

Tree-Mediated Interactions Between the Jack Pine Budworm and a Mountain Pine Beetle Fungal Associate

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Abstract

Coniferous trees deploy a combination of constitutive (pre-existing) and induced (post-invasion) structural and biochemical defenses against invaders. Induced responses can also alter host suitability for other organisms sharing the same host, which may result in indirect, plant-mediated, interactions between different species of attacking organisms. Current range and host expansion of the mountain pine beetle (*Dendroctonus ponderosae*, MPB) from lodgepole pine (*Pinus contorta* Douglas ex Loudon)-dominated forests to the jack pine (*Pinus banksiana* Lamb.)-dominated boreal forests provides a unique opportunity to investigate whether the colonization of jack pine by MPB will be affected by induced responses of jack pine to a native herbaceous insect species, the jack pine budworm (*Choristoneura pinus pinus*, JPBW). We simulated MPB attacks with one of its fungal associates, *Grosmannia clavigera*, and tested induction of either herbivory by JPBW or inoculation with the fungus followed by a challenge treatment with the other organism on jack pine seedlings and measured and compared monoterpene responses in needle. There was clear evidence of an increase in jack pine resistance to *G. clavigera* with prior herbivory, indicated by smaller lesions in response to fungal inoculations. In contrast, although needle monoterpenes greatly increased after *G. clavigera* inoculation and continued to increase during the herbivory challenge, JPBW growth was not affected. However, JPBW increased feeding rate to possibly compensate for altered host quality. Jack pine responses varied greatly and depended on whether seedlings were treated with single or multiple organisms, and their order of damage.

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