

# Polyphagous Shot Hole Borer/ Fusarium Dieback Update

By Tim Spann

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The Polyphagous Shot Hole Borer (PSHB) (*Euwallacea* sp.), the vector of Fusarium dieback disease in avocado, continues to be front and center on CAC's radar. CAC is currently funding three research projects on the beetle/Fusarium complex through the University of California, Riverside, which are making significant progress in understanding this important pest/disease complex.

Dr. Richard Stouthamer, UC Riverside Professor of Entomology, is using molecular genetic techniques to try to determine where the beetle originated. His work is indicating that the beetle may originate from a region of Thailand, and he is in the process of obtaining more samples from there to confirm his preliminary findings. This is important information to know as it may allow for the discovery of biological control agents that evolved with the beetle in its native habitat and could possibly be used to control it in California.

Also working on the beetle side of this issue is Dr. Tim Paine, another UC Riverside Professor of Entomology. Dr. Paine is working on understanding the life cycle of the beetle and potential control strategies. Most recently, his team has been looking at pesticides and chipping as tools for PSHB control. It is important to note that **NO** pesticides are currently registered for use in avocados against this pest. To date, three common pesticides (imidacloprid, dinotefuron, and bifenthrin) have shown positive results at reducing PSHB populations in castor bean plants. However, it must be understood that despite these pesticides reducing the beetle population in an infected tree, the Fusarium fungus can continue to grow and block the tree's vascular system.

In order to minimize the risk of spreading PSHB, we must know how to dispose of wood from dead or dying trees that are removed from the landscape or grove. Dr. Paine's team has been working on this aspect of control as well, with some encouraging results. They have been looking at the effect of chipping beetle-infested wood into coarse (>2 inch), medium (1-2 inch) and fine (<1 inch) chips, compared to intact logs, to see if the beetles survive and can emerge and infest new wood. In their trials to date, chipping (all sizes) has been effective at dramatically reducing the number of beetles that emerge and re-infest trap logs placed on top of the chips. This work has also shown that intact infested



- ▲ Positive finding *Fusarium* sp./Polyphagous Shot Hole Borer
- Negative-*Fusarium* sp./Polyphagous Shot Hole Borer

Known distribution of *Fusarium dieback*/Polyphagous shot hole borer in southern California as of December 17, 2012. Map and data courtesy of Dr. Akif Eskalen.

logs are capable of supporting the beetle for two or more months, and should never be moved from infested areas.

Dr. Akif Eskalen, UC Riverside Extension plant pathologist, has been working with his team to identify suitable hosts for the PSHB/Fusarium complex, screen fungicides for their ability to control Fusarium dieback, and track the spread of the infestation. To date, 335 different tree species have been observed to determine if they are suitable hosts for PSHB, *Fusarium* sp., or both. Of these 335 species, 213 showed signs of attack by PSHB, and the *Fusarium* sp. was recovered from 108. Many of those 108 species are not suitable hosts for PSHB; rather it "tests" a lot of different trees, and in the process can inoculate some of them with the *Fusarium* sp. In total, only 21 species have been identified as suitable reproductive hosts for PSHB. That is, species in which the beetle is capable of reproducing and the fungus can grow. In addition to avocado, this group of 21


includes such common landscape trees as box elder, English and coast live oak, California sycamore, several maple species, as well as the invasive castor bean, among others.

As mentioned earlier, controlling the beetle does not rid the tree of the *Fusarium* fungus, so effective methods for controlling both components of this complex will be necessary. Dr. Eskalen's team has collected *Fusarium* samples from avocado, box elder and castor bean for use in laboratory fungicide screening trials. As with pesticides, it must be stressed that **NO** fungicides are currently registered for use on avocado against this fungus. Of the 11 fungicides that have been tested, eight showed some level of growth inhibition against the *Fusarium* fungus in laboratory assays. Of these eight, three were significantly better than the others, metconazole, pyraclostrobin, and tebuconazole, and these have moved into preliminary greenhouse and field trials.

Recently, Dr. Eskalen's lab has identified a second fungal pathogen associated with PSHB/*Fusarium* dieback; *Graphium* sp. Dr. Eskalen's preliminary data suggest that the *Graphium* sp. may be the primary food source for PSHB larvae, whereas the adults primarily feed on the *Fusarium* sp. Both of these fungi have been isolated, and healthy avocado nursery trees have been inoculated with each of them separately. These tests show that both fungi are pathogenic,

and early results indicate that the *Graphium* sp. may be a more aggressive pathogen than the *Fusarium* sp.

Since the last update, there has been significant movement of the beetle in two areas, but the infestation is still mostly restricted to Los Angeles County and northern Orange County, some distance from primary commercial avocado growing regions. The first is along the northern edge of the known infestation, between Altadena and Glendora, along the Angeles National Forest. This area was previously known to be infested, but there has been an apparent increase in the concentration of the infestation in this area. The second area of spread is in San Bernardino County, from Pomona to Ontario, bordered by the 10 freeway on the north and the 60 (Pomona) freeway to the south. There has been little movement along the other boundaries of the known infested area.

If you notice anything that may look like multiple small holes on the trunk or branches of trees, even if it is not associated with any dieback, you are encouraged to contact Dr. Eskalen at (951) 827 3499 or by e-mail at [eskalenlab@gmail.com](mailto:eskalenlab@gmail.com), or the CAC office at (949) 341 1955. Do not move suspect material out of your area for identification. More information about the Polyphagous Shot Hole Borer and *Fusarium* dieback visit [www.eskalenlab.ucr.edu](http://www.eskalenlab.ucr.edu) or [www.avocadosource.com](http://www.avocadosource.com). 

## Researchers need your help

Dr. Tim Paine's lab is investigating which avocado cultivars are most vulnerable to the PSHB/*Fusarium* dieback complex. To do this, they need your help to obtain study material from a number of different avocado varieties. Specifically, they need:

Freshly pruned branches from infested avocado trees.

Freshly pruned branches from avocado trees outside the area where the beetle is found.

Castor bean stands for pesticide trials.

Infested branches from other tree species attacked by the beetle.

Branches are preferred to be about 2 to 6 inches in diameter, and it is important that the cultivar name be known.

If the branches are infested with the beetle, please **DO NOT** transport them out of the area. The beetle survives very well in cut wood. Dr. Paine's lab will come and pick them up, and package them for transport.

For more information or to help by donating material please contact the Paine lab:

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