Pest e-alerts

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Scout Now for Japanese Beetles in Ornamental, Fruit, and Row Crops

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Japanese beetle adult (Univ. of Minnesota).

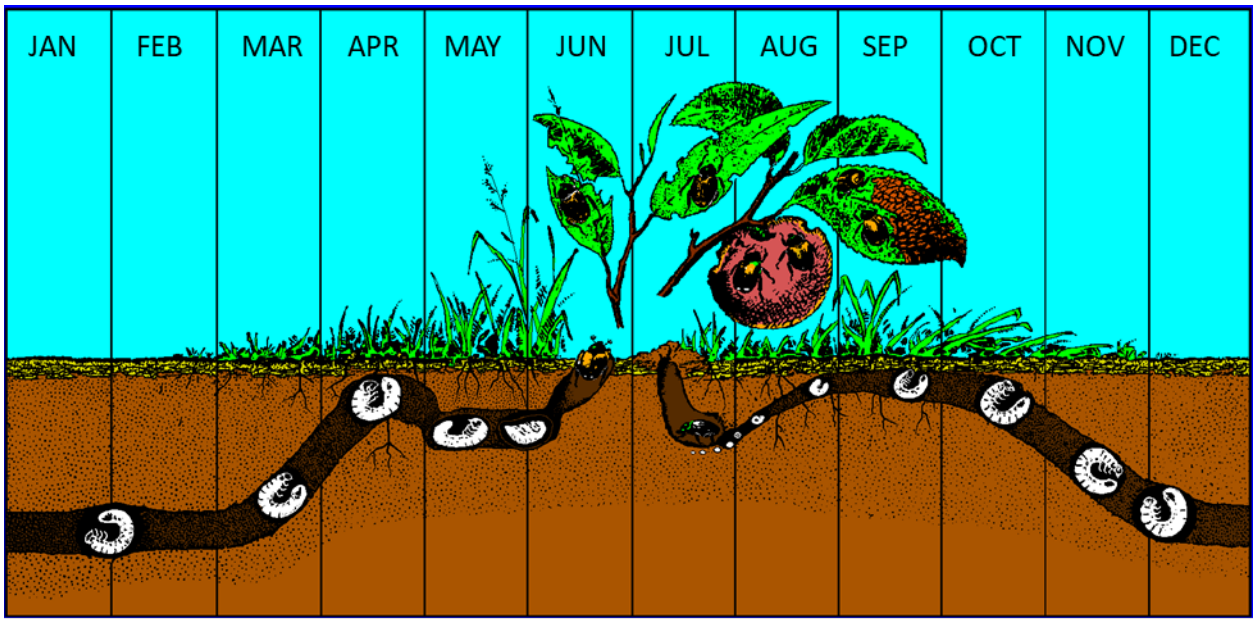
Japanese beetle (*Popillia japonica*) has begun emerging this summer and our earliest reports are coming from Ottawa County. Although this exotic, invasive pest has been steadily expanding its range westward, it is primarily a problem in the eastern half of Oklahoma. Japanese beetle is becoming one of our most significant insect pests because it congregates in large numbers to feed on the foliage, fruits, and flowers of more than 300 plant species. Additionally, the larvae are a type of white grub that feed on the roots of many grasses, including those found in pastures, golf courses, and lawns.

Description: Adult Japanese beetles are robust and measure about 3/8 inch (9.5 mm) long and 1/4 inch (6.5 mm) wide. The body is metallic green with bronze wing covers. A row of white tufts of hair are found along each side of the body next to the outer edge of the wing covers. The larva is a typical C-shaped white grub with a brown head and three pairs of short legs. Larvae develop through three instars (stages) before pupating. First instars measure about 1/16 inch (1.5 mm) long and third instars are about 1-1/4 inch (32 mm) long.

Distribution: Japanese beetle is native to Asia and the first U.S. report is from Riverton, New Jersey in 1916. The beetle was likely introduced as white grubs hitchhiking within the root zone of irises shipped from Japan. The beetle is common in all states east of the Mississippi River, except Florida, and is steadily encroaching westward. The distribution of Japanese beetle in Oklahoma is currently limited to approximately ten counties, but the beetle is widespread throughout several northeastern counties including Adair, Cherokee, Delaware, Tulsa, and Wagoner Counties. Isolated populations have been found in Creek, Kay, Oklahoma, and Payne Counties, and the pest likely occurs in small pockets elsewhere in the state.

Japanese beetle larva (Oklahoma State University).

Life Cycle: Japanese beetles have one-year life cycles. Overwintering larvae migrate upward in March and April and resume feeding on plant roots until May, when they move deeper in the soil, form an earthen cell, and pupate. Adults emerge late June through July and are active during the day, commonly found feeding and mating in large numbers on susceptible plants. Females repeatedly enter the soil and can lay 40-60 eggs during their lifetime. Eggs hatch 1 to 2 weeks later and first instars begin feeding on plant roots. The first instars molt in 17 to 25 days, while second instars take 18 to 45 days to develop and molt again. Most grubs reach third instar by late September, and by October they dig deeper into the soil to overwinter.



Life cycle of Japanese beetle (Dave Shetlar, The Ohio State University).

Hosts: Adults feed on more than 300 different plant species and are considered major pests of ornamental, fruit, and vegetable plants. Japanese beetles also attack several row crops, including soybean and corn. Adults tend to prefer feeding on roses (*Rosa* spp.), flowering crabapple (*Malus* spp.), birch (*Betula* spp.), elm (*Ulmus* spp.), and zinnia (*Zinnia* spp.). Japanese beetle is also an important economic pest of grapes and other economically important crops.

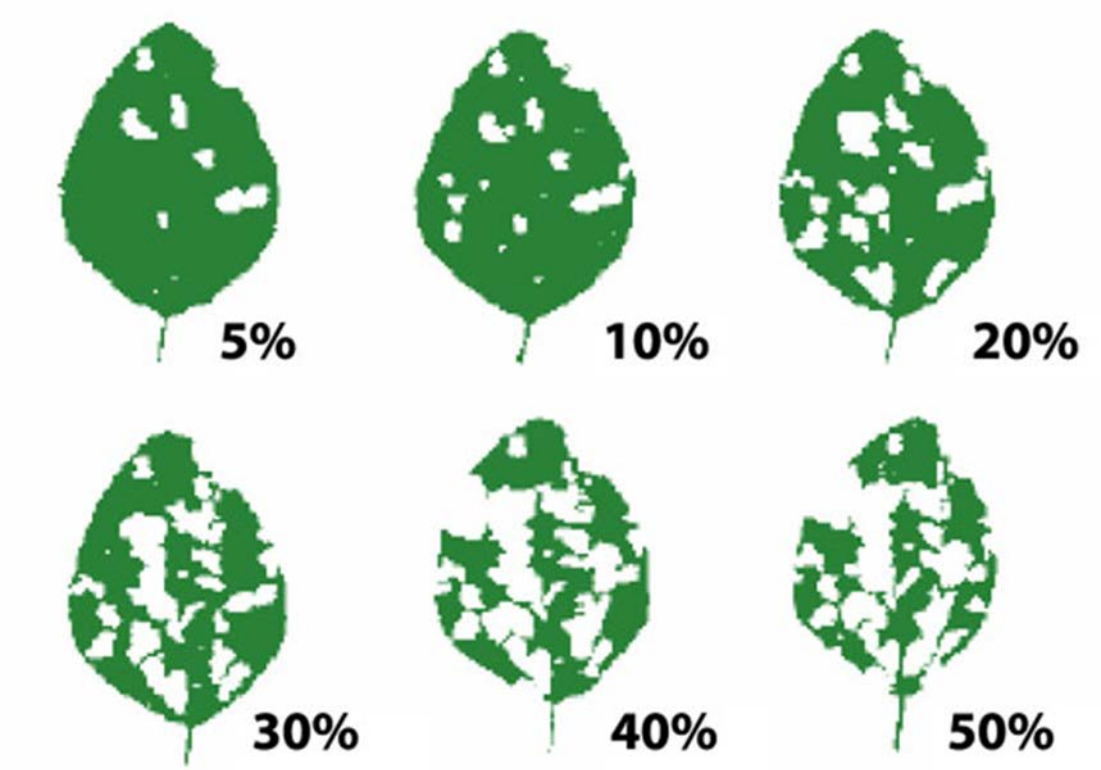
Feeding damage to rose flowers by adult Japanese beetle (Whitney Cranshaw, Colorado State University, Bugwood.org).

Damage: Adults feed during the day, preferring hot weather and plants located in full sun. In fruit and vegetable crops, defoliation often results in reduced yield. Healthy host plants can survive even complete defoliation by the beetle, but young or weak host plants may not be able to withstand heavy attacks. Adults also feed directly on fruits and flowers of ornamental, fruit, and vegetable plants. Feeding damage to these tissues is characterized by large holes, and fruits and flowers are often consumed entirely under intense pest pressure. When feeding on foliage of soybean and other plants, they prefer consuming the softer leaf tissue and avoid any leaf veins. This creates a leaf "skeleton" that is referred to as skeletonization.

Skeletonized soybean leaves from feeding by adult Japanese beetle (Daren Mueller, Iowa State University, Bugwood.org).

Damaged corn ear silks from feeding by adult Japanese beetle (Daren Mueller, Iowa State University, Bugwood.org).

The visible damage they cause can be very disturbing to someone unfamiliar with their feeding. In soybeans, they typically feed on the upper leaves of the canopy and are more numerous along the field margin. This can result in overestimating the amount of actual defoliation that is present in the crop. When scouting for defoliation, collect leaves from the upper, middle, and lower portions of the canopy and scout the interior of the field to get an accurate estimate of actual percent defoliation. To estimate defoliation in soybean, randomly collect 6 leaflets (2 from the lower, 2 from the middle, and 2 from the top of the canopy) from 5 locations and estimate percent defoliation by averaging the defoliation level from 30 leaflets using the visual chart below.



PLANT STAGE	TREATMENT THRESHOLD
3-leaf to beginning of bloom	35% average defoliation
Bloom to pod fill:	15-20% average defoliation
Full pod fill to maturity:	35-40% average defoliation, or 5-10% pods damaged

In corn, Japanese beetle will feed on the leaves, but the most serious injury occurs when they feed on corn ear silks as the plants are pollinating, causing a reduced number of kernels. To estimate ear damage, check 5 randomly chosen plants from 5 locations within the field. Be sure to check plants within the field, because this pest tends to prefer feeding along field margins. Count adult beetles, and estimate the length of silk remaining on those ears. Estimate the maturity of the corn by counting immature tassels and shaking emerged tassels to see if pollen is still being shed. Consider an insecticide application if there is an average of 3 or more beetles per ear, silks have been clipped to less than ½ inch, AND there is less than 50% complete pollination. For control suggestions, refer to **CR-7167: Management of Insect and Mite Pests in Soybean, or CR-7192: Management of Insect and Mite Pests in Corn**. Both fact sheets can be obtained from your local Cooperative Extension Office or through Oklahoma Extension Fact Sheets at http://factsheets.okstate.edu/.

Cultural control for landscape plants: Handpicking adult beetles can be effective when they first colonize landscape plants. Beetles are less active in the morning and evening when it is cooler and can be killed by dropping them in a solution of soapy water. Japanese beetle traps, which contain an aggregation pheromone and a floral lure to attract both males and females, have been commercially available for several years. However, these traps usually attract more beetles than they capture, leaving landscape plants vulnerable. In addition, adult Japanese beetles can fly one

mile or more, so beetles that are caught in traps are readily replaced in the landscape by colonizing individuals. Thus, the use of Japanese beetle traps is generally not recommended. The only situation where traps may be useful is if traps are used across a large area like an entire neighborhood. If traps are used, they should be checked and emptied regularly, making sure to kill any live beetles by dunking them in soapy water.

Various Japanese beetle traps are commercially available, but note that large numbers of beetles can quickly overwhelm traps, often resulting in more beetles colonizing landscape plants.

Biological control: Biological control of Japanese beetle is an active area of research, and several species of natural enemies have been released against this pest in other states. However, establishment has been limited for parasitic flies and wasps released for Japanese beetle control. Efforts are now being directed toward biological control of these beetles with disease-causing microbes, and several insecticide formulations contain these microbial agents.

Chemical control for homeowners: There are many insecticides labeled for Japanese beetle control, and several are available to homeowners. Look for insecticide products containing acephate (Orthene), carbaryl (Sevin), bifenthrin, cyfluthrin, deltamethrin, lambda-cyhalothrin, or permethrin. When adult activity is heavy, insecticide sprays may be needed every 5 to 10 days. Applications of imidacloprid (e.g., Bayer Advanced Tree & Shrub Concentrate) should be made at least 20 days prior to Japanese beetle adult activity. However, check the label carefully for pollinator protection requirements for use of products containing imidacloprid and other neonicotinoids. In general, soil applications of insecticides to target larvae will not reduce adult Japanese beetle populations because adults are strong fliers and colonize landscapes from surrounding areas. For insecticide recommendations for nurseries, homeowners, and fruit crops, refer to **E-832: OSU Extension Agents' Handbook of Insect, Plant Disease, and Weed Control**.

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