Interaction of an Invasive Bark Beetle with a Native Forest Pathogen: Potential Effect of Dwarf Mistletoe on Range Expansion of Mountain Pine Beetle in Jack Pine Forests

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Abstract

In recent decades, climate change has facilitated shifts in species ranges that have the potential to significantly affect ecosystem dynamics and resilience. Mountain pine beetle (*Dendroctonus ponderosae*) is expanding east from British Columbia, where it has killed millions of pine trees, primarily lodgepole pine (*Pinus contorta* Douglas ex Loudon) over the last 10 years. In Alberta, mountain pine beetle is in portions of the lodgepole pine x jack pine hybrid zone and was recently intercepted at the western edge of jack pine (*P. banksiana* Lamb.) forests. There is a potential threat that mountain pine beetle will expand into the naïve host, jack pine, which extends from Alberta into eastern Canada and the Great Lakes Region in the United States. A successful invasion of jack pine by mountain pine beetle could generate serious ecological and economic problems throughout the boreal forest. Therefore, studies conducted during this initial establishment of mountain pine beetle in jack pine forests, and their applied implications for controlling the invasion, are highly relevant for the rest of jack pine and eastern pine forests. If done proactively, such studies may identify jack pine stands susceptible to mountain pine beetle and help forge pre-emptive management strategies prior to mountain pine beetle arrival. The further easterly expansion of mountain pine beetle might be constrained by low winter temperatures, by the amount of weakened or stressed trees, and by low, endemic, beetle populations. The native parasitic plant, dwarf mistletoe (*Arceuthobium americanum*), induces stress in jack pine and causes extensive damage throughout its range. In this study, we will investigate whether infection of jack pine by the dwarf mistletoe will influence jack pine susceptibility to mountain pine beetle. The work that started in 2011 will evaluate how dwarf mistletoe-induced chemical and physiological changes in jack pine affect growth and development of mountain pine beetle and its associated fungi. Interactions between dwarf mistletoe and mountain pine beetle on jack pine will be identified by addressing a number of research objectives, focusing primarily on how changes in jack pine defenses mediate mountain pine beetle-dwarf mistletoe interactions. These investigations are important because the eastward expanding wave of mountain pine beetle will likely first encounter, and colonize, these highly abundant dwarf mistletoe-infected jack pine trees.

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