

The Effects of Girdling on the Ectomycorrhizal Fungal Community Associated With Tanoak (*Lithocarpus densiflorus*)¹

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Abstract

Phytophthora ramorum was identified as the lethal agent of tanoak (*Lithocarpus densiflorus*), black oak (*Quercus kelloggii*) and coast live oak (*Quercus agrifolia*) in central areas of California. Although the geographic origin remains unknown, its severe impact on tanoaks and *Quercus* species, its limited geographic range and the existence of a single clonal population in North America are indicative of a recently introduced pathogen. Pathogenic invasions of this magnitude are often recognized as serious threats to the maintenance of biodiversity affecting both structure and function of ecosystems. Although several studies aim to understand the epidemiology, pathogenicity and treatment of *P. ramorum*, the effects on the microbial community remain unknown. The objectives of this study were to simulate the formation of cankers formed by *P. ramorum* through physical girdling of trees and to measure the impacts on the ectomycorrhizal biomass in both roots and soil. A randomized block design was implemented with five blocks (60 x 60-m) divided into three (20 x 20-m) plots. Baseline sampling was performed to examine ectomycorrhizal composition and biomass prior to girdling. Trees were treated in one of the following manners: (1) gouged for the entire circumference to prevent translocation in phloem (fully girdled), (2) physically girdled half of the tree to reduce carbon flow (half girdled), or (3) left untreated as a control. Root tips were sampled 5, 9 and 13 months after treatment. Quantification of extracted DNA from tanoak roots and collected soil was completed using TaqMan chemistry. Primers and probes were designed to target particular guilds (*Cenococcum*, *Sebacina* and *Tricholoma*) that were encountered in community assays and exhibited a broad spectrum of reproductive and ecological characteristics. We found no evidence to support the loss of ectomycorrhizal biomass of specific guilds on roots; however, there was strong evidence to support significant reduction in biomass of *Cenococcum* and *Tricholoma* from soil. The ratio of pg of DNA to dry biomass was higher during drier sampling periods for *Cenococcum geophilum*, likely from imposed water stress. Given that microbial populations mediate decomposition and mineralization rates, it is not improbable to expect that the negative impacts on the ectomycorrhizal populations may influence nutrient balance in an ecosystem after invasion by *P. ramorum*.

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