

## Seasonal Trends in Response to Inoculation of Coast Live Oak with *Phytophthora ramorum*

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We developed a branch cutting inoculation method to provide a controlled system for studying variation in response to inoculation of coast live oak (*Quercus agrifolia*) with *Phytophthora ramorum*. This method has advantages over inoculations of trees in the field, in containing the inoculum and in allowing high levels of replication and time series of responses.

We have previously reported significant tree-to-tree variation, with little population variation in lesion size using this method. Here we report on a time series in which branch cuttings were collected from the same trees at 9 dates through a full year cycle. Branch cuttings were sampled from 33 trees from two sites at China Camp in Marin County, California, including 18 trees from one site that had suffered heavy mortality from this disease (Miwok Meadows) and 15 trees from a second site that has had little infection (Chicken Coop Island). Our inoculation experiments showed a very marked seasonal cycle in lesion size. Largest lesions were produced in the spring and declined through the summer, reaching a minimum in the August inoculation. There was an increase in response in the October inoculation to levels that were not significantly different to those in the late spring and early summer. The large lesions produced in the spring are at a time when cambial activity and sugar mobilization are likely to be at a maximum in this Mediterranean climate species and could provide a very suitable environment for the pathogen. The minimum lesion size in August is likely to coincide with very low activity of the cambium during summer drought. The increase in lesion size in October suggests that sugars may be more important than the size of the cambial zone in determining activity of the pathogen. At this time of year the cambium has generally completed cell divisions and cell differentiation and is likely to be composed of only a few cells in thickness. However, sugars may be actively transported to storage sites and possibly for root growth in the late autumn. We propose to test whether cambial activity or sugar contents in the phloem are correlated with seasonal activity of the pathogen in future studies.

Our inoculations confirm significant tree-to-tree variation in lesion size that we have shown previously. This suggests that populations should harbour important genetic variation in susceptibility to *Phytophthora ramorum*. The seasonal cycle in response to inoculation indicates that for comparative purposes, susceptibility tests should be carried out at the same time. Late spring to late summer inoculations are likely to show the least seasonal variation in response, but because of relatively low responses are likely to provide poor levels of detection of differences among individuals.