

A Disease of Many Names: Botryosphaeria, Avocado Branch Canker, Dothiorella Canker

Many growers have observed a significant increase in branch dieback in their avocado trees over the past several years, especially during California's historic drought. The cause of this dieback is a group of fungi called *Botryosphaeria*. The disease is commonly referred to as avocado branch canker (ABC) and was formerly known as *Dothiorella* canker.

The Rise of *Botryosphaeria*

The *Botryosphaeria* family, Botryosphaeriaceae, is a diverse group of fungi composed of 17 genera and 110 species, which represent plant pathogens (primarily of woody plants), endophytes (fungi that live synergistically within plants), and saprobes (decomposers). They are found everywhere in the world, except the polar regions.

Over the past decade or so, the Botryosphaeriaceae has risen as an important group of plant pathogens. Fungi in this family are now major pathogens of walnuts, almonds, pistachios, grapes and olives, as well avocados, in California.

No one is certain why this group of pathogens has apparently become more aggressive or abundant. However, it is likely related to climate change. The pathogenic members of the Botryosphaeriaceae are opportunists that typically attack stressed plants. Droughts, extreme temperature events, and even invasive pest outbreaks all have created a more stressful environment for our

orchard crops, which may be contributing to the increase in this group of diseases.

For avocados specifically, the decreasing water quality — primarily increased salinity — that most avocado growers are now struggling with, is a major stress factor that cannot be over emphasized.

Current Situation in Avocados

In 2018, the California Avocado Commission (CAC) gathered a group of experts to assess the situation in California avocado groves and develop recommendations for the industry (see "Understanding Avocado Branch Canker" in the Summer 2018 issue of *From the Grove*). As a result of that meeting, CAC solicited proposals for research projects to understand exactly which species of fungi were causing ABC and to develop management tools for the industry. In the 2018-19 fiscal year, CAC began funding a project with Dr. Themis Michailides, University of California Kearney Agricultural Center and the world's top *Botryosphaeria* researcher, who has worked extensively on this disease in California's nut crops.

Dr. Michailides and his team have been working diligently on this project, focusing on six objectives during the first year of research:

- Determine the extent of ABC problems in avocado groves
- Identify the most aggressive species of fungi



A cross section of an avocado branch showing the classic V-shaped necrosis associated with avocado branch canker.

- Study the life cycle and disease cycle of these fungi in avocado groves
- Determine when and how avocado shoots are infected
- Determine what factors influence disease expression
- Determine whether infections remain latent (dormant) and then lead to disease expression

The extent of the problem. Surveys performed by the research team throughout California's avocado growing region found the **pathogens causing ABC were present in every grove sampled**, ranging from young groves

— newly planted to four years old — to old mature groves. In addition, these surveys found that the pathogens are present on woody tissue, flowers, fruit stems (peduncles), leaves, and young and mature fruit. In other words, these pathogens are everywhere and simply looking for an opportunity to attack your trees, young or old.

Causal agents. The specific pathogens found in avocado groves were six species in the Botryosphaeriaceae as well as three species of *Colletotrichum*, the causal agent of anthracnose disease. All of the six species of the Botryosphaeriaceae were found to be pathogenic to avocados. They also were found to be more aggressive than the *Colletotrichum* species. These studies confirm the role of the Botryosphaeriaceae pathogens as the primary causal agents of ABC; however, there may be some synergistic relationship with *Colletotrichum* that is yet to be discovered.

Disease infection in avocados. Detailed studies of the pathogens in controlled laboratory environments found that the pathogens differed in their ability to grow under different temperature regimes. Pathogen growth rates generally increased from 68 °F to 86 °F, and only one species continued growing above 95 °F.

Controlled field inoculation studies with the various pathogens that were conducted at CAC's Pine Tree Ranch grove in Santa Paula found that wounds and high humidity increase the risk of infection and disease incidence. Additionally, these studies found that at least one of the Botryosphaeriaceae species and one of the *Colletotrichum* species can be recovered from infected but symptomless avocado tissues (flowers, twigs, leaves and fruit), suggesting the existence of latent infections in avocado. A latent infection is defined as an equilibrium state between the pathogen and host plant when the pathogen

causes little, if any, physical symptoms on the host.

Infectious, over wintering fruiting structures that produce asexual and sexual spores of both Botryosphaeriaceae and *Colletotrichum* species were found on both living and dead tissues in orchards. This further indicates how entrenched these pathogens are in groves and the difficulty growers will have in trying to eliminate all infections.

Lastly, controlled studies using potted trees found that trees subjected to drought stress had larger disease lesions than trees receiving adequate irrigation. This suggests that drought stress is one environmental factor that predisposes avocados to infection by ABC pathogens or may trigger latent infections to become active infections.

Current Management Recommendations

A search of the registered fungicides in California for use on avocados shows no products registered for use against *Botryosphaeria*; however, there are a number of products registered for use against anthracnose (*Colletotrichum* species). For a current list of these products, growers are encouraged to use the free Agrian database (<https://home.agrian.com/>). Go to “Label Lookup” at the top of the page, then click on “Advanced” in the pop-up window. This allows a search by crop and pest. Be sure to carefully read all pesticide labels before use and, remember, the label is the law.

Based on the Dr. Michailides team's research, the following are current recommended best management practices for managing ABC in avocado groves.

- Avoid pruning during or immediately after rain, dew or heavy fog. The moisture causes the fungi to release spores, which easily can cause infection. Spores are still present in



An avocado tree showing symptoms of avocado branch canker.

the grove during dry weather, but at much lower levels.

- Prune out dead limbs and twigs that house the pathogen fruiting structures and remove them from the grove to the extent practical to reduce inoculum levels in the grove.
- Prune dense canopies to increase air flow and reduce humidity. Be sure to make proper pruning cuts that will heal quickly (for a pruning primer see “Pruning 101: Pruning Dos and Don'ts for Healthy Trees” in the Winter 2017 issue of *From the Grove*).
- Reduce tree stress and maximize tree health with proper irrigation and fertilization practices. Make every effort to source good quality water and manage rootzone salinity, especially for new plantings.
- Reduce planting stress of new trees by ensuring new trees are properly planted and irrigated. Avoid planting during periods that will cause tree stress — heatwaves, Santa Ana winds, etc. 🍷