

Polymerase Chain Reaction (PCR) Applications in White Pine Blister Rust Resistance Screening

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Abstract—A goal of breeding programs for resistance to white pine blister rust is the development of multigenic resistance, even if the genetics and mechanisms of resistance may be imperfectly understood. The goal of multigenic resistance has prompted efforts to categorize host resistance reactions at increasingly finer scales, to identify heritable traits that may confer quantitative resistance. PCR amplification of *Cronartium ribicola* DNA presents a sensitive and highly specific method for detection of *C. ribicola* in host tissues, and is well suited to screening of large numbers of samples for which other methods of pathogen detection (e.g., microscopy) may be unsuitable. PCR amplification can be used to detect presence of the pathogen in different host tissues, and so can provide useful information on putative resistance responses that may be localized in specific tissue types. We report development of a PCR based assay for detection of *C. ribicola* in pine needle tissue and the results of PCR screening for *C. ribicola* in limber pine and whitebark pine individuals that have been identified as having as yet uncharacterized resistance responses that prevent or impair colonization in needle, shoot, root and bark tissues, and discuss the advantages of this method in operational breeding programs. PCR amplification detected *C. ribicola* in symptomatic regions of western white pine, whitebark pine and limber pine needles at 6 months after inoculation; *C. ribicola* was detected in the nonsymptomatic region of only one of six infected needles tested. Work is continuing to improve the sensitivity of the technique.

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