

***Phytophthora* species Can Be Reliably Detected by Dogs Both From Infested Substrates and Infected Plants¹**

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Abstract

In recent years, reports of *Phytophthora* detections have increased from plant production facilities supplying plant stock for restoration projects (Garbelotto and others 2018). When introduced into new natural habitats through infected plant stock, the potential for *Phytophthora* infection and spread is high. Monitoring of nursery stock is key to reducing new introductions into wildlands, however, sampling in nurseries is currently considered too expensive and complex to be performed on a large scale.

This study was undertaken to determine if it would be possible to train ecological scent detection dogs to discern *Phytophthora species* and discriminate *Phytophthora* odors from other scents in leaves and soil of infected plants. The U.C. Berkeley Forest Pathology and Mycology Lab teamed with H. T. Harvey & Associates to develop a *Phytophthora* detection dog pilot study (Swiecki and others 2018), starting with a single dog.

The training has occurred in phases, first to expose the dog to recognize *Phytophthora* odor in a range of media. Four species of *Phytophthora* - *P. ramorum*, *P. cinnamomi*, *P. nemorosa* and *P. cactorum* – were grown in four different media – soil-water solution, soil-water-pea broth solution, local soil collected under oak trees, and commercial potting soil. The dog had a 100% detection level in blind testing consisting of 10 trials each.

Phase two of the training employed infected *Rhododendron* plants for the scent trials. *P. ramorum* and *P. nemorosa* were inoculated on leaves, while *P. cinnamomi* and *P. cactorum* were soil inoculated. The dog again had a 100% detection success level in blind testing.

In phase three, discrimination training of *Phytophthora* from co-occurring *Pythium* isolates was performed to ensure that the detection is genus specific. In addition, we tested the dog's ability to correctly identify *Phytophthora* infection in plant species other than *Rhododendron* spp. A fifth species of *Phytophthora* – *P. tentaculata* – was added to the dog's repertoire during this phase.

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The dog had 100% detection rate in double-blind testing consisting of 10 trials on the new *Phytophthora* species and very promising results during the *Pythium* discrimination trial.

Results from the study so far suggest that ecological scent detection dogs may offer an innovative and reliable method to survey for *Phytophthora* in a variety of settings. Dogs could offer a rapid way to reliably detect the pathogen in a variety of controlled environments, such as nurseries; to prescreen plants before they are installed at habitat restoration sites; and possibly to identify infected naturally occurring plants and soil in the field.

Literature Cited

Garbelotto, M.; Frankel, S.J. and Scanu, B. 2018. Soil- and waterborne *Phytophthora* species linked to recent outbreaks in Northern California restoration sites. *California Agriculture*. 72(4): 208-16.

Swiecki, T.; Quinn, M.; Sims, L.; Bernhardt, E.; Oliver, L.; Popenuck, T. and Garbelotto, M. 2018. Three new *Phytophthora* detection methods, including training dogs to sniff out the pathogen, prove reliable. *California Agriculture*. 72(4): 217-225.