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CONTROL OF THE WHITE PINE WEEVIL IN YOUNG PLANTATIONS USING A SPRING APPLICATION OF INSECTICIDES

P. de Groot and B.F. Zylstra

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INTRODUCTION

For decades, the white pine weevil, *Pissodes strobi* (Peck), has been a persistent pest of white pine (*Pinus strobus* L.) and sitka spruce (*Picea sitchensis* [Bong.] Carr.) plantations. More recently, the weevil has caused serious damage in other conifer species, most notably jack pine (*Pinus banksiana* Lamb.), Scotch pine (*Pinus sylvestris* L.), black spruce (*Picea mariana* [Mill.] B.S.P.), white spruce (*Picea glauca* [Moench] Voss), and Norway spruce (*Picea abies* [L.] Karst.). In some situations, control of the weevil is necessary to maintain the economic viability of the plantation and to ensure that high-quality lumber can be produced. Leader clipping is one recommended method and the work by Lavallée and Morrisette (1989) should be consulted for details. However, in some situations, like high-value progeny tests, seed orchards, and special or elite commercial plantations, leader clipping may not be desirable or economically feasible. Here, insecticides may offer an alternative.

The purpose of this technical note is to provide field staff with guidance on the control of white pine weevil in young plantations using a spring application of insecticides. Recommendations regarding specific insecticides are not made because changes to the registration of existing products may occur, and/or new products may be registered. The authors assume users have a basic understanding of the application of insecticides, and that they have received appropriate training and certification in their handling. It is also assumed that the need for insect control with insecticides has been

clearly established, and that what is now required is information on when and how to control the weevil.

Successful control of the white pine weevil with insecticides requires that the applicator understand some of the basic biology and behavior of the insect. With this knowledge, the applicator can ensure that the exposure of the weevil to the insecticide is optimized. The following step-by-step set of guidelines is intended to help the applicator determine when and how the insecticide should be applied.

TIMING OF INSECTICIDE APPLICATIONS

A spring application of the insecticide is recommended. Although the spring is a busy time of year, and access to some sites can be limited, insect control at this time can be more effective than in the fall. There are at least three reasons for this: 1) spring applications reduce damage in the current year, 2) fall applications kill many insects that would otherwise die overwinter, and 3) weevils flying into a site in the spring would not be controlled by fall applications.

FIELD ASSESSMENTS

Step 1

Fact: Adult weevils begin to emerge in the spring from the soil litter when the snow around the base of the trees starts to melt and air temperatures reach 6° C or more.

Actions: Begin surveys of the trees when the snow starts to disappear from around their base. As an early warning system, examine 20 trees that are the most exposed to radiant heat; these are usually found near the edge of the plantation or on exposed hilltops.



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Step 2

Fact: Adult weevils crawl along the main stem of the tree or fly to the leaders where they feed and mate (Fig. 1).

Actions: At the early warning sites examine tree leaders for weevils. Be careful when examining the leaders as weevils drop off easily when disturbed. When weevils have been observed at these sites, visit other parts of the plantation to assess the level of insect activity. Tag, and number with flagging tape, 150 trees along a loop or transect spread over the plantation, and record the number of trees with weevils. Keep this record for the next time an assessment is conducted.

Step 3

Facts: Adult females feed mostly on the previous years' growth of the leader, beginning at the apex. They feed for several days before laying eggs in the feeding punctures. The eggs are covered with a faecal pellet that later turns black (Fig. 2). A hand lens is usually required to see the faecal pellets.

Actions: Every 3–4 days continue the examination of the 150 trees. Record the presence of adults as before and, where weevils are located, or have been noted earlier, carefully examine the leaders for the presence of feeding punctures and the black faecal pellets. Finding the pellets will take practice, but it does become easier with experience. When 10–20 percent of the leaders with feeding punctures have at least one egg (i.e., 10–20 percent of examined leaders show signs of faecal deposits), spraying operations should be undertaken as soon as the weather permits. Typically, the first eggs are found within 7–10 days of the first adults. About the time that spraying is to begin you will notice that the buds of hardwoods, such as trembling aspen (*Populus tremuloides* Michx.), balsam poplar (*Populus balsamifera* L.), willow (*Salix* spp.), or pin cherry (*Prunus pensylvanica* L. f.), will have swollen and begun to burst. Also, most of the snow will have just disappeared from the site at this time.

Step 4

Fact: Weevil emergence typically extends over 3–6 weeks, depending on weather and conditions within the plantation.

Actions: Use the information from the 150-tree survey to determine what portions of the plantation should be treated first. If practical, treat those areas where the weevils have been active the longest and then proceed throughout the plantation in an orderly method until the area with the shortest weevil activity is treated.

INSECTICIDE APPLICATION

Step 5

Facts: There are two types of ground spray equipment that can be used to treat young plantations: 1) backpack pressurized sprayers, or 2) backpack motorized mist blowers.

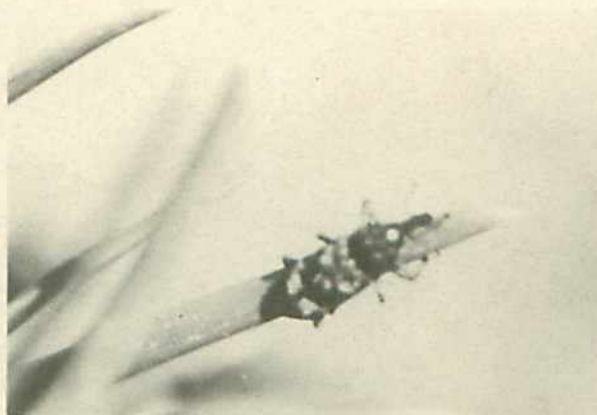


Figure 1. A white pine weevil on foliage.



Figure 2. Faecal deposits used to seal three feeding punctures.

Each sprayer has its advantages and disadvantages, depending on the size of the trees and the plantation, topography, and sensitivity of the environment within and around the plantation.

Backpack sprayers are operator-carried machines designed to spray small quantities of spray, and are used mainly for spot treatments of individual trees. There are two basic types available—those held by hand or a shoulder strap, and those carried on the back like a knapsack (Fig. 3). Advantages of these sprayers are that they 1) permit precision targeting of



Figure 3. Applying spray with a backpack sprayer.

an insecticide; 2) are simple to operate and easy to clean, maintain, repair, and store; 3) have a initial low purchase price and low operating costs; and 4) are lightweight. Disadvantages of these sprayers are that they 1) require frequent refilling because the tank is small; 2) the treatment of trees is slow, and therefore large plantations may not be treated in time; and 3) trees larger than 3–4 m are difficult to treat.

Backpack mist blowers use forced air to produce and move spray droplets. The advantages of these sprayers are that they 1) are simple to operate, maintain, and calibrate; and 2) are versatile machines that can be used to quickly and efficiently treat individual trees up to 8 m in height, or stands up to 4 m in height. Their disadvantages are that they 1) have a small tank capacity (usually 10–15 liters); 2) are more expensive to purchase and operate than are backpack sprayers; and 3) are much heavier than backpack sprayers.

Action: Decide on the type of sprayer to be used.

Step 6

Fact: Each insecticide label will provide specific instructions on the use and application rate for the insect to be controlled.

Actions: Follow the instructions on the label and determine the volume necessary to apply the required dosage per hectare.

Backpack sprayers are calibrated to deliver a given volume per unit of time. For white pine weevil, calibrate the sprayers to deliver enough volume to cover the leader just to the point of run-off. For effective treatment of the leader, applications should be made on opposite sides. The amount of volume applied will depend on the length and width of the leader, but typically about 10 ml of spray is applied on one side, for a total of 20 ml per tree.

Mist blowers are also calibrated to deliver a given volume per unit of time. With mist blowers, calculate a comfortable walking speed and adjust the flow rate to deliver 50–75 L/ha. Spray alternate rows of trees by aiming at the leaders and letting the spray drift downwind. Only one side of the leader needs to be treated.

The following example is for a backpack sprayer calibrated to apply an insecticide at 1.1 kg active ingredient per hectare.

Variables:

2 500 trees/ha (from stocking estimates or other data)

Volume per tree to be applied = 20 ml/tree (from field calculations)

Flow rate of the sprayer = 600 ml/min, or 10 ml/sec (from field calculations; some sprayers have adjustable flow rates)

Calculations:

Time to treat one tree: $20 \text{ ml} \div 10 \text{ ml/sec} = 2 \text{ sec}$

Volume per ha: $2\,500 \text{ trees/ha} \times 20 \text{ ml/tree} = 50 \text{ L/ha}$

Percent concentration of spray: $1.1 \text{ kg AI (ha)} \div 50 \text{ L/ha} = 2.2 \text{ percent (AI)}$

Step 7

Fact: Insecticides seldom provide 100 percent protection; therefore some leader loss can still be expected after treatment.

Actions: In late August or early September determine the percentage of leaders destroyed after treatment. Examine 200 trees (do not include the 150 trees from the spring survey) in a loop or transect spread throughout the plantation, and count the number of leaders destroyed by weevils.

Step 8

Facts: Weevils will immigrate into the plantation from adjacent, untreated areas. Plantations usually remain susceptible to weevil damage until crown closure occurs.

Action: Determine the need for treatment each year.

CONCLUSION

Spraying leaders with insecticides is not difficult, but it is important to ensure that there is thorough coverage of the leader to optimize insecticide effectiveness. Timing is the most important variable. Therefore, treat the leaders early in the spring as soon as there is evidence of eggs (brownish black faecal plugs, *see* Fig. 2.). Generally the insecticide is most effective when the first eggs are laid. Additional details on insecticides and spray variables can be found in de Groot and Helson (1993, 1995) and de Groot et al. (1995). Copies of these publications are available from the principal author.

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Peter de Groot



Bert Zylstra

Peter de Groot is a research scientist with the Canadian Forest Service. He specializes in the biology, ecology, and management of plantation insects.

Bert Zylstra, a research technician with the Canadian Forest Service, assists in the studies of plantation insects.

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Natural Resources Canada
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