# CONTROL OF STRAWBERRY ROOT WEEVIL IN THE NEW YORK STATE NURSERIES

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In the early summer of 1950, about a dozen spots (approximately 1 foot in diameter) of dead trees were found in beds of 2-year-old white spruce and Norway spruce seedlings at Lowville Nursery. Most of these spots were on the south side of the seedbeds, and death of the seedlings was tentatively attributed to sunscald. No spots like these were seen during the 1951 growing season. In the fall of 1951 all of the stock at Lowville appeared to be healthy.

In the spring of 1952, just as the frost was leaving the ground and the shipping season was about to get under way, the needles of a large portion of the 3-year-old white spruce seedlings began to turn brown and/or grayish-green in spots from 1 to 48 square feet in area. Upon examination it was found that the fine roots were gone. As the seedlings were pulled from the ground the bark sloughed off the roots. Also, radiating out from these spots were areas of trees with green, healthy looking tops, but the roots were completely destroyed. About 1-1/2 million trees had to be destroyed as they were not fit to send out for field planting. At that time the cause of the condition was not known or even suspected.

In the fall of 1952, specialists at Cornell University and the State College of Forestry suggested that the causal agent might be strawberry root weevil. During the winter of 1952-53, on the basis of greenhouse tests at the Saratoga Nursery, the larvae of strawberry root weevil were determined to be the cause of the losses. To work out control measures studies were made of the life cycle and feeding habits of the weevil. This information is given at the end of this article.

Again in the spring of 1953 it was observed that larval feeding during the late fall and early winter had caused the loss of about 2 million 2- and 3-year-old seedlings, most of them at the Lowville Nursery, but some at the Saratoga Nursery. Most of the seedlings killed were white spruce but other species, including red pine, Norway spruce, Douglas-fir, and balsam fir, were also attacked.

1/ Investigations were made at the direction of Mr. E. J. Eliason, Assistant Superintendent of Tree Nurseries, NYS Conservation Dep't. Mr. Hill is Horticulturist, Bur. of Nurseries, NYS Cons. Dep't.

The objective of the control measures in the spring of 1953 was to completely eliminate the weevil-from both nurseries, in the shortest possible time. Therefore, there was little time for experimental work, and control on a wholesale basis was initiated immediately. , Soil samples taken at this 'time revealed that the majority of the weevil larvae were in the top 6 to 8 inches of soil. The first control method used was rototilling after .one of several different types of chemicals had been applied to limited areas while the weevil was in the larval stage. The chemicals used were lindane, paradichlorobenzene, dieldrin, and chlordane. This method of control destroyed some of the larvae, but it did not reduce the population to any great extent. Whether the slight reduction in larvae was caused by the rototilling, the chemicals, or a combination of the two is not known. This method was again used when the weevils were in the pupal stage, but it had no noticeable effect on the pupae population.

During the .second week in June an entomologist from the Shell Chemical Corporation visited the Lowville Nursery and suggested that a dieldrin spray be applied at 1 /2 pound (50 percent wettable powder) per acre in about 25 gallons of water as soon as the majority of the adult weevils emerged from the soil. A power sprayer was used to apply the dieldrin water solution and the Lowville Nursery was literally covered with dead and dying adult weevils. At this time, a very few adult black vine weevils were discovered at the Lowville Nursery. The larvae and adults of this insect are similar to the strawberry root weevil, but are about twice the size. The adults and larvae of the black vine weevil are about 1 /4 inch in length, and the adult is black. The same control measure is applicable to the two species of insects. To control both species of weevils during the summer of 1953 all the seedbeds, cover cropped areas, and the land surrounding the nurseries were sprayed twice with dieldrin at the rate
given above.

In the summer of 1954, only a few larvae were found in the soil. In fact, where a shovelful of soil would have yielded 50 to 100 larvae in 1952, only about 15 larvae could be found on an acre in 1954. However, at the rear of the Lowville Nursery an eruption of adult weevils occurred in some NS 3-0 stock. This may have been the result of a skip in the dieldrin spraying the previous summer or inadequate spray for the extremely high population in that area. During the summer of 1954, both nurseries were again completely sprayed with dieldrin at the rate of 1 /4 pound (50 percent wettable powder) per acre in 25 gallons of water when the adult weevils emerged.

Dieldrin will be sprayed at the 1 /4 pound per acre rate on. all nursery property at Lowville and Saratoga when the adult weevils are expected to

emerge, until there are no signs of the two species of weevils. It is believed that 100 percent control of these insects was achieved by the fall of 1954.

The extremely rapid buildup in the weevil population during the year 1951 might be attributed partly to a high soil moisture content throughout the growing season, a warm summer, .and moderate temperatures until late in the fall. Where the weevils originally came from is a mystery because examination of the fields surrounding the nurseries showed them to be completely clear of adults and larvae.

The following information on life cycle, feeding habits, and damage of the strawberry root weevil (Brachyrhinus ovatus) may be helpful to others who may need to control this weevil. The life cycle of the black vine weevil (Brachyrhinus sulcatus) is similar to that of the strawberry root weevil.

Description of weevil stages. The adult weevil is 5 to 6 mm. long; its color is light brown to black, depending upon maturity; and it is wingless and has a, modified snout. The larva is 3 to 5 mm. long, its body is white to creamy white in color, its head is brown. The pupa is 4 to 6 mm. long and is white to light brown, depending upon maturity.

Life cycle of the strawberry root weevil (Brachyrhinus ovatus). In July the adult weevil lays 15 to 30 eggs in soil crevices and under loose debris on the ground. Each egg is about 0. 5 mm. in diameter, is white when first laid, and turns brown after a day or 2. The eggs hatch into larvae within 2 or 3 weeks. The larvae feed on roots of seedlings until the ground freezes, and they resume feeding in early spring. Overwintering larvae start to pupate about the middle of May. The pupal stage lasts about 10 days to 2 weeks; after this stage the adults remain in the cell for about a week until their bodies are well hardened. The first adults emerge from the soil about June 1, and the majority of the adults have emerged by the second or third week in June The adults then feed on the needles of the seedlings about 3 or 4 weeks before they are capable of oviposition (laying eggs). Thus there is a 2- or 3- week period, after the majority of the adults have emerged, for spraying to control the weevil. The life cycle may vary slightly with weather conditions.

Description of weevil feeding. The adults feed on needles of seedlings during the night. They cut spruce needles in two just above the center. On the other species they cut out pieces of the needles along the sides. The larvae feed on the roots of seedlings of all species. In the New York State nurseries they were especially damaging on white spruce; they consumed all of the fine roots and stripped the bark from the larger roots, sometimes girdling them.

Weevil damage and early identification. The larvae feed extensively on the roots until the ground freezes around them. Usually no damage can be seen on the seedlings until spring, too late to do anything about the stock that is old enough for shipping. In early spring, as soon as the frost is out of the ground, spots of seedlings with brown and grayish green needles appear throughout the beds. The seedlings can be pulled from the ground very easily because all of the fine roots are gone and part of the bark on the larger roots has sloughed off. Examination of the top 8 inches of soil supporting the discolored seedlings is necessary to determine whether or not larvae are present. The larvae are difficult to see, but they can be separated out by sifting the soil. If there is a heavy infestation when the seedlings are removed, the presence of larvae will give the ground the appearance of just having been covered with rock salt.