THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
College of Agricultural and Environmental Sciences
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White Grub Pests of Turfgrass

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White grubs are the larvae of scarab beetles. All are C-shaped, white to dirty white in color, with a brownish head and legs. Usually, they have a darker grey area at the tip of the abdomen. The adults are medium-sized beetles that feed on a variety of trees and shrubs. More than a dozen different species may damage turf in the Southeast. Some of them, such as Japanese beetles and Green June beetles, are serious pests of ornamentals and certain fruits, including figs, peaches and grapes.

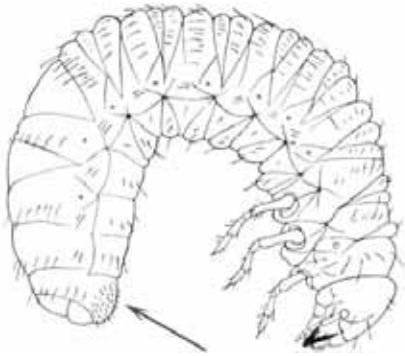

Figure 1. Location of raster on grubs. The pattern of spines on the raster, located on the underside of the tip of the abdomen, is used to identify individual species and groups.

While adult beetles may be pests in their own right, it is the grubs that damage turfgrasses. Most grubs feed primarily or exclusively on grass roots, cutting the plants off from water and nutrients. Typical symptoms of white grub damage include yellowing or browning of the leaves, signs of drought stress even when moisture conditions are good, and turf that is loose enough to pull easily from the soil. With heavy infestations, the ground becomes spongy to the step. Additional damage occurs when predators like moles, birds, skunks, raccoons or armadillos root up the turf while hunting for the grubs.

Because most white grubs never come to the soil surface until they emerge as adults, the usual methods of sampling for turf pests, such as soap flushes, will not work. The only way to find grubs is to dig them up. To minimize turf damage, use a shovel to cut three sides of a 1-foot square and roll the sod back like a carpet. If the soil is dry, irrigate thoroughly the day before you plan to examine it to move the grubs back near the surface. The grubs can be collected by sifting through the top 2 inches of soil once the sod is pulled back.

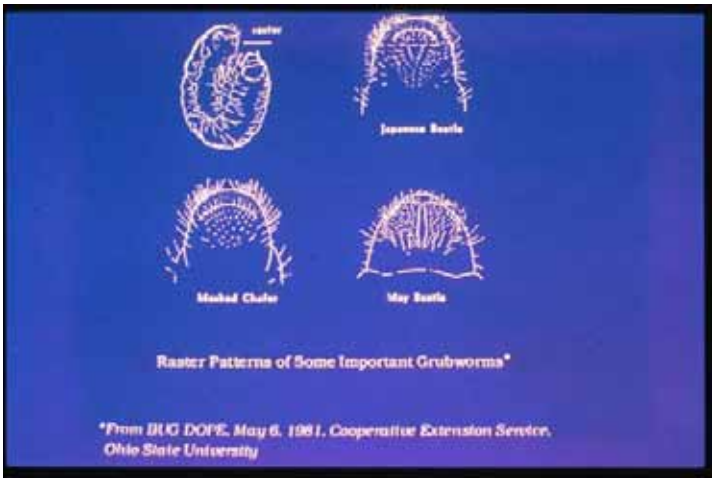

Figure 2. Raster patterns used for identification of white grubs.

Effective control of white grubs requires some knowledge of the life cycle of the particular species or group involved. The first hurdle is identifying the insect. This often requires a magnifying glass or hand lens and a willingness to get close to the grub. (Squeamish individuals can call on their county agents for assistance.) The pattern of spines on the raster, located on the underside of the tip of the abdomen, is used to identify individual species and groups. The illustrations provided will help sort this out. The following key identifies the major pest grubs found in Georgia. Contact your county Extension agent for specific insecticide recommendations.

White Grub Key

1.	Grub with small legs relative to body size; crawls on its back with legs in the air; spines on raster form several parallel rows	Green June Beetle
	Larger legs; crawls with legs on the ground	2
2.	Spines on raster scattered randomly	Chafers
	Spines on raster form two distinct rows	3
3.	Spines on raster form two convergent rows	Japanese Beetle
4.	Spines on raster form two parallel rows	May or June Beetles

Green June Beetles

The Green June beetle (GJB) is one of our most widespread scarabs and is found throughout Georgia. Adults are very colorful, and their day-flying habits make them familiar insects. They are a velvet green color on top, with yellow-orange edges. The underside is shiny metallic bronze and green. They are often seen flying low over turf areas or congregating around fruit trees from mid-June through August.

Biology

The GJB has one generation per year. It spends the winter deep in the soil as a large grub. Grubs resume feeding in the spring, then pupate in cells in the ground in May and June. About three weeks after pupation, adults emerge. Eggs are laid in the soil during July and August and hatch in 10 to 15 days. Grubs feed actively during late summer and fall and may be active in warm periods throughout the winter.

GJB grubs are unusual among Georgia pest species in that their primary food is dead and decaying plant material, not live grass roots. The damage they inflict upon turfgrass is mechanical. They loosen the soil and damage roots as they tunnel, and leave mounds of dirt on the surface when they emerge at night to feed. The grubs spend the daytime resting in vertical tunnels in the soil. These tunnels average 6 to 12 inches deep, but in sandy soils they may be more than 3 1/2 feet deep.

Identification

Green June beetle grubs are easily distinguished from other white grub species by the size of their legs, which are very small compared to the size of the grub. The back of the thorax is covered with short, stiff hairs and has three distinct ridges per segment. These ridges are used for crawling, and are a great identification characteristic — only the GJB grub crawls on its back with its legs up in the air.

Green June Beetle Grub

Green June Beetle Adult

Sampling and Control

The mounds of dirt left on the soil surface as the grubs emerge at night are a key symptom used to diagnose GJB infestations. To confirm the diagnosis, sample for GJB grubs as you would for other white grubs, by cutting three sides of a 1-foot square and laying the sod back. Because GJB grubs spend the day resting in burrows rather than feeding, you'll have to examine the top 4 inches of soil to get an accurate idea of your population. If an average of six to eight grubs per square foot is found, an insecticidal treatment will probably be needed.

While white grubs in general are among the most difficult turf pests to control, the GJB is one of the easiest. Because these grubs come to the surface at night, they come in contact with pesticides more readily than other species. Some widely available insecticides are very effective against GJB but generally provide poor control of species that remain below the surface.

Chafers

Although there are several species of chafers (genus *Cyclocephala*) in Georgia, the most important pests are the Northern Masked Chafer (NMC) and Southern Masked Chafer (SMC). Both are found throughout the state, although the SMC is generally more common. They are strongly attracted to lights and sometimes appear in great numbers near store fronts, porch lights and swimming pools.

Biology

All of the chafers found in Georgia have one-year life cycles, with adults emerging in early summer. The adults are quite active night fliers, but they do not feed and are not pests themselves. They return to the turf in the daytime to lay eggs. These eggs hatch in two to three weeks. Grubs feed on a mixture of plant roots and

organic matter in the soil. They grow quickly, reaching full size by late August. Damage to turf is heaviest in September and October. Grubs overwinter deep in the soil, returning to the surface in the spring to feed for several weeks before pupating a few inches deep in the soil.

Identification

Grubs of Georgia chafers can be identified by size and by the pattern of spines on the raster. Full-grown grubs are about 1 inch long and the spines on the raster are scattered randomly, with no distinct rows formed.

Chafer Raster

Chafer Adult

Sampling and Control

Except for dry or cold periods, chafer grubs spend most of their time in the root zone, near the soil surface. Irrigate before sampling (or go out after a rain) and then cut three sides of a 1-foot square and peel the sod back. Chafer grubs should be in the top 2 to 3 inches of soil. Well-managed turf can support a surprising number of these grubs, and populations of 10 or more per square foot may not cause significant decline of the grass.

Controlling chafer grubs is somewhat more difficult than controlling Green June beetles because the chafers do not come to the soil surface to feed. Irrigate prior to treating if the soil is dry. After treating, apply 1/2 inch of water to move the insecticide down into the soil.

Japanese Beetles

Japanese beetles were introduced into the United States around 1916 and have since spread to infest much of the East Coast from Maine to northern Georgia and inland across the Mississippi River. In Georgia, these pests are found as far south as Macon and are often abundant in and around the Atlanta area. Because the adults feed heavily on foliage of a wide range of ornamental plants, fruit trees, vegetable plants and shade trees, they are very serious pests independent of the damage done to turf by the grubs. They are striking insects, with a brilliant metallic green coloring and coppery-brown forewings that do not quite reach the tip of the abdomen. A row of five white spots along the side of the abdomen and a pair of white spots on the top of the last abdominal segment distinguish this beetle from similar species such as the Green June beetle.

Biology

Japanese beetles have a single generation each year. Adults appear in late May and may be active into July. Adults live four to six weeks and females lay eggs during most of their lives. Eggs hatch in about two weeks. After maturing in the fall, the grubs overwinter in the soil and resume feeding in the spring. After two to four weeks, the grubs mature and pupate in cells in the soil. Adults emerge three to four weeks later and remain in the cells for several days before digging to the surface. Adults are active during the day, returning to the turf in late afternoon.

Identification

Japanese beetle grubs have two distinct rows of spines on the raster that converge to form a "V." These rows are much shorter than the rows on the rasters of May or June beetles. Full-grown grubs are about 1 inch long.

Japanese Beetle Raster

Japanese Beetle Adult

Sampling and Control

Japanese beetle grubs spend most of their time near the surface unless dry soil conditions drive them deeper. Large grubs will usually be found at the soil/thatch interface if moisture is adequate. They are easily exposed by laying the sod back and looking in the top 1 to 2 inches of soil and in the roots of the grass. Irrigate thoroughly several hours prior to sampling if the soil is dry.

Irrigation is also needed before application of control materials under dry conditions. Apply 1/2 inch of water after treating to move the insecticide down into the soil.

May or June Beetles

Beetles in the genus *Phyllophaga*, several dozen species of which are found throughout Georgia, are known collectively as May beetles or June beetles (MJB). The adult beetles are very common; they often fly in great numbers to lights. They are generally brownish, sometimes with a mottled pattern, with long spindly legs. They range in size from just over 1/2 inch to almost 1 inch long. The beetles feed on a variety of trees and shrubs, including many ornamental and shade trees. Most prefer deciduous plants but some attack various pines. In addition to turf injury, the grubs may also damage ornamental plants (both in the landscape and in nurseries), pine seedlings, pastures and other crops.

Biology

In Georgia, most MJB take two years to complete their life cycles. Some take only one year, especially in the south, while others can take three years to become adults. Depending on the species, adults emerge from the soil in the spring or early summer (between March and July). They are active at night, when they feed and mate, and then return to the soil in the daytime. Eggs are laid in the soil near the preferred host and hatch in three to four weeks. Grubs feed on roots and overwinter in the soil as second or third instars. They resume feeding in the spring and either continue to feed and grow through the summer (two-year cycles) or pupate in the soil and emerge as adults later that season.

Identification

MJB grubs have two distinct longitudinal rows of spines on the raster. The rows are parallel rather than converging like those on Japanese beetle grubs.

May or June Beetle Raster

May or June Beetle Adult

Sampling and Control

Sample for MJB grubs by laying the sod back and sifting through the top 3 to 4 inches of soil. These grubs tend to move up and down in the soil more than the other groups and are often found at greater depths. Good soil moisture is a necessity for sampling and effective control. Irrigate thoroughly before treating with insecticides and water after treatment to move the chemicals down off the grass and into the soil.

Photo credit: Green June Beetle Grub, Green June Beetle Adult, Japanese Beetle Adult and Phyllophaga Adult photos from the Bugwood Network at www.insectimages.org. All other photos courtesy of W. Messner, University of Kentucky.

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