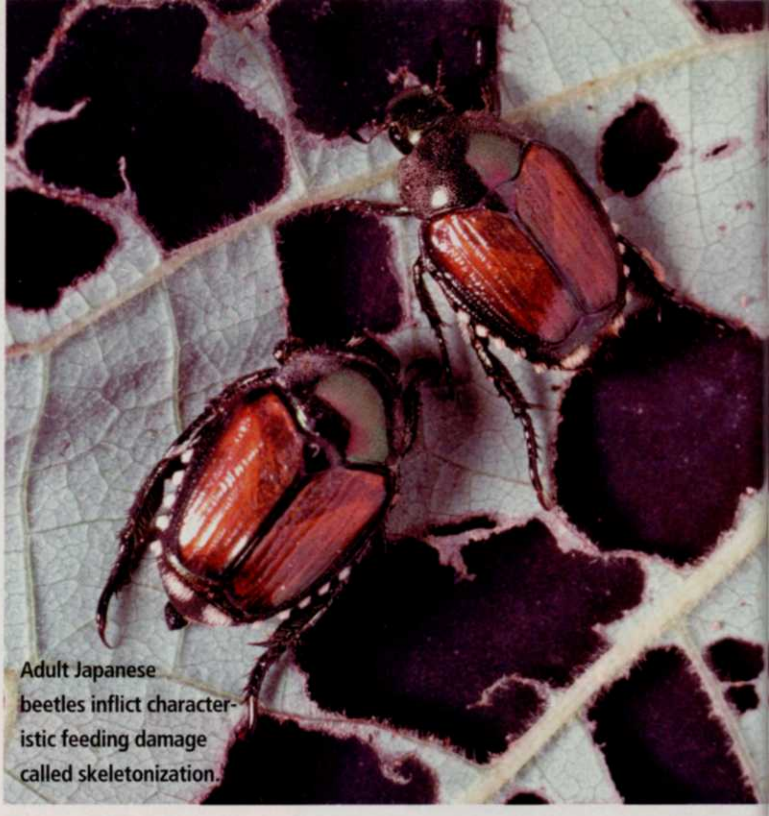
Beetle-mania



Adult Japanese beetles inflict characteristic feeding damage called skeletonization.

Research and careful observation dispel some long-standing beliefs regarding Japanese beetles and their control

BY DAVID HELD

The Japanese beetle is a destructive urban landscape pest in the eastern United States. This metallic colored beetle was accidentally introduced to a nursery in Riverton, NJ in 1916. It's likely that the beetle larvae (white grubs) arrived in the soil ball of nursery stock. The beetle is currently present in all states east of the Mississippi River except Florida.

Japanese beetles have one generation per year. The adults are present from June to August in Kentucky, when they'll actively feed and mate on susceptible plants, often defoliating them.

The females leave the plants to seek out turfgrass and lay eggs, which will hatch into grubs. The grubs feed on roots and organic matter in the soil and continue to grow throughout the summer. In the fall, as soil temperatures cool, they move down in the soil below the frostline for winter. In the spring, they move back up into the root zone and begin feeding. During May, they pupate in the soil in preparation for adult emergence in June. (Check with your local extension service for a more precise timing of the Japanese beetle life cycle in your region.)

The damage Japanese beetles cause to trees, ornamentals and turfgrass is extensive. More than a half billion dollars a year is spent trying to control them. Since its introduction into the United States, the problem of managing this beetle has resulted in an array of management recommendations such as companion planting and host plant resistance. Let's take a careful look at some of the folklore surrounding Japanese beetles and try to balance those anecdotes with recommendations based on field research.

Trapping folklore

The Japanese beetle is strongly attracted to blends of plant odors, particularly those that are floral and fruity. Based on this, commercial traps were developed and proposed as a possible management tool for the adults and larvae. The use of traps in commercial and residential landscapes has been touted for reducing or eliminating defoliation by the adults and reducing the presence of grubs in the local turf. When evaluated in replicated experiments, however, the presence of traps didn't reduce the amount of damage to nearby plants. In fact, traps increased defoliation of nearby plants while having no effect on grub populations in surrounding turf.

Milky disease

Milky disease is a bacterial infection of grubs that results after it ingests spores of *paenibacillus popilliae* while it feeds. An infected grub has a distinctive milky-white appearance relative to a healthy grub. In the field, this disease is often present when grub populations are high. Milky disease is considered one of many natural buffers in the soil that suppress heavy populations of grubs.

Commercial products containing the bacterial spores have been developed for use as a microbial insecticide for Japanese beetles. Users apply powders containing lit-

erally millions of bacterial spores to infested turf for grub control. These products, however, didn't fulfill the claim as a "natural" insecticide. Also, the application of commercial powders to turf didn't increase the occurrence of the disease or result in reduced grub numbers. A contributing factor to the products' failure was their purity. Analysis showed significant contamination of milky disease powders with other non-infective bacterial spores.

Companion planting

Companion planting is a horticultural synergism between a crop plant and one or more plant species that results in the protection of the crop plant from pests. These garden companions are commonly aromatic herbs or other fragrant plants grown to mask the smell of a favorite garden ornamental or vegetable plant.

There are several recommendations regarding Japanese beetles and roses, one of their favorite foods, in organic gardening books and magazines. For example, interplanting members of the onion family, *allium sp.*, anise or fennel *foeniculum vulgare*, and rue, *ruta graveolens*, with roses are said to protect the plants from Japanese beetles attacks. Likewise, certain plants like four o'clocks, mirabilis jalapa, and zonal geranium, *pelargonium x hortorum*, are considered effective trap crops because they may intercept beetles as they're flying to roses to feed.

When tested in replicated small garden plots, however, there was no reduction in the number of beetles on roses interplanted with rue, garlic chives or zonal geranium. Roses interplanted with geraniums generally had more beetles than roses planted alone.

A milky disease infected grub on the left, compared with a healthy grub on the right. Milky disease is common among concentrated infestations in the field but has been shown to be ineffective as a commercial microbial insecticide.

Plant selection

Japanese beetle adults feed on over 300 species of plants in 79 plant families, but there are plants that are truly resistant to feeding. This resistance occurs across species and among cultivars of the same species. In field trials with different cultivars, resistance is quite evident when one cultivar is completely defoliated and the other cultivar next to it is untouched by the beetles. While no apparent resistance to beetle feeding has been shown among rose cultivars, there's considerable variation among the crabapples, lindens, elms and birch.

This infestation of grubs has completely consumed the roots of this turf. Turf damaged by white grubs like Japanese beetles is easy to diagnose. It will roll back like a loose carpet.

Selection of a resistant species or cultivar can be an important strategy for managing beetle feeding damage. Some of the information regarding resistant and susceptible woody plants can be found at: **http://www.uky.edu/Agriculture/PAT/recs/crop/pdf/entfa409.pdf.**

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The flowers of certain ornamental plants such as cannas, hibiscus, hollyhock, dahlias and roses are like candy to Japanese beetles. If these plants are in bloom, beetles will land on the flowers and begin feeding, almost ignoring the leaves. Among roses, cultivars with white or yellow flowers are more attractive to Japanese beetles.

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A littleleaf linden tree in mid-summer completely defoliated by adult Japanese beetles. Notice the typical top-down feeding pattern common to trees defoliated by Japanese beetles.

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Varieties with larger blooms are also more appealing to the beetle. In experiments with red or yellow flowering rose bushes, Japanese beetles will land on the yellow flowering ones, sometimes ignoring even the most fragrant red varieties.

Biorational insecticides

Adult beetles are commonly managed with applications of short-residual insecticides, like carbaryl or synthetic pyrethroids. There has been increased interest in the use of other biorational insecticides, including various formulations of neem-based feeding deterrents. In laboratory tests, these products effectively reduce the amount of feeding. In field tests when beetle infestations are heavy, even repeated applications aren't sufficient to prevent damage.

Regardless of the control product, once a plant becomes damaged it can serve as a beacon to other beetles, attracting them with odors produced by the damaged leaves. Therefore, preventing feeding damage early and keeping plants undamaged as long as possible reduces the attraction of more beetles to those plants. LM

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