Pome Fruits—Biological Control

Earwig Aggregations: Trap Height vs. Aggregation Pheromone

Steven R. Booth
Vancouver Research and Extension Center, Vancouver, WA

Keywords: earwig, pear psylla, pear

Previous investigations have shown the European earwig to be an important pear psylla natural enemy which aggregates to sites of high earwig density. A better understanding of the aggregative response would enhance the efficacy of augmentative releases. Objectives of this study were: 1) manipulate earwig movement within and among trees by providing earwig shelters of differing height, degree of scent saturation, and shelter permanence, 2) substantially augment resident earwig populations by augmentative release and 3) demonstrate psylla suppression due to those releases.

The study was conducted during summer 1992 in an Okanagan Valley, B.C., commercial pear block managed with a "soft" pest control program. Earwig shelters consisted of rolled-up white canvas strips which could be washed to remove earwig scent. An earwig shelter was placed on alternate trees in two l40-tree grids in a release and a non-release plot. Each shelter received one of the following treatment combinations: permanent/high, permanent/low, replaced/scented/high, replaced/scented/1ow, replaced/nonscented/high and replaced/nonscented/ low. Treatment combinations were replicated five times within a grid. Shelters were scented by placement in a bucket with 300 earwigs for six days. Earwigs in shelters were counted weekly and shelter replacements were made every two weeks. Tree canopies were periodically sampled for earwigs, other predators, and psylla immatures. To determine the relationship between earwig and psylla densities, additional trees without shelters were also sampled. In one grid, earwigs periodically were released at mid-height in each tree bearing a shelter for a total of 160 earwigs/tree. At the final release date of August 18, released earwigs were marked and coded according to the treatment of the shelter on the release tree. On September 7, similarly marked and coded earwigs were released on each treated tree in the adjacent, previously non-release grid.

Earwig density increased faster and reached higher densities in the release grid than in the non-release grid. In both grids, earwigs/shelter peaked sooner than earwigs/tray. Regression analyses showed no relationships between earwigs/shelter and earwigs/tray. In both release and non-release grids, distribution of earwigs among shelter type and height changed over time. In the non-release grid, differences among shelter treatment were quite variable and not significant at any sample period, but more earwigs were found in the low traps than in the high traps. In the release grid, treatment effects were significant at two of the four general sample periods. For those two periods, an examination of orthogonal contrasts clarified the treatment effect. In the release grid during the second sample period, contrasts of permanent vs replaced and high vs low were significant, while that between scented and non-scented was not. During the last sample period, the contrast of high vs low was significant, while the other two contrasts of interest were not. Most marked earwigs were found in the same shelter type and height as their codes. Marked earwigs coded to a shelter of a different type and height as that in which they were found had been released on trees with replaced/non-scented/low shelters. Despite an initially higher value, average psylla density was lower in the release grid than the non-release grid near season's end, but higher earwig densities did not necessarily correlate with lower psylla densities, either within or among sample periods. Regression analyses demonstrated at best a weak relationship between numbers of earwigs and psylla on individual trees. Natural enemies were relatively higher in the release grid.

These experiments did not fully demonstrate that releases of large numbers of earwigs can control pear psylla, partly due to unequal numbers of other psylla natural enemies in the experimental grids. In addition, psylla densities were quite low in both grids until late season and some earwigs may have foraged in the ground cover. The experiments did show that earwig dispersal can be manipulated both within and among trees. Not surprisingly, seasonality played a major role in earwig movement. The mode of earwig release helped determine choice of shelter type and height, as earwigs apparently climbed the tree upon release. The significant contrast between permanent and replaced shelters but non-significant contrast between scented and non-scented shelters suggests that the earwig aggregation pheromone takes time to accumulate and can be relatively easily removed.