



Verticillium Wilt

Verticillium wilt is a systemic fungus disease that grows inside the trees vascular system, much like Dutch elm disease and oak wilt. However, it is not an aggressive pathogen, and is less serious. Infected trees may survive many years after infection. Increasing the health of the infected plant will sometimes allow the plant to seal the diseased areas beneath a layer of thick sapwood.

Verticillium wilt is caused by two fungi: *Verticillium albo-atrum* and *Verticillium dahliae*. *Verticillium* attacks a wide range of woody plants and is common among plantings of ornamental trees and shrubs. This disease is frequently misdiagnosed.

Cause and Infection

Verticillium wilt is a soil borne fungus that is parasitic on living tissue of many different plants. It survives in the soil on dead organic matter and as specialized survival structures called microsclerotia and resting hyphae. When feeder roots come into contact with these survival structures they germinate and penetrate into the plant's roots. The fungus will also enter through wounds on the roots. Once inside the plant the fungus produces spores that spread upward through the sapwood. The plant responds to this by blocking its' vascular system. This reduces the water supply to the leaves and wilt develops.

Symptoms and Diagnosis

Verticillium wilt has chronic or acute phases. The external symptoms of the acute phase include: wilting, leaf curling and drying, fall coloration, defoliation, twig and branch dieback and death of the plant. These symptoms are indicative of infection in the current season's

sapwood. Trees and shrubs may exhibit acute symptoms for several years in a row and then skip a growing season. However the disease is usually progressive, starting at the bottom with symptoms moving higher in the plant each growing season.

Death of sapwood from a previous infection leads to the chronic phase of the disease. The symptoms include: decline in twig and leaf growth, sparse foliage, scorching of the leaves and dieback of individual twigs and branches. Both phases of the disease can occur simultaneously on a single plant. Symptoms of both phases can occur in sections of the plant or encompass the entire plant.

Large trees usually die slowly, while small trees may die quickly. Usually the first visible symptom is a sudden wilting of the foliage on one or several twigs of a branch. The first wilting may not be detected until a large portion has wilted or leaves have fallen off. A general yellowing may precede wilting. Most plants show wilt in July; however, the symptom may occur anytime during the growing season.

Trees and shrubs showing partial wilt during a growing season may wilt further and die the following year. Others may recover and not wilt in succeeding years. The pattern depends on the extent of root infection, the location of the disease in the plant and the overall health of the tree. Severe infections will kill a tree or shrub in a single season.

Accurate diagnosis of Verticillium wilt involves checking for internal signs of the disease. The fungus lives in the water conducting tissue and discolors the outer sapwood rings that are found just under the bark. The patterns of discoloration vary from individual spots to partial or complete rings in one or more annual

growth rings. The discoloration in maples is light green to olive green and may be difficult to find. Discoloration in elms is generally brown. It may be necessary to culture a sample of an actively wilting branch in order to assure an accurate diagnosis.

Treatment

Trees and shrubs showing general and severe wilt cannot be saved and should be replaced by a disease resistant species. Plants showing wilt in only a small portion of the canopy may be saved or their useful life prolonged. When treating a tree or shrub it is important to remember that the disease is a weak pathogen and only attacks stressed plants. The goal of treatment is to promote the formation of a thick layer of healthy sapwood which may seal in the infected parts beneath.

The first step of treatment is to improve the growing conditions for the tree or shrub. This involves fertilization to promote growth and

watering to prevent drought stress. DO NOT over water because saturated soils are extremely damaging to plant roots.

Pruning out the dead and wilting branches will not rid the tree of the fungus because it is found throughout the plant. Pruning does however remove weakened limbs, which may be attacked by other opportunistic fungi and insect pests.

At this time there is no fungicidal treatment that is effective in the control of this disease. The best defense is to prevent the initial infection by keeping trees healthy and growing vigorously. On sites where Verticillium has been identified it is best to plant disease resistant trees and shrubs when replacing dead and dying plants.

After assessing your site and plant health your Consulting Arborist can make specific recommendations regarding care and treatment of your important landscape plants.



Trees & Shrubs Susceptible to Verticillium

Ash	Horse Chestnut
Azalea	Kentucky Coffeetree
Barberry	Lilac
Black Locust	Magnolia
Boxwood	Maple
Brambles	Plum
Buckeye	Privet
Catalpa	Redbud
Cherry	Rose
Cork Tree	Russian Olive
Currant	Serviceberry
Gooseberry	Smoke tree
Daphne	Spirea
Elder	Sumac
Elm	Viburnum
Grapevine	Wiegela
Honeysuckle	

Trees & Shrubs Resistant to Verticillium

All Conifers	Larch
Apple	Linden
Beech	Mountain Ash
Birch	Mulberry
Butternut	Oak
Crabapple	Pear
Dogwood	Pine
Fir	Poplar
Gingko	Rhododendron
Hackberry	Spruce
Hawthorn	Sycamore
Hickory	Walnut
Honey locust	Willow
Hornbeam	Yew
Juniper	

Specific varieties of some types of plants listed may be found to be susceptible or resistant to infection. This variation occurs because of genetic variation among plants and differences in the virulence of the various strains of Verticillium as well as regional variation in growing conditions.