is also possible that air currents may spread the spores over long distances. Trunk or stem infection then may occur if the fungus should lodge in an above-ground wound.

For control in nurseries, Verticillium-susceptible weeds such as lamb's quarters, amaranth (pigweed), nightshade (horse nettle) and ground cherry should be controlled. Rotating susceptible and non-susceptible species is also recommended. Certain plant parasitic nematodes are capable of interacting with Verticillium to increase the incidence and severity of disease in susceptible shade tree seedlings. Nematode control, therefore, is recommended, and specific information concerning this is provided in the Virginia Plant Disease Control Guide.

The following are recommended disease control suggestions in outplantings:

1. Positive laboratory diagnosis should first be made.
2. Prune wilted branches back to wood showing no streaking; be sure to sterilize pruning tools between cuts with alcohol or in a household bleach solution (1 part of bleach and 9 parts of water). Diseased materials should be burned.
3. If the entire tree is killed or severely infected, it should be removed and replaced with a resistant species.
4. Wilt severity is sometimes reduced in mild cases by the use of "balanced" fertilizers. Liberal and prompt application of a preferably soluble fertilizer with a balanced formula such as 10-10-10 is recommended.



Fig. 1. The right half of the maple is diseased (D), while the left half appears healthy (H).

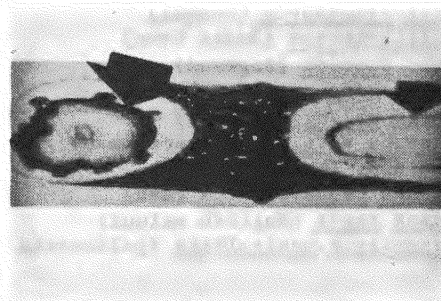


Fig. 2. Vascular discoloration in sapwood.