# Interaction of *Trichoderma asperellum* With *Phytophthora ramorum* Inoculum Soil Populations and Enzyme Secretion[1]

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## Abstract

There is a continuing desire to investigate the potential of biological control to manage the spread of *Phytophthora ramorum*. A specific isolate of *Trichoderma asperellum* has been demonstrated to be effective in reducing *P. ramorum* soil populations to non-detectable levels. This study was conducted to investigate the interaction of different *T. asperellum* application rates with different initial soil populations of *P. ramorum* in a mock nursery setting and to investigate the impact of these interactions on important enzyme levels. Field trials were set up in the fall and spring where soil in a nursery bed was infested with *P. ramorum* chlamydospores at three different levels (< 2, 5-10, and > 15 cfu/cm$^3$ soil). A commercially formulated wettable powder of a *T. asperellum* isolate was applied at two different levels ($10^6$ and $10^7$ cfu/cm$^3$ soil) by drenching the soil and raking into the top 3 cm of soil. Soil samples were collected every 4 weeks and baited with rhododendron leaf disks to determine the presence of *P. ramorum*. Overall results were inconsistent and difficult to make definitive conclusions. In the spring trial, only the high application rate of *T. asperellum* eliminated *P. ramorum* at all three initial soil populations.

The primary mechanism involved in the biological control of *P. ramorum* with the tested *T. asperellum* isolate appears to be direct parasitism. The enzyme laminarinase, which catalyses the hydrolysis of β-1-3 linkages in polysaccharides of D-glucose residues connected by β-1-3 linkages or mixture of β-1-3 linkages and β-1-6 linkages, is believed to be an important enzyme in cell wall degradation of *Phytophthora* spp. Studies were conducted to determine if enzyme activity was induced in the presence of *P. ramorum*. Secreted laminarinase activity was measured in liquid medium in the presence of various levels of *P. ramorum* mycelium. As a comparison, enzyme activity was also measured in the presence of *P. tentactulata* and in medium alone. After 24 and 120 h, laminarinase activity was significantly higher in the presence of *P. ramorum* mycelium compared to controls in the medium alone. Enzyme activities increased as *P. ramorum* mycelium was increased. Enzyme levels did not increase in the presence of *P. tentaculata*, regardless of the amount of mycelium present in the medium.

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[1] A version of this paper was presented at the Sixth Sudden Oak Death Science Symposium, June 20-23, 2016, San Francisco, California.

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