Incidence of *Phytophthora ramorum* Inoculum Found in Soil Collected from a Hiking Trail and Hikers' Shoes in a California Park

S..A. Tjosvold[1], D.L. Chambers[1], J.M. Davidson[2], and D.M. Rizzo[2]

[1] University of California Cooperative Extension, 1432 Freedom Blvd, Watsonville, CA 95076;

[2] Department of Plant Pathology, University of California, Davis, CA. 95616.

Introduction

Phytophthora ramorum, the causal agent of the disease commonly known as Sudden Oak Death, is a prevalent pathogen in California with its effects evident in 12 counties and found on 14 different oak, tanoak and non-oak hosts. The disease has been commonly found in areas of high recreational use such as state parks and forest service lands.

In some of the most heavily diseased areas, recreational hikers frequent the trail systems. It is important to understand if the pathogen inoculum is found in soil along the hiking trails and, if inoculum is there, whether it could be picked up on shoes of recreational hikers. The spread of inoculum could then be a real threat as a hiker visits new areas.

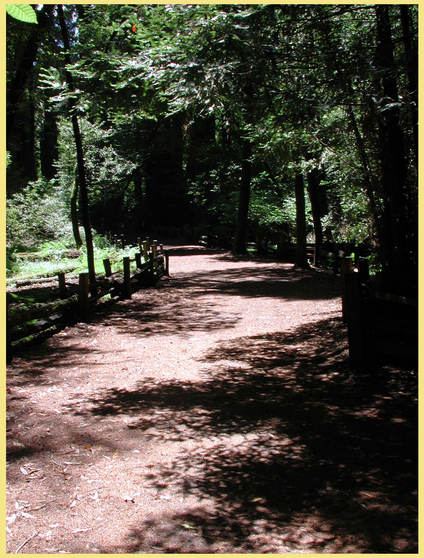


Fig. 1. The nature trail frequented by tens of thousands of local and foreign visitors per year. Soil was sampled from this trail at the same five general locations throughout the period. For each sample, surface leaf litter was removed and approximately 500 mL soil was sampled from the top 2-5 cm of the soil surface.

Materials and Methods

- Sampling began following rainy periods in March and May and then monthly through the dry summer and fall period 2002 in a popular California State Park.
- On each sampling date, soil was (1) sampled from the trail soil at the same five general locations distributed along a 1.3 km "nature trail" loop (Fig. 1) and (2) washed from the bottom of hikers' shoes who had hiked the trail (Fig. 2 and 3) .
- In the laboratory, trail soil samples, shoe soil and associated wash-water samples, were baited with pears (fig. 4), inspected for characteristic *P. ramorum* lesions, and pear tissue from suspicious lesions were transferred to PARP media for pathogen identification (fig. 5). All baiting and incubation was done at room temperature.

Fig 2. Soil was removed from the bottom of shoes after the hiker had completed the trail. On 05-21-02, 2.0 to 15.3 g dry wgt. were removed from each hiker's two shoes.

Fig 3. After a hiker had completed the 1.3 km trail, both shoes were spray washed with 500 mL distilled water to dislodge as much soil into a 3.8 L polyethylene zip-lock bag.

Results

1. In the spring rainy periods, the incidence of successful pear baiting for *P. ramorum* varied from 40 – 80 % success rate for trail soil and 40- 95% success rate for soil removed from hiker's shoes.

   In the dry summer period, no baiting was successful from trail soil or shoe soil.

Table 1 Incidence of *P. ramorum* and sample date

Sample Date	Shoe		Trail	
	# Samples	% Positive	# Samples	% Positive
03/10/02	0	0	5	60
03/12/02	20	90	0	0
03/18/02	22	40	0	0
03/19/02	0	0	5	40
03/25/02	20	90	5	80
05/21/02	20	95	5	60
07/10/02	20	0	5	0
08/22/02	20	0	5	0
09/17/02	20	0	5	0
10/08/02	20	0	5	0
11/11/02	20	5	5	0

Fig 4. Baiting: Two Danjou pears were cleaned gently with mild liquid soap and water, placed in the sample bag containing shoe soil and associated wash water (left) or in trail soil (right) for approximately 48 hours or until lesions appeared.

Fig 5. After baiting: Pears were placed on paper lined trays for an additonal 48 to 96 hours. If distinctive lesions, consistent with those caused by P. ramrum appeared, then isolations were transferred to PARP for positive identification

Results (continued)

Immediately after the first Fall rain, *P. ramorum* was again detected on 5% of sampled hikers' shoes but not from trail soil. Table 1.

2. Incidence was highly correlated with rainfall. Fig. 6 and 7.
3. This data indicates that controlling *P. ramorum* movement on shoes might be appropriately targeted at rainy periods.

Fig. 6 Shoes and Rainfall: Isolations of *P. ramorum*
Sampled 03/10/02-11/11/02

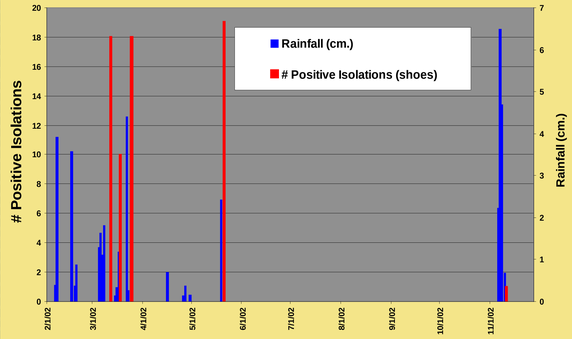
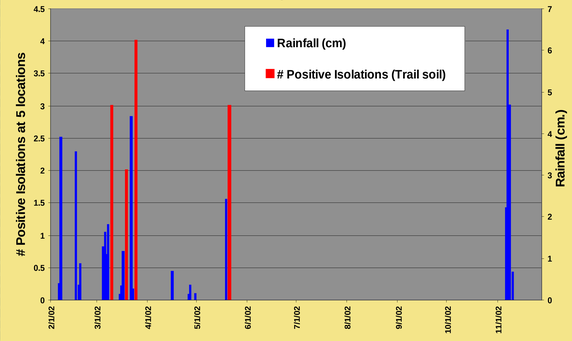


Fig. 7 Trail Soil and Rainfall: Isolations of *P.ramorum* Sampled 03/10/02-11/11/02



Acknowledgements

This research was supported, in part, by the USDA-Forest Service, Pacific Southwest Research Station and USDA Forest Service, State and Private Forestry