

Guidelines for the control of *Coniophora eremophila* on lemon trees in southwestern Arizona

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Background and introduction

Coniophora eremophila is the only known indigenous species of *Coniophora* found in the Sonoran desert. This species was described in 1975 by Lindsey and R. L. Gilbertson of the University of Arizona, Plant Pathology Department. It has been observed fruiting on numerous species of desert trees, shrubs and cacti, mainly as a saprobe on dead fallen wood associated with a brown rot. Sonoran desert species on which *Coniophora eremophila* has been found include ironwood, desert willow, saguaro cactus, Arizona black walnut, pointed leaf manzanita, velvet ash, cholla cactus, Mexican elder, velvet mesquite and the oneseed juniper, commonly found in New Mexico.

Most recently, an isolate from brown rot in a fallen saguaro was found to express the characteristics of *Coniophora* and was found to be identical to isolates from lemon. Interestingly, no fruiting bodies have been found to be associated with disease in lemon trees. In addition, the cultural morphology of *Coniophora* is unique at the genus level but, it is said to be difficult or impossible to differentiate between species in culture.

In recent studies conducted by Bigelow, Gilbertson and Matheron, results indicate that of the citrus cultivars grown in Yuma County, lemon trees are the most susceptible to infection and that rootstock does not appear to influence the growth of *Coniophora eremophila*.

Biology

There are 12 species of *Coniophora*, four of which are known to occur in Arizona. The three species other than *Coniophora eremophila* occur in conifer forest ecosystems at higher elevations in the state. Most of the 12 species of *Coniophora* in North America are not known to cause decay in living trees. However, three species other than *Coniophora eremophila* (*C. olivaceae*, *C. fusispora*, and *C. puteana*) are reported to cause decay in living trees. These other three species cause root and butt rots but are not known to cause decay in upper trunks and/or branches. Since no other species of *Coniophora* has been found in the Sonoran desert, scientists have concluded that the *Coniophora* causing the common brown rot in lemon is *Coniophora eremophila*.

Collections listed in the database from the Herbarium at the University of Arizona, Tucson have only 14 entries of wood decay fungi that are associated with citrus. The only brown rot fungus reported in citrus is *Amylosporus campbellii* which is a root and butt rot fungus not known to cause decay in trunks and branches like *Coniophora eremophila* does.

The Compendium of Citrus Diseases lists six diseases associated with living wood and involving fungal pathogens. The only living wood decay fungi included causes white rots not brown rots. Other reported diseases include root rot and butt rots found in both Florida and Texas and though one of the pathogens (*Ganoderma lucidum*) is known to occur in Yuma, it is not considered an important pathogen in Yuma County.

Much of the citrus grown in Yuma County is grown in close proximity to native desert plant species. Many of the species have been identified as host plants for *Coniophora eremophila* and are suspected of providing the spores which are aurally dispersed into neighboring groves. Laboratory studies suggest that this fungus is well adapted to high temperatures and can survive up to 40 degrees centigrade. In addition, the spores of this species are thick-walled and are presumed to have the ability to travel great distances without desiccation or loss of viability.

Symptoms

Decay caused by *Coniophora* is typically located in trunks and branches and not in the roots. This decay is believed to originate from airborne basidiospores germinating on pruning wounds or broken or split branches, subsequently spreading through the heartwood and into the sapwood.

This brown heartwood rot of lemon trees has been a serious problem in Yuma for a considerable period of time and was first reported to be associated with a

Coniophora species in 1992. This was the first report of a species of *Coniophora* causing a decay of living wood in citrus, or any other fruit trees. Many mature lemon groves in Yuma County express a high percentage of visible brown heartwood rot which is usually associated with a progressive dieback, decline and reduced fruit production, breaking of branches and cracking of large limbs due to loss of strength.

Lemon trees bearing heavy fruit loads commonly express these symptoms, particularly when stressed by heavy winds, rain or other environmental factors. Longitudinal splits often occur on branches with heavy fruit loads and will provide the potential for an abundance of infection sites.

Control

There is a limited amount of information available regarding the true biology of this fungus and the decay it causes in relation to cultural practices. For this reason alone it is difficult to make recommendations for control. The most obvious cultural disease management strategy would be reducing the number of infection sites on the trees. However, lemon trees grow so rapidly on the Yuma Mesa and produce so prolifically that they are subject to heavy pruning and often break lateral limbs due to such heavy fruit loading. Other injury sites from equipment damage, wind and weather damage, frost and insect injury can also be considered suitable infection sites for this fungus.

Though treatment of all these sites with fungicides may not be feasible, rapid removal of decaying branches as a sanitation practice and the treatment of pruning wounds in young groves should reduce the spread and growth of this fungus. Continuing studies are in progress to evaluate several different chemical treatments for pruning wounds and to determine if wounds on small branches are as susceptible to *Coniophora* as wounds on large branches.

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