



Verticillium Wilt of Pistachio

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Introduction

Verticillium wilt is a common vascular wilt disease of many economically important crops. The disease was first identified in pistachio in California in 1970s and historically has been a serious problem of pistachio. With the introduction of resistant rootstocks, the significance of Verticillium wilt has diminished greatly in the US. In Arizona, Verticillium wilt can be a significant problem of older pistachio trees on susceptible rootstocks (*Pistacia atlantica* and *P. terebinthus*) in Cochise county. The disease often is lethal to trees and tree death causes significant yield loss and incurs high replanting costs.

Pathogens

Verticillium dahliae (fungus: Ascomycetes).

Host Range:

Verticillium wilt affects numerous herbaceous and woody plant species. Important hosts in Arizona include: 1) vegetables: cucurbits, chile pepper, eggplant, and potato; 2) fruit nut trees: pistachio, olive, almond, strawberries and raspberries; 3) agronomic crops: cotton and alfalfa; and 4) landscape plants: rose, elm, and maple.

Disease Cycle:

The fungus survives as microsclerotia in the soil for many years, especially when previous soils have been planted with susceptible crops such as cotton, alfalfa, and cucurbits prior to orchard establishment. Microsclerotia germinate in the vicinity of actively growing roots and produce hyphae to infect roots. The fungus invades the xylem vessels of roots and leads to systemic infection of vascular system of the tree. Prolific fungal growth in the xylem channels restricts or disrupts the flow of water and nutrient. Disease development is favored by cold temperature, wet soil and stressed tree conditions. Hot summer may inactivate the fungus in aboveground portions and re-infections from roots may occur as favorable conditions return. Microsclerotia are produced in infected tree and returned



Leaf scorching on a pistachio tree affected by Verticillium wilt

to the soil for repeated infections or survival. The fungus are spread by contaminated soils and nursery stocks as well as pruning tools.

Symptoms and Diagnosis:

Pistachio trees of any age are susceptible. First leaf symptoms on affected branches are interveinal chlorosis and yellowing, followed by drying with a scorched appearance. The affected leaves fall off, leaving the branches barren. In late spring or summer, high temperature often leads to rapid wilting of one or more scaffold branches or death of the entire tree within a

single season. In some cases, the disease can be chronic and causes a tree disorder called “thin leaf decline” where slow branch dieback with a gradual canopy thinning, and reduced tree vigor and yield is the typical symptoms from season to season. Symptom expression varies with a specific rootstock and scion combination, inoculum density in the soil, disease severity, and environmental conditions. The diagnostic symptom is the vascular staining of branch, stem and root, but may not always be present.

Conditions can be confused with:

Cotton (Texas) root rot or Phymatotrichopsis root rot, Phytophthora crown rot. Verticillium wilt does not exhibit rots of root or crown, but has a distinct vascular staining in xylem of root, stem and branch. For a definitive diagnosis, symptomatic tissues should be collected and wrapped in a dry paper towel, placed in a plastic bag, and shipped **overnight** to the University of Arizona’s Extension Plant Pathology laboratory in Tucson. All submissions should be accompanied by completed [Plant Disease Diagnostic Form](#).

Management

The most effective tool to manage verticillium wilt is to replace the susceptible rootstocks (*Pistacia atlantica* and *P. terebinthus*) with the resistant rootstock Pioneer Gold (*P. integerrima*), PG II or UCB I (*P. integerrima* x *P. atlantica* hybrid). The occurrence and severity of verticillium wilt may be reduced by reducing tree stresses and maintaining tree health via proper management of irrigation and nutrients. Avoid planting trees in infested fields with a crop history of cotton, alfalfa and cucurbits. Pre-plant Soil fumigation and solarization may reduce microsclerotia populations within the soil, but will not eradicate the fungus.

Additional Resources

Raabe, R.D. and Wilhelm, S. 1978. Susceptibility of several *Pistacia* species to *Verticillium albo-atrum*. Plant Dis. Rptr. 62:672-673

Holtz B., Teviotdale B.L., and Epstein L. 2016. Soil-borne diseases in Pistachio Production Manual (L. Ferguson and D.R. Haviland Ed.) University of California Agriculture and Natural Resources Publication 3545, 257-264



Dark brown staining of xylem tissues in a branch



Thin leaf decline of a tree infected with Verticillium wilt



See-through canopy associated with thin leaf decline



Slow twig dieback over several seasons



Rapid death of one scaffold branch



Rapid death of all but one scaffold branch



Lower areas of orchards with several tree fatality, trees located at the leading edge of infection continue to decline gradually (note dead trees in the center were replaced with young trees with resistance to Verticillium wilt)



Death of a pistachio tree affected by Verticillium wilt



Bark crack or death on a tree with severe symptoms of Verticillium wilt



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