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Final Report: Biological and cultural control of Azalea lace bug

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The Azalea lace bug (AzLB), *Stephanitis pyrioides*, is an emerging pest in the Northwest of ericaceous plants. In the East Coast, releases of predatory green lacewing (GLW) larvae have reduced azalea lace bug nymphs on azalea plants. Yet, the effect of GLW on rhododendrons is not known, rhododendrons have much larger leaves and a more open canopy than azaleas. Some preliminary work by our lab and Rosetta's lab indicate GLW releases and water sprays can suppress pest numbers on rhododendrons.

Obj. 1) Evaluate the efficacy of GLW releases on potted and landscape rhododendrons. (Obj. 2 discusses water spray)

Landscape: ☺ *At the end of the trial at 8 weeks, the release of GLW predators at the egg stage resulted in plants having fewer adults per leaf (Fig. 1a), and marginally lower percent of damaged leaves than the control (Fig. 1b).*
There was no difference at 8 weeks in the presence/absence of nymphal lace bugs (data not shown). Nymph counts were all-around low because of generation turnover.

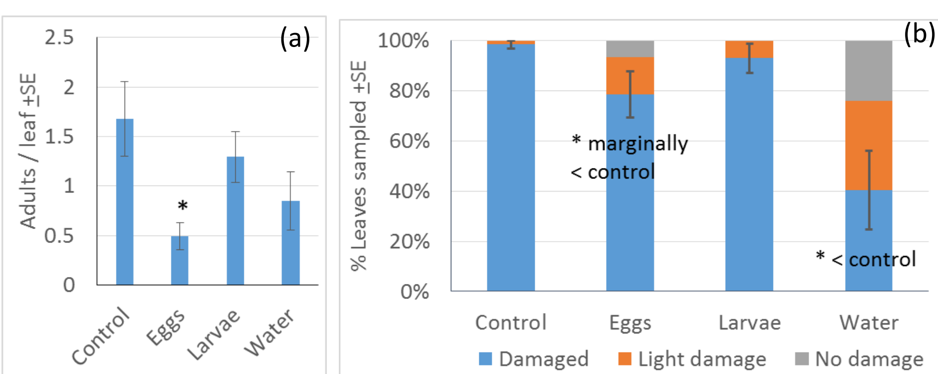
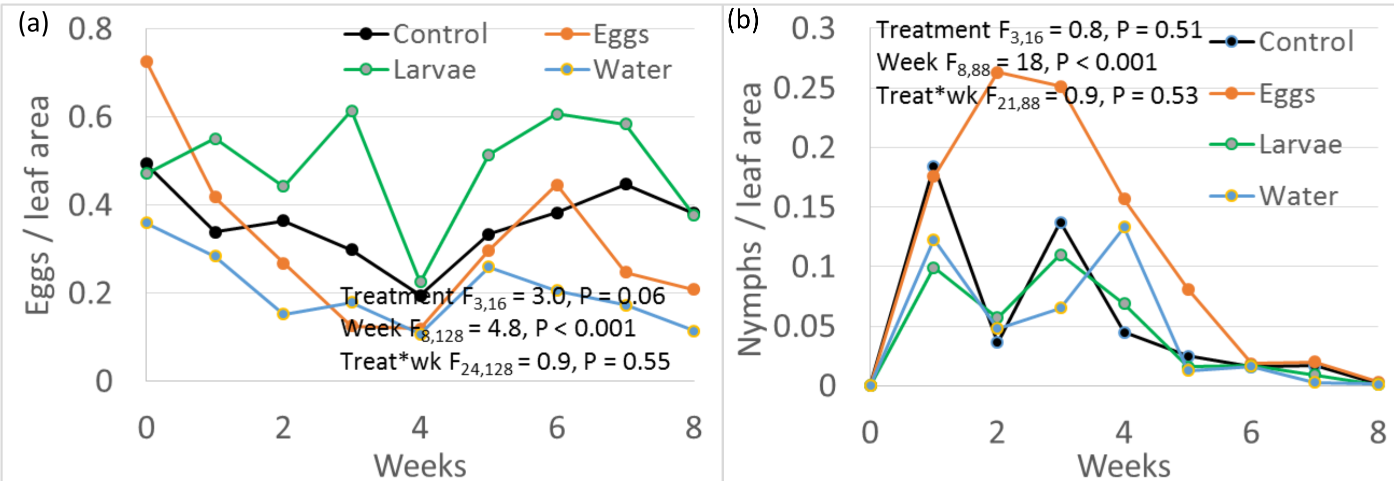


Fig. 1. Visual sample of 40 random leaves per plant at 8 weeks with **(a)** average number of adult lace bugs per leaf per plant, and **(b)** average % damaged leaves per plant.

In addition to visual samples of random leaves at the end of the trial (above), visibly infested leaf samples were taken back to the lab for counting under the microscope and measuring leaf area each week.
There were mixed results in the overall counts of lace bug eggs, nymphs or adults when standardizing counts per cm² leaf area (Fig. 2a-c). Overall, the number of adult lace bugs was higher in control plants.



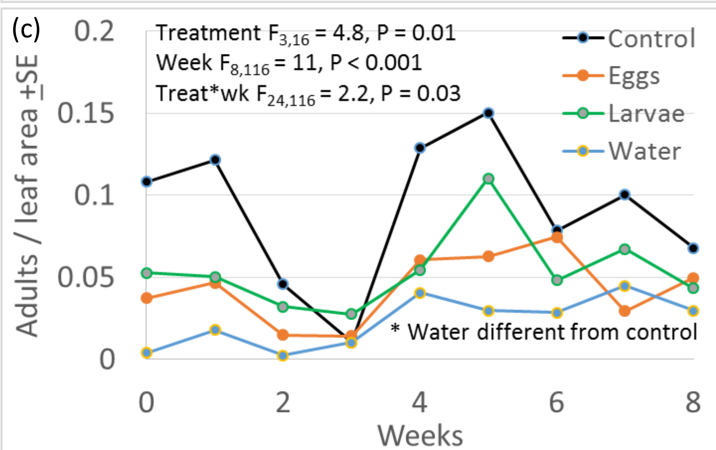


Fig. 2 (a) Average number of lace bug eggs found per leaf adjusted by leaf area cm², **(b)** nymphs, and **(c)** adults on variously treated plants over 0-8 weeks.

☹ **Pitfall**: Now the challenge of this study was that we could not set up treatment in plants with similar infestation levels nor of the same cultivar. Thus, the fact that plants vary in susceptibility to lace bugs and have different starting populations may have masked treatment effects.

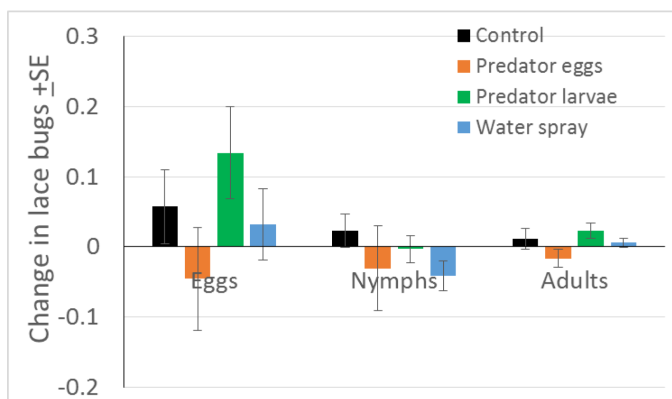


Fig. 3. Average change in the number of lace bugs at the egg, nymphal, and adult stages on plants 1 week after water sprays or predators were applied.

To better look at the impacts of GLW releases even though each plant had different starting densities, we looked at the change in lace bugs the week after a treatment was applied when lace bugs nymphs were present: from weeks 2 to 3, weeks 4 to 5 and weeks 6 to 7. *Taking this* *into consideration, there was a general decrease in the number of lace bug eggs, nymphs, and adults 1 week after application of GLW eggs (Fig. 3)*, although differences were marginal or not significant. Past laboratory studies showed that GLW larvae readily consume lace bug nymphs but do not always consume lace bug adults in closed containers.

Methods landscape: The trial occurred at a private garden with landscape rhododendrons where no insecticide were used. The trial was initiated July 21, 2016 (week 0) when lace bug eggs had been observed 2 weeks prior and expected to have hatched. The nymphal stage is more vulnerable to predation. However, upon microscopic examination of leaves taken from the field at week 0, eggs rather than not small nymphs were found. ☹ Thus the trial may have been initiated a week early. Five infested plants received 6 egg cards of green lacewing (~1000 eggs total), five plants received ~88 green lacewing 2nd instar larvae, and five plants received no treatment as the control. Larvae were tapped onto the plant from a hexcel unit. Treatments were repeated every 2 weeks into the end of August, and sampling occurred until the 8th week September 8.

Two types of sampling were done to compare treatment effects. First, weekly leaf samples of 5-20 leaves were removed per plant, depending on leaf size and plant canopy density, and counted for lace bug eggs, nymphs, and adults under the microscope. Because this sampling affects the appearance of the plants, leaf removal was limited to a few per week and only visibly damaged leaves were removed. At the end of the experiment, we also took visual leaf samples of 40 random leaves per plant. We recorded whether the leaf upperside was damaged on >5% of the surface, <5% (light), or not damaged. We also counted the number of live adults and presence or absence of live nymphs by poking the lace bugs. Because this visual checking may remove lace bugs and affect samples taken in subsequent weeks, this sampling was only done at the end of the experiment.

Potted plants: ☺ One week after GLW predatory larvae were released, there was an immediate reduction in the number of lace bug nymphs per leaf. This 84% reduction with the predator was significantly higher than the 25% observed pest reduction in the control (t-test = -2.2, P < t 0.03). Over all 4 weeks, the lace bug counts were not significantly different (Fig. 3).

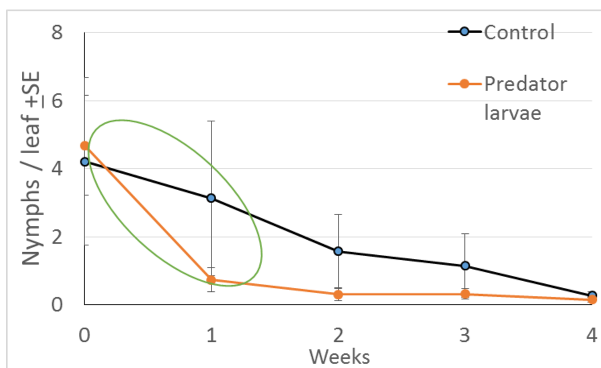


Fig. 3. Average number of lace bug nymphs per leaf following release of predatory larvae

Methods potted: Six potted plants received 15 green lacewing larvae, and six plants received no treatment. Leaf samples were taken weekly similar to as described in the landscape methods.

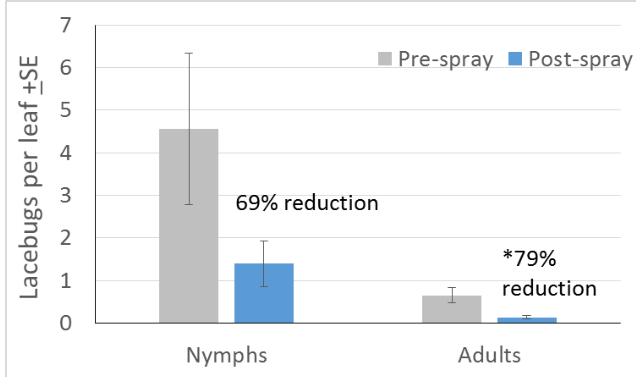


Fig. 4. Average number of lace bugs per leaf right before and after a water spray.

Obj. 2) Evaluate the efficacy of water sprays on rhododendrons.

Field ☺: *Water sprays immediately dislodge lace bugs, and can be a non-toxic and easy control method for homeowners and landscape managers. Significant reduction of adult lace bugs and marginal reduction of nymphs occurred after spraying water on plants on July 21 and August 4 (Fig. 4).*

<u>Longer-term ☺:</u> *Weekly pest counts showed that water sprays significantly reduced the number of adult lace bugs (Fig. 2c). There was a marginal impact on the number of lace bug eggs (Fig. 2a). The consistently lower numbers of eggs found on water-sprayed plants may have reflected the fact that adult pest removal reduces future population growth and deposition of eggs. At the end of the trial, water sprays resulted in plants with a lower percent of damaged leaves than the control (Fig. 1b).*

Methods field: Five landscape plants were sprayed with water at ~38 PSI using a pressurized CO_2 backpack sprayer in the above-mentioned rhododendron garden. Samples were taken weekly and sprays were applied every 2 weeks as described above. On weeks 0 and 2, 5 leaves were taken before spraying, and 5 leaves taken after spraying to determine the immediate effects of water sprays. We did not spray potted plants with water because this would be unpractical. Water sprays were feasible with plants that had higher and sparser canopies as sprays had to be applied on the underside of leaves to dislodge the lace bugs.

Lab ☺: *Higher mortality occurred when adults were sprayed with water at 6.8 PSI in a Petri dish (Fig. 5).*

Methods lab: Lace bug adults were sprayed in a Petri dish with water at 6.8 or 15 PSI in a Potter Spray Tower, or not sprayed and handled in a similar manner. Each treatment was replicated in 17-18 dishes with 10 adults per dish. Afterwards, adults were transferred to arenas with an azalea clipping in a water wick to monitor survival over 14 days. Mortality was recorded every 2-3 days.

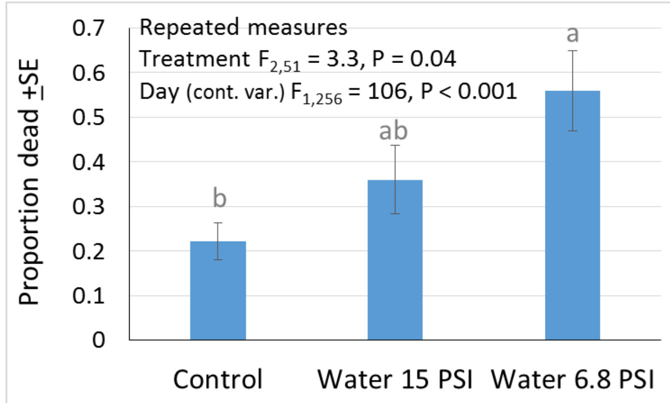


Fig. 5. Proportion of dead adult lace bugs after water sprays or no sprays in the Potter Tower.

Note: Different spray pressures were used in the lab and field trial based on what was practical. While spray pressures differed, so did the medium. A hard Petri dish was used in the lab trial, and rhododendron leaves which would bend back during sprays in the field trial. Spraying lace bugs at PSI above 15 in a Petri dish would cause lace bugs to be blown off the apparatus, and hence difficult to monitor mortality. Lace bugs were sprayed at 38 PSI in the field based on Rosetta's prior work, and based on observations of lace bugs being removed from leaves at this pressure.