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RESEARCH ARTICLE

Evaluation of several commercial biocontrol products on European and North American populations of *Phytophthora ramorum*[†]

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Five commercially available biological control products were tested *in vitro* with seven isolates of *Phytophthora ramorum* from North American (NA1, NA2), and European (EU1) populations. The *in vitro* tests included dual culture methods and detached leaf assays on wounded Rhododendron and Camellia leaves. Variability in response to biocontrol agents among isolates of *P. ramorum* from North American and European populations was examined. In dual culture tests, both *Bacillus subtilis* products (Companion[®] and Serenade[®]) resulted in better inhibition of the NA1 group than NA2 and EU1. Actinovate[®] (*Streptomyces lydicus*) was the least effective of the three bacterial biocontrol agents and there was no difference in percent inhibition among *P. ramorum* lineages. Two products containing *Trichoderma* spp. were tested: Plant Helper[®] (*T. atroviride*) caused 100% inhibition of all lineages of *P. ramorum*, while SoilGard[™] (*T. virens*) was only about 30% effective. There was great variability among *P. ramorum* isolates in their response to biocontrol agents. All treatments reduced *P. ramorum* lesion size on both Rhododendron and Camellia. Combined treatments of Actinovate[®] with one other BCA did not perform as well as either treatment used individually. Best results were obtained with Serenade[®] on Rhododendron and Camellia foliage, especially against the NA1 group. Lack of a linear relationship between percent inhibition of *P. ramorum* by BCAs *in vitro* and foliar treatments on detached Rhododendron and Camellia leaves indicates that *in vitro* testing is a poor predictor of BCA performance on plant material.

Keywords: *Phytophthora ramorum*; biological control; *Streptomyces*; *Bacillus subtilis*; *Trichoderma*; nursery crops; ornamental plants; ramorum blight; sudden oak death

Introduction

Phytophthora ramorum S. Werres & A.W.A.M. de Cock (Oomycetes: Peronosporales), the organism causing sudden oak death and ramorum blight, is an emerging problem in wildlands and nurseries (Garbelotto 2004). As of May 2008, 45 proven host species and 72 associated hosts (regulated as nursery stock) have been identified for

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[†]Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the Canadian Forest Service or the Canadian Food Inspection Agency.

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