Monitoring Techniques for the Annual Bluegrass Weevil

By Benjamin A. McGraw and Albrecht M. Koppenhöfer

As spring has arrived in the Mid-Atlantic and Northeast, it is time to start thinking about doing battle with an annual foe: the annual bluegrass weevil (ABW) (*Listronotus maculicollis*) ("*Hyperodes* weevil"). The ABW is particularly destructive on short mown areas around the golf course (tees, fairways, collars, greens) with a high percentage of *Poa annua*. Limited damage has also recently been observed in pure creeping bentgrass stands.

A modified blower/ vacuum collects ABWs to measure the population.

Adult weevils overwinter in protected habitats such as leaf litter, tall grasses, and rough (Diaz and Peck 2007). In spring, weevils migrate to the playing surfaces where they feed, mate, and deposit eggs into the turfgrass stem. Most management plans seek to control adults prior to egg laying, for once eggs have been deposited, chemical insecticides are less effective. The first three larval instars tunnel within the stem whereas the last two instar feed externally on the crown. It is the feeding by the 4th and 5th instars that cause the most extensive turf damage.

Preventive management requires an accurate assessment of the timing of the adult migration. However, rather than gauging adult populations and potential turf loss, most superintendents rely on unrelated plant phenological indicators to estimate the presence of adults on the playing surfaces. Observations made in the late 1970s suggest that full bloom of *Forsythia* spp. indicates that overwintering adult populations have begun moving onto short mown areas and that the full bloom of flowering dogwood *(Cornus* spp.) indicates the end of the migration (Tashiro et al. 1978). Sometime between the two events adult population densities peak and preventive insecticides should be applied for maximum control before significant numbers of eggs can be laid. However, observations of variable ABW adult emergence from overwintering sites (McGraw and Koppenhöfer 2009) and variability in development of Forsythia spp. within sites have led us to question the reliability of these plant indicators.

Recently, "softer" chemicals (e.g., indoxacarb, spinosad) have been brought to market for a curative approach to reducing ABW larval populations. This approach is more environmentally sensitive than preventive management with broad-spectrum insecticides such as pyrethroids, especially if applied only where populations are above thresholds (30 to 80 larvae per ft2). Unfortunately, there are no effective sampling methods to forecast the probability of larval damage. Each of the current larval monitoring practices has drawbacks, and typically no monitoring is done due to the expense (i.e., time and labor) or damage caused by sampling. Sampling larvae involves taking core samples from the turf followed by extraction with irritants (e.g., saline) to estimate population densities relative to arbitrarily set thresholds.

We conducted field studies over a two-year period to find new approaches to monitoring overwintered adult populations and potentially forecast larval densities. Since adults are easier to see (and therefore monitor) than larvae, we sought to determine if a modified leaf blower/vacuum could provide a rapid and accurate estimate of ABW adult density and then determine if there is a correlation between adult densities and future larval densities.

Fairways on three golf courses in central and northern New Jersey were sampled weekly by vacuum and core sampling from late March through the end of the third generation in mid-October to estimate adult abundance and to compare techniques. A leaf blower/vacuum was fit with a mesh (324 openings per square inch) basket to capture adults as they entered the nozzle. A section of fairway (36 square feet) was vacuumed by placing the nozzle directly on the turf and vacuuming in a zig-zag pattern while maintaining a tight fit of nozzle and turf. The entire section was covered during 10 seconds of vacuuming. Afterward, the basket was emptied on a tray and the numbers of adults counted. The estimate of adults in vacuum samples was compared to destructive soil sampling with a turf plugger followed by saline extraction in the laboratory.

The relationship between the number of adults vacuumed and future larval densities was studied on the edges of six fairways. On each fairway 32 plots (each 36 square feet) were sampled to estimate adult density. Each plot was vacuumed weekly between the start of adult emergence from overwintering sites through the end of the egg laying period of the overwintered adults (mid May in northern New Jersey). Once the egg laying period was complete, the plots were sampled for larvae, and larval densities were compared to the numbers of adults captured in weekly sampling periods as well as during the entire adult sampling period.

Results

ABW vacuum sampling proved as reliable and consistent as soil coring + saline extraction for estimating adult densities and peaks in abundance. But vacuum sampling was non-damaging to the turf, took less time to process a sample, and gave instantaneous information on presence and density.

Additionally, vacuum sampling detected adults in low densities on fairways prior to when plant indicators *(Forsythia* full bloom) would have indicated in both years of the study. In each year of the study, vacuuming sampling allowed us to detect two separate peaks in adult densities, indicating staggered emergence from overwintering sites. The timing of the two peaks was similar between courses and years (1st = April 21-23; 2nd = May 5-7).

Strong relationships were found between number of adults collected in vacuum samples and future larval densities in both years. The number of adults collected either during the second peak of adult abundance or across the entire 6-week sampling period was significantly correlated with larval densities. These correlations suggest that egg laying occurs over an extended period, yet the majority of eggs are deposited during the second peak in abundance. Future work is needed to optimize the size of the area sampled and the number of samples needed to adequately correlate adult and larval densities to best integrate curative controls.

ABW vacuum sampling proved as reliable and consistent as soil coring.

Conclusions

Turfgrass managers have several methodologies to assess ABW populations. Unfortunately, most turf managers opt to manage ABW without assessing presence or population density. Our studies indicate that vacuum sampling can be an effective tool and provide a rapid estimate of ABW adult density. In addition, we found that adult counts on fairways are correlated to future larval densities. Future work is needed to determine adult ABW density thresholds and if this information can aid in targeting curative controls against larval stages.

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