



Japanese Beetle in Field Corn

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Scientific Name: Coleoptera: Scarabaeidae *Popillia japonica* Newman

Size: Adult is 1/3 to 1/2 inch long; the fully developed grub or larva is 1/2 to 1 inch long.

Color: The adult is shiny metallic green with copper-brown wing covers and is characterized by the presence of five tufts of white hairs which protrude from under the wing covers along each side of the abdomen, with two additional tufts of white hairs on the tip of the abdomen (Fig. 1); the grub has a distinct head capsule that is dark brown to orange in color with the rest of the body an off-white or grayish color due to the presence of soil or fecal matter in the hindgut (Fig. 2).

Description: The larva typically curls into a C shape when disturbed and can be differentiated from other annual white grubs on the basis of its characteristic V-shaped raster (pattern of spines) on the underside of the last abdominal segment (Fig. 3).

Life Cycle: Japanese beetles take one year to complete their life cycle, spending about ten months in the soil as grubs or pupae with adults present from June through September. The female lays a total of 40 to 60 eggs in clutches of one to five eggs at a time from mid-July through mid-August. The eggs are laid at soil



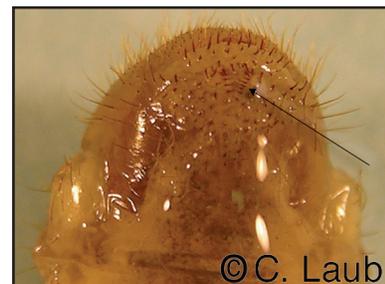
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Fig. 1. Adult Japanese beetle



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Fig. 2. Grub of Japanese beetle



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Fig. 3. V-shaped raster of Japanese beetle (see arrow)

depths of 2 to 4 inches, depending on soil type and moisture level. The eggs hatch after two to three weeks, and the newly hatched grubs immediately start feeding on germinating seeds and young root hairs. The grubs continue to feed on roots until the third instar stage in early fall. When soil temperatures fall below 60°F, the grubs move down below the frost line to overwinter. For overwintering, the grubs often move down only 2 to 6 inches below the soil surface; however, some grubs may go as deep as 1.5 to 2 feet. In spring, when soil temperatures rise above 50°F, the grubs move to within 1 to 2 inches of the soil surface and resume feeding. Grubs continue to feed until late May or early June when they pupate in an earthen cell about 1 to 3 inches deep in the soil. Pupation lasts for one to three weeks.

Distribution: The Japanese beetle is an introduced pest from Japan and was first detected in the United States in 1916 in New Jersey. At present, the Japanese beetle is commonly found in most states east of the Mississippi River, extending from Maine to Georgia.

Hosts: Japanese beetle adults are known to feed on the foliage, flowers, and fruits of more than 400 different ornamental and agricultural plant species. Some of the preferred host plants are apple, apricot, asparagus, birch, blackberry, blueberry, cherry, corn, elm, grape, maple, peach, plum, raspberry, rose, soybean, walnut, and zinnia. The immature or grub stage of the Japanese beetle is a serious pest of turfgrass, field crops, ornamental trees and shrubs, and vegetable crops.

Grub Injury to Corn: Japanese beetle grubs can severely injure seeds and newly developing roots of corn seedlings. On germinating corn seeds, grubs will chew

off the fine rootlets, which interferes with uptake of water and nutrients, especially phosphorus. This leads to symptoms of wilting and purpling of the stem. The seed dies if enough injury occurs before germination is completed. Early-planted corn, corn planted into lighter, sandier soils, or corn planted into pastures, old sod fields, or following soybeans is at greatest risk for grub damage. In Virginia, late-planted corn is at lower risk to injury because third-instar grubs typically complete feeding by late May to early June.

Adult Injury to Corn: Japanese beetle adults feed on corn silks during the early stage of silking. Silk feeding, also called silk clipping, interferes with pollination, thereby impairing kernel development and reducing grain yield. Significant reduction in kernel set occurs only when silk clipping takes place prior to completion of pollination. Consequently, fields with late-planted corn, where silking coincides with the peak activity of adult beetles, are at greatest risk of reduced grain yields.

Sampling

Grub Sampling: Identifying cornfields at risk to annual white grubs should be done by sampling 2 to 3 weeks before corn planting. The recommended methods for the preplant sampling of annual white grubs include baited wire traps (Fig. 4) and direct soil sampling methods. It should be noted that the bait station method is another preplant soil sampling technique that was designed for sampling wireworms (Fig. 5). Recent Virginia field trials have indicated that the bait station method will often attract annual white grubs like the Japanese beetle; however, no economic thresholds exist for this pest.

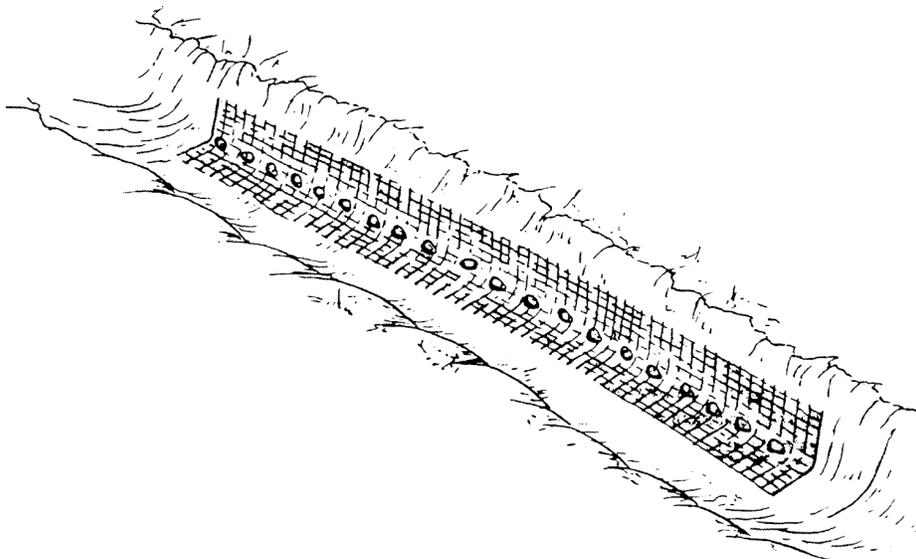


Fig. 4. Baited wire trap in ground

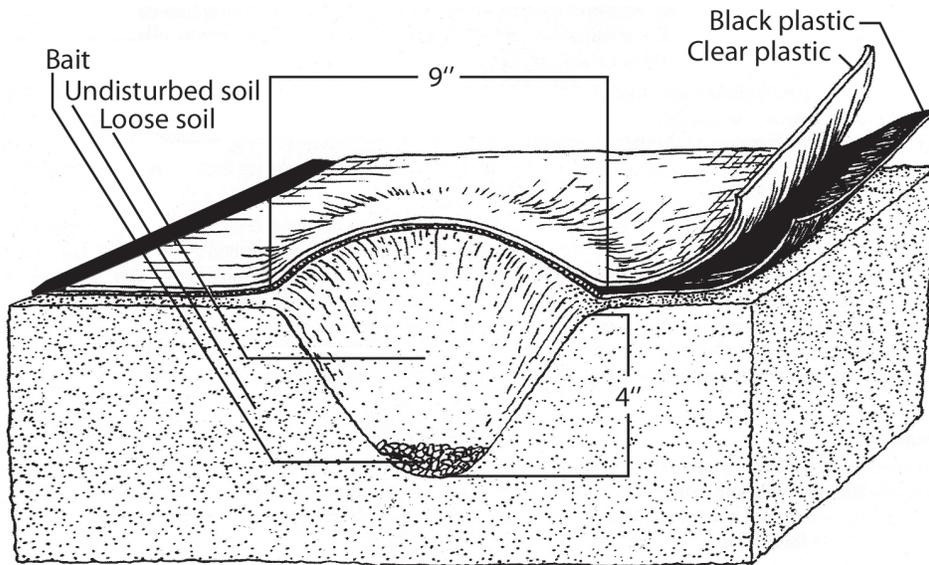


Fig. 5. Bait station

The baited wire trap method consists of 20 untreated corn seeds spaced evenly along a 2-foot long by 3-inch wide strip of 1/4-inch wire mesh that is bent lengthwise at a 90° angle to keep the seeds in place. Traps should be installed in 2-inch deep furrows and covered with soil at least two weeks before planting. A good rule of thumb for fields up to ten acres in size is to install one to two baited wire traps per acre that are spaced uniformly throughout the field. For larger fields, one baited wire trap per acre is suggested. Keep in mind, however, that the more traps that are used the better the sampling estimate will be.

Traps should be removed from the soil after two weeks to inspect the seeds and newly developing roots for signs of feeding injury. An average of 5 percent injury to corn seeds per trap is a nominal economic threshold for annual white grubs. For more details on baited wire traps, refer to the *Pest Management Guide, Field Crops*, Virginia Cooperative Extension publication 456-016.

The direct soil sampling method consists of counting all white grubs in soil dug out from an area 1-foot square by 4 to 6 inches deep. Take a minimum of one soil sample per acre in fields up to ten acres in size, and a minimum of one soil sample per two acres in fields more than ten acres in size. An average of two or more annual white grubs per soil sample is considered a nominal economic threshold for this method. One advantage of soil sampling over the baited wire trap method is that only one visit per field is necessary. The baited wire trap method requires two visits, one to install the traps and one to inspect them.

Adult Sampling: Scouting for adult Japanese beetles should begin before pollination occurs. Mentally divide the field into five equal sections. For each section, randomly select five plants and count the number of Japanese beetles per ear. In addition, determine the percentage of plants with silk clipping. An insecticide application is warranted if an average of more than three adult beetles is found per silking ear, or if 50 percent of the plants have silks clipped to a length of 1/2 inch or less.

Chemical Control

Some of the soil insecticides labeled for corn rootworm control provide acceptable control of annual white grubs and other secondary soil pests, such as wireworms and seedcorn maggots in corn. However, it is important to carefully check the label for specific rate information because some products require higher application rates for annual white grubs than for corn rootworms. In addition, current Bt corn hybrids that are effective against corn rootworms are ineffective against annual white grubs and other secondary soil insects.

Refer to the most recent edition of the *Pest Management Guide, Field Crops*, Virginia Cooperative Extension publication 456-016, for additional information on application rates and methods. Because rescue treatments are generally ineffective for annual white grubs after the crop has been planted, insecticide application at the time of planting is often necessary to protect the crop and to avoid replanting.