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Biological Control of Euonymus Scale



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Cover: *Chilocorus kuwanae* is a major predator of euonymus scale. (Agricultural Research Service photo by Tim McCabe.)

Plants in the *Euonymus* family are used in many parts of the United States as ornamental specimens in the landscape. This is an extremely versatile group of woody ornamentals that come in a variety of growth habits and foliage colors. Growth habits include shrubs, climbing vines, ground covers, and small trees. The two most common species, *Euonymus fortunei* and *E. japonica*, are evergreen, meaning they retain their foliage

throughout the winter. Many varieties have dark green foliage, although variegated types are also very popular. Foliage color on the variegated varieties is usually a combination of dark green with other shades of green or yellow or white. The leaves of two common deciduous species change color from dark green to red in the fall prior to leaf drop. In addition to the attractive foliage, several types bear bright red or

orange fruits, a characteristic that further enhances the plants' attractiveness.

Euonymus plants rank 12th among the top 20 common ornamentals planted in landscape settings. But their popularity is declining because these plants are often attacked by an insect pest called euonymus scale. This pest is hard to control, and both homeowners and professional groundskeepers often replace affected euonymus plants with other



Euonymus plants offer the landscape designer several choices in structure and foliage color. Left to right, the variegated *E. fortunei* varieties "Emerald Surprise" and "Gaiety" plus a dark green variety of *E. japonica* with red berries. (APHIS photos by Laurie Smith.)



species. For many years, the U.S. Department of Agriculture (USDA) has been conducting research to find new ways to control euonymus scale. This brochure describes that effort, which involves using natural enemies in a pest management strategy called biological control.



Some types of euonymus exhibit colorful fall foliage.
(APHIS photo by Laurie Smith.)

Life Cycle of Euonymus Scale

Many of the 140+ species of euonymus are susceptible to euonymus scale. This pest belongs to a family of insects known as armored scales. They are an

unusual group of insects that remain immobile on the plant throughout most of their lives.

Euonymus scale begin life as eggs produced by the female under her protective covering. The newly hatched

scale are mobile for a brief period, during which they are known as crawlers. The crawlers move a short distance from their birth site and then attach their mouthparts permanently to the euonymus plant. Immature males develop a white, waxy protective covering over their bodies, while the females develop a brown covering similar in appearance to an oyster's shell. The females remain permanently attached to the plant. Males remain immobile until they molt into the adult stage. Adult males live only 1 day, during which time they can fly and mate with mature females. Euonymus scale pass through the winter months in the form of mature females and immature males.

Euonymus scale have one to three generations per year, depending on the climate. Warmer climates are associated with more generations. Because of the increased number of generations and increased winter survival in warmer parts of the country, euonymus scale tend to be more serious a pest there than in cooler climates.



Euonymus scale: immature males and females and a mature (winged) male.

A Pest of Foreign Origin

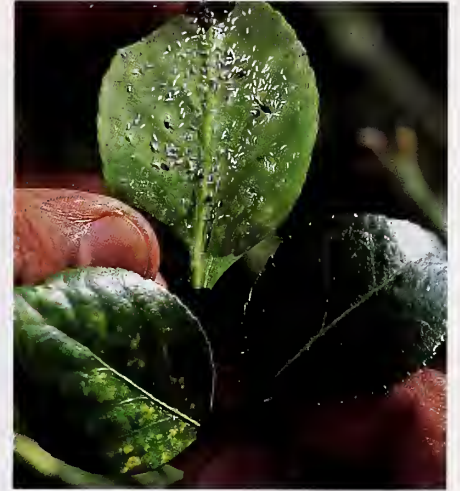
Like many pests in the United States, euonymus scale is of foreign origin. It was accidentally brought into this country from Asia. Most of the euonymus grown here has its origins in plants brought from Asia during the last 200 years. Undoubtedly the scale came here with some of the early plant importations, before USDA began agricultural quarantine and inspection at ports of entry. Unfortunately, the natural enemies of euonymus scale did not get introduced into the United States.

Euonymus Scale Damage

Euonymus plants infested with the scale are affected in a number of ways. Very light infestations appear to have little effect on the plants. However, light infestations often develop into large populations with thousands of scale feeding on a single plant. Severe infestations of euonymus scale can kill part or all of the plant if they are left unchecked.

Symptoms of scale feeding are readily visible where medium to severe

infestations are present. Varieties with dark green foliage exhibit yellowing of the leaves. Variegated types exhibit a pinkish-red color on the leaves when euonymus scale is present. In severe scale infestations, thousands of the mature female scales encrust the euonymus stems, and many leaves drop. The white scale covers of immature males are also readily visible on the leaves of the plant.



Euonymus plants showing damage caused by euonymus scale.

USDA Biological Control Efforts Against *Euonymus* Scale

In the 1980's, USDA's Agricultural Research Service imported natural enemies (predators and parasites) of euonymus scale from Asia. Some of these proved to be successful at controlling the pest where they were experimentally released. Based on the success of this work, it was recommended that USDA's Animal and Plant Health Inspection Service (APHIS) implement a nationwide project for the biological control of euonymus scale.

In 1991 APHIS initiated a biological control project on euonymus scale. The agency believes that this project will benefit homeowners, landscapers, and nursery people alike. Project work will be performed in more than 35 States. The following activities are typical:

- Conducting surveys to determine the density of the pest in the landscape,
- Surveying to determine the distribution of euonymus scale natural enemies already present in the United States, and
- Releasing exotic species of natural enemies at selected locations.

Natural Enemies Involved

Predators

One of the predators already introduced into the United States is a species of lady beetle called *Chilocorus kuwanae*. This natural enemy has proven to be very effective in reducing or even eliminating heavy populations of euonymus scale. It also feeds on a species of scale attacking winged euonymus, on San Jose scale, and on white peach scale. Each one of these lady beetles consumes several hundred scale during its lifetime. Experimental



To date, *Chilocorus kuwanae* is the most successful of the euonymus scale natural enemies imported into the United States.

release plots are providing effective control within a 2-year period after the release of 50 *Chilocorus kuwanae* in a single shrub.

Another introduced predator of euonymus scale is a beetle called *Cybocephalus nipponicus*. This species is very small, approximately the size of a pinhead. While not as voracious as *Chilocorus kuwanae*, *Cybocephalus nipponicus* is useful in controlling the scale.



Cybocephalus nipponicus adults are no bigger than the head of a pin, but they willingly consume euonymus scale. (Photo courtesy of USDA, Agricultural Research Service.)

Parasites

Other natural enemies of euonymus scale include parasitic Hymenoptera, tiny insects that are relatives of wasps but do not sting. Unlike predators, which simply gorge themselves on many scales, parasites are more subtle. The female parasite lays an egg inside the scale insect's body. When the egg hatches, the immature parasite larva slowly feeds on its host. The parasite's development will kill the scale.

Two species of euonymus scale parasites (*Encarsia* near *diaspidicola* and *Coccobius* near *fulvus*) were recently collected in China. Others will be collected during the next few years elsewhere in Asia, where the scale originated.

Natural enemies brought into the United States first go to a quarantine facility. There they are isolated, identified, and carefully screened from undesired organisms. Once the natural enemies pass this strict screening process, they are sent to a receiving

laboratory, where they are allowed to reproduce under controlled conditions.

After sufficient numbers become available, the natural enemies are released on scale-infested euonymus plants at selected outdoor locations,

where the enemies will multiply. Eventually their offspring fly to other locations or are collected by USDA workers, cooperators, or homeowners and redistributed.



Parasitic wasps are being imported into this country to add to the complex of natural enemies.

You Can Help

Property owners and groundskeepers are often faced with decisions regarding control of this scale pest. Consider using biological control techniques instead of relying on pesticides. When insecticides are sprayed against euonymus scale, most of them will also kill beneficial insects, such as parasitic wasps and predaceous lady beetles.

Learn more about the pest, such as how to identify it, its life stages, and control options, including those utilizing biological control. Contact your local Cooperative Extension System agent for information specific to your area. Other resource people include entomologists at land-grant universities or State departments of agriculture, or specialists with the main APHIS office in your State. These contacts can furnish updates on this and other biological control projects in your area.

Project Goals

The goal of this project is to colonize exotic natural enemies of euonymus scale across the United States. Once these predators and parasites become



APHIS personnel and cooperators check euonymus plants for the presence of scale and the establishment of its natural enemies.

well established, euonymus scale will be under biological control, which will be self-perpetuating. With the right combination of natural enemies, biological control is effective and long lasting.

Successful biological control of euonymus scale will lessen the amount of pesticides used in the urban environment. The availability of this safe, effective, and natural means of pest control will encourage nurseries to stock the attractive and versatile euonymus plant, and ready availability will return the species to its appropriate niche in the landscape.

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