Chemical Ecology of Sudden Oak Death / Ambrosia Beetle Interactions

Frances S. Ockels and Pierluigi Bonello, Dept. of Plant Pathology, The Ohio State University, Columbus, OH 43210; 614-688-5409; ockels.1@osu.edu; Brice McPherson, Center for Forestry, and David L. Wood, Div. of Insect Biology, Dept. of Environmental Science, Policy, and Management, University of California, Berkeley, CA 94720

Coast live oaks, *Quercus agrifolia*, infected with *Phytophthora ramorum* in California produce a characteristic sequence of symptoms and signs. Ambrosia and bark beetles (Coleoptera: Scolytidae) consistently tunnel into the bark of bleeding cankers in naturally infected trees. In field monitoring conducted since 2000, every bleeding coast live oak that subsequently died had been colonized by beetles while bleeding cankers were the only symptom of *P. ramorum* infection. Although the function of these beetles in decline and death of infected trees has not been confirmed, they likely disrupt nutrient and water conduction and accelerate structural failure. In mechanically inoculated trees, beetles colonize the cankered areas within 9 months of inoculation. This behavior is not consistent with the reported feeding ecology of these saprotrophic insects. In an inoculation study, we used traps to monitor the response of beetles to both infected and wounded but uninfected trees. Traps placed on inoculated trees caught significantly more scolytid beetles than traps on trees that were only wounded. Six species of saprotrophic beetles are now known to be attracted to these infected trees. This directed response to native oaks infected by a putative introduced pathogen points to the production of volatile chemical attractants (kairomones).

Samples of volatiles emitted from the bark of infected and control oaks were collected in the field by strapping 1-L wide mouth plastic bottles directly on to the bleeding produced by cankers on inoculated trees, and over the site of the “inoculation holes” on the uninfected, but wounded trees. The point where each bottle rested against the bark was sealed to minimize mixing with external air. Samples were collected 24 h later by exposing solid phase micro-extraction (SPME) fibers to the atmosphere inside the bottles for 30 min. The samples were analyzed by gas chromatography-mass spectrometry. Putative identification of eluting compounds was based on matching with natural product spectra contained in the Wiley Registry of Mass Spectral Data. The implication of this work for the understanding of new ecological relationships involving coast live oak, a new pathogen, and saprotrophic insects will be discussed.