willow sharpshooter STUNTING OF HYBRID POPLAR growth

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Introduction

Over the last 5 years, the only insect pest that has been documented to cause significant damage to the hybrid poplar at the Malheur Experiment Station has been the willow sharpshooter (*Graphocephala confluens*, Uhler), a type of leafhopper. Willow sharpshooter was not known to be an economic pest of poplars. This report describes the impact of sharpshooter feeding on tree growth and our attempts at monitoring and control of the sharpshooter.

Materials and Methods

Willow Sharpshooter Observations and Control

Until 1999 the willow sharpshooter (leafhopper) was not observed in the trees. In late June of 1999 an infestation of leafhoppers was first observed in parts of the plantation. The population appeared to have peaked in early July. At the population peak the leafhopper numbers were such that when walking through the badly infested parts of the plantation the insects could be heard rustling in the tree canopy. The advice of a consultant who inspected the leafhopper infestation was that the trees tolerate the feeding and control was not necessary. After early July the population seemed to dwindle until late August, when large numbers of adults were again observed. The field was sprayed with Diazinon AG500 at 1 lb ai/ac on September 4. Leafhoppers were not observed when the plantation was checked on September 6.

In 2000, adult leafhopper numbers started increasing in mid-May. The field was sprayed aerially with Diazinon AG500 at 1 lb ai/ac on May 27. Leafhoppers were not observed when the plantation was checked 2 days later. In early July, adult numbers again started to increase. The field was sprayed with Warrior at 0.03 lb ai/acre on July 10. After the second insecticide application leafhoppers were not observed for the rest of the season.

During the 2001 season, three leafhopper sampling methods were tested. Sampling methods were (1) aerial sweeps of the tree canopy using a large net with 15-ft extension handle, (2) visual inspections of foliage on the sprouts (sucker growth) from the lower trunk, and, (3) use of yellow sticky traps suspended from the lower branches of the tree canopy. All sampling methods were replicated and conducted on a weekly basis from April 1 through mid-July during the 2001 growing season. The sticky traps were used to monitor the adult leafhopper population. Aerial net and leaf observations recorded both adult and nymphal population levels of the leafhopper. Sampling and observed population trends assisted in timing of insecticide treatments.

Tree Production Practices

The trees were grown on a Nyssa-Malheur silt loam (bench soil) with 6 percent slope at the Malheur Experiment Station. The soil had a pH of 8.1 and 0.8 percent organic matter. Hybrid poplar sticks, cultivar OP-367, were planted on April 25, 1997 on a 14-ft by 14-ft spacing.

In 1999, the 2 year old trees were irrigated with a microsprinkler system (R-5, Nelson Irrigation, Walla Walla, WA) with the risers placed between trees along the tree row at 14-ft spacing. The sprinklers delivered water at the rate of 0.14 inches/hour at 25 psi and a radius of 14 ft. The poplar field was used for irrigation management research (Shock et al. 2002) and groundcover research (Feibert et al. 2000) from 1997 through 1999. Plots were three rows wide and seven trees long.

In 2000 and 2001, the trees were irrigated either with the microsprinkler system or with a drip-irrigation system. Two drip tapes (Nelson Pathfinder, Nelson Irrigation Corp., Walla Walla, WA) were laid along the tree row. The two drip tapes were spread 2 ft apart, centered on the tree row. The drip tape had emitters spaced 12 inches apart and a flow rate of 0.22 gal/min/100 ft at 8 psi. The trees were irrigated when the soil water potential at 8-inch depth reached -50 kPa. The microsprinkler-irrigated trees had 2 acre inches of water applied at each irrigation and the drip-irrigated trees had 1.54 acre inches of water applied at each irrigation. Irrigations were run from May through September each year. Plots were six rows wide and seven trees long.

Soil water potential (SWP) was measured by granular matrix sensors (GMS; Watermark Soil Moisture Sensors model 200SS; Irrometer Co. Inc., Riverside, CA) at 8-inch depth. The GMS were installed along the tree row and between risers and trees. The GMS were previously calibrated (Shock et al. 1998) and were read at 8:00 a.m. daily starting in May, the starting date for the irrigation treatments.

Tree Growth Measurements

The heights and diameter at breast height (DBH, 4.5 ft from ground) of the central three trees in the two middle rows in each plot were measured in early May 1999, and in early October each year. Annual growth increments for height and DBH were calculated as the difference in the respective parameter between October of the current year and October of the previous year. Annual growth increments for 1999 were calculated as the difference in the respective parameter between October 1999 and May 1999. By the end of the season in 1999, leafhopper feeding caused the death of terminal shoots of trees in the affected parts of the plantation. The death of the terminal shoots resulted in the loss of apical dominance, causing the tree to grow in a bushy way, with a flat top and a witches'-broom appearance. Trees in the undamaged parts of the plantation retained the normal conical canopy shape. Leafhopper damage was evaluated subjectively as the degree to which the tree canopy deviated from a conical appearance (0 = no damage, 10 = maximum damage). Leafhopper damage was evaluated in October each year.

Results and Discussion

Tree Growth

Tree height increments decreased with increasing leafhopper damage in all years (Fig. 1 to 3). Diameter at breast height increment decreased with increasing leafhopper damage in 2000 and 2001 (Fig. 1 to 3). In 1999 DBH increment was not affected by leafhopper damage. Tree heights in October 2001 were lower for trees with higher leafhopper damage (Fig. 4). Diameter at breast height in October 2001 was not correlated with leafhopper damage (Fig. 4). Damaged trees retained the witches'-broom appearance and had dead terminal shoots through 2001.

Reductions in tree growth from leafhopper damage are probably largely due to the 1999 damage; the percentage of trees with a damage level greater than 0 remained stable through 2001. The percentage of damaged trees was 41, 30, and 45 percent in 1999, 2000, and 2001, respectively. Also, the average subjective damage level remained stable through 2001. The average subjective damage levels were 3.3, 0.74, and 1.8 in 1999, 2000, and 2001, respectively. In addition, the more timely control measures in 2000 and 2001 did not allow the leafhopper populations to build up to the 1999 level. The tree damage symptoms are persistent despite the improved leafhopper control. The trees could be infected with Pierce’s disease, which is known to be transmitted to many plant species by other species of leafhopper.

Monitoring

Of the three leafhopper sampling methods the yellow sticky traps appeared most useful in detecting adult leafhopper population trends. The numbers peaked on May 29 and June 6 with average adults per weekly trap collection at 16 and 17 leafhoppers, respectively (Fig. 5). The aerial net sweep samples only recovered trace levels throughout the sample period. Observations of the leaves on water sprouts (epicormic sprouts) detected a hatch of small leafhopper nymphs, which coincided with the trap catch peak of June 6. Aerial application of Warrior insecticide at 0.03 lb ai/acre occurred on June 11. Control was excellent and only a few leafhoppers were observed during the remaining sampling period through July 31. No additional infestations occurred during the 2001 season. Although the aerial net counts were low during the 2001 season, the timely and effective insecticide treatment may have prevented the leafhopper population from increasing as observed in 1999. Aerial sampling might have caught adult leafhoppers as they spread to the upper tree canopy in 1999.

Under the conditions of this study it appears that yellow sticky traps may be a useful sampling tool to predict population trends of adult leafhoppers in poplar tree plantations. They may help forecast the first nymphal hatch and help effectively time insecticide applications. Careful monitoring of the leafhopper in 2001 resulted in one aerial insecticide application for control. Two applications were made in 2000.

References

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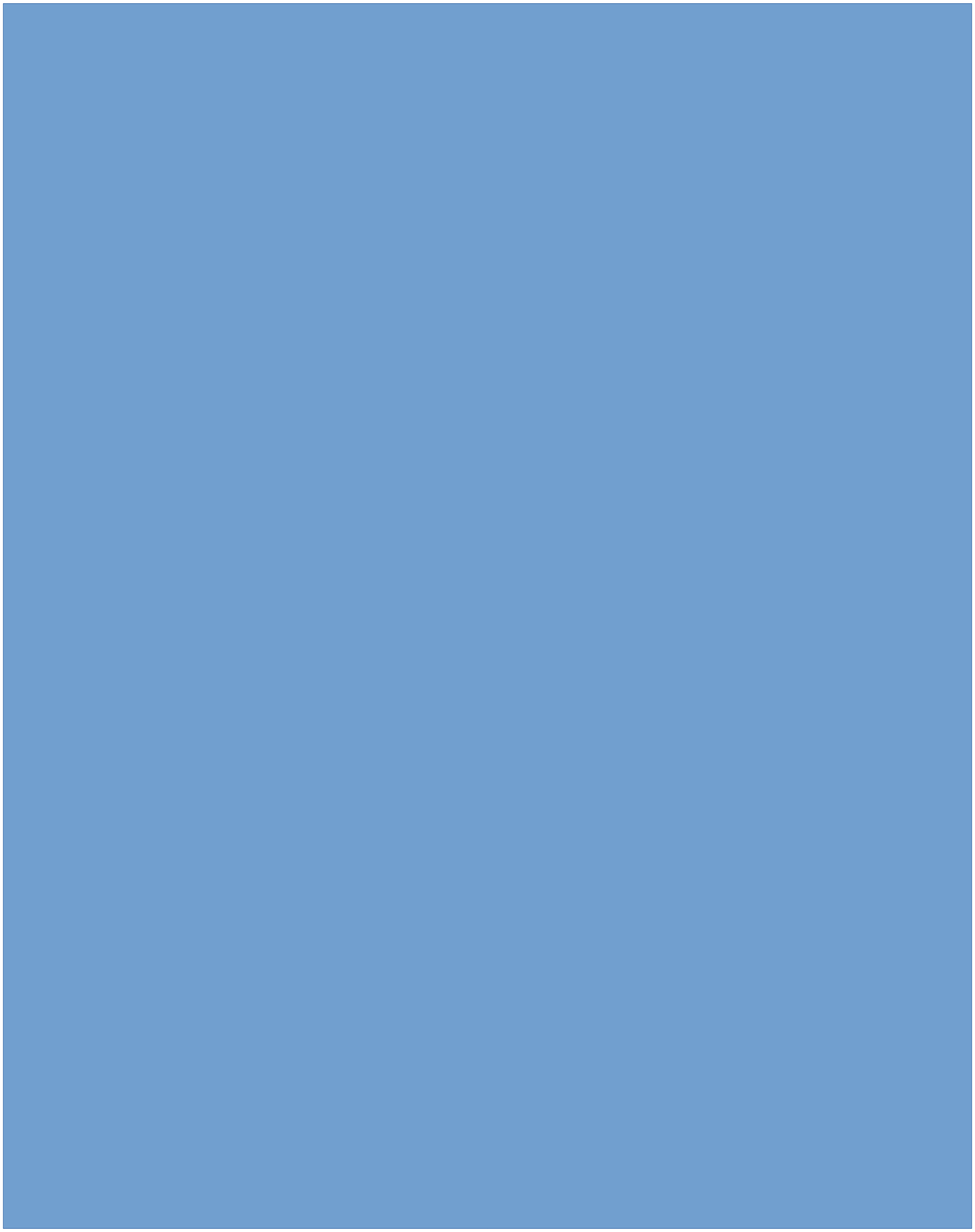

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Figure 1. Relationship between the subjective evaluation of leafhopper damage (0 = no damage, 10 = maximum damage) on hybrid poplar in 1999 and tree growth increments

during 1999.   Malheur Experiment Station, Oregon State University, Ontario, OR.

Figure 2. Relationship between the subjective evaluation of leafhopper damage (0 = no damage, 10 = maximum damage) on hybrid poplar in 2000 and tree growth increments during 2000. Malheur Experiment Station, Oregon State University, Ontario, OR.

Figure 3. Relationship between the subjective evaluation of leafhopper damage (0 = no damage, 10 = maximum damage) on hybrid poplar in 2001 and tree growth increments during 2001. Malheur Experiment Station, Oregon State University, Ontario, OR.

Figure 4. Relationship between the subjective evaluation of leafhopper damage (0 = no damage, 10 = maximum damage) on hybrid poplar in 2001 and tree height and DBH in October, 2001. Malheur Experiment Station, Oregon State University, Ontario, OR.

Figure 5. Average number of adult leafhoppers in insect yellow sticky traps in a hybrid poplar plantation in 2001. Malheur Experiment Station, Oregon State University, Ontario, OR.