

Branching out

from the Canadian Forest Service ■ Laurentian Forestry Centre

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Controlling the white pine weevil: naturally!

In the Canadian boreal forest, insect pests cause timber losses of several million cubic metres every year. In keeping with the goals of sustainable forest management, Canadian Forest Service researchers with the ECOBIOM¹ group are exploring potential avenues for using environmentally benign methods to control insect outbreaks in Canadian forests.

The white pine weevil, one of several insect pests that wreak havoc on the forests of eastern Canada, is particularly fond of eastern white pine and Norway spruce. This weevil is such a widespread pest in Quebec that these two tree species are seldom used in reforestation nowadays.

In eastern Canada, a well-known indigenous fungal species, *Beauveria bassiana*, is currently being studied for the potential it may offer in terms of preventing weevil-induced damage.



White pine weevil.
Photo: SCF



White pine weevils affected by muscardine, a disease caused by the fungus *Beauveria bassiana*.
Photo: SCF

Spring emergence

In spring, white pine weevils move from their overwintering sites in the soil to trees, where they begin feeding on the leaders (terminal shoots) from the previous year. The females deposit their eggs under the bark. Upon emerging, the larvae begin feeding on the tissues under the bark, eventually killing the previous year's leader along with the current year's leader. Repeated attack can result in stem deformation and hence reduced log quality. Any direct control method that is developed must target the adults because the larvae are well protected in their hiding spots under the bark.

¹ ECOBIOM: Extended collaboration on biological control of forest insects or pathogenic micro-organisms. This group includes CFS researchers from across Canada and from the Institut Armand-Frappier.

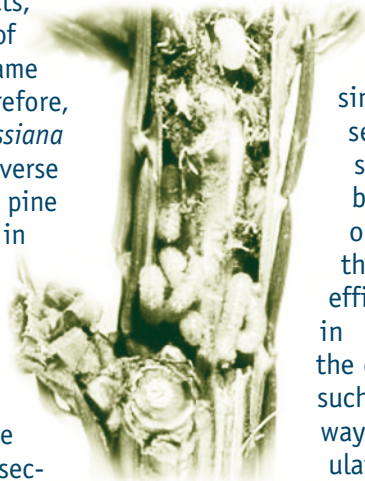


This fungus, which occurs naturally across Canada, causes a disease called muscardine (see photo) in some insects. The fungus infects insects by penetrating their integument². Since this fungus is present in the soil, it can persist in the environment and spread by hitching a ride on its insect hosts.



Wilted terminal shoot after an attack by the white pine weevil.
Photo: SCF

The fungus *B. bassiana* attacks a wide variety of insects, but not all strains of *B. bassiana* affect the same insect species. Therefore, some strains of *B. bassiana* may not have an adverse effect on the white pine weevil. The first step in research aimed at using *B. bassiana* as a control agent was to identify which strains would be most effective against the white pine weevil. In a second stage of research, the



White pine weevil larvae under the bark of a terminal shoot. Photo: SCF

Before a biological insecticide can be put on the market, it must be shown to be effective and completely safe. Furthermore, the product must be economical to use, that is, the benefits it provides in terms of protection must outweigh the production costs. Although widely used in Europe, *Beauveria bassiana* is still the focus of a number of research projects in Canada, particularly in the agricultural sector, where it has been used successfully time and again. In spite of this, *B. bassiana* is still not registered for use in Canada.

ECOBION group tested two strategies for introducing *B. bassiana*. The first method involves applying the fungi to the soil surface to stop the weevils from moving to the trees and the second involves spraying tree leaders to contaminate the adults during the egg-laying period.

Laboratory testing has revealed the potential that *B. bassiana* offers as a control agent for the white pine weevil. If this biological control method proves to be as effective in the forest as in laboratory tests, *B. bassiana* should help to reduce weevil-induced damage in Norway spruce and white pine plantations significantly. Both treatment methods—applying the fungi to the soil surface and spraying them on

the leaders—exhibited the efficacy required to kill this insect pest. Nonetheless, since *B. bassiana* is sensitive to natural sunlight, efforts must be directed at developing a formulation that will optimize the efficacy of *B. bassiana* in the field. Pending the commercialization of such a product, the best way to keep weevil populations in check still involves silvicultural

control in young plantations and the pruning and destruction of infested leaders.

USEFUL LINKS:

Entomology research at the Canadian Forest Service

www.nrcan-rncan.gc.ca/cfs-scf/science/resrch/entomology_e.html

Gestion du feu, des insectes et des maladies des arbres au Québec (MRNF) (French only)

www.mrnf.gouv.qc.ca/forets/fimaq/index.jsp

Pest Management Regulatory Agency (PMRA)

www.pmara-arla.gc.ca

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2 Integument: the outer covering, or cuticle, that protects the insect body.