

# Factors Influencing *Phytophthora ramorum* Infectivity on *Umbellularia californica* and Testing of a Defoliation-Based Control Method<sup>1</sup>

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## Abstract

The primary foliar host for *Phytophthora ramorum* is California bay laurel, *Umbellularia californica* (Hook. & Arn.) Nutt., a main reservoir for the pathogen in California woodlands. We investigated environmental and pathogen-mediated influences on incidence and severity of *P. ramorum* infection of *U. californica*, as well as developing non-destructive means for controlling *P. ramorum* in woodlands.

Distribution and abundance of *P. ramorum* in California is typically assessed by counting symptomatic hosts and confirming by culturing the pathogen from field-collected samples. In 2010, extensive culturing was conducted within a previously established plot network in Sonoma County, California where *P. ramorum* has been studied since 2003. Symptomatic leaf tissues from 424 trees in 153 plots randomly distributed within a 275 km<sup>2</sup> region were collected. *Phytophthora ramorum* was successfully cultured from 138 trees (32.5 percent) and collected from 71 plots (46.4 percent). Culture success was greatest in the southwest portion of the study area and lowest in the northeast. Culture success was positively related to topographic moisture index and field count of symptomatic leaves at the site, and negatively related to average mean temperature at the site. Culture success in the laboratory could be used as an indicator of inoculum load in the field. Studies that rely solely on culture success to determine pathogen presence should use caution in interpreting results, as they may overlook some false negatives.

Additionally, a live plant model was developed to assess the validity of the commonly used detached leaf method for predicting interactions that occur between *P. ramorum* and foliar hosts. Specifically, infectivity of detached and attached leaves from the same *U. californica* trees in a growth chamber was assessed and compared to infectivity of detached leaves in an incubator. After 7 days, lesions were scored. Mean infection score did not differ between detached and attached leaves in the growth chamber. Detached leaves in the growth chamber and in the incubator also did not differ significantly. Despite differences in light and humidity between the growth chamber and the incubator, no differences in infection score were found between any treatments. These results suggest that the detached leaf assay is a good indicator of infectivity in live trees.

Controlled defoliation was examined as an alternative to the current practice of managing *P. ramorum* through the destruction of *U. californica* trees near symptomatic plants. Twenty-four *U. californica* seedlings were placed in six enclosures under infested canopies in the Fairfield Osborn Preserve in February 2011. Two trees in each enclosure were sprayed in May and July 2011 with ethephon, which releases ethylene upon decomposition, thereby inducing leaf abscission. Lesions were counted post treatment in January 2012. Leaves that received treatment developed significantly fewer lesions compared to the control group. Control saplings had 3.5 fold more infections than defoliated saplings. Defoliated saplings did experience excess lateral shooting, a side effect of ethephon, as well as a dead zone at the crown. Further testing could determine the long-term effects of ethephon on *U. californica* saplings and whether this dead zone is permanent or temporary. Ethephon does show promise as an alternate control method for *P. ramorum*.

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