# The Importance of Pest Biology

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Understanding the BIOLOGY of a pest organism is cornerstone to achieving effective control! Regardless of the target pest (insect, disease, weed, etc), by having comprehensive knowledge of the life cycle, behavior (habits), ecology (habitat), preferred host(s), vulnerable life stage(s), etc. enables one to select and implement the appropriate intervention/management strategies or tactics to attain maximum control. Equipping oneself with as much information as possible about a particular pest allows one to more effectively solve pest problems from a long-term perspective rather than simply for short-term control. Subsequently, primary reliance or dependence on conventional chemical control strategies are substantially reduced, and greater opportunity for alternative control options such as biological and cultural control options are attainable.

An excellent example is that of the Japanese beetle, *Popillia japonica* Newman. The Japanese beetle is an univolting insect, it has only **one** generation per year. Unlike most insect pests that have only one life stage that causes damage to plant material, this particular insect has **two** life stages that cause damage. Both the adults and larvae (grubs) of the Japanese beetle cause serious damage to respective plant parts. Japanese beetle adults are gregarious, sun-loving animals that are mainly active during the day in full sun, typically from 10:00 a.m. - 5:00 p.m. Because they prefer direct sunlight, they can be regularly found in the upper canopy of preferred hosts, especially on the southern and western exposure. Adult Japanese beetles do not defoliate leaves, they merely skeletonize the leaves by feeding on the chlorophyll tissue within the margins of leaf veins. As adults, they are polyphogous insects and feed on a plethora of host plants (> 300). However, some plant species such as oaks (*Quercus* spp.) are un-preferred host, thus they are typically damaged.

As for the larvae (grubs), they too

are a damaging life stage, especially to turfgrass roots. Unlike the adults, Japanese beetle grubs don't really discriminate food sources; they will simply feed on most any succulent root tissues, as well as on organic matter when root tissues are limited. However, Japanese beetle grubs do have some minimal requirements such as adequate soil moisture to ensure proper physiological development and survival. The grubs grow and develop by a process called molting; this process is regulated by biochemicals specific to insects. These chemicals are called insect hormones.

Likely the most important requirement of an insect is to regulate water; without water insects are basically doomed. For this reason, entomologists have developed synthetic insect hormones that disrupt the natural molting process and exploit a vulnerable stage in an insect's developmental process. As a result, larvae (grubs) loose valuable water necessary for survival; subsequently, death often results.

There are three larval (grub) stages associated with the Japanese beetle and these stages are commonly referred to as instars. Upon hatching from eggs, the 1st instar grub stage is measurably smaller than the fully-grown 3rd instar stage. In addition, as may be predicted, smaller grubs consume substantially less biomass of roots than do larger 2nd and 3rd instar grubs. The younger, smaller grubs are generally more highly susceptible to respective control agents including predators, pathogens, biorational insecticides, as well as conventional insecticides.

As mentioned, the Japanese beetle has only one generation per year. Adult beetles typically begin emerging from the soil (turf and mulch beds) in mid-to-late June, with peak adult emergence occurring around July 4th. Immediately after adult emergence, the adults begin feeding on various susceptible plant material, mate, and begin laying eggs commonly in turf that has a relatively short cutting height (< 1 1/2 inches) and that has adequate soil moisture, especially in loamy soils. After an incubation period of 1-3 weeks, small, young 1st instar grubs immediately begin feeding on the roots of respective turfgrass or ornamentals. The grubs will continue to feed and develop until the first measurable frost, whereby they will innately make their way below the frost-line, maintaining a 1-3 inch margin below the frost line where they will overwinter. In the subsequent spring they will resume feeding for approximately 3-6 weeks depending on the growing conditions prior to pupating (transforming into an adult). The pupation process typically requires 3-4 weeks, after which adult Japanese beetles begin emerging from the soil to complete the one-year life cycle.

By gaining an in depth understanding of a target pest's biology, more possible management options as well a greater likelihood of effective control of a respective pest may be achieved. Begin by taking a closer look at pest biology and make a concerted effort to fully understand pest biology. Not only will it increase your level of control, but it may also reduce your primary reliance on the use of conventional pesticides, saving you valuable resources such as time and money.

## 2004 WGCSA Events

| Date | Location | Speaker/Event |
|---|---|---|
| April 26, Monday | Hawks View Golf Club<br>Lake Geneva, WI<br>Jeff Townley - GC Supt | |
| June 2, Wednesday | Edgewood GC<br>Big Bend, WI<br>Jeff Millies, CGCS - Supt. | Super/Pro |
| June 21, Monday | Oconomowoc Golf Club<br>Oconomowoc, WI<br>Dustin Riley - GC Supt | |
| July 12, Monday | Rolling Meadows Golf Course<br>Fond Du Lac, WI<br>David Brandenburg - GC Supt | |
| July 27, Tuesday | O.J. Noer Turfgrass Facility<br>Verona, Wi<br>Tom Schwab | UW-Madison<br>Field Days |
| September 27, Monday | The Legend at Brandybrook<br>Wales, WI<br>Jake Renner - GC Supt | Supt/Tournament |
| October 12, Tuesday | North Hills CC<br>Menomonee Falls, WI<br>Randy DuPont - GC Supt | Superintendent/Guest |
| October | Lake Arrowhead Golf Club<br>Nekoosa, WI<br>Eric Jasin - GC Supt | Dinner/Dance |
| November 16-17 | American Club<br>Kohler, WI | Turf Symposium |
| **2005 WGCSA Events** | | |
| January 10-12 | Marriott Madison- West<br>Madison, WI | WTA Winter Conf. |