

## FACT SHEET

Japanese beetle, *Popillia japonica* Newman

## INTRODUCTION

Japanese beetle, *Popillia japonica* Newman, is a serious pest of over 250 different ornamentals, vegetables, trees, and shrubs, including many varieties of shrub willow. Originally from Japan, this invasive species was first identified in the eastern United States in 1916 and continues to cause extensive damage throughout the northeastern United States. By 1998, Japanese beetle was established in all states east of the Mississippi River except Florida, as well as many parts of the Mid west. During the summer months, adults will feed on a variety of plant species, leaving only a lacy network of leaf veins. Blends of plant volatiles released from beetle-damaged leaves strongly attract other adults producing very large localized beetle populations. During the summer, adult females lay eggs in nearby turfgrass and juvenile grubs spend the fall and spring feeding on roots. Management of Japanese beetle infestations will require control of both the adult and grub stages. Breeding new varieties of shrub willow resistant to attack by Japanese beetle will help reduce the damage they cause.

Beetle damage on young *Salix erioccephala* 'S25'Japanese beetle on *Salix x dasyclados* 'SV1'

## BIOLOGY

Japanese beetle adults are oval with six white tufts of hair along each side of their body, metallic green with bronze-colored wings, and are approximately 12 mm (~1/2") long. The adult female beetle lays 40 to 60 eggs over several weeks, slightly below the soil surface, usually only a short distance from where she is feeding. Eggs hatch within a few weeks into small grubs that are creamy white, C-shaped, and approximately 24 mm (~1") long when fully grown. Grubs feed on roots of a variety of grasses, weeds and nursery crops until the temperature cools in late summer and early fall, at which time the immature grubs burrow 50 to 100 mm (~2 to 4") underground to overwinter. In early spring, grubs become active again and feed on roots until they pupate. The pupae hatch and emerge from the soil in late June and immediately start feeding on the upper surface of leaves of a number of different plant species. Volatiles released by Japanese-beetle-damaged leaves (Loughrin et al, 1995, 1997) and a strong aggregation pheromone emitted by unmated females (Ladd, 1970) attract additional beetles to a potential food source. On clear, warm, humid days, beetles will take flight and move to new host plants.

## SUSCEPTIBILITY

Japanese beetle adults feed on the upper side of leaves eating between the veins to produce skeletonized leaves. Feeding usually begins at the top of the plant, and the beetles move down the plant as feeding continues. Mid-morning to late afternoon is peak feeding time with some feeding occurring in the evening and minimal feeding through the night (Kreuger and Potter, 2001). Japanese beetle display preferential feeding on specific varieties of shrub willow, causing the most damage to varieties of *Salix eriocephala* (including 'S25') and *S. x dasyclados* 'SV1', with lower levels of damage to *S. purpurea* varieties, such as 'Fish Creek', 'Alleghany', and 'Onondaga'. Populations of Japanese beetle adults expand rapidly and can cause considerable damage to foliage, but long-term effects on yield have not been quantified. Grubs do major damage to turfgrass roots and studies have shown grubs display a preference for perennial ryegrass (Crutchfield and Potter, 1994). It is not thought that shrub willow roots are damaged by grub feeding.

More information on Japanese beetle can be found at [http://www.aphis.usda.gov/lpa/pubs/pub\\_phjbeetle04.pdf](http://www.aphis.usda.gov/lpa/pubs/pub_phjbeetle04.pdf) and <http://counties.cce.cornell.edu/oneida/home%20garden/INSECTS/Japanese%20Beetles.pdf>. For more information on shrub willow, please visit <http://willow.cals.cornell.edu>, [www.doubleawillow.com](http://www.doubleawillow.com) or [www.esf.edu/willow](http://www.esf.edu/willow).

## References:

- Crutchfield, BA and DA Potter, 1994. *J. Entomol. Sci.* **29**:398-406.  
 Gorden, FC and DA Potter, 1985. *J. Econ. Entomol.* **78**:774-78.  
 Kreuger, B and DA Potter, 2001. *Environ. Entomol.* **30**:172-80.  
 Ladd, TL Jr. 1970. *J. Econ. Entomol.* **63**:905-8.  
 Loughrin, JH, et al. 1995. *J. Chem. Ecol.* **21**:1457-67.  
 Loughrin, JH, et al. 1997. *Environ. Entomol.* **26**:334-42.

Kimberly D. Cameron<sup>1</sup>, Gregory Loeb<sup>2</sup>, Lawrence P. Abrahamson<sup>3</sup>, Cullen White<sup>1</sup>, and Lawrence B. Smart<sup>1\*</sup>

<sup>1</sup>Dept. of Horticultural Sciences, <sup>2</sup>Dept. of Entomology, Cornell University, NYS Agricultural Experiment Station, Geneva, NY 14456

<sup>3</sup>SUNY College of Environmental Science & Forestry, Syracuse, NY 13210

\*Contact: [lbs33@cornell.edu](mailto:lbs33@cornell.edu), 315-787-2490

Funding provided by New York Farm Viability Institute to LB Smart.

## MANAGEMENT

Management of Japanese beetle must include management of both the adult and grub. While adult beetles are attracted to plant volatiles, the effectiveness of traps baited with pheromone and plant volatiles is heavily debated. In many studies traps did not prevent or reduce damage to plants nor reduce larval densities in the soil (Gorden and Potter, 1985). Traps are more useful in monitoring for new infestations of Japanese beetle. Insecticidal sprays, such as pyrethroid and carbaryl products, are often used to control adult Japanese beetle populations, but they provide only temporary protection. While insecticidal soap sprayed directly on adult beetles effectively kills them, it does not provide any residual benefit. Assessing grub populations in soil or root samples can help determine whether management with insecticides is needed. If so, insecticides, such as imidacloprid and halofenozide, are registered for the control of grubs in turf and should be applied preventatively in summer after egg laying has started. Insecticide control of grubs in the spring is not effective and not recommended. Susceptible varieties of willow should not be planted near large turf areas, such as golf courses. Sustainable management of Japanese beetle adults and grubs will probably only occur with the development of resistant host plants. A goal of the New York willow breeding program is to identify new varieties of shrub willow resistant to Japanese beetle.

Beetles mating on *S. eriocephala* 'S25' (left) and severely skeletonized leaves of a young *S. x dasyclados* 'SV1' (right)

