

ARE NOVEL PLANT CHEMICALS FRIENDS OR FOES OF NATIVE INVASIVE INSECT HERBIVORES? EXPLAINING SUCCESSFUL HOST RANGE EXPANSION OF MOUNTAIN PINE BEETLE IN CANADA'S BOREAL FORESTS

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Mountain pine beetle has recently breached the geo-climatic barrier of the northern Rocky Mountains and invaded in the jack pine (*Pinus banksiana*) forests in Canada. The jack pine forest ecosystem is considered a novel habitat. However, the mechanism underlying this successful host expansion is unknown, but likely involves phytochemicals that play significant roles in the acceptance and colonization of hosts by insect herbivores and their microbial symbionts. We have focused on whether compatibility of jack pine chemicals with beetles and their symbiotic fungi has facilitated the colonization of this novel host and identified five mechanisms that have likely facilitated the beetle host range expansion. First, jack pine trees appeared to have less pronounced chemical defenses than a historical host of MPB (lodgepole pine, *P. contorta*). Second, prior to the arrival to the jack pine forests, invasion of a zone of hybrids of jack and lodgepole pine trees in Alberta by beetles likely improved their success in the jack pine as hybrids show chemical characteristics of both novel and historical hosts. Third, fungal and bacterial symbionts of beetles likely contributed beetle performance in the jack pine by detoxifying toxic secondary compounds as jack pine was compatible for the growth of both the fungi and bacteria. Fourth, similarity of secondary compounds and fatty acids between the novel and historical hosts may have facilitated the host expansion of beetles because of compatibility of these chemical compounds for pheromone production, aggregation on the host trees, larval development, and the growth of its fungal symbionts. Finally, jack pine contained low concentrations of defense and inhibitory compounds, and high concentrations of precursor and synergistic compounds that make historical host trees susceptible to beetles. I conclude that compatibility of primary and secondary chemical composition of jack pine to MPB and its symbiotic fungi has likely facilitated the host range expansion.

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