Billbugs facilitate weed invasion in lawns

Doug Richmond

Objective

To determine how weed invasion patterns differ between lawns experiencing different levels of billbug damaged.

Rationale

Billbugs are one of the most commonly misdiagnosed insect-related problems in turfgrass. Because of the time of year when billbugs damage occurs, it is easily confused with other stresses including summer dormancy, disease, and compacted soil. Although it is intuitively obvious that insects can reduce the vigor of turfgrass plants, only rarely do we make the connection between this damage and other ensuing problems such as weed invasion. Furthermore, there is presently almost no data substantiating a relationship between billbug damage and weed invasion. Therefore, the main goal of this research was to document and describe the relationship between billbug damage and weed invasion. This information should help the lawn care industry by clarifying the potential significance of billbugs in facilitating weed invasion.

How it Was Done

The study was conducted over the course of two field seasons. During 2003, three sites, experiencing different levels of billbug damage, were selected and a permanent 40' transect was established across each. Levels of billbug damage were determined by employing a simple tug-test which is diagnostic for this insect. Along each transect, three 1 ft^2 quadrats were randomly placed and 1000 seeds each of dandelion, large crabgrass and black medic were added during August. The proportion of tug-tests showing positive evidence of billbug activity was used as a predictor of weed density.

During 2004, a similar procedure was used, but experiments were conducted at 6 sites. Quadrat size was increased to 0.25 m^2 and 10 soil cores were sampled to determine billbug populations levels. The proportion of soil cores containing billbug larvae or pupae was used as a predictor of weed density. Turfgrass stand density was determined by collecting 6 turf and soil cores (4 1/4" diameter) along each transect and counting the number of live tillers. Turfgrass species composition at each site was also determined by sampling 60 randomly selected tillers and identifying then to species.
During both years, weed population density in each quadrat was determined prior to adding weed seeds and over time.

Results

During 2003, all three weed species (dandelion, large crabgrass and black medic) were found at significantly higher levels at the two locations experiencing billbug damage (Figs. 1, 2, and 3) and dandelion was able to persist through the winter.

Sampling during the following spring (April 2004) indicated that billbug damaged areas also had significantly more bare ground than the undamaged area. Even though the weed seed bank was not augmented with either species, significantly more white clover and corn speedwell was detected at the two sites experiencing billbug damage (Figs. 4 and 5).

During 2004, weed density was not correlated with turfgrass species composition. However, by October overall weed density was positively correlated with the proportion of billbug infested soil cores (Fig. 6) and negatively correlated with tiller density (Fig. 7). Turfgrass tiller density was only marginally negatively correlated with the proportion of billbug infested soil cores (Fig. 8).

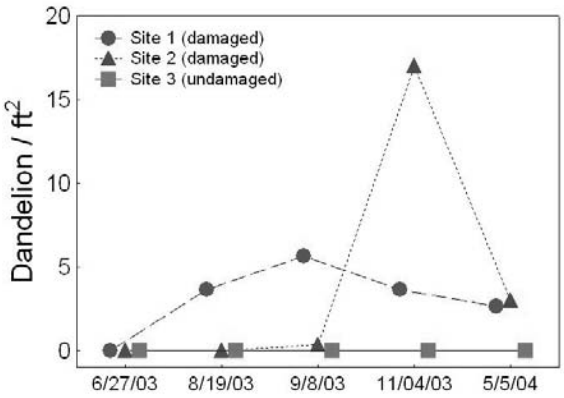

Figure 1. Dandelion plant density over time in turfgrass lawns experiencing different levels of billbug damage

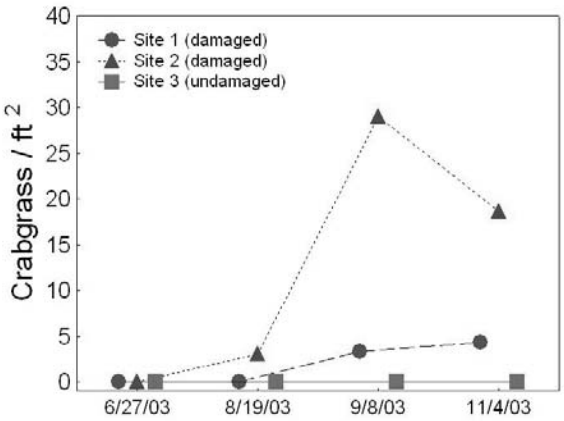

Figure 2. Large crabgrass plant density over time in turfgrass lawns experiencing different levels of billbug damage

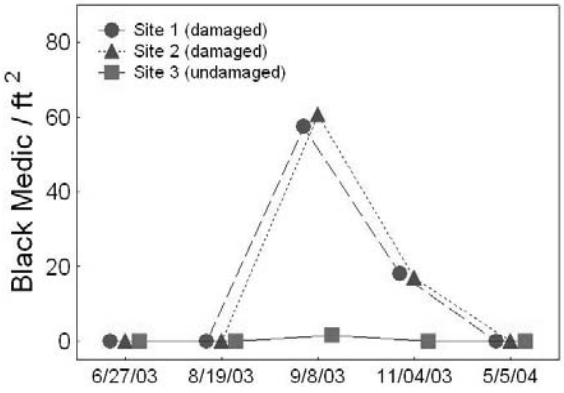

Figure 3. Black medic plant density over time in turfgrass lawns experiencing different levels of billbug damage

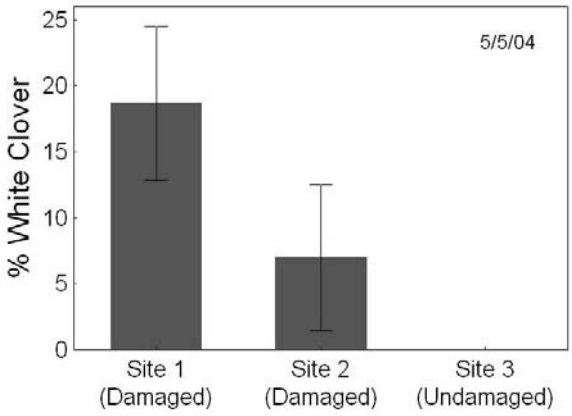

Figure 4. White clover percent cover in turfgrass lawns experiencing different levels of billbug damage

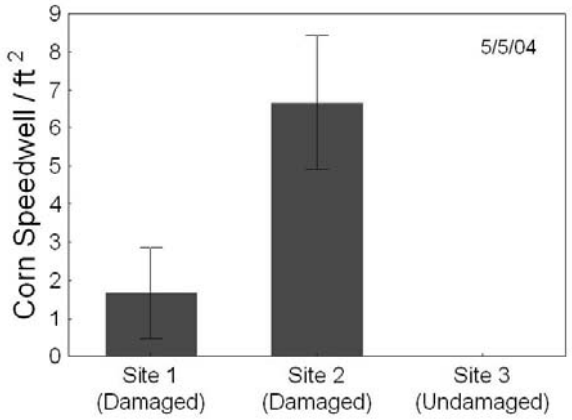

Figure 5. Corn speedwell density in turfgrass lawns experiencing different levels of billbug damage

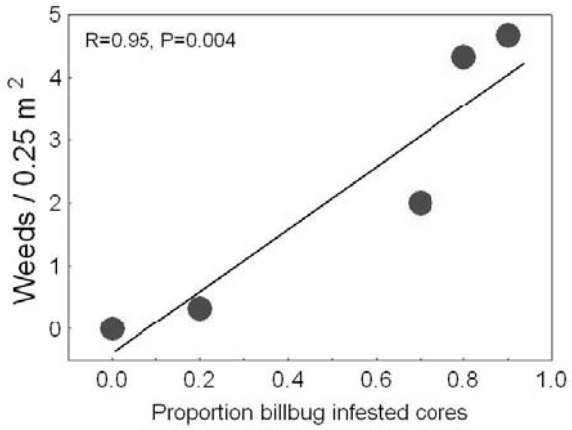

Figure 6. Correlation between the proportion of soil cores infested with billbugs and overall weed density in turfgrass lawns

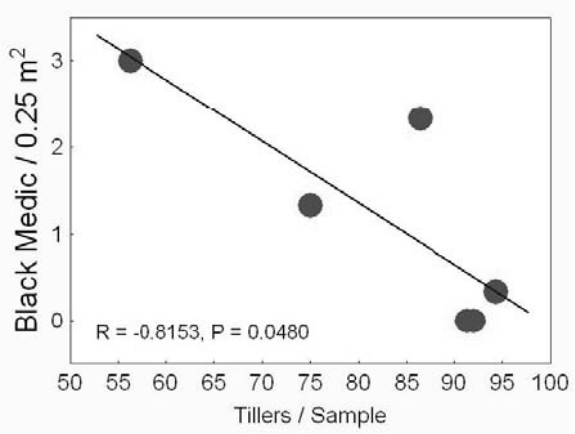

Figure 7. Correlation between turfgrass tiller density and density of black medic plants in turfgrass lawns

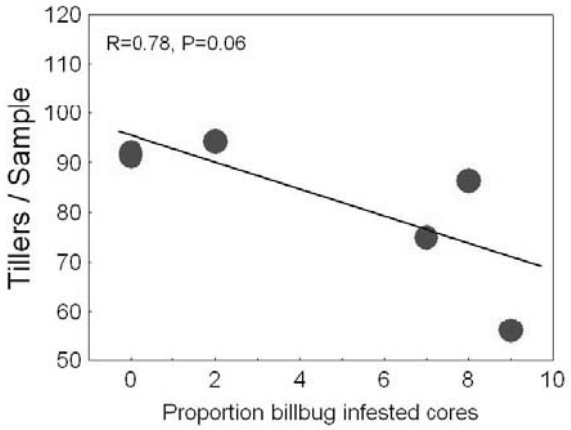

Figure 8. Correlation between the proportion of soil cores infested with billbugs and turfgrass tiller density