ASSOCIATION OF TENLINED JUNE BEETLE WITH CROWN GALL IN A TULARE COUNTY WALNUT ORCHARD

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ABSTRACT

Though Tenline June Beetle (TLJB) (*Polyphylla* spp.) is an inhabitant in many orchards, it only causes damage in a fraction of infested blocks. TLJB damage is sporadic within orchards and is often associated with sand streaks, particularly during drought years. On a Farm Call in 2009, I noticed that the larvae of TLJB seemed more prevalent in the soils around trees infected with *Agrobacterium tumefaciens* (*At*) than uninfected trees. In 2010 and 2011, the orchard was surveyed to assess the potential association of TLJB with crown-gall infected trees. In 2010, trees were surveyed and designated as symptomatic or asymptomatic for *At* and TLJB populations were assessed on paired symptomatic and asymptomatic trees. TLJB populations were determined in the soil to a depth of 30 cm and at a 30 cm radius from the tree. In 2011, I utilized a less labor-intensive approach, and sampled TLJB larvae from the root systems of declining trees that had been excavated for replant. Consequently, the 2010 survey was conducted on healthy trees, and the 2011 survey was conducted on declining trees. In both years, TLJB larval populations were higher on *At*-infected trees than on uninfected trees. The larvae were often found embedded within gall tissue. It is possible that TLJB predation on walnut roots and gall tissue contributed either additively or synergistically to decline of trees infected with *At*. It is not known whether the larvae preferentially feed on gall tissue, or whether larval root and crown predation enhances disease incidence and severity of crown gall by creating infection courts for the bacterium.

OBJECTIVES

Determine whether TLJB predation is more prevalent on *A. tumefaciens* (*At*)-infected walnut trees than on uninfected trees.

PROCEDURES

Field sites. All field work was conducted in two blocks of walnut (Tulare on Paradox rootstock) in Tulare, CA in the 9th and 10th leaf, 2010 and 2011, respectively. The 2010 survey was conducted on trees in a sandy region within the north block of walnuts. The 2011 survey was conducted on trees excavated from two blocks (north and south) of walnuts.

2010 TLJB survey strategy. In April 2010, trees were categorized as either *At*- symptomatic or *At*-asymptomatic in a sandy region of the north block of walnuts. Using a random number generator, 8 *At*-symptomatic trees were selected at random for assessment of associated TLJB larvae. To allow for paired sampling of *At*-symptomatic and *At*-asymptomatic trees, the larvae were also sampled from the nearest *At*-asymptomatic tree in the same row. A trench was dug around the base of each tree, 30 cm deep and at a 30 cm radius from the base of each tree. In order to reduce sampling bias, sampling at each tree was limited to 25 minutes. Larvae were collected from the soil and enumerated. A paired, one tail, t-test was used to compare larval populations on *At*-asymptomatic and *At*-symptomatic trees.
**2011 TLJB survey strategy.** Because the 2010 sampling strategy was extremely labor intensive, the February 2011 sampling was conducted on exposed roots and crowns of declining or dead trees that had been removed with a backhoe. Sampling was conducted immediately after each tree was excavated. TLJB larvae were enumerated from all excavated trees, and each tree was designated as either symptomatic or asymptomatic for At infection. Consequently, in the 2011 survey, populations of TLJB larvae on At-symptomatic and At-asymptomatic trees were compared using a two-tailed t-test, and not a paired t-test as in the 2010 study.

**RESULTS**

In the 2010 paired survey, there was no difference in the number of TLJB larvae associated with At-symptomatic and At-asymptomatic trees (t≤0.06). In the 2011 survey of excavated trees, there were not enough At-symptomatic trees in the south block to make comparisons; however, in the north block there were significantly more TLJB larvae associated with At-symptomatic trees (t≤0.03) than At-asymptomatic trees.

**DISCUSSION**

Because of the different strategies employed in 2010 and 2011, the survey conducted each year targets slightly different questions. The 2010 survey was limited to a total of 16 trees due to the laborious nature of the sampling from mature, standing trees, whereas 35 trees were assessed in 2011. In 2011, all samples were collected from declining trees, the excavation of which made it easy to survey TLJB larval populations. In 2011 there were more TLJB larvae associated with At-symptomatic trees than At-asymptomatic trees. The detection of a statistical difference in 2011, but not in 2010 may simply be a consequence of higher numbers of trees assessed in 2011. Alternately, it may demonstrate that more TLJB larvae are associated with crown gall in declining trees.

The cause of heightened TLJB larval populations on trees with crown gall is not known. Proposed rationales for this observation include, but are not limited to, the potential for larvae to have a feeding preference for gall tissue, and the potential for larval predation to create infection courts for infection by A. tumefaciens, thus enhancing disease incidence and severity of crown gall.