



Sudden wilting and browning of foliage on one side of the tree is typical of Verticillium wilt. (Photo by John Obermeyer)

DISEASES OF LANDSCAPE PLANTS

Verticillium Wilt of Woody Plants

Verticillium wilt, caused by fungi in the genus *Verticillium*, is one of the most common and destructive diseases of woody ornamental plants in the Midwest. Common and highly susceptible hosts include redbud, smoketree, tree-of-heaven, and maples. Rose, lilac, boxwood, and barberry are also frequent hosts. In addition, *Verticillium* also infects many food crops, including potato, tomato, pepper, eggplant, and raspberry. In all, more than 300 plant species have been reported susceptible to this disease (Table 1).

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Table 1. Woody Plants Susceptible to Verticillium Wilt

Common Name	Scientific Name	Common Name	Scientific Name
Ash	<i>Fraxinus spp.</i>	Magnolia	<i>Magnolia spp.</i>
Barberry	<i>Berberis spp.</i>	Maple	<i>Acer spp.</i>
Boxwood	<i>Buxus spp.</i>	Osage Orange	<i>Maclura pomifera</i>
Brambles	<i>Rubus spp.</i>	Persimmon	<i>Diospyros spp.</i>
Buckeye	<i>Aesculus spp.</i>	Privet	<i>Ligustrum spp.</i>
Black gum	<i>Nyssa sylvatica</i>	Redbud	<i>Cercis canadensis</i>
Black locust	<i>Robinia pseudoacacia</i>	Rose	<i>Rosa spp.</i>
Box elder	<i>Acer negundo</i>	Russian Olive	<i>Elaeagnus angustifolia</i>
Catalpa	<i>Catalpa spp.</i>	Sassafras	<i>Sassafras albidum</i>
Cherry, Plum	<i>Prunus spp.</i>	Serviceberry	<i>Amelanchier spp.</i>
Cork tree	<i>Quercus suber</i>	Smoke Tree	<i>Cotinus coggygria</i>
Elm	<i>Ulmus spp.</i>	Sumac	<i>Rhus spp.</i>
Golden rain tree	<i>Koelreuteria paniculata</i>	Tree-of-heaven	<i>Ailanthus altissima</i>
Honeysuckle	<i>Lonicera spp.</i>	Tuliptree	<i>Liriodendron tulipifera</i>
Horse chestnut	<i>Aesculus spp.</i>	Tupelo	<i>Nyssa spp.</i>
Japanese pagoda tree	<i>Styphnolobium japonicum</i>	Viburnum	<i>Viburnum spp.</i>
Lilac	<i>Syringa spp.</i>	Weigela	<i>Weigela spp.</i>
Kentucky coffee tree	<i>Gymnocladus dioicus</i>	Yellowwood	<i>Cladrastis kentukea</i>

Symptoms

During midsummer, leaves turn yellow at the margins, then brown and dry. Sudden wilting of leaves on one or several branches may occur, which is known as flagging. Frequently, the foliage on only one side of a tree wilts [Cover image]. The wood under the bark of wilting branches is discolored in streaks following the length of the stem. The discoloration will vary from bright olive-green (maples) to chocolate-brown (redbud), depending upon the tree species and how long it has been infected. The discoloration might occur as distinct bands, streaks, or flecks in the sapwood [Fig. 1]. To examine for discolored sapwood, cut into the outer sapwood at the base of branches showing leaf wilt; also examine the outer rings of wood at the cut end of a pruned branch for discoloration. [Fig. 2]



Fig. 1 - Smoketree (left), Barberry stem (center, photo by Janna Beckerman) and Maple stem (right) showing discoloration of the water-conducting vessels caused by Verticillium infection.



Fig. 2 - Maple stem showing discoloration. (Photo by John Obermeyer)

Host susceptibility, site conditions, and environmental conditions influence severity of symptom development. Trees under drought, nutrient, or salt stress are more symptomatic. Speed of decline due to *Verticillium* wilt will also depend on the tree species. An infected tree may die in a single season or linger on for many seasons, with branch after branch dying and later being invaded by other decay or canker fungi.

Pathogen:

Soil-borne fungi in the genus *Verticillium* cause a vascular disease in trees commonly referred to as Verticillium wilt, with the species *V. dahliae* being the most common pathogen encountered in the Midwest. The fungus is well-adapted as a soil inhabitant and produces resting structures, known as microsclerotia, in both the soil and in infected plant tissue that can survive for many years. Fungal hyphae produced by these structures can directly penetrate roots of susceptible host plants, and grow within the water-conducting tissues (xylem). The tree responds to infection by plugging some water conducting vessels with gums and other materials, which restricts water flow, leading to drought-like symptoms and dieback.

Management:

There are no effective fungicide treatments for infected trees. Trees or shrubs with mild symptoms can often be maintained for several years by pruning out dead limbs and providing optimal care (appropriate amounts of mulch and fertilizer, and irrigation during dry periods). When fertilizing a tree infected with Verticillium wilt, use of products with higher potassium (K) values can also help with water management, and reduce drought stress. In some cases, these tactics may delay progression of the disease for a number of years; however, infection is not cured since the disease originates in the roots. Ultimately, most susceptible woody plants decline and die within a few years following first appearance of symptoms. Only *Verticillium* resistant trees and shrubs should be planted in landscape sites known to have *Verticillium* in the soil. Maples or other susceptible plants replanted in these sites may thrive for a few years before becoming symptomatic as new roots grow into soil infested with the fungus and become infected. Table 2, below, lists woody plants that are generally resistant to Verticillium.

Table 2. Woody Plants Resistant to Verticillium Wilt

Common name	Scientific Name	Common name	Scientific Name
Apple	<i>Malus spp.</i>	Larch	<i>Larix spp.</i>
Beech	<i>Fagus spp.</i>	Linden	<i>Tilia spp.</i>
Birch	<i>Betula spp.</i>	Mountain ash	<i>Sorbus americana</i>
Crabapple	<i>Malus spp.</i>	Oak	<i>Quercus spp.</i>
Dogwood	<i>Cornus spp.*</i>	Pawpaw	<i>Asimina triloba</i>
Fir	<i>Abies spp.</i>	Pear	<i>Pyrus spp.</i>
Firethorn	<i>Pyracantha spp.</i>	Poplar	<i>Populus spp.</i>
Ginkgo	<i>Ginkgo biloba</i>	Pine	<i>Pinus spp.</i>
Hackberry	<i>Celtis spp.</i>	Rhododendron	<i>Rhododendron spp.</i>
Hawthorn	<i>Crataegus spp.</i>	Spruce	<i>Picea spp.</i>
Hickory	<i>Carya spp.</i>	Sweetgum	<i>Liquidambar styraciflua</i>
Holly	<i>Ilex spp.</i>	Sycamore	<i>Platanus spp.</i>
Honeylocust	<i>Gleditsia triacanthos</i>	Walnut	<i>Juglans spp.</i>
Hornbeam	<i>Carpinus spp.</i>	Willow	<i>Salix spp.</i>
Juniper	<i>Juniperus spp.</i>	Yew	<i>Taxus spp.</i>
Katsura tree	<i>Cercidiphyllum japonicum</i>	Zelkova	<i>Zelkova serrata</i>

**Verticillium* is rarely reported on *Cornus* spp. but may occur in some settings.

The first and most important step in managing disease is to accurately diagnose the problem so the most effective measures can be employed. Branch dieback and internal symptoms within the wood can look similar to that caused by internal decay fungi. Confirmation of Verticillium wilt requires testing in a diagnostic lab. To submit a sample to Purdue University's Plant Pest and Diagnostic Laboratory visit the website (www.ppd.l.purdue.edu) or call 765-494-7071 for detailed information on how to submit a sample, including photos of the tree. You may also contact the Extension Educators at your local county office of Purdue Extension Service (<https://extension.purdue.edu/about/county-office.html>).

Submit a sample that is representative of the problem and shows the varying degrees of symptoms. Send several branches that are cut to about a foot in length and are at least an inch in diameter showing the symptoms. Samples need to be taken from living or recently dead branches; if the sample has been dead or has dried out too long, recovering the pathogen may not be possible. Include a sample submission form with a detailed description of the problem and other useful information about the site, the age of the tree or shrub, and the date of planting.

Ship the sample and submission form early in the week to:

Plant & Pest Diagnostic Laboratory
Purdue University
915 W State Street, LSPS room 116
West Lafayette, IN 47907

References:

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