

Episodic Abiotic Stress and *Phytophthora ramorum* Blight in Rhododendron: Impacts on Root Infection, Symptom Expression and Chemical Management¹

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Abstract

Of concern for disease management and certification programs in nursery ornamentals is that roots, when colonized by *Phytophthora ramorum*, may serve as a potential reservoir of inoculum. An additional complication is that the above ground portion of plants with root infections may be asymptomatic. Our central hypothesis is that mild abiotic stresses can compromise basic host resistance to trigger systemic development of disease from soilborne infections. Corollary to this is that these stresses may also influence the efficacy of chemical management.

Growth chamber and outdoor nursery experiments examined the influence of abiotic stresses on root infection and systemic disease development. Three *P. ramorum*-susceptible cultivars of *Rhododendron* sp.—‘Cunningham’s White,’ ‘Gomer Waterer,’ and ‘Roseum Elegans’—were examined for their responses to chilling, water logging, water deficit, or salinity. For growth chamber experiments, standard conditions were a 16-hour photoperiod with a temperature cycle of 22 °C (day) and 15 °C (night). For chilling experiments, inoculated plants were transferred to a 20 °C /4 °C day/night temperature regime (12-hour cycle), 16-hour photoperiod for 5 days, followed by return to standard growth conditions until evaluation. Water logging, water deficit, and salinity were imposed by standard or previously published methods. In addition, three *P. ramorum* isolates, all from Marin County, California, were used. An outdoor trial also was established in June 2011 in the nursery at the National Ornamentals Research Site at Dominican University of California in San Rafael, California. In this trial, the interaction of salt and fungicide treatments (Subdue Maxx[®] or Aliette[®]) was examined in relation to root colonization and *P. ramorum* development. Plants were inoculated by adding a *P. ramorum*-infested V-8 broth/vermiculite medium to the soil. Six months after initiation, plants were evaluated for symptom expression and root samples were collected and plated on PARPH medium for detection of *P. ramorum*.

There was no evidence for disease predisposition in rhododendron by chilling. In contrast, brief episodes of salt or drought stress predisposed plants to enhance subsequent *P. ramorum* development, although this effect varied with isolate and appeared to be related to differences in virulence as determined by lesion development on rhododendron leaves. In the nursery, Subdue Maxx[®] and Aliette[®] partially suppressed *P. ramorum* root colonization, even in plants experiencing an episode of salt stress. However, in all treatments, roots were heavily colonized, although plants appeared healthy on visual inspection and did not show any above-ground symptoms of infection. These results indicate that rhododendron plants can sustain extensive and perhaps prolonged colonization of roots by some strains of *P. ramorum* without apparent stem or foliar symptoms, and raise concerns about the adequacy of current practices for monitoring *P. ramorum* in the nursery.

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