

# Verticillium Wilt

## OF WOODY ORNAMENTALS



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### ABOUT THE AUTHOR

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## Introduction

Verticillium Wilt is caused predominantly by the two soil-borne fungi, *Verticillium albo-atrum* and *Verticillium dahlia*. Verticillium Wilt is a serious, often lethal, vascular disease of many woody and herbaceous plants. Many food crops such as tomato, potato, eggplant, raspberry, and strawberry are afflicted. Many woody trees and shrubs in nurseries and landscapes are affected by the disease. Interestingly, Verticillium Wilt is rarely a serious factor in natural woodlots or forests. Table #1 contains a brief list of woody plants that are known to be susceptible to Verticillium Wilt. Table #2 contains a list of woody plants that tend to be resistant to Verticillium Wilt. It is interesting to note that some species of “resistant” plants are occasionally found to exhibit Verticillium infections, but may be listed as susceptible or resistant; examples include Linden and Dogwood.

## Symptoms & Disease Cycle

Symptoms of Verticillium Wilt can range from mild to severe. Very often, certain branches or sections of trees or shrubs may “wilt”, exhibiting branch dieback (Photos 1, 2A & 2B). Remission of symptoms may sometimes occur. Or, wilt may proceed to other branches in succeeding years. Sometimes, the entire plant may decline and die within a year or two. Mild symptoms may be represented by sparse foliage, leaf curling, scorch symptoms (marginal browning, Photo 3), stunted annual growth, smallish and yellowing foliage, partial

defoliation, and abnormal seed production (representing stress). Verticillium Wilt is sometimes found in conjunction with and/or contributing to such issues as “Maple Decline”. Cambium tissues killed by Verticillium may be invaded by other opportunistic microbes or pests. Symptoms of Verticillium Wilt may mimic other issues such as winter injury, construction damage, salt toxicity, drought, soil water saturation, decline and many other cultural and environmental factors.

Vascular discoloration (“streaking”) in cambial tissues is often a good diagnostic symptom of Verticillium Wilt infections (Photos 4 & 5). The vascular streaking may vary in color from green, to yellow, to brown, and to black, depending on the species of affected plants. Chronic infections may result in prominent stem cross-section discoloration (Photo 6). Some species of plants such as green ash may not always exhibit prominent streaking. While streaking may be fairly



**1** Typical symptoms of Verticillium Wilt include sectional limb dieback, such as those exhibited by this Smoketree (*Cotinus*). The disease may progress aggressively or slowly from one year to the next.

**2A** This Catalpa tree exhibits the typical symptoms of Verticillium Wilt, but no vascular streaking could be found in the upper branches.

**2B** The Catalpa tree in Photo 2A was one of a pair (on right); it was removed and, luckily, completely recovered the following season. Verticillium-infected plants would not normally recover so dramatically. The cause of the “dieback”, which turned out to not be dieback, was subsequently believed to be due to a temporary reaction to something toxic such as a vehicle’s exhaust or chemical exposure.







diagnostic, the lack of vascular discoloration does not automatically imply that the plant is not affected by Verticillium. The author has sometimes noted Verticillium discoloration in the lower stem (trunk) of a tree, but not in the branches. Hence, it is sometimes advisable to follow up suspicions of Verticillium Wilt with more thorough examinations and possibly a lab culture.

Verticillium is a soil-borne fungus; it is capable of surviving as a saprophyte for many years in the soil without a host plant. Verticillium infections of roots are the primary means of plant infection; root infection may be favored by stress (example: drought) and by injury (Photo 6). After infection, the fungus may move through the vascular systems where, as with Oak Wilt or Dutch Elm Disease, it may be impeded by the plant's own defensive mechanisms (chemical tyloses, etc.). Verticillium may also infect weeds, enabling the fungus to maintain a healthy, viable presence in the soil. Plants killed by the Verticillium fungus decompose in the soil where the fungus may remain until another opportunity for infection may occur. After killing a plant, small dark survival structures known as microsclerotia are formed; these microsclerotia help the fungus survive long periods as well as aid in dispersal by wind or soil movement.

### Verticillium Wilt Management

Even though Verticillium Wilt is often viewed as difficult to manage, there are a variety of tools that may help us to challenge this sometimes devastating disease.

**Plant Health:** Cultural factors that promote vigor and good growth in plants may help an infected plant "outgrow" the disease. Avoid stress by providing adequate moisture and nutrition (fertilizer), but not too much fertilizer.

**Avoid Wounding Roots:** It is not uncommon for many landscapes to have annual and perennial beds in the vicinity of trees and shrubs (Photo 7). The more the soil

is disturbed and root damage occurs in the vicinity of susceptible plants, the greater the likelihood of Verticillium Wilt infections.

**Avoid Contaminated Mulch:** Trees and shrubs killed by Verticillium are often chipped into mulch where the Verticillium fungus can be spread to new landscapes and/or plants (Photo 8). It is best to destroy (burn, etc.) plants killed by Verticillium.

**Utilize Resistant Plants:** When trees or shrubs are killed by Verticillium, one of the most effective disease management strategies is to use resistant species of plants as replacements.

**Crop Rotation:** In nurseries, it is not uncommon for continuous cropping of susceptible plants to result in a buildup of Verticillium in the soil and increased infections in succeeding crops. Rotation away from susceptible host plants may help reduce Verticillium populations in the soil.

**Soil Replacement:** In rare landscape situations where Verticillium has killed a tree, it may be possible to replace the soil with soil that is not (as) contaminated by Verticillium species. Such situations may include, for example, a client's demand for the highly susceptible Japanese maple in a particular location. This may be an iffy proposition.

**3** Foliar symptoms of Verticillium Wilt are quite varied, but may include wilt (death), scorch, discoloration, etc.

**4 & 5** Typical "streaking" induced by Verticillium in plants, both in cross-section (Photo 4) and longitudinally (Photo 5). Check for Verticillium in cross-section by cutting a branch or longitudinally by scraping the bark to expose the cambial tissues.

**6** Due to continuous cropping and other cultural practices (cultivation), nursery plants may be infected by Verticillium fungi. Chronic infections result in extensive cross-sectional discoloration. The only clue of a Verticillium Wilt infection on this maple tree, ready for sale and transplant, was some dead, leafless branches at the top of the tree. Previously sold plants often declined in the landscape after transplanting, resulting in an investigation of the cause.





**Plant Examination:** Because Verticillium Wilt is very common in the continuously cropped nursery setting (Photo 6), it would be prudent to examine plants very closely prior to purchasing potentially infected plants for installation in the landscape.

#### Chemical or “Natural” Treatments:

Although some arborists, landscapers and suppliers claim success for Verticillium Wilt by chemical or natural, biological treatments, whether they are applied as soil amendments or by trunk injections, the author has not witnessed any conclusive, scientific evidence to recommend such procedures on a regular basis except for a trial and error attempt for Verticillium Wilt remediation.



Photos by David Roberts.

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Continuously injuring the roots of trees and shrubs increases the chances of Verticillium Wilt infections. The property owners of this old landmark oak in Ann Arbor, Michigan plant annuals adjacent to the trunk of the tree every spring. Luckily oaks are not considered a prime host for Verticillium, but oaks are a host for Phytophthora (collar rot).

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Verticillium can survive in wood chips created from Verticillium-infected trees. If mulch contaminated by Verticillium is distributed around susceptible trees, they may have a greater chance of succumbing to Verticillium Wilt.

#### Table #1

##### Woody Trees and Shrubs Susceptible to Verticillium Wilt

Viburnum  
Barberry  
Wiegela  
Honeysuckle  
Rose  
Azalea  
Gooseberry  
Currant  
Spirea  
Daphne  
Photinia  
Privet  
Lilac  
Sumac  
Elm  
Ash  
Buckeye  
Horse Chestnut  
Catalpa  
Maple (most species)  
Locust  
Elder  
Smoketree  
Russian Olive  
Osage Orange  
Redbud  
Sassafras  
Serviceberry  
Tree-of-Heaven  
Tulip Tree  
Yellowwood  
Magnolia  
Cherry (& other stone fruits)

#### Table #2

##### Woody Trees and Shrubs that Exhibit Resistance to Verticillium Wilt

All Gymnosperms  
(Fir, Ginkgo, Spruce, Pine, Taxus, Larch, Arborvitae, etc.)  
All Monocots (grasses)  
Apple  
Crabapple  
Mountain Ash  
Beech  
Birch  
Boxwood  
Butternut  
Chestnut  
Dogwood  
Firethorn  
Hawthorn  
Sweetgum  
Hackberry  
Hickory  
Holly  
Katsura Tree  
Linden  
Honey Locust  
Oak  
Paw Paw  
Pear  
Plane Tree/Sycamore  
Poplar  
Quince  
Rhododendron  
Walnut  
Willow  
Zelkova

