

# Bringing scale problems down to size

By Cliff Sadof

**S**cale insects, those obscure little bumps on twigs, branches and leaves, are among the most problematic, and poorly understood insect pests encountered on woody plants. They damage trees by sucking plant juices and often are ignored until tree limbs leaf out late in spring, or mysteriously start to die. This is probably because during most of its life, a scale doesn't look anything at all like an insect. To make matters even worse, each scale spends most of its life, immobile and hidden from view under a tough skin, or waxy armor that is impenetrable by insecticides.

While the work-a-day world is focused on grass, groundskeepers need to know how to identify scale insects and should have a good idea of how to control them.

The first question typically asked is, How do I know if the bumps I am seeing on twigs and leaves are scales?

If you can flip the bump off with your thumbnail without disturbing the tissue below, then the bump is a scale. Other bumps that are not normally present on your tree or shrub may be galls, or the fruiting bodies of fungal diseases. Galls are abnormal growths of plant tissue often containing, mites, wasps, flies, or aphids, and some of their relatives. Fruiting bodies are part of a fungal pathogen that bursts through the plant tissue.

## What are scales?

Scales are insects closely related to aphids. From a damage perspective there are two types, those that excrete a sugary liquid excrement called honeydew and those that do not. Honeydew producers can create both a public nuisance and a threat to plant health. Parked cars, walks, and benches beneath infested trees often become a sticky mess. The sugary liquid attracts ants, flies and stinging wasps. Plants become

unsightly when a black fungus called sooty mold grows on honeydew. Sooty mold will shade leaves and reduce plant growth. Scales that do not produce honeydew may simply cause dieback and make the plant appear unthrifty.

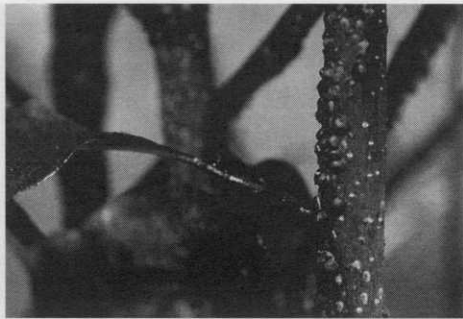
Soft, kermes, and bark scales, mealybugs, margarodids, and ensign scales produce honeydew. These scales suck fluids from the plant vascular system. They only produce honeydew when they are actively feeding. Typically honeydew production will fall off between molts and when scales are producing eggs.

In contrast, armored scales and pit scales do not produce honeydew and are less mobile and less closely related to aphids. The wiry mouthparts of armored scales move like a plumber's snake to burst plant cells and feed on their contents. Pit scales are likely to do the same to the raised gall tissue that surrounds them.



*Euonymus scale on Japanese euonymus.*

Scales spend most of their lives immobile, with their tubular mouthparts anchored to the plant tissue on which they feed. After the eggs hatch beneath females the young scales are called crawlers. Crawlers are small (<1/32") and flattened, looking like dust on the plant surface. Since crawlers lack chewing mouthparts they must leave the scale by crawling out from



*Tuliptree scale on Magnolia. Note black sooty mold on leaves and stems from honeydew secretion of this soft scale.*

beneath the adult female body. Scale infestations spread within a plant as crawlers walk to the site where they settle and feed. They move to new plants when they are blown by the wind to nearby plants or plant parts. In the landscape, scale infestations can also be brought in on nursery stock. Adult males of all scales are winged and because they have no functioning mouthparts are rather short-lived.

After an armored scale crawler begins to feed, it becomes very flat and covered with a clear wax shell. As it continues to grow, it remains beneath its waxy armor. At each of the three successive molts, it produces a new shell that expands beneath the old armor. This waxy covering is difficult to penetrate with insecticides. Winged males crawl out from beneath their cover and mate with covered females who produce eggs. Females can produce about 100 eggs each.

Soft scales are not covered by a waxy shell and excrete large amounts of honeydew. Crawlers hatch from eggs in mid-summer. In most species, crawlers go directly to leaves where they spend most of the summer. They return to the twigs and bark where they spend the winter as settled second stage scales. They continue to grow on twigs in the spring until winged males mate with wingless females, who swell with up to 1,000 eggs.

### **Where are scale problems usually found?**

Scales are mostly found on plants in disturbed areas. This includes areas near pavement, highly managed turf, or plantings that regularly receive insecticide applications.

These areas are prone to scale problems because they create conditions unfavorable for the natural enemies of scales that usually keep them under control in undisturbed sites.

These natural enemies include predatory lady beetles that consume many scales and parasitic wasps that consume individual scales. Furthermore, plants on many of these sites suffer from water stress that can contribute to the growth of scale populations.

### **What can I do to reduce my problems with scales?**

- Minimize stress.

Scales will thrive on trees that are under stress. Keep trees mulched and watered. Do not over-fertilize. Slower growing trees, including those planted in a high-stress site or with variegated leaves can require more care.

- Prune out heavily infested limbs.

Scale infestations are rarely, if ever uniformly distributed on a tree because they move around by either walking or being blown to new limbs. Consequently, trees are usually killed limb by limb. You can exploit this habit to your advantage by pruning out some of the more heavily infested limbs before scales crawlers emerge.

Consider radical pruning for rapidly growing woody plants like yellowtwig dogwood, or euonymus that are heavily infested. For mature trees, whose growth is slowed, this option is less desirable.

- Use dormant season oil sprays for armored scales.

When trees are dormant and scales and natural enemies are less active spray trees with a 3% spray of superior oil (e.g. Sunspray Volk, Scalecide) or a 4% rate of Ultrafine oil (Ultrafine, Sunspray 6E-Plus, Rockland and others) to kill scales. These materials work by smothering scales and disrupting their membranes.

Parasitized scales and those that winter in the egg stage (e.g. pine needle scale, oyster-shell scale, and winged euonymus scale) are generally not killed by this method. Many of the important scale pests, however do not winter in the egg stage. Scale predators winter in the leaf litter and are not killed by this spray. Be sure to follow label restrictions

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Bring  
down

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about sensitive plants. Applying oil on blue needled conifers may turn them green.

Coverage is essential to effective control with oil. When spraying scale-infested ground covers with oil use adequate pressure to cover the scales that lie deep in the ground cover. Studies that applied 4% Ultrafine oil at 250 psi with a Greenarde JD-9 handgun to Pachysandra achieved a 66% reduction numbers of euonymus scale.

- Use summer oil sprays for all scales and mealybugs.

Ultrafine oil, can be applied at the 2% rate in the summer when leaves are present to kill scales. This material will kill any crawlers and scales that have recently settled.

It is not effective against armored scales after the clear scale body starts becoming covered with opaque waxy armor. It is also less effective against soft scales and mealybugs with each successive molt.

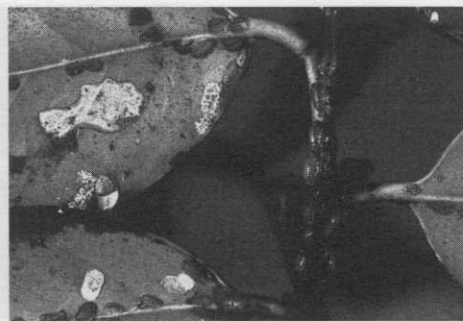
Treating pachysandra ground cover in both the dormant season and when crawlers were active reduced euonymus scale populations by 99% .

Oil spray will also kill natural enemies flying and walking on the tree at the time of application. Like the dormant spray, it does not kill parasitoids developing within scales. Natural enemies on nearby trees and unsprayed tree portions will suffer no ill effects when they fly back to sprayed areas after the oil has dried.

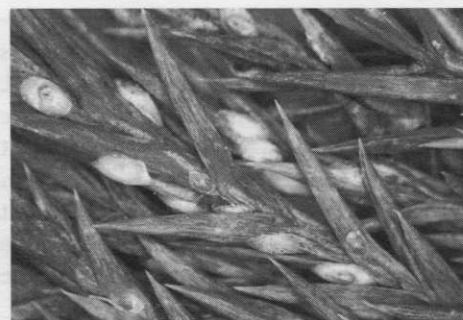
- Use systemic soil, applied insecticide for honeydew producing scales.

Soil applied insecticides (e.g. Merit 75 WSP) can also kill honeydew producing scales when they are actively feeding on leaves and twigs. Although it can take several weeks to get enough material into the tree canopy, materials like Merit are long lasting and have a long window of activity.

Ironically, armored scales are not controlled by Merit because they do not ingest enough of the plant sap to receive a toxic dose of this insecticide. These materials are likely to kill all natural enemies feeding on honeydew producing insects located on treated trees.



*Cottony camellia scale on Holly. Note black sooty mold on leaves and stems from honeydew secretion of this soft scale.*



*Juniper scale on Juniper.*

- Reserve summer conventional sprays for emergencies only.

Conventional pesticides (e.g. diazinon, malathion, acephate, chlopyrifos, bifenthrin, and cyfluthrin) only kill the crawling stage of scales since they cannot penetrate a scale's tough skin or waxy cover. These materials work best when applied at the beginning of the crawler period.

Crawlers are killed by direct spray contact or as they walk along treated surfaces for days or even weeks after spraying.

The long -lasting killing power of these insecticides can work against you when you are trying to manage scales because of their negative impact on natural enemies. When natural enemies are greatly lowered live scales remaining on the tree are free to increase their numbers after the insecticide loses its effectiveness. With each female scale having between 100 and 1000 eggs each, leaving a couple of dozen scales on a tree can cause a big problem.

— *Cliff Sadof is an associate professor of entomology at Purdue University.*