



Polyphagous Shot Hole Borer + Fusarium Dieback A Pest Disease Complex on Avocado in CA

BACKGROUND



Polyphagous Shot Hole Borer (PSHB), *Euwallacea* sp. #1, is an invasive beetle that carries three fungi: *Fusarium euwallaceae*, *Graphium euwallaceae*, and *Paracremonium pembeum*. The adult female (1.8-2.5 mm long) tunnels galleries into a wide variety of host trees, where it lays its eggs and grows the fungi. The fungi cause Fusarium Dieback (FD) disease, which interrupts the transport of water and nutrients in at least 38 tree species that are suitable for beetle reproduction.

A separate invasion of the closely related Kuroshio Shot Hole Borer (KSHB) has been detected in San Diego County. KSHB is morphologically indistinguishable from PSHB, but it is genetically distinct and carries different species of *Fusarium* and *Graphium*.

Photo (adult female) credit: Gevork Arakelian/LA County Dept of Agriculture.

HOSTS

PSHB can reproduce and grow *Fusarium* in at least 38 known species, called reproductive hosts. Relative susceptibility among these species is dynamic and varied. Some of the more susceptible reproductive hosts appear to be avocado, box elder, coral, palo verde, silk tree, white alder, castor bean, and several species of sycamore, cottonwood, and willow. Visit ishb.org for the full list of known reproductive hosts.

SIGNS + SYMPTOMS

Attack symptoms (e.g. gumming, staining, frass, sugary exudate) are a host tree's visible response to stress and vary among host species. On avocado, sugary exudate on trunks or branches may indicate PSHB attack (fig. A-C). Note that exudate may be washed off by rain events and therefore is not always present on heavily infested branches.

Fusarium dieback pathogens cause brown to black discoloration in infected wood. Scraping away bark over the entry/exit hole reveals dark, discolored tissue (fig E, F). Advanced infections eventually lead to branch dieback and death of the tree.



PSHB entry/exit-holes are ~0.85 mm in diameter, about the size of the tip of a ballpoint pen (fig. D). The female beetle's abdomen is sometimes seen sticking out of the hole.



Dark staining in PSHB galleries shows the extent of infection (fig. G, H).



LOOK-ALIKE SYMPTOMS ON AVOCADO

Many other pests can cause staining, sugary exudate, or bark damage on avocado. Look out for signs and symptoms that look similar to those of PSHB/FD.

Avocado trunk canker,
Phytophthora menzei
Fig. I, J



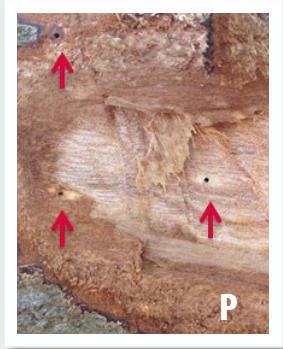
Black streak disease
Botryosphaeria spp.
Fig. K, L



Bacterial canker,
Xanthomonas campestris
Fig. M, N



Ambrosia beetle,
Xyleborus saxeseni
Fig. O, P
Secondary beetle
2-2.4 mm long,
smaller entry holes
than those of PSHB;
attacks stressed and
dying trees
Photo credit: (O) Christoph
Benisch <kerbtier.de>



**Avocado branch
canker and
dieback, caused by**
Botryosphaeriaceae
(*Neofusicoccum* spp.
including *N. australe*,
N. luteum, *N. parvum*;
Fusicoccum aesculi;
Dothiorella iberica;
Diplodia mutila;
Phomopsis sp.
Fig. Q, R



HOW TO REPORT A SUSPECT TREE

Please report suspected tree infestations to UC Riverside (eskalenlab@gmail.com). Submit the following information:

- Contact information (name, city, phone number, email)
- Suspect tree species
- Description of suspect tree's location (and/or GPS coordinates)
- Description of suspect tree's symptoms
- Photos of suspect tree and close-up photos of symptoms (see examples)

Take photos of suspect trees from several distances. Include photos of:

1. the trunk or symptomatic branches;
2. the symptoms (close-up); and
3. the entry/exit hole, if visible, with a ballpoint pen for scale (remove exudate if necessary). If dieback is observed, take a picture of the entire tree.



PSHB ONLINE

Stay up-to-date on the latest PSHB research.

- Eskalen Lab at UC Davis (<https://ucanr.edu/sites/eskalenlab>)
- UC Riverside Center for Invasive Species Research (cizr.ucr.edu)

AUTHORS

Akif Eskalen, Ph.D (UCDavis), Monica Dimson (UCCE Orange); John Kabashima, Ph.D (UCCE Orange). Images provided by Eskalen and Dimson unless cited otherwise.