

An Investigation into Western White Pine Partial Resistance Against the Rust Pathogen *Cronartium ribicola* Using In Vitro Screening Method

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Abstract

Cronartium ribicola is one of the most destructive forest pathogens of North American white pines. The pathogen infects pine trees through their stomata, colonizes the stem, and produces stem cankers the following growing season. In this research, we collected samples from different white pine populations across Canada and the United States to develop an efficient ex vitro and in vitro screening method for phenotype expression of western white pine (*Pinus monticola* Douglas ex D. Don) following inoculation with *C. ribicola*. A major group of partial resistant plants in British Columbia, described as difficult-to-infect (DI), presented significant resistance in our field trials. We developed a disease assessment index, based on both in vitro and ex vitro techniques, to evaluate specific reactions to the pathogen of the DI plants. A disease progression index (DPI) for each category has been established. *Ribes* leaves from 2-year-old plants have been successfully cultured and maintained on the half-strength Murashige and Skoog (MS) medium supplemented with 0.02 μ M NAA+0.1 μ M IBA. These in vitro inoculated leaves produced urediospores after 2 weeks and teliospores after 6 weeks in culture. The preliminary results from our DI screening experiments indicated a significant difference in the number of successful infections between DI and control populations. Further morphological investigation into the mechanism(s) responsible for these variations with electron microscopy revealed a considerable difference in the morphology of stomata. Also, the amount of epicuticular wax on the stomata of the resistant populations was significantly higher than the control plants. These adaptations could provide a greater structural defense system against white pine blister rust.

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