



WHITE GRUBS IN HOME LAWNS

Home lawn areas in Pennsylvania often are subject to severe and extensive injury (Fig. 1) by the larval stages (grubs) of various species of scarab beetles. Japanese beetles and northern masked chafer grubs are the predominant damaging white grub species associated with home lawns. Several other white grub species including Asiatic garden beetle, European chafer, green June beetle, May and June beetles, and Oriental beetle are occasionally observed in home lawns and may cause significant damage.



Figure 1. Oriental beetle grub damage

DESCRIPTION

Grubs are dirty white, soft bodied, and robust with a brown head and six well-developed legs, with exception of green June beetle grubs, which do not have well-developed legs. When the turf is lifted to expose the grubs, they usually will be lying on their sides in a C-shaped position (Fig. 2). The size of a white grub varies

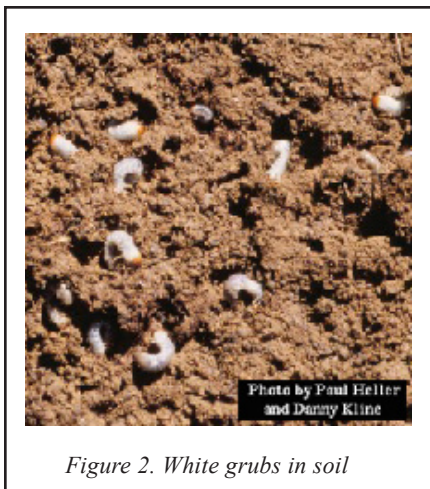
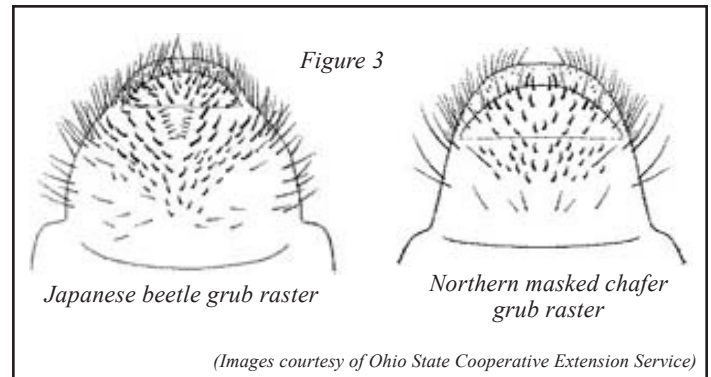


Figure 2. White grubs in soil

with the species and its age. Full-grown third-instar Japanese beetles and northern masked chafer grubs average slightly over one inch in length. White grub species can be distinguished by examining the grub's raster pattern. The raster is a grouping of definitely arranged hairs, spines, and bare spaces on the underside of the last abdominal segment in front of the anus. Japanese beetle grubs have a V-shaped raster pattern, while northern masked chafer grubs have a nondescript "random" raster pattern (Fig. 3). Adult beetles differ considerably in color markings, shape, and size. Japanese beetle adults are brilliant metallic green,



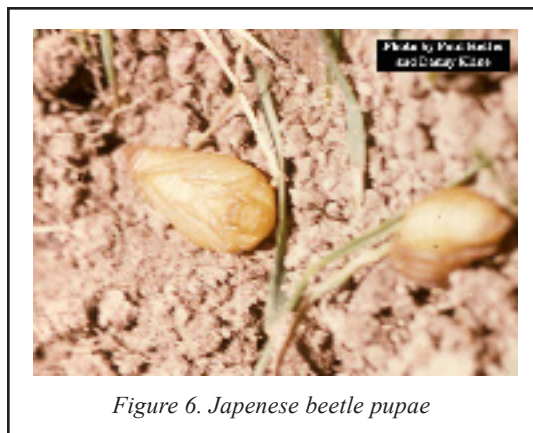
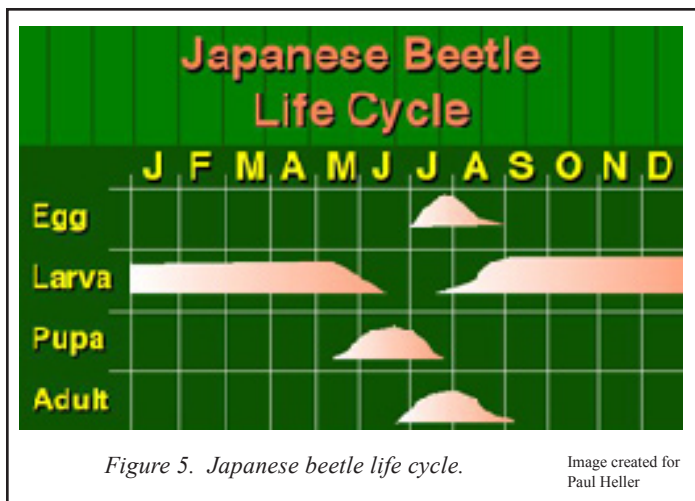
3/8 to 1/2 inch long, bearing coppery brown wing covers, with five lateral spots with white hairs on each side of the abdomen, and short gray hairs covering the underside of the insect. They were first observed in the United States in 1916 in southern New Jersey. Northern masked chafer adults (Fig. 4) are chestnut brown, covered with fine hairs, resemble small June beetles, and are roughly 1/2 inch long. Likewise, the adults have dark chocolate brown heads that shade to a light brown (masked appearance). Northern masked chafer is native to the United States.



Figure 4. Northern masked chafer adults with eggs

GENERAL LIFE HISTORY

With the exception of the common May or June beetle, which has a three-year life cycle, the life history of the beetles mentioned above is completed in 12 months (Fig. 5). The adult beetle lays its eggs in the ground during the summer. As soon as the grubs hatch, they start feeding on the roots until cold weather drives them two to eight inches deeper into the soil where they overwinter. When warm weather arrives in the spring, the grubs move up from the lower soil regions and resume feeding near the surface until they become mature and pupate (Fig. 6) from May through early-June. Adult northern masked chafers, which are active at night, and Japanese beetles can emerge in central Pennsylvania



from mid-June through mid-July. Later emergence can occur and is dependent on local weather conditions.

DAMAGE

Heavy white grub infestations can destroy grass roots, causing the affected area to become spongy, which allows the sod to be rolled back like a piece of carpet. Evidence of grub damage, including patches of dead or dying turf, are visible during spring (April and May) and late summer and fall (September and October). A good indication of a grub infestation is the presence of skunks, crows, or moles feeding on turf. However, remember that moles also feed on earthworms or insects living on shallow tree roots. The symptoms of a grub infestation are not always obvious. Survey and map the area in question to be sure an infestation is present. Using a garden spade, remove one square foot of turf and soil (two to four inches deep) at several locations. Examine the soil, thatch (excess grass cuttings and debris), and turf thoroughly for grubs. When the examination is complete, lay the sod back in place and pack it in firmly. Watering in the areas previously sampled is advantageous to preventing the area from drying out and dying.

Surveying can be done anytime the grubs (with a one-year life cycle) are near the surface. However, to obtain maximum results from any curative insecticide treatment, the home lawn area should be surveyed during August through early September. A wide array of variables can influence the severity of damage from white grubs. It is difficult to establish a set number of grubs per square foot that can be used to determine whether a curative control measure is needed. However, in most cases, five to ten grubs per square foot often is used as the threshold for curative treatment depending on which grub species is present. Thus, each situation must be evaluated and judged separately.

Adult northern masked chafers can be monitored by using a black light trap, while Japanese beetle adult flight activity can be observed by using a sex pheromone floral lure trap.

CONTROL

Nonchemical—Cultural

If homeowners can keep their lawn dry during July and early August, beetle eggs may dry up and die. Unfortunately, this will also result in brown grass until water is applied to initiate growth. Various environmental factors can affect white grub populations and may vary from region to region.

Nonchemical Curative—Biological

A bacterial milky disease is available to suppress Japanese beetle grubs, but it is of little or no value in controlling other scarab species. This material is available to homeowners and should be applied according to label directions. Remember, this product may require three to five years to become established in your home lawn to suppress a Japanese beetle grub population. In order for this bacterial agent to become established, you need a Japanese beetle grub population. Thus, you should not apply an insecticide treatment before or after applying milky disease.

Insect parasitic nematodes are available to curatively suppress various white grub species. Two major species available for suppressing grubs are *Steinernema* spp. and *Heterorhabditis* spp. Insect parasitic nematodes do not have a long shelf life. Likewise, be sure to follow all label directions regarding irrigating in this organism immediately following their application. Be sure to read the accompanying literature with each shipment or purchase of insect parasitic nematodes since select pesticides can negatively impact these living organisms. Research results with insect parasitic nematodes to curatively suppress white grubs have not been consistent. Most researchers report that *Heterorhabditis* spp. usually perform better against white grubs than *Steinernema* spp. We need to remember that these nematodes are living, breathing organisms, and they need special handling in their storage and shipment. This extra care carries through to the application. Prior to applying this type of curative control measure be sure to check the expiration date on each package of insect parasitic nematodes.

Chemical—Curative or Rescue Home Lawn White Grub Strategy

You need to apply a curative application during the summer when the grubs are small and actively feeding near the surface. Depending on where you are located in Pennsylvania, this could be from August through mid-September. You will need to sample on a regular basis to determine the absence or presence of grubs and which larval instar is actively feeding. In some cases you may be able to spot treat where the damage is located. Curative grub controls usually have short active residual periods. Therefore, a curative application has to be made at the proper time. Optimum timing can vary by several weeks but is dependent on grub species and weather conditions/soil temperatures in a given year. *Please note that all products should be irrigated in after treatment according to specific label directions.*

Some individuals also make a spring application, which is usually not as effective as the summer application. This may be attributed to the fact that grubs are larger and are not as easily controlled in the spring. Likewise, using a curative insecticide with a limited residual effect in April or May affords no protection against re-infestation by egg-laying adult beetles later in the season

Chemical—Preventive Home Lawn White Grub Strategy

A number of registered formulations can be used in a preventive white grub control program. The need for a preventive application can be based on historical monitoring of the site, previous records or experiences, current-season adult trapping or other methods. Most homeowner insecticide formulations for preventive grub control state that the product should be applied before grubs hatch or prior to egg hatch. Prior to purchasing a product be sure to read the label regarding optimum time to treat for grubs.

Based on adult trap catches of northern masked chafer in 2005 from central Pennsylvania, preventive applications could have been applied from mid-June through mid-July since northern masked chafer egg hatch occurs approximately 14 to 21 days after egg lay. However, it is important to remember that this information is based on data collected from central Pennsylvania or University Park, Pa. You would have to adjust your treatment schedule based on what happened in your specific geographical region. Properly timing an application of a registered preventive grub control formulation is very critical. It is important to recognize that weather conditions and soil conditions can influence beetle emergence each year. *Please note that all products should be irrigated in after treatment according to specific label directions.*

Japanese beetle adult emergence was very close to northern masked chafer emergence in 2005. Thus, timing a preventive application for control of Japanese beetle grubs would be very similar to the

northern masked chafers' application timing. Japanese beetle eggs usually hatch approximately 14 days after being laid. Hence, a preventive application of a registered insecticide applied between mid-June and mid-July in 2005 in Centre County should have provided preventive control of the two latter scarab white grubs (i.e., Japanese beetle and northern masked chafer). *Please refer to specific labels for use site restrictions, dosage rates, safety equipment, application timing, and so forth.*

A review of 2005 trap data indicated that first flight of adult Asiatic garden beetle was recorded in early July. Asiatic garden beetle eggs hatch about 10 days after being laid by the adult female. Although we do not have European chafers in central Pennsylvania, they have been known to appear prior to emergence of northern masked chafer adults. The use of a black light trap can greatly assist in determining the optimum time to apply a preventive control measure.

WARNING

Pesticides are poisonous. Read and follow the label directions and safety precautions. Handle them carefully and store in original, labeled containers—out of the reach of children, pets, and livestock. Dispose of empty containers quickly, in a safe manner and place. Do not contaminate forage, streams, or ponds.

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