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Digger Article- Growing Knowledge Series- OSU and USDA

Beneficial Insects for Aphid Control in Willamette Valley Christmas tree Farms

By Ryan Hill, Chal Landgren and Jana Lee

Controlling aphid populations and its associated damage on field grown conifers using beneficial insects is an ongoing aspiration for many growers. Unlike greenhouse releases of beneficial insects, field releases suffer from a number of inherit problems briefly summarized by the question- Where did they (the beneficial insects) go???

In the summer of 2014 we began an observational study of aphids in Christmas tree plantations attempting to shed a little light on the issue. Our fundamental question was- Can we limit aphid damage in Christmas trees utilizing releases and /or attracting beneficial insects?

Why? - For many Christmas tree growers, the 2013 growing season exhibited some of the worst aphid damage of the past decade, leading to increased insecticide applications. Sensitivity over honeybee deaths due to pesticide application has raised interest in alternative pest control strategies for a range of field grown crops.

Our Study- After reviewing numerous options for biological control of aphids in conifers and consulting with practitioners, we selected three natural enemies of aphids for field release and one lure/attractant. Our three natural enemies and our release targets were:

- *Aphidoletes aphydimyza* (predatory midge). Target release was 10,000/ac. Midges arrived as larva and were released as adults (photo 1) within days of hatching.
- *Aphidius matricariae* (small parasitic wasp) Target release was 2000/ac. Initial release of adults was 400/ac. then 600/ac then 1,000 ac.
- *Chrysoperla rufilabris* (green lacewing). Target release was 5,000 eggs/ac. A generalist predator Fondren et al. (2004) suggested that their releases could lower aphid populations in Fraser fir Christmas trees. Released as eggs on sticky cards (photo 2) spread around fields

Releases were conducted in three stages beginning the 1st week of May, mid May and concluding the first week in June.

Another way to improve biological control of pests is to attract natural enemies into the field. Plants release volatiles when insects feed on them, and these odors can attract natural enemies. Methyl salicylate, is one common plant-produced odor, and available

as a commercial lure (Predalure™). We distributed 15 Predalure™ tabs/ac. as our target (photo 3). Methyl salicylate has shown some potential for being an effective component of an integrated pest management strategy as the lures do attract predators but their ability to improve pest management is not always clear (Rodriguez-Saona et al. 2011).

Sites and evaluations-We released natural enemies at 8 Christmas tree sites. Tree species were a mix of noble and Grand fir and treatment areas varied from 1-4 acres. We paired green lacewing and midges at five sites (photo 4). At three sites, we paired the release of parasitic *Aphidius* wasps with Predalure™. Nonrelease sites for comparisons included nearby and adjacent tree fields. The final release counts on one site varied somewhat from ideal (e.g. a 4 acre field receiving 30,000 *Aphidoletes* rather than the desired 40,000).

Starting in June 8, 25 random trees per acre were inspected every two weeks at each site until mid-August such that each site was scouted 5 times. During inspection, each tree was evaluated for live aphid presence on the trunk, new and older needles, with a scale ranging from 0 (none), 1 (1-20 aphids), and 2 (20+ aphids). Mummified eggs and the presence of cast aphid's skins were recorded for presence/absence. Visual damage from aphids was rated from 1-4 (1= none, 4= heavy aphid population) and all aphids predators were tallied when found.

Observations- At the end of the study, all observed predators were tallied for all sites (Figure 1). Ladybugs and hoverflies turned out to be the most common aphid predator identified. Neither were part of our releases suggesting that naturally occurring beneficials could have a positive role in Christmas tree fields. Lacewings were released and were the third most commonly observed beneficial. Mummies from *Aphidius* wasp activity were never observed and *Aphidoletes* midge predators were rare (the small size of *Aphidoletes* made it difficult to identify). Other insects that were found included minute pirate bugs, damsel bugs, stilt bugs, predatory mirids, and soldier beetles.

Of the eight fields, only three sites showed increasing aphid populations during the summer. Of these fields, all of them had more natural enemies observed on trees with higher aphid infestations (Figure 2). *Aphidoletes* midge and green lacewings were released at these sites. Further study is necessary to find a method for increasing the efficiency of each treatment. This may include testing the species separately, altering release times, or release methods (releasing adults, eggs, or larvae).

The five fields that did not have severe aphid infestations still contained beneficial insects. Also, 3 of the 5 fields that had low aphid populations were treated with the *Aphidius* wasp and Predalure™ though almost no *Aphidius* activity was observed during our observations. Predalure™ may have potential though the lack of aphid activity in

general limited our ability to draw conclusions on effectiveness. Sadly for our trial, 2014 was not a problem year for aphids across the region. We can speculate as to why, but this observational study was a first step to see if we could find signs of activity from the released natural enemies within fields.

Conclusions -

1. Most of the observed aphid predators we found were not from our releases. Enhancing these existing predators is worth looking into. Conservation techniques such as planting native floral vegetation can help sustain these predator populations with pollen, nectar and alternative non-pest prey before pests are available in the field.
2. Among the predators we did release, lacewings were the most numerous. Here we have no way to determine if the lacewings we found hatched from eggs we placed on trees. But we found them and releases of these are straightforward and deserving of additional review.
3. Evaluating the impacts from *Aphidius* wasp releases and Predalure™ in field trials was difficult. A study with releases/deployment on smaller sites with adequate spacing from homogenous control sites would be necessary to draw firmer conclusions.

References

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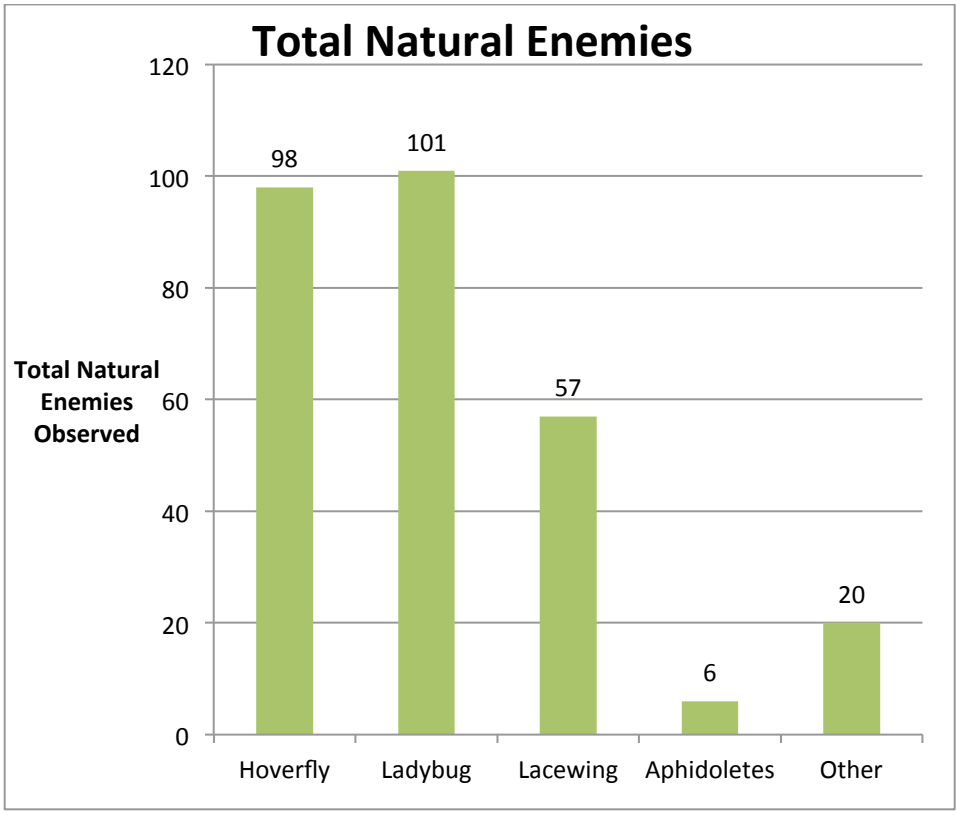

Figure 1: counts for all beneficial insects observed during the duration of the study.

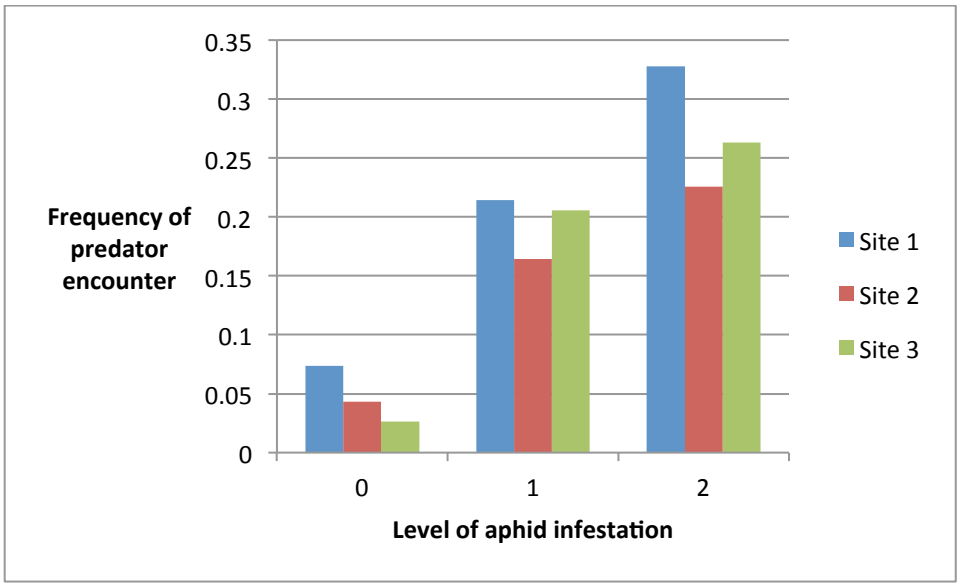

Figure 2: Frequency of predator encounter based on aphid infestation level for the sites with highest aphid counts.

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