



## Overview of Verticillium Wilt and their Pathogen-Host Interaction in Plants

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### DESCRIPTION

Verticillium Wilt is a hemibiotrophic soil fungus that can cause plant vascular diseases and cause significant economic losses worldwide. Its hosts include more than 400 species of dicotyledonous plants, such as annual grasses, perennials and woody plants. The average cotton yield loss caused by verticillium wilt is about 10%-35%. As fighting this disease is an urgent task for many countries, it is essential to better understand the interactions between plants and *V. dahliae*. Fungi can promote or inhibit plant growth, which is very important; however, the most important relationship between plants and fungi is the relationship between host and pathogen.

Plants can resist *V. dahliae* through various mechanisms such as cell wall modifications, extracellular enzymes, pattern recognition receptors, transcription factors, and Salicylic Acid (SA)-related signaling pathways. Jasmonic Acid (JA)/Ethylene (ET). During the past decade, several studies on the physiological and molecular mechanisms of plant resistance to *V. dahliae* have been performed. In this review, many genes involved in resistance are summarized to provide a theoretical basis for better understanding of the molecular genetic mechanisms of plant resistance to *V. dahliae*. Additionally, it serves as a resource for research focused on developing genetic resistance mechanisms to combat verticillium wilt.

These include the well-known Verticillium fungi that enter trees and disrupt living tissue, causing the tree to weaken or die. Based on disease symptoms, the pathogenic fungus is usually the dominant organism in the identified soil. Soil with high biodiversity can prevent soil-borne fungal diseases. Pathogenic fungi are responsible for many agricultural root diseases, including verticillium and downy mildew. Ascomycete fungi are microscopic and predominate in agricultural soils and grasslands, while basidiomycetes can produce large fruit or the fungi predominate in residue-rich soils and forest floors. Some fungi help

control diseases and predators, including fungi that trap insect-eating nematodes and can be used as biological controls.

More than 200 species of mainly dicotyledonous plants, including herbaceous annuals, perennials and woody species are hosts to Verticillium disease. Because symptoms of Verticillium disease can vary between hosts, there are no unique symptoms in all plants infected with this fungus. Symptoms of the disease may include wilting, chlorosis, growth retardation, necrosis, and thinning of the veins. Brown vascular discoloration can be seen on cross-sections of stem tissue.

Transporting infected plants can move pathogens long distances. In bare-rooted or vegetatively propagated plants such as ornamentals or mints, nurseries can spread the fungus by selling asymptomatic but infected planting material.

Likewise, Verticillium can spread in infected potatoes. Once introduced into a field or landscape, pathogen spread occurs primarily through tillage and soil movement by wind or water. Verticillium propagules were found in highest concentrations in the top 30 cm (12 inches) of the ground, but were recovered at depths as low as 41 cm (16 inches). Inoculation density and disease severity tend to increase from year to year when susceptible plants are grown.

### CONCLUSION

Potato and mint verticillium wilt symptoms are often more severe in fields infested with the root nematode, *Pratylenchus penetrans*. This nematode can aggravate the disease by altering the host's physiology, making the plant more vulnerable. Symptoms can develop even when population densities of Verticillium and *P. penetrans* are too low to cause serious disease. For affected vegetables, remove and discard the plant; don't compost it. For ornamental plants, prune affected branches and destroy them immediately. Do not use infected wood as wood chips for landscape mulch.

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