



TECHNICAL NOTE No. 271

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CONTROL DAMAGE BY SEEDLING DEBARKING WEEVIL

Introduction

Damage by seedling debarking weevil to newly planted seedlings on cutovers can be reduced to tolerable levels using, of all things, nematodes. Until now we had but two alternatives: wait 2-3 years until the infestation subsided or "hot plant" right away and fill in the gaps later. Now we have a third alternative in which waiting and replanting are not necessary.



The Insect

The seedling debarking weevil, *Hylobius congener*, is a kind of beetle, the larvae of which live in the soil. After an area is clearcut, the weevils fly into the area, attracted by odors given off by the dying roots of the harvested crop. They lay their eggs, the larvae feed on the roots, and a very large number of adult weevils is produced. These weevils must feed. Because the new seedlings are the most attractive food on the site, they will be severely damaged.

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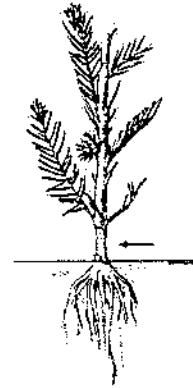


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The Damage

Damage to seedlings shows as gnawed bark at the bases of the seedling stems. If this damage girdles the stem, or involves 3/4 or more of the circumference, the seedling will be killed. If more than 10% of the seedlings in a plantation are killed in all or a part of a plantation, replanting or fill-in planting may be necessary. All plantation species (spruce, pine, tamarack) are vulnerable. It may not help if there is a lot of natural regeneration on the site because small wild seedlings are also vulnerable.



The Nematodes

The entomopathogenic nematodes (literally, "thread-like worms that make insects sick") used to develop this control technique are called *Steinernema carpocapsae*, Umea strain, and are commercially available as Scanmask[®]. The nematodes are too small to see with the naked eye, but millions of them suspended in water make a pinkish-orange cloud. They are harmful only to insects, which they attack by invading the body. After they enter, they release bacteria that kill the insect and provide food for the next generation of nematodes. The bacteria can live only with the assistance of the nematodes and they will not harm people, warm-blooded animals, birds, or fish.

Another nematode, the same species but a different strain called "All," was used in some experiments and field trials. Available as Biosafe[®] or Exhibit[®], it should work as well as Scanmask[®].

The Treatment

Using nematodes is easy. A suspension in water is simply applied to the seedlings in multipots with a watering can. Water is applied next to wash down any nematodes on the upper parts of the seedlings. The seedlings can then be planted in exactly the same way as usual.

Details of Treatment

Handling Nematodes

Nematodes may be received in one of two ways, in ice water in a jug, or on a solid medium in a bag or plastic bottle. Those in water should be kept refrigerated at 5°C to 10°C. This is to slow them down so they do not use up their energy reserves and die. Air should be bubbled through, using an aquarium pump, to keep the water aerated from the bottom, and the nematodes from settling out. This is to prevent them from suffocating. Those on solid medium or in jars can be stored in a cool place and removed from the medium into water suspension according to the manufacturer's instructions. They should then be used immediately or kept in a fridge with a bubbler as described above.

Application with Watering Can



Trees are best treated shortly before planting, either the previous late afternoon or evening, or first thing in the morning. Arrange the multipots in a tight rectangle on flat ground so that all can be reached with a watering can. To prepare the nematodes for application, shake the stock suspension thoroughly immediately before measuring out the required amount. Measure enough to deliver 300,000 nematodes per tree or 33.5 million per 67-cell multipot. At 3,000 trees per hectare, the rate is 900 million nematodes per hectare. Pour the appropriate amount for the trees to be treated into a watering can, add water, and mix thoroughly. Apply the suspension to the seedlings as uniformly as possible in sweeps in one direction and then again at right angles. Refill the watering can with water and repeat the process, but do not use so much water that it runs out the bottom of the multipot containers. Some

nematodes will be lost around the perimeter, but little will be lost if the multipots are close together.

Application in the Nursery

In some cases, it may be easier to apply the nematodes in the greenhouse. This can be done through an overhead sprinkling system, but the spray mix must be kept agitated in the reservoir. Otherwise, the nematodes may settle and the treatment would not be uniform. Again, follow the treatment with an application of plain water. Nematodes will survive in multipot cells for months, but to ensure their strength, they should be applied shortly before planting time.



Wherever treated, except under glass, the seedlings must be protected from sunlight, because ultra-violet radiation will kill the nematodes in a few moments. After treatment, the seedlings must be protected from drying out and from temperatures over 30°C. If the seedlings are treated in the nursery and delivered to the site on stacked pallets, they should be kept shaded.

Planting Procedure

No change in planting procedure is necessary. However, entire cutovers must be treated and planted, and they should be at least 500 m from neighboring new cutovers. This is because weevils may invade the treated area from untreated areas.

Benefits and Costs

Costs

1. About \$360 per hectare for nematodes assuming 3,000 planted seedlings per hectare. (Also assuming a purchase of 1 trillion nematodes, enough to treat 1,111 ha at 900 million/ha.) Prices are moving downward as nematode production increases.
2. Cost of application, which is almost negligible.

Benefits

1. Avoid expensive replanting or fill-in planting.
2. Gain about 2 or 3 years to harvest, which at current prices is worth about \$60 to \$80 per hectare.
3. Get a headstart on competing vegetation; avoid the cost of initial chemical site preparation which, in 1992, cost from \$277 to \$362 per hectare, depending on the method and the size of the area.
4. Reduce environmental concern about chemical weed and brush killers.

Profit

Estimated \$35 to \$205 per hectare, and avoid concern about chemical herbicides.

Background

Like any other pest control method, this one is not guaranteed to work every time. The above recommendations are based on 2 years of field trials in private woodlots on Cape Breton Island, preceded by field cage experiments. The sequence of events was:

Before 1990

The stage was set by earlier field work in mainland Nova Scotia and by Dr. Albert Pye and associates working in Sweden with a very similar debarking weevil.

1990

Field cage treatments resulted in reductions of killed seedlings from 12% to less than 1%. They provided evidence to confirm that weevils invading from neighboring sites could undo the benefits of the nematode treatment.

1991

Field trial results indicated a reduction in seedlings killed from 37% to 47% in two untreated plantations to 6% and 7% in two treated plantations. Scanmask[®] may have been marginally better than Biosafe[®] or Exhibit[®].

1992

Field trial results, using only Scanmask[®], resulted in no reduction at 100,000 nematodes per tree, but at 200,000 per tree only 11% were killed (reduced from 27% and 28% in two untreated plantations). At 400,000 per tree, only 3% of the trees were killed. In the plantation treated at 200,000 per tree, most of the damage was in one sector with less vegetation, thicker duff, and moister conditions. We therefore recommend 300,000 nematodes per tree to ensure success on exceptional sites.

1993

A field demonstration is planned somewhere in Pictou or Antigonish counties where weevil damage is generally the worst. Probably in October, the results of a spring treatment will be demonstrated and contrasted with an untreated planting. At the same time, the treatment and planting procedure will be demonstrated.

Summary

To reduce seedling debarking weevil damage to seedlings on "hot-planted" clearcuts, the roots of seedlings may be treated with nematodes.

1. If ordered outside Canada, an import permit will be required from Agriculture Canada (see below).
2. Order nematodes in advance to ensure delivery when needed (sources listed below). Allow time for customs and Agriculture Canada inspections.
3. Follow manufacturer's instructions for handling and use of nematodes.
4. Mix and apply nematodes to seedlings in multipots.
5. Rinse seedlings with water.
6. Plant seedlings in the usual way.

Import Permits

Contact your nearest Agriculture Plant Protection Office. There are offices in most major towns and cities in the Maritimes. Allow a month or more for your application to be processed because all living plant and animal material is so controlled, and spring is the busiest season.

Suppliers

Entomopathogenic nematodes are not produced commercially in Canada. They are available directly from a U.S. producer or Canadian distributors.

Scanmask®: BioLogic Biocontrol Products
Springtown Road
P.O. Box 177
Willow Hill PA
17271 U.S.A.
(717) 349-2789

Exhibit®: Ciba-Geigy Canada Ltd.
6860 Century Ave.
Mississauga, Ont.
L5N 2W5
(416) 821-4420

BioSafe®: Plant Products Co. Ltd.
314 Orenda Road
Brampton, Ont.
L6T 1G1
(800) 387-2449

Feedback

We would like to hear from people who try this control method: whether it worked satisfactorily or not. Your experience will help us make better recommendations.

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