FOUR INSECT PESTS OF CONIFER NURSERIES IN BRITISH COLUMBIA

Gwen Shrimpton

ABSTRACT: Four pests of conifer nurseries in British Columbia, the strawberry root weevil, tarnished plant bug, European marsh crane fly, and conifer root aphid, are described. Their general pest status, occurrence in the nurseries, life history, damage, and control are briefly discussed.

INTRODUCTION

Increased demand for seedlings has made nursery managers more aware of pest losses. Insect damage can affect both the quality and quantity of seedlings and may indirectly affect reforestation plans. Use of insecticides can also lead to environmental contamination. This paper outlines two insect management programs based on the biology of the insect, that have been developed in British Columbia (B.C.) nurseries and provides information on two recently identified insect pests.

STRAWBERRY ROOT WEEVIL

The strawberry root weevil, Otiorhynchus ovatus, is primarily a pest of strawberries and related plants and occasionally damages conifer seedlings in the Pacific Northwest. Ovatus ranges across North America in a broad band, covering all the provinces of Canada and the northern half of the United States. It is particularly abundant in the humid climate of the coastal regions (Warner and Negley 1976). In B.C. conifer nurseries it has been a notable pest of bare-root conifers at Surrey Nursery.

There is one generation a year with both adults and larvae overwintering. Adults become active in mid-April and begin egg-laying in May. Larvae that overwinter emerge as adults during June, and feed for about one month before becoming sexually mature.

Newly emerged adults are tan. When mature, they are dark-brown to black, about 1/4-inch (6.0 mm) long, and egg-shaped in outline. Adults are flightless and all are females. Usually the adult insects rest during the day in protected places. At night, temperature permitting, they feed on plant foliage, including conifer seedlings, and often chew the needles off close to the stem.

The larvae are up to 3/8 inches (1.0 cm) long, slightly curved, creamy white with brown heads, and legless. They inhabit the top 10.0 inches (25 cm) of the soil around host plant roots. In heavy infestations there can be as many as 300 larvae per square foot (3000 per m^2).

In conifer nurseries the larvae eat the fibrous roots of the seedlings, stripping most laterals. In heavy infestations, they may even girdle the root collar. In bare-root stock, damage has occurred predominantly along the edges of 2+0 panels. It is usually in patches, because weevils are somewhat gregarious. There has been no notable damage in 1+0 stock to date, and the insect does not appear to be hostspecific. One indication of weevil damage is the ease with which seedlings can be pulled from the ground. Strawberry root weevil damage is often not detected until the seedlings are lifted, although seedlings may become chlorotic during the fall.

Strawberry root weevil populations at Surrey Nursery are monitored by using board traps to determine the length of the adult emergence period, the distribution of the weevils throughout the nursery, and the effectiveness of the control programs. However, these traps do not give a reliable estimate of the numbers present or provide control. Traps are one-foot (30.0-cm) lengths of "two-by-four" placed flat on the soil surface, flagged with tape, and numbered. These simple traps work because adult weevils feed on foliage at night and seek a cool, dark hiding place during the day. Best results are obtained when boards are in open areas because they provide the only source of shelter. More weevils are caught in 1+0 and fallow than in 2+0 panels.

Traps are checked every Monday, Wednesday, and Friday. Weather conditions, number, and color of adults found are recorded. The presence of tan-colored adults indicates that the population is still emerging. Most weevils are caught on hot, sunny days. In cool, cloudy weather weevils are less inclined to seek shelter. In hot weather, boards should be checked in the morning as they may heat up during the day and the weevils will move elsewhere.

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Gwen Shrimpton is the Nursery Pest Management Coordinator for the British Columbia Ministry of Forests, Surrey, British Columbia

The current control program consists of a surface application of acephate (Orthene) to kill the adult weevils. The aim of the program is to reduce the population before egg-laying begins. The first spray is applied 2 weeks after the adult population starts to emerge in spring and later applications may be necessary. At Surrey Nursery, acephate is not providing satisfactory control. Trials are being conducted to gain registrations for furadan (Carbofuran) which is used on strawberries and fenvalerate (Bydrin) which is used on ornamentals. A trial to control larvae with the nematode, Heterorhabditis heliothidis, a biological insecticide, was conducted at Surrey last spring (1984). The initial results are promising and work will be continued.

TARNISHED PLANT BUG

The tarnished plant bug, Lygus lineolaris, first caused notable damage at several nurseries in B.C. In 1983. This insect is found across North America. It is an important pest of many agricultural crops, especially alfalfa, and has a wide range of native hosts. Several species of Lygus are similar in appearance and habits, but only L. lineolaris has been identified in B.C. nurseries to date.

Adult L. lineolaris are mottled yellowish or reddish-brown, 1/4-inch (7-cm) long and half as wide, with flat, oval bodies. Lygus adults overwinter in the crowns of plants and in debris. They may be active throughout the winter in warmer climates. The adults become active the first warm days of spring, mate soon after emerging, and begin egg-laying. There are five nymphal instars (immature stages) which are greenish and resemble aphids, requiring about 3 weeks altogether. There are two to three generations a year in the Pacific Northwest and up to five in the Southern U.S. (Metcalf and Flint 1962).

These insects feed by sucking plant juices and, at the same time, introduce a toxic saliva into the plant; terminal shoots and buds are preferred. On conifers, damage to the terminals has caused stunting and multiple leaders. At affected nurseries, up to 20 percent of both container and bare-root stock has been attacked. A preference for species of pine has been observed.

Lygus damage to conifer seedlings has been confirmed in replicated caging studies. Three styroblocks containing pest-free white spruce, lodgepole pine, and interior Douglas-fir seedlings were placed in a growth chamber, and 20 adult Lygus bugs were introduced. Typical damage was observed in one week. Control seedlings experienced no damage.

Lygus are active insects and will readily move among crops. Sticky coated, non-ultraviolet-reflecting white rectangular traps hung from branches are used to monitor when bugs have invaded orchards in eastern Canada and the U.S.A. (Prokopy and others 1982).

A series of tests with these traps were conducted at several B.C. nurseries in 1984. Trials included a series of painted cardboard, sticky traps in seven shades of yellow, six shades of grey and five other colors; a series of yellow traps positioned at 1, 2, 3 and 4 feet (30, 60, 90 and 120 centimeters) above the seedlings; and a series of yellow traps placed in horizontal and vertical positions. Catches of Lygus adults were very low on all types of traps. Use of these traps is not reliable in conifer nursery culture. No pheromone has been isolated for this pest and sweep netting on conifers is not possible in the early part of the growing season because the new flush could be damaged.

Currently, foliar applications of diazinon are being used for control. Tests are being conducted with dimethoate (Cygon) which is systemic and may offer longer protection.

EUROPEAN MARSH CRANE FLY

The European marsh crane fly, Tipula paludosa, was introduced to the Vancouver southern B.C. area in the mid-1960's and it has since spread up the coast to Prince Rupert, to Vancouver Island, and to some parts of Washington around Puget Sound. It is unlikely to spread much farther because it is limited by moisture. T. paludosa is primarily a pest of grasses (Wilkinson and MacCarthy 1967).

Adult crane flies resemble giant mosquitoes with bodies about 1 inch (2.5 cm) long. They are brownish-grey with two transparent wings and six long, spindly legs. Adults are abundant from late August to early September; they do not feed and lay eggs immediately. The legless larvae are called leatherjackets due to their tough, grey, leatherlike skin. They live in the soil and feed almost continuously throughout the fall, and during warm periods in the winter. When it gets warmer in the spring they feed voraciously and attain their full size of about 1 1/4 inches (3 cm) by April or May. They then remain dormant until early July, when they pupate. There is one generation a year.

In B.C. nurseries, leatherjacket damage is restricted mostly to 2+0 bare-root and transplant stock because they are in the nursery during March and April when the larvae are actively feeding. Leatherjackets girdle the seedlings at soil line and may consume some of the upper roots. The damage has a neat appearance, the stem is nearly always completely ringed, and only the bark is removed. Damage has a spotty distribution with small patches of one to seven seedlings attacked throughout an Infested area. Each patch is probably the work of one larva.

Leatherjackets can also attack container stock. Larvae infesting plugs often remain with the plug after the lift. No damage is evident while the seedlings are growing on the nursery, however, when the plug is planted out in the

spring the seedling may be girdled and the pest transported to new areas.

A control program should be aimed at the young larvae. They are at the most susceptible stage to insecticides and the later instars girdle seedlings. In B.C., sprays are applied about mid-October in the evening because leatherjackets browse at the soil surface at night. A single drench of diazinon is used. Most larvae wriggle to the surface before they die, so an estimate can be made of the numbers present and a kill achieved.

Only nurseries with crane fly populations are included in the program. All container stock is treated, as well as 1+0 and transplant seedlings which will be in the ground in the spring. Grassy areas around the nursery are also treated, as they could harbor reservoir populations.

CONIFER ROOT APHID

A conifer root aphid, Pachypappa tremulae, has been collected from several nurseries in B.C. and Alberta. Unfortunately, little is known about the life history, damage, or distribution of this aphid and its taxonomy has been confused.

Apparently, there are two stages in the life history. One is on the roots of conifers where it secretes a white, waxy substance; spruce roots seem to be preferred, however, records also exist for pine, larch, and Douglas-fir. The other life cycle stage occurs on the leaves of quaking aspen, Populus tremuloides, where leaf nests are formed. However, the leaf nest phase may not be necessary and it may survive all year on Douglas-fir or spruce (Stoyan 1975).

In conifer nurseries, P. tremulae is usually found on container spruce and spruce potted for grafting; there are few records from bare-root. The apparent preference for container over bare-root stock may be explained by the aphid's intolerance to a soil that retains water.

The white, waxy infestations are usually first noticed at lifting and look similar to mycorrhizae fungi. They are on the surface of the plug between the roots and the container wall, closer to the top of the plug than the bottom. Their distribution on the roots appears to be limited by oxygen availability.

Most nurseries with infestations of this root aphid have not reported damage because infested seedlings are not chlorotic or undersized. Damage from this insect will probably be minimal when the seedlings are growing in the nurseries with ample nutrients and moisture. Problems could arise in planting sites if the seedlings are stressed. However, soil mites and other predators may control aphids present on outplanted seedlings. Since the aphids are harmed by desiccation, some mortality may also occur during seedling lifting and sorting.

Pest management in forest nurseries is a relatively new field. As new pests are discovered they are identified, their biology investigated, and management programs are developed using all available tools including cultural, physical, biological, and chemical controls.

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