

Spatial and Temporal Aspects of Tylosis Formation in Tanoak Inoculated With *Phytophthora ramorum*¹

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Abstract

Phytophthora ramorum is an oomycete pathogen that causes sudden oak death in several species of Fagaceae including tanoak (*Lithocarpus densiflorus*). Symptoms on tanoak include stem cankers and crown death. Stem infection was thought to be restricted to bark and cambium, but has recently been shown to include sapwood.

Woody tissue colonized by fungal pathogens often has a greater abundance of tyloses than non-infected tissue, and tyloses have been interpreted as a host defense response to infection. In this study, we are investigating the spatial and temporal development of tyloses in tanoak logs and living trees inoculated with *P. ramorum*.

In a preliminary study, 30 logs were freshly cut from disease-free tanoak trees in southern Oregon. Half the logs were inoculated at cambium depth with *P. ramorum*, and half were inoculated with a sterile agar plug (wounded controls). At 2, 4, and 7 weeks, sapwood tissue samples were fixed in FAA and hand-sectioned for microscopy. Vessel diameters, the frequency of tylosis occurrence, the presence of hyphae, and the total vessel area occluded by tyloses were recorded. *P. ramorum* appeared to induce tylosis formation in tanoak sapwood by four weeks after inoculation. The spread of hyphae was more rapid than the formation of tyloses, indicating that tyloses may not be an effective defense response in limiting the growth of the pathogen. The relatively slow tylosis formation within tanoak sapwood in response to *P. ramorum* infection may provide insight as to why tanoak is so susceptible to this pathogen.

An unexpected finding was the reduction in the frequency of tylosis occurrence in inoculated logs from four to seven weeks. As the lesions developed, tylosis frequency increased in the xylem vessels. However, tyloses seem to become less frequent within the lesion near the point of inoculation and more frequent near the margin of the lesion. The reduction in tyloses may be due to hyphae within the lesion secreting enzymes that degrade the tylosis cell wall or elicitors that induce a hypersensitive response.

A field study is underway to examine spatial and temporal aspects of *P. ramorum* infection in relation to tylosis formation and specific conductivity of sapwood in living trees. Tanoak trees in California were inoculated with the pathogen in May 2006 and tissue samples were collected in September 2006. Additional samples will be collected in 2007 to track development of the infection and host response.

Key words: Sudden oak death, xylem, host response, stem canker.

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