



Rooting out brown root rot disease in Guam's limestone forests

Fungi are not always nice guys. Take *Phellinus noxius*, an aggressive pathogen known to cause a disease referred to as brown root rot. This disease has been detected in over 200 species of trees across 59 families throughout the Asia-Pacific region and as far west as the Arabian Sea. Brown root rot has been known to exist on Guam for at least the past 25 years but rarely seen. This changed after a group of forester surveyors attended a UOG seminar about *P. noxius* in 2013 and then began looking for it in Guam's limestone forests. Within a few weeks three trees species were found infected at several locations, the most common species being the local Paipai or *Meiongyne cylindrocarpa* (formerly known as *Guamia mariannae*).

The characteristic brown or black sock at the base of the tree is distinctive of brown root rot, but this symptom may present differently in various tree species. Many trees will exhibit this distinctive symptom while some exhibit patches of brown, crusty rot all along the trunk and roots. This pattern can be seen on banyan trees.

Phellinus noxius begins its growth on the outer surface of roots and stems then invades and rots the wood beneath. The most common way for *P. noxius* to spread is when the roots of healthy trees contact roots, stems, or stumps of infected trees. Less common, but can result in spread over large distances, is when spores produced by the fungus are carried by air currents. Brown root rot is expected to increase this year as a

result of tree wounding from recent storms that passed near Guam: Tropical Storm Maria, Typhoon Mangkhut, and Typhoon Yutu.

One of the main pathways of infection by *Phellinus noxius*, as well as other fungi, is by entering via wounds or tree injuries. Damage caused by typhoons, and even tropical storms can leave trees susceptible to attack by fungal pathogens such as *P. noxius*. Wounds on trunks and branches expose tissue to infectious spores while wounds at the tree base or below ground expose tissue to infection through contact with roots of diseased trees. Even a diseased tree knocked over in a storm poses a threat to neighboring trees as the fungus grows out of the rotting tree into the soil in search of live, healthy trees to infect.

Since 2013, there has been a concerted effort by researchers to gain a deeper understanding of brown root rot in the Pacific region. Preliminary conclusions from an on-going genetic diversity study identified three distinctive groups of *P. noxius*: (1) American Samoa, (2) Eastern Asia (Hong Kong, Malaysia, Taiwan, Japan), (3) Australia and Pacific islands (Guam, Saipan, Palau, Yap, Pohnpei, Kosrae, Japan, Taiwan). Extension assistants working with Dr. Schlub will be collecting soil samples from healthy and infected tree in the Anao limestone forest in northern Guam for an on-going soil metagenomic study at the University of Colorado.

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On this Guam tree, signs of *Phellinus noxius* can be seen as a characteristic brown sock, which begins at the base of the trunk and extends upwards.

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