K-STATE Kansas State University

Home and Horticultural PESTS

Annual White Grubs in Turf

High maintenance turfgrass may appear picture perfect during summer only to decline later with dead areas appearing amid healthy, green turf. The damage is most often caused by **white grubs**, the major insect pest of turfgrass in Kansas. These pests are the larval stages of scarab beetles, of which there are approximately 1,500 species in North America. Of the nearly 200 species found in Kansas, only a few are of economic importance.

May beetles/June bugs and masked chafers

May beetles (also known as June beetles) attract attention in late spring and early summer evenings. Beetles are attracted to light and congregate beneath porch and street lights. These beetles have a three-year developmental cycle. Their grubs rarely cause problems in turf. The white grubs of masked chafer beetles cause the dead spots which show up in lawns during late summer and fall. Masked chafer beetles have a one-year life cycle, so their grubs are called annual white grubs.

Grubs of masked chafers (*Cyclocephala* spp.) are the predominant scarab species causing problems in high maintenance turf in Midwestern states. In Kansas, six masked chafers species have been documented. Two have official common names: *Cyclocephala lurida* (southern masked chafer) and *C. borealis* (northern masked chafer). Two have unofficial common names: *C. pasadenae* (southwestern masked chafer) and *C. hirta* (western masked chafer). *Cyclocephala longula and C. melanocephala* have no common names. All have similar seasonal life histories and developmental rates.

Cyclocephala spp. Seasonal Life History

Masked chafer beetles (Figure 1) emerge from the soil in early to midsummer. After mating, females burrow back into the soil where they deposit eggs. In two to three weeks, small, first instar grubs emerge. Larval development proceeds rapidly, and by mid to late September most will have matured. With the approach of cooler weather and lower soil temperatures, larvae burrow deeper into the soil where they remain dormant during winter. In response to warm spring weather and elevated soil temperatures, grubs become active and move up in the soil to just below grass root zones. Because most grubs reach full size the previous fall, there is little additional springtime feeding. Grubs pupate during June (Figure 2). Beetles emerge two to three weeks later to repeat the seasonal life cycle.

Figure 1. Masked chafer beetles

Figure 2. Masked chafer beetle pupae

Feeding Damage

First and second instar grubs cause minimal damage to grass roots (three smaller grubs, Figure 3). Damage becomes noticeable in September and October (Figure 4) after larger and more ravenous third instar grubs (largest grub, Figure 3) have fed on on grass roots (Figure 5). Grub feeding damage can be more severe on dry turf and less vigorous plants that are improperly fertilized or competing with weeds for available plant nutrients.

Figure 3. Second and third instar white grubs

Control Tactics

There are two approaches for controlling annual white grubs: preventative treatments and rescue treatments. **Preventative treatments** are applied in situations where perfect turf is essential. Routine preventative insecticide applications protect turf from grub damage. The disadvantage is cost. Enough insecticide must be purchased to treat an entire site. There is also a chance that insecticides would not

Figure 4. White grub damage to turf

Figure 5. Grass roots infested with white grubs

have been necessary because grub populations might have been negligible in the first place.

Preventive insecticide treatment effectiveness depends on the type of insecticide and timing of the application. Contact insecticides with short residual properties (i.e. the active ingredients carbaryl, trichlorfon and permethrin) must be applied when a majority of grubs are the most susceptible, in the first and second instars. The application timing (when 90 percent of a season's grubs are in the first and second developmental stages) occurs 30 to 40 days after the flight peak of masked chafer beetles. While flight peaks vary by year and location, a rule of thumb is that peaks occur the first 10 days of July. The optimal treatment window for annual white grubs in Kansas is approximately August 10 through August 20.

Two relatively new active ingredients (imidacloprid and halofenozide) have longer residual properties, so the timing of those applications is less rigid. Product labels may state that applications can be made from May through August. To ensure adequate insecticide residues are present when needed, imidacloprid and halofenozide are best applied while mating and egg-laying occur during the masked chafer flight period, traditionally between mid-June and late July. For a list of insecticides for grub control, see Table 1. Given the number of companies promoting their product lines, there are many insecticides available to control white grubs in turf. Check retail outlets to determine what is available locally. Read and study the product label to ensure safe, proper and effective use.

Rescue treatments fit situations where a wait-and-see option is acceptable for grub control. It is important to frequently inspect turf sites and note areas that appear abnormal. Clues include off-colored turf near dark, healthy grass, turf with a dry or wilted appearance, and gradually thinning turf. Because their root systems are weakened from grub feeding, turf in these areas can be easily rolled back to reveal white grubs on the exposed soil surface (Figure 6). Rescue treatments need to be applied only where grub concentrations are high enough to cause these symptoms.

Often grubs are detected too late. People notice dead spots (Figure 7) after grubs have destroyed root systems or when turf is disturbed by skunks and racoons foraging for grubs (Figures 8). At this point, reducing grub populations with spot insecticide rescue treatments may prevent further turf dieback and discourage foraging.

Effective Grub Control

In addition to the timing of insecticide applications, several factors must be considered to control white grubs.

Thatch. Contact insecticides are applied to the soil surface, but grubs are underground. Insecticides need to move into the soil zone to contact grubs. Thatch interferes with the movement of insecticides into the soil and may reduce the amount of toxicant entering the soil. Before applying insecticides, use a hand rake, power rake, vertislicer or core/plug aerator to reduce or open up the thatch layer to help penetrate the thatch.

Amount of insecticide used. Apply the amount of insecticide indicated on the label. Cutting back to save money or expanding the treatment area beyond what is specified on the label results in an inadequate amount of product to kill pests.

Equipment calibration. New application equipment must be calibratated to ensure accurate delivery of labeled insecticide rates. Although a new piece of equipment may come with a predetermined setting, calibration is still recommended because of manufacturing irregularities. Also, rated settings for one brand of equipment may differ from another

Figure 6. Turf rolled back to reveal white grubs

Table 1. Insecticides for Grub Control

Active Ingredient	Common Trade Name *	Residual Activity
carbaryl	Sevin	short
halofenozide	MACH 2, Kill-A-Bug Granules	long
imidacloprid	Merit, GRUBEX, Long-Season Grub Control	long
permethrin	Ant, Flea and Tick Killer Granules	short
trichlorfon	Dylox, 24-Hour Grub Control	short

**Many companies purchase active ingredients and formulate their own product lines. Check individual product labels to determine the active ingredient being purchased and used.*

brand. Calibration is also recommended when switching to a different formulation of the same active ingredient or when switching to a different product. Older equipment must be recalibrated because of nozzle wear from the repeated grinding action of granular insecticides.

Water. Pre- and post-treatment irrigations enhance product performance. Pre-watering will cause grubs to move up in the soil and bring them closer to insecticides. Premoistened soils facilitate the movement of water and insecticide into the soil. Irrigating immediately after treatment removes insecticide residues from grass and soil surface where they tend to degrade rapidly.

Speed of kill. Contact insecticides need time to move from the soil surface down into the soil where grubs are active. Even after initial contact, it takes time for insecticides to kill pests. Grubs will still be alive and moving, but not feeding. Wait seven to 10 days after application to assess treatment effectiveness.

Other important factors. Study individual product labels to achieve maximum grub control. The pH of the water carrier, product freshness, freshness of tank mix and need for mixture agitation vary depending on the product. Conditions during insecticide applications play a role in the distribution and coverage of the treatment. Granular applications are possible when excessive winds may prohibit liquid spray applications.

Figure 7. Dead spots in turf

Figure 8. Foraging damage

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