Integrated Pest Management

What's With All The *Lygus*?

Introduction

Tarnished plant bugs, commonly called by their generic name *Lygus*, are widespread pests to many agricultural crops. It has only been in the past 20 years that this insect has been confirmed as a damaging agent in conifer seedling nurseries. Since then, *Lygus* has been found in nurseries around the world. A disturbing trend is that the number of injured seedlings is increasing every year, and more species of *Lygus* are involved.

Figure 2* - Lygus *injured pine seedling (left).

Damage

Lygus attacks most conifer species with the exception of hemlock and true fir, and shows a preference for 1+0 stock types. Deformation of terminal shoots, loss of terminal leaders, flagging of the needles, and stem lesions are among the most common symptoms of *Lygus* feeding. *Lygus* adults (Figure 1) and nymphs prefer to feed on actively growing terminal meristems. Their feeding causes a small lesion near or on the terminal apex of conifer seedlings. The injection of enzymes that hydrolyse plant cell walls results in the destruction of the apical meristem. In pine, this is expressed in a distinctive terminal distortion with the needles being thicker, shorter than normal, and twisted (Figure 2). In most cases, the entire tip of the seedling is twisted over, and if a bud has formed, it usually develops on an angle. Attacks often cause the initiation of adult needles, and often, an elongated scar is found down one side of the stem. Later in the season, this injury results in the loss of apical dominance and the development of multiple tops. In spruce, *Lygus* damage initially causes a checking or 'shepherds crook' at the tip of the stem. This frequently develops into a seedling with two leaders. A scar is usually obvious down one side of the stem. In western red cedar, damage is expressed as distorted growing tips on a variety of branches that gives a 'clubbed' appearance to the affected seedlings.

***Figure 1 - Adult* Lygus**

In both bareroot and container nurseries, *Lygus* damage is more prevalent around the perimeter of the growing area. In greenhouses, seedlings closest to entrances usually sustain the most damage. Even when the roofs and sides are removed from the houses, most damage occurs around the outside edges and along inside aisles. In pine, larch and Douglas-fir, damage usually occurs in small patches of 2 to 5 seedlings. In contrast, *Lygus* related damage in spruce is observed as single attacks and not in patches of seedlings. Seedlings are susceptible to attack as soon as the first true needles are developed and damage continues through the growing season, from mid-May to late September. Often their migration is determined by factors in surrounding areas. For instance, nurseries surrounded by alfalfa fields can find a large increase in Lygus populations when the alfafa is harvested. Once frosts begin in the fall, the adults seek overwintering sites and damage ceases.

***Lygus* Species**

Studies done in nurseries located in the southwest corner and interior of BC have shown that the composition of *Lygus* species vary by nursery location and climate. In 1996 and 1997, a taxonomic identification of adults caught on sticky traps were determined for a series of nurseries. In total, five *Lygus* species (Table 1) were positively identified from lodgepole pine or western red cedar seedlings - *L. shulli Knight, L. hesperus Knight, L. elisus* Van Duzee, *L. lineolaris* P. de Beauvois and *L. robustus* Uhler. In 1998, a caging study was done to compare the life

Table 1 - Trapping results for *Lygus* bugs in British Columbia forest tree nurseries

Lygus species	Frazer Valley	Okanagan Valley	Interior
L. shulli Knight	Yes	Yes	No
L. hesperus Knight	Yes	Yes	No
L. elisus Van Dusee	Yes	No	Yes
L. lineolaris P. de Beauvois	No	No	Yes
L. robustus Uhler	No	No	Yes

cycle and feeding habits of the two predominant species, *L. shulli* and *L. elisus.* At 25°C, both species developed from egg to adult in 23-24 days. But at cooler temperatures, *L. elisus* completed its cycle in 63 days at 15°C compared to *L. shulli* in 93 days at 12.5°C. This suggests that the mix of *Lygus* species at a given nursery may change considerably depending on exterior environmental conditions and location.

Monitoring *Lygus*

Past *Lygus* monitoring has been done with sweep nets but recently the use of yellow sticky traps (Figure 3) has become an alternative. In 1995, a small monitoring program was initiated at a reforestation nursery in BC to determine the effectiveness of the traps. Results from this preliminary study showed that yellow sticky traps could be used effectively to monitor *Lygus* bugs in conifer nurseries. In 1996, populations of *Lygus* bugs were monitored at two reforestation nurseries throughout the summer to determine the temporal distribution of *Lygus* species within the crop and surrounding vegetation. Three sizes of plastic traps were used (small, 12.7 by 19.1 cm; medium, 17.8 by 19.1 cm; large, 19.1 by 30.5 cm) and each trap size was positioned at 2 heights (5 cm and 30 cm) above the seedling canopy. In general, small traps caught more *Lygus* per trap and per cm2 than the medium or large traps. Within the crop, more *Lygus* per trap and per cm2 were caught on traps positioned 5 cm above the canopy than at 30 cm. The advantage of the smaller trap cards within the crop are cost, evaluation time and their utility in monitoring other pests (i.e. fungus gnats and thrips).

Figure 3 - Yellow sticky traps

***Lygus* Control**

Bareroot Stock. Control of *Lygus* includes eliminating host weeds, vacuum systems, avoiding the sowing of susceptible species adjacent to the fields and the use of pesticides. At J. Herbert Stone Nursery, bug vacuuming with the Bug Vac and pesticides are used in combination for their 1+0 bare root crop. At the first indication of seedling damage or presence of *Lygus* in sticky traps, a pass is made in the field with a Bug Vac. This equipment covers three beds and pulls insects from the trees through a vacuum system as it passes over the beds. The insects are torn apart as they are sucked through the fan system. If this treatment has not been effective or there has been a

steep increase in the population of insects, the insecticide, esfenvalerate, is then applied. Monitoring and treatment applications are continued until the presence of *Lygus* and seedling damage has tapered off.

Container Stock. Nurseries in BC use a preventive spray program of 2 to 4 application of cypermethrin each growing season to prevent *Lygus* bug damage. In recent years, some Canadian growers have commented on the variability of protection offered by cypermethrin in controlling *Lygus* feeding on conifer seedlings. A caging study was initiated in 1996 to determine the effectiveness of cypermethrin (Cymbush 250 EC) and dimethoate (Cygon 2E) residues in preventing feeding damage by *Lygus*. The seedlings were compared at four post-spray intervals (3, 7, 11, and 15 days after spray application) and at four seedling ages (8,13,16 and 22 weeks after sowing). Dimethoate (Cygon 2E) was chosen as a comparison as it is registered for *Lygus* control in alfalfa and provides good control of *Lygus* species in strawberries. It is also used in conifer nurseries in California, where it provides excellent control of *L. hesperus.* In general, cypermethrin was significantly more effective than dimethoate in preventing *Lygus* bug damage in lodgepole pine seedlings at 8, 13, and 22 weeks after sowing. The proportion of seedling damage due to *Lygus* bug feeding was less than 10 percent for both insecticides at 13, 16 and 22 weeks after emergence but as high as 70 % in the first 8 week after seedling emergence. These results suggest that a more intensive protection program is required during early seedling growth stage. During the first 8 weeks after seedling emergence, the greatest protection by both insecticides occurred within the first 7 days after application, then after the insecticides were ineffective.

Recommendations

1. Monitoring *Lygus* bugs within the crop should start soon after seedling emergence and continue on a weekly basis throughout the susceptible growth period (0 - 11 weeks after emergence).

2. Based on nursery trials, *Lygus* monitoring is most efficient when small 5.1 x 7.5 in. (13 x 19 cm) yellow sticky traps are placed every 3,230 to 5,380 ft^2 (300 to 500 m2) of seedling area. Sticky traps should be positioned 1 ft (30 cm) above the ground, one per 5,380 ft^2 (500 m^2) of surrounding vegetation.

3. Monitoring *Lygus* from surrounding vegetation can provide an estimation of the size of the *Lygus* bug population. This information can help predict the arrival of *Lygus* bugs within the crop and timing of insecticide applications. Perimeter monitoring should start when mean daily temperatures are above 41 ^oF (5 ^oC) and continue until peak of flight of the first generation.

4. A significant negative relationship was found between the age of container seedlings and the mean proportion of seedling damaged by L*ygus* bug suggesting that protection of seedlings, especially for lodgepole pine, should be most intensive in the first 13 weeks from sowing.

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