

Can Insecticides Prolong Survival of Oaks Infected by *Phytophthora ramorum*?

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Phytophthora ramorum infection kills many, if not most, infected coast live oaks, *Quercus agrifolia*. Several genera of ambrosia and bark beetles (Coleoptera: Scolytidae) colonize infected trees and are suspected to hasten tree death. Insecticide treatment is being offered to property owners to prevent the death of high value trees, although controlled studies of its efficacy are lacking. We are testing the efficacy of the synthetic pyrethroid insecticide permethrin in prolonging the life of infected coast live oaks and the closely related Shreve oaks, *Q. parvula* var. *shrevei*. We are also following the progression of *P. ramorum* infection in the absence of beetle colonization.

Asymptomatic coast live oaks (80 in each of two Marin County sites) were randomly assigned to three treatments in July 2002: inoculated, mock-inoculated (wounded but not inoculated), and control. Half of each group was randomly selected for spraying with permethrin twice each year, in August and February, prior to beetle flight periods, following recommended application levels. A Shreve oak study using the same protocol was started in March 2003 on 80 trees in Henry Cowell State Park, Santa Cruz County. Permethrin was applied in March and August.

After one year, 72% of the inoculated coast live oaks were bleeding. Permethrin treatment prevented beetle colonization during March and April 2003. However, by July, the mean number of beetle tunnels per tree did not differ as a function of permethrin treatment, indicating that efficacy decreased with time. Fewer beetles tunneled into the permethrin-treated trees than untreated trees in subsequent beetle flight periods. The damage to the bark caused by *P. ramorum* cankers may negate the effects of insecticides. Through October 2004, four (12%) inoculated trees had died, compared with one (4%) in the permethrin-treated group. Bleeding developed in 45% of the inoculated Shreve oaks in one year. Very little is known about the course of *P. ramorum* infection in this species. Bleeding in the inoculated trees tends to be more limited, and beetles appear to be less consistently associated, than in coast live oaks. Through October 2004, no inoculated Shreve oaks had died.