



## Rapid 'Ōhi'a Death (Ceratocystis Wilt of 'Ōhi'a)

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### Introduction

A newly identified disease has killed large numbers of mature 'ōhi'a trees (*Metrosideros polymorpha*) in forests and residential areas of the Puna and Hilo Districts of Hawai'i Island. Land-owners have observed that when previously healthy-looking trees begin to exhibit symptoms they typically die within a matter of weeks. Pathogenicity tests conducted by the USDA Agriculture Research Service have determined that the causal agent of the disease is the vascular wilt fungus *Ceratocystis fimbriata* (Keith et al. 2015). Although *Ceratocystis fimbriata* has been present in Hawai'i as a pathogen of sweet potato for decades (Brown and Matsuura 1941), this is the first record of any *Ceratocystis* species affecting 'ōhi'a. It is not yet known whether this widespread occurrence of 'ōhi'a mortality results from an introduction of an exotic strain of the fungus or whether this constitutes a new host of an existing strain. This disease has the potential to kill 'ōhi'a trees statewide.



**Figure 1. Symptoms of *Ceratocystis* wilt of 'ōhi'a include rapid browning of affected tree crowns.**

### Extent

The disease affects non-contiguous forest stands ranging from 1 to 100 acres. As of 2014, approximately 6,000 acres from Kalapana to Hilo on Hawai'i Island had stands showing greater than 50% mortality. The disease has not yet been reported on any of the other Hawaiian Islands.

### Symptoms

Crowns of affected trees turn yellowish (chlorotic) and subsequently brown within days to weeks; dead leaves typically remain on branches for some time (Figure 1). On occasion, leaves of single branches or limbs of trees turn brown before the rest of the crown of becomes brown (Figure

2). Recent investigation indicates that the pathogen progresses up the stem of the tree. Trees within a given stand appear to die in a haphazard pattern; the disease does not appear to radiate out from already-infected or dead trees. Within two to three years nearly 100% of trees in a stand succumb to the disease. Other trees and shrubs in the forest such as kōpiko (*Psychotria* spp.), 'ohe mauka



Figure 2. Mortality on the right fork of an 'ōhi'a tree infected with *Ceratocystis*.

(*Polyscias* spp.), strawberry guava (*Psidium cattleianum*), *Melastoma* spp., and Koster's curse (*Clidemia hirta*) are not affected by the disease.

*Ceratocystis* manifests itself as dark, nearly black, staining in the sapwood along the outer margin of the trunks of affected trees. The stain is often radially distributed through the wood (Figures 3, 4, and 5). Wood samples incubated under moist conditions in plastic bags for a week produce characteristic fruiting bodies of *Ceratocystis* called perithecia (Figure 6). These fruiting bodies produce large numbers of spores whose transport accounts for subsequent infection of previously healthy 'ōhi'a trees.

### Methods of Transmission

It is not yet known how the disease spreads from tree to tree or from forest stand to forest stand. In other *Ceratocystis* plant hosts such as sweet potato, cacao, mango, and



Top: Figure 3. Cross-section of an infected 'ōhi'a showing the characteristic dark staining of sapwood caused by *Ceratocystis*. Above: Figure 4. Close-up of characteristic dark staining of sapwood from *Ceratocystis*.

eucalyptus, the fungus is moved by insects, soil, water, infected cuttings, pruning wounds, or tools, and these modes of transmission may also be involved in infections of 'ōhi'a trees and stands (Harrington n.d.). *Ceratocystis* has been found in soils under infected stands in Hawai'i, as well as in frass (sawdust) produced by wood-boring beetles in infected trees. Contaminated soil, windblown frass, and infected wood may all transmit the disease.

### What to Do

As of early 2015 the disease was confined to Hilo and the Puna district on Hawai'i Island. Landowners who suspect *Ceratocystis* infection of 'ōhi'a trees outside these areas are encouraged to contact Drs. Friday, Hughes, or Keith at the above addresses with reports and locations of infected areas. Digital photographs of crowns of infected trees and wood showing the characteristic staining will help in assessing likelihood of an infection.





**Figure 5. Bark slash of an 'ōhi'a tree showing tangential view of dark staining of sapwood from *Ceratocystis* infection.**

Currently, there is no known method of protecting 'ōhi'a trees from becoming infected with *Ceratocystis* nor an effective treatment to cure trees that exhibit symptoms of the disease. To reduce the spread of *Ceratocystis*, landowners should not transport wood of affected 'ōhi'a trees to other areas. The pathogen may remain viable for over a year in dead wood. Tools used for cutting infected 'ōhi'a trees should be cleaned either with Lysol™ or a 70% rubbing alcohol solution. A freshly prepared 10% solution of chlorine bleach and water can be used as long as tools are oiled afterwards, as chlorine bleach will corrode metal tools. Chainsaw blades should be brushed clean, sprayed with cleaning solution, and run briefly to lubricate the chain. Vehicles used off-road in infected forest areas should be thoroughly cleaned underneath so as not to carry contaminated soil to healthy forests. Shoes, tools, and clothing used in infected forests should also be cleaned, especially before being used in healthy forests.

For more information and updates on research on *Ceratocystis* wilt of 'ōhi'a, see <http://www.ohiawilt.org> or scan the QR code.



**Figure 6. Close-up of perithecia, or sexual fruiting bodies, of *Ceratocystis* on diseased 'ōhi'a wood.**

## References

- Brown, A.C., and M. Matsuura. 1941. Black rot of sweet potato. Agricultural Extension Circular #134, University of Hawai'i.
- Harrington, T. n.d. Diseases caused by *Ceratocystis* species. <http://www.public.iastate.edu/~tcharrin/CeratoDis.html> (accessed April 27, 2015)
- Keith, L.M., R.F. Hughes, L.S. Sugiyama, W.P. Heller, B.C. Bushe, and J.B. Friday. 2015. First report of *Ceratocystis* wilt on 'ōhi'a. *Plant Disease*. <http://dx.doi.org/10.1094/PDIS-12-14-1293-PDN>

