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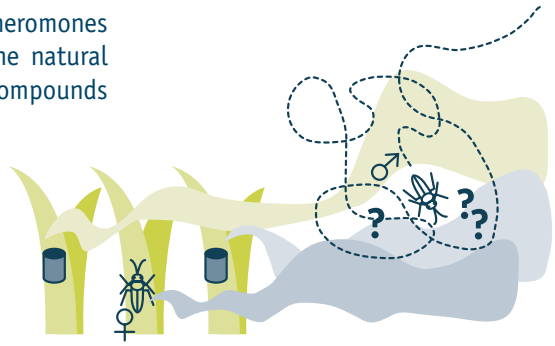
Use of the mating disruption approach: protecting trees by tricking insect pests

Controlling insect pests in forests is a constant challenge. Aside from prevention and monitoring, there are very few means available to achieve this goal. With the aim of heading off trouble and minimizing damage to trees, some Canadian Forest Service researchers have refined the use of pheromones as a tool for manipulating the reproductive behaviour of insects. This method is called mating disruption.

Basically, this control strategy involves spraying the pheromone chemical derived from the target insect species into the air to confuse the males so that they are unable to locate and mate with females. Because mating is disrupted, the size of the larval population is reduced and so is the level of damage to trees.

Although this approach seems simple, it entails a number of challenges. For example, the synthetic pheromones may not be equivalent to the natural pheromones. The choice of compounds and their concentration and distribution in the area to be treated, as well as stand structure, are all factors that impinge on the success of pheromone dispersion.



Mating disruption.
Photo: unknown

The situation in Quebec

Multi-Pher pheromone trap.
Photo: CFS

Because the use of chemical pesticides is banned in Quebec forests, alternative approaches are required. At present, *Bacillus thuringiensis* or *B.t.* is the only biological insecticide authorized for use. Like chemical insecticides, however, this bioinsecticide has a low specificity and can affect all lepidopterans. Also, the danger of using only one control measure is that the targeted insect pests are likely to develop resistance.

Another strategy, the mass capture of insects in pheromone traps, is only effective against a small number of forest insect pest species. While parasitoid- or predator-based control methods have been found to be highly effective in the laboratory, they have yet to prove their worth in the field.

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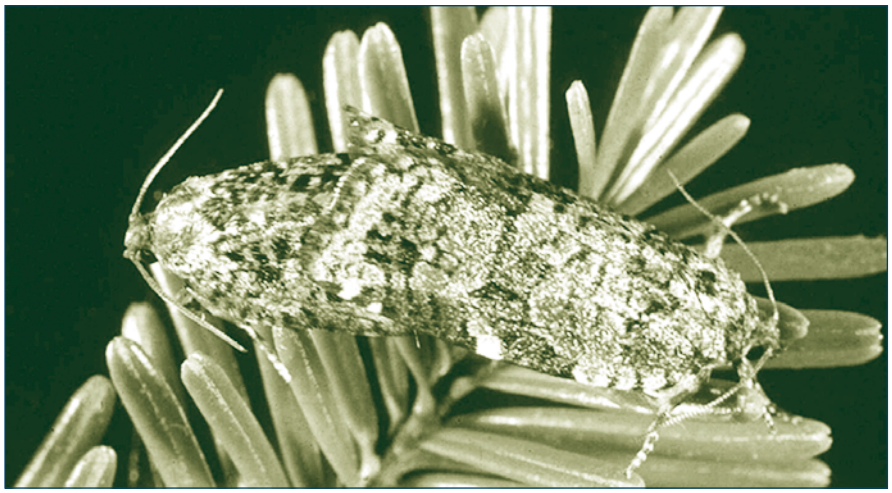
Another challenge is that the insects themselves may throw a wrench into the disruption strategy. For example, the males of some species are able to use sound or select trees based on silhouette in order to locate females successfully. Very dense insect populations tend to be conducive to chance encounters and hence mating between males and females. Furthermore, insects from a neighbouring site that is infested may invade the treated site, thwarting the disruption strategy. Another potential drawback is that the efficacy of natural enemies may decline because of the reduction in the density of the insect pest population.

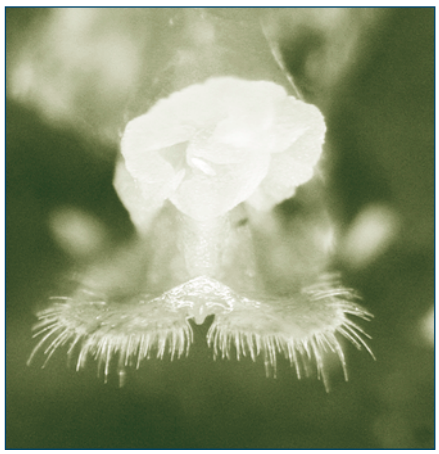


Mating behaviour of spruce budworm.
Photo: CFS

A look at the strategy adopted south of the border

The mating disruption method is now an integral part of the national gypsy moth control strategy in the United States. The gypsy moth program, called "Slow the Spread," is aimed at halting the spread of this highly invasive exotic pest which poses a threat to hardwood forests. A vast network of pheromone traps are being used for the early detection of low-level moth populations present in areas bordering on the main infestation zone. The goal is to eradicate those moths either through the low-density mating disruption approach or through aerial spraying of *B.t.* to control higher pest densities.

Nonetheless, mating disruption is an effective pest control method, especially when the pheromone product and the dispensers are of suitable quality. Taking into consideration all of the key ecological aspects, this strategy should achieve its full potential in sites where the insect pest has a low population density and the populations are isolated. The approach most likely to gain currency in the future is the use of mating disruption in conjunction with other biological control measures as part of an integrated pest management strategy. One of the most promising complementary approaches involves directly inhibiting pheromone production in females.



Pheromone gland.
Photo: CFS

FOR MORE INFORMATION, PLEASE CONTACT:

Johanne Delisle
Natural Resources Canada
Canadian Forest Service
Laurentian Forestry Centre
1055 du P.E.P.S.
P.O. Box 10380, Stn. Sainte-Foy
Quebec City, Quebec G1V 4C7
Phone: (418) 648-2526
Fax: (418) 648-5849
E-mail: johanne.delisle @nrcan.gc.ca
Web site: www.cfl.cfs.nrcan.gc.ca

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