

ABATE

Integrated reduced-chemical control of *Hylobius abietis* in Sitka spruce

PROJECT TEAM

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BACKGROUND

The large pine weevil, *Hylobius abietis*, is a major obstacle to reforestation of coniferous plantations in northern Europe. Female weevils lay their eggs in recently cut stumps, where development takes place. The emerging adults feed on the bark of young seedlings, killing 60-100% of plants if they are not protected. Currently, seedlings are protected by chemical insecticide (cypermethrin), either by dipping before planting or by spraying immediately afterwards. Maintaining forest health in accordance with the principles of sustainability involves favouring preventative and biological pest management options over chemical insecticides.

OBJECTIVES

The objective of the ABATE project is to reduce reliance on chemical insecticides in reforested sites by developing biological control measures for the large pine weevil (*Hylobius abietis*). The overall aim is to suppress numbers of weevils emerging from stumps. Agents investigated include insect-killing nematodes, stump-colonising fungi, and parasitoids. The main objective for 2008 was to bring nematodes closer to operational level in Ireland, specifically:

- assess the success of large-scale application of nematodes in Coillte forests;
- assess the quality of fermenter-produced *Heterorhabditis downesi*;
- monitor effects of nematodes on non-target insects.

PROGRESS

Following on from successful small-scale field trials conducted as part of this project, Coillte treated 150 hectares of their estate with nematodes (*Steinernema carpocapsae*) in 2007 and a further 71 hectares in 2008. The ABATE team monitored the success of the application on a total of eleven sites and showed that nematodes can suppress the number of weevils emerging from treated stumps for at least two years after application. This was done by comparing numbers of adult weevils emerging into insect traps erected over nematode-treated and untreated (control) stumps on each site. Seedlings were planted on treated sites in the winter following the 2007 nematode application, and these were monitored for damage throughout the weevil feeding period in 2008. Little feeding damage was recorded on four of five replanted sites, but one site suffered unacceptable damage. This site had exceptionally high populations of weevils emerging in both 2007 and 2008. Since nematodes typically kill only a proportion (up to 80%) of the weevil population, treated sites with very high populations will still have enough weevils left alive to devastate a crop, and so an alternative pest management approach is required for such sites.

The large-scale field application employed *Steinernema carpocapsae*, as this species was already available commercially. Another nematode, *Heterorhabditis downesi*, has consistently out-performed *S. carpocapsae* in our trials, but was not available in large enough quantities to treat whole sites. It has recently been brought into production by a biocontrol company, and enough fermenter product was available for small-scale field testing this year. Fermenter produced *H. downesi* was more effective than *S. carpocapsae* produced and shipped under similar conditions, confirming that this nematode is promising for use in forest protection.

Nematodes are generally regarded as safe to humans and the environment; nevertheless, in order to detect any impact of nematodes on non-target insects in clearfell forests, beetles collected from emergence traps were identified. Forty-six species of beetle, other than *H. abietis*, were recovered from the traps. Beetle abundance and biodiversity appear to be influenced by site factors rather than treatment (nematode versus no nematode).



Stumps on a clearfell site are sprayed with insect-killing nematodes to reduce the numbers of emerging pine weevil adults. Newly planted seedlings are thus protected from feeding damage by this pest. The spray rig was developed by Forest Research UK.

Photo: Aoife Dillon.

OUTPUTS

Dillon, A.B. and Griffin, C.T. 2008. *Controlling the large pine weevil, Hylobius abietis, using natural enemies*. COFORD Connects, Silviculture/Management No. 15.

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Everard, A., Griffin, C.T. and Dillon, A.B. 2008. Competition and intraguild predation between the braconid parasitoid *Bracon hylobii* and the entomopathogenic nematodes *Heterorhabditis downesi*, natural enemies of the large pine weevil, *Hylobius abietis*. *Bulletin of Entomological Research*. doi:10.1017/S0007485308006287