JAPANESE BEETLES: THEY'RE HERE!

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Slowly but surely Japanese beetles have been making their presence known in Wisconsin. Until this year, Japanese beetles had been primarily isolated to only a few counties in Wisconsin. However, this year, damage was reported in many new locations throughout Wisconsin including the Wisconsin Dells, Sheboygan, Green Bay, as well as areas around Madison that had not yet seen Japanese beetles, just to name a few. To date, they have been found in over 30 of Wisconsin's 72 counties. It is merely a matter of time before they reach other counties.

Japanese beetle adults and grubs are fairly easy to identify. The adults are shiny, metallic green, oval, and approximately _ inch long. They have coppery-brown wing covers with five patches of white hairs along each side of their bodies. Male Japanese beetle adults are usually smaller than females, but otherwise they look similar to the females. The grubs look like most other white grub species having three pairs of jointed legs, and a yellow-brown head capsule, and they are often found assuming the infamous C-shape position in the soil. However, Japanese beetle grubs can be easily differentiated or identified by the distinctive arrangement of hairs on the ventral (underside) of their abdomen (rear) near their anus. With a low-powered hand-lens (jewelers loop), you can see the arrangement of hairs that form two distinct rows of short spines that are arranged in the shape of a truncated V pattern.

Both Japanese beetle adults and larvae (grubs) can cause extensive damage to ornamental plant material (adults, foliage only; grubs, roots only) and turfgrass roots (grubs only). The adult beetles attack a wide range (over 300 known species) of ornamental plants.

Japanese beetle adults typically begin feeding on the upper canopy of the host, on the upper leaf surface. Feeding damage results in a lace-like appearance, leaving only a skeleton of veins. Such damaged results in leaves turning brown, dying, and eventually falling-off. Some plant materials are highly preferred over others. Preferred hosts include lindens, grapes, Norway maples, purple-leaf plums, and roses just to name a few. Adult beetles are also particularly attracted to flowers and fruits, especially plants that have white, yellow, or pastel colors.

The grubs are known to feed on and destroy most all cool-season turfgrasses, as well as many woody and herbaceous plant materials. Such feeding can cause severe damage to turf (Figure 1). The grubs are below-ground (soil dewellers) feeders that feed on the roots and rhizomes of nearly all commonly used turfgrass species and cultivars. The grubs are capable of eliminating a plant's entire root system. Where in high numbers (25 grubs per square foot), they can destroy large areas of turf in a relatively short period of time, especially if the turf is stressed by dry soil conditions, drought, or heavy traffic. First evidence of injury by grubs is localized-patches of pale, discolored and dying turfgrass that displays

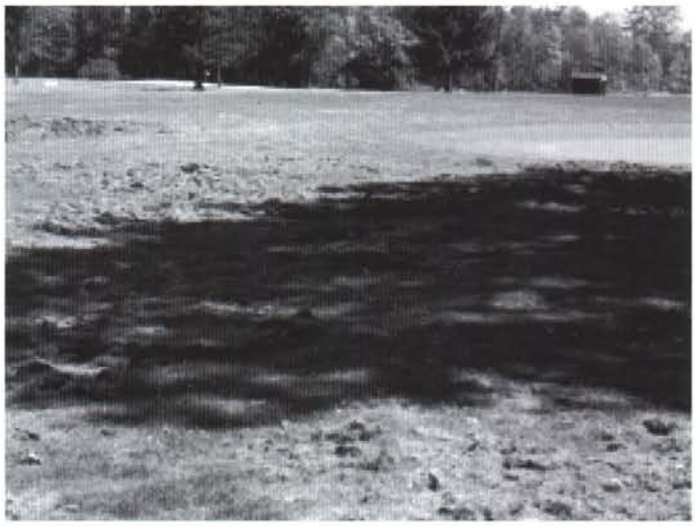

Figure 1. Japanese beetle grub damage, accentuated by raccoon and skunk damage

symptoms of drought stress. The small damaged areas often rapidly enlarge and coalesce as grubs grow and expand their feeding range. Such areas of turf will have a "spongy" feel under foot and can be easily lifted or rolled much like a carpet. Raccoons, moles, and skunks are highly attracted to white grub infested turf, and the foraging of these animals are strong indicators of white grub activity. Also, flocks of birds, especially starlings, feeding are potential indicators of possible white grub infestations.

Fortunately, Japanese beetles only have a one-year life cycle. The adults emerge from the soil beginning mid to late-June, and peak adult activity occurs in mid-July in Wisconsin. Mating and egg-laying begins within a few days after after emergence, mating, and adult feeding. Virgin females produce a pheromone (air-borne sex attractant) that attracts males. As many as 20-100 males may aggregate on the ground around a single female. Female adults prefer to lay their eggs in turf that is irrigated rather than in dry, compacted soil. Each females lays between 1—4 eggs in the upper three inches of soil, and this cycle is repeated every few days until the life-span of the female is completed. A typical life-span ranges from 30—45 days and as many as 60 eggs can be laid by each female.

The eggs usually hatch in approximately two weeks depending upon environmental conditions. Thereafter, the young grubs (first instar) begin feeding on the fine roots and organic matter in the upper three inches of soil where the eggs were laid. Grubs go through a physiological process called molting, whereby the insect grows from a certain life stage (instar) to an advanced or larger stage. Japanese beetle grubs remain in the second instar for approximately 2—3 weeks and the third instar for 3—4 weeks. Later in the summer (late August), most grubs will feed in the upper two inches of the soil, however they will burrow deeper during periods of drought. The grubs will continue to feed and grow until late fall, or around the first frost. Thereafter, the grubs will begin to burrow deeper as soil temperature fall below 60 degrees Fahrenheit. Most grubs will overwinter 2—8 inches in the soil. However, grubs will continue to burrow further into the soil profile as soil temperatures continue decrease. In the spring when soil temperatures begin to reach 50 degrees Fahrenheit, the grubs will slowly move back into the root zone and resume feeding vigorously for another 4—6 weeks. After this event, the grubs will burrow slightly deeper to begin preparation of an earthen cell which is created for the Japanese beetle to transform (pupate) from the grub stage into the adult beetle whereby it begins its life-cycle over again.

Effective management of Japanese beetles depends on the targeted life stage (adult or grub). Japanese beetle adults can be controlled by implementing plant selection, chemical control, or a combination of these strategies. Trapping of adults is not an effective means of control.

ADULTS

Plant Selection

The use of resistant plant species when planning a

landscape or replacing plant materials is an effective management strategy of Japanese beetle adults. Certain plants are highly attractive and often sustain heavy feeding damage. Also, other plants such as grapes, multiflora rose, sassafras, smartweed, and Virginia creeper may attract adult beetles resulting in a higher incidence of egg-laying in adjacent turf.

Chemical Control

Several insecticides are labeled for use for control of Japanese beetle adults. Such products include bifenthrin (Talstar), carbaryl (Sevin), acepahte (Orthene), cyfluthrin (Tempo), deltamethrin (DeltaGard), imidacloprid (Merit), lambda-cyhalothrin (Scimitar), and permethrin (Astro). The aforementioned products are foliage sprays, and where beetles are highly abundant, they may require repeated applications to protect susceptible host plants. Because of the systemic properties of Merit (imidacloprid), it can be used as a soil drench or injection the fall preceding. This control approach allows the product to be applied to larger trees (> 50 feet) that may be difficult to treat with a foliar spray.

GRUBS

Cultural Control

Because eggs and young grubs rarely survive in relatively dry soils, withholding irrigation during peak adult beetle flight may help to reduce respective grub populations. However, adequate moisture in late August and September can help the turf tolerate and/or recover from grub damage.

Biological Control

There are plethora of biological products that allegedly control Japanese beetle grubs, however performance of many of these products has been quite inconsistent. Such products include Milky disease spore, insect-infecting nematodes, and fungal pathogens such as *Beauveria bassiana* and *Metarrhizium*.

Chemical Control

Most soil insecticides provide adequate control of Japanese beetle grubs, as well as other white grub species. However, specific criteria or conditions must be fulfilled in order for achieve optimal control. These include factors such as accurate timing of the treatment, treatment must be watered into the turf, and minimal thatch must be present. Until now, the most common approach to grub control was to apply short-residual insecticides after eggs had hatched, and before grubs had caused visible damage. This approach is termed "curative" control. And, the ideal treatment time is early to mid - late August. Such curative treatments can be applied later even after the damage appears, but larger grubs (2nd and 3rd instars) are often much more difficult to control. From a curative control perspective, only two products are recommended for effective grub control. These products include: carbaryl (Sevin) and trichlorfon (Dylox/Proxol). Although Dursban is labeled for grub control, it is an extremely poor choice. In the spring, when grubs are distributed variably throughout the soil profile, curative grub control applications are not typically recommended unless circumstances dictate.

As a result of the development of new chemistries or improved grub control products, preventative treatments of long-residual insecticides are now available and are gaining popularity as the preferred control or management strategy of many turfgrass managers. Turfgrass managers are choosing to apply products such as halofenozide (Mach 2) and imidacloprid (Merit) during June and July to control young grubs as soon as they hatch in late July and early August. This approach seems to provide added value from the standpoint of an "insurance policy" against potential grub damage.