

# Managing Scale Insects on Ornamental Plants<sup>1</sup>

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## Introduction

Scale insects are a diverse group of piercing-sucking pests (Hemiptera) commonly found on ornamental plants in landscapes and nurseries. There are over 180 species of scale insects in Florida, but only a small percentage are important pests of ornamental plants (Dekle 1976; Hamon and Williams 1984). Scale insects are small, inconspicuous insects that use hair-like mouthparts to extract plant sap from leaves or branches. These insects can secrete a waxy covering that protects them from the environment and most chemical control measures. There are several families of scale insects; however, they can be generally divided into two main categories: armored and soft. **Distinguishing** between the two is important because their biology and management differ.

Armored scale insects (Hemiptera: Diaspididae) feed on the contents of cells just under the surface of leaves and bark and excrete their waste in the form of a protective cover (called a test). This cover can be removed to reveal the soft-bodied insect feeding beneath (Figure 1). Once female armored scales begin to feed on a host plant they will remain immobile in that location for the remainder of their life. Even after death, the scale insect cover may remain on the plant for several years. Armored scales are

the most diverse group of scale insects in Florida with over 130 species (Dekle 1976).

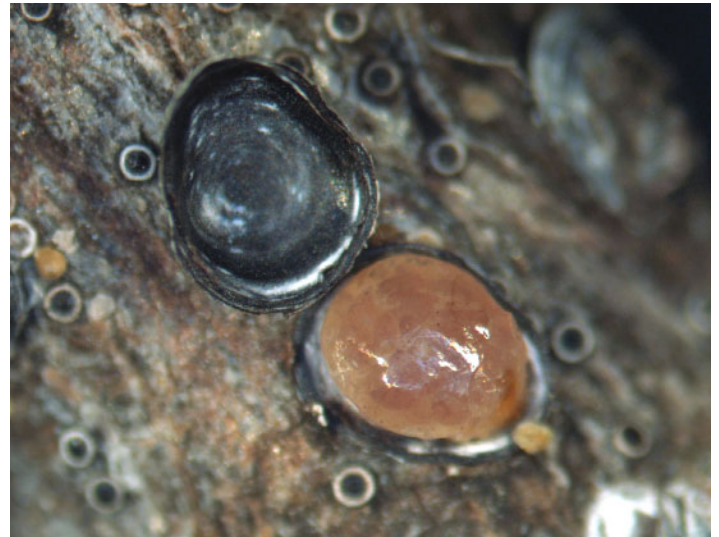


Figure 1. Gloomy scale, *Melanaspis tenebricosa*, with armored covering removed.

Credits: A.G. Dale

## Common Armored Scales

Florida red scale (*Chrysomphalus aonidum*)

Cycad aulacaspis scale (*Aulacaspis yasumatsui*)

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Tea scale (*Fiorinia theae*)

False oleander scale (*Pseudaulacaspis cockerelli*)

White peach scale (*Pseudaulacaspis pentagona*)

Boisduval scale (*Diaspis doisduvalii*)

Gloomy scale (*Melanaspis tenebricosa*)

Obscure scale (*Melanaspis obscura*)

Soft scales (Hemiptera: Coccidae) differ from armored scales in a few important ways. The waxy cover of soft scales is not separate from the insect's body and cannot be removed. Although both are sedentary, unlike armored scales, female soft scales are mobile in every life stage until they begin to produce eggs. In addition, soft scales feed on the phloem vascular tissue of plants and excrete honeydew as waste. There are over 40 reported soft scale insect species in Florida (Hamon and Williams 1984).



Figure 2. False oleander scale, *Pseudaulacaspis cockerelli*, on southern magnolia leaves.

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## Common Soft Scales

Hemispherical scale (*Saissetia coffeae*)

Tuliptree scale (*Toumeyella liriodendri*)

Florida wax scale (*Ceroplastes floridensis*)

Croton scale, (*Phalacrocooccus howertoni*)

Brown soft scale (*Coccus hesperidum* L.)

*Philephedra tuberculosa*

Banana-shaped scale (*Prococcus acutissimus*)

There are at least 16 other families of scale insect pests, the most important of which include Kerriidae, Monophlebidae, Eriococcidae, and Pseudococcidae. Most of these scale insects are typically grouped with soft scales due to similarities in biology and management. As with soft scales, these insects excrete honeydew as waste and have soft waxy covers as part of their body.



Figure 3. Tuliptree scale, *Toumeyella liriodendri*, nymphs on southern magnolia leaves being tended to by ants.

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## Other Common Scale Insect Pests

Cottony cushion scale (*Icerya purchasi*) (Monophlebidae)

Lobate lac scale (*Paratachardina lobata lobata*) (Kerriidae)

## Identification and Damage

Armored scales range in size, shape, and color. Adults often have a low profile against the plant surface. As adults, many soft scale insects have a convex, dome-like or cottony appearance, which makes them relatively easy to find. However, nymphs of both are small, often flat, and inconspicuous, which makes detection difficult without close inspection. Due to their size and behavior, scale

insects frequently go unnoticed on landscape plants until they reach high numbers.

At low levels of infestation, scale insects are rarely damaging to their host plant. Scale insects damage plants by feeding on vascular fluids and cell contents, which contain sugars and nutrients. This can reduce plant photosynthesis and growth and often presents itself as yellowing leaves, premature leaf drop, branch dieback, or gradual plant death. Soft scale honeydew excretions lead to sooty mold growth, a fungus that can turn plant surfaces black, reducing photosynthesis and making plants unsightly (Figure 4). Scale insect infestations are common on plants stressed due to improper planting, physical damage, or environmental stress. Therefore, cultural management is key to managing scale insect pests.



Figure 4. Wax scale-infested holly shrub with extensive sooty mold growth.  
Credits: A.G. Dale

## Biology

Female scale insects go through three general life stages: egg, nymph, and adult. The life stage *most susceptible to control* is the first instar nymph, called a crawler. Adult female armored and soft scale insects are sedentary and wingless and produce offspring. Male scale insects are morphologically different from females. Males go through four life stages and develop wings as adults so they can more easily find females to mate with. Depending on the species, female scale insects may reproduce sexually or parthenogenetically, meaning they can produce offspring without mating.

Scale insects can actively disperse by crawling or by wind to other regions of a host plant or to nearby plants. Evidence suggests that scales may also disperse phoretically by attaching to and riding on other surfaces like bird's feet. One of the most common ways that scales become introduced to the landscape is by using infested plant material. Therefore, close inspection of plant material prior to planting new plants is critical.

## Armored Scale Biology

Female armored scale insects are only mobile as crawlers (Figure 5). After selecting a feeding site, females settle on the plant where they lose their antennae and legs and begin to produce their waxy covering. Here, they will feed on the content of plant cells for the remainder of their life. Adult females produce offspring either internally or by depositing eggs underneath their body, typically in the tens to hundreds (Beardsley and Gonzalez 1975). Eggs will hatch and emerge from the covering to find a suitable feeding site and begin the cycle over.

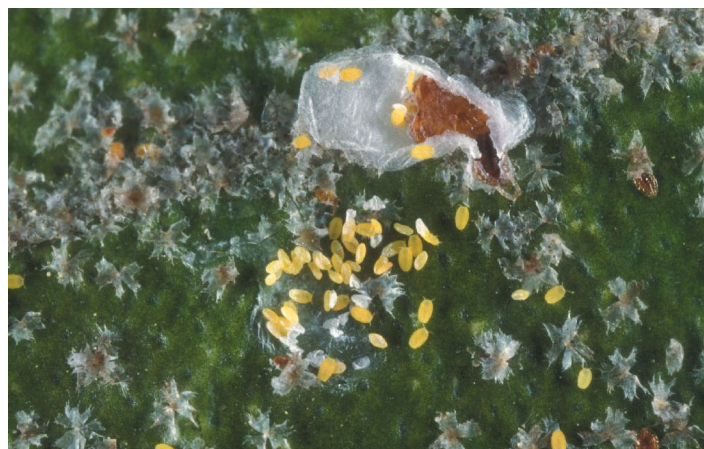


Figure 5. False oleander scale, *Pseudaulacaspis cockerelli*, crawlers and eggs from underneath an adult female.  
Credits: Lyle Buss, University of Florida

## Soft Scale Biology

Female soft scale insects are mobile during all life stages until they begin to produce eggs. Many species transition from the bark to leaf feeding sites throughout the season. In their final location, adult females will appear more dome-shaped or produce a cottony elongation on their body, which contains the eggs. These structures can contain thousands of eggs at a time (Figure 6) and facilitate rapid increases in scale insect abundance.

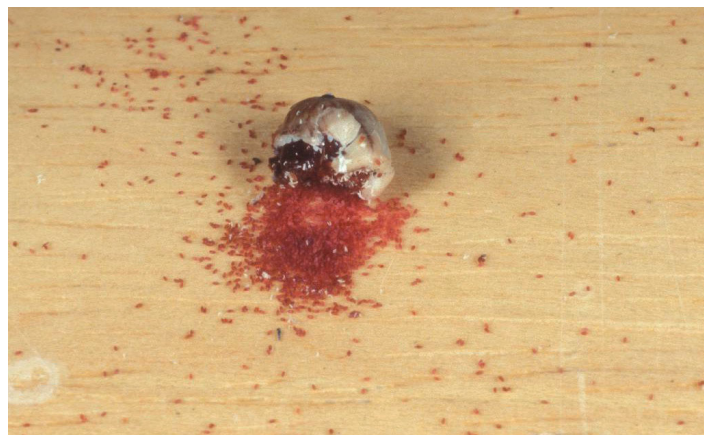


Figure 6. Barnacle scale, *Ceroplastes cirripediformis*, adult female ovisac and eggs.  
Credits: Lyle Buss, University of Florida

## Scouting and Monitoring

Monitoring for scale insects should begin in early spring and continue through mid-summer except in more tropical climates in which crawlers can be found all year. A 5 to 10x hand lens is helpful for spotting and identifying scale insects on plant material. When scouting plants, look for yellow regions on the surface of leaves (Figure 7), which may indicate armored scale feeding on the underside. Also scout for shiny plant surfaces or black sooty mold, which are indicative of soft scale feeding. Monitoring for ant or wasp activity may also help because many ant and wasp species feed on the honeydew secretions of soft scale insects (Figure 3).



Figure 7. Tea scale, *Fiorinia theae*, feeding damage on the surface of a camellia leaf.

Credits: James Castner, University of Florida

Many predators and parasitoids attack scale insects in the landscape and keep them below damaging levels. When scale insects have been located, look closely for evidence of predation (large openings in scale covers) or parasitism (circular holes in scale covers). Also check to see if scale insects are alive by mashing them with your finger nail or pocket knife to see if a colored liquid comes out. If scales are dead, no liquid will come out when the insect is crushed, and control measures may not be warranted.

## Decision Making

Unfortunately, few aesthetic or economic management thresholds exist for managing scale insect pests on ornamental plants. Scales can exist in low abundance without causing plant damage. Consider what is damaging to the plant or aesthetically acceptable for the landscape. Monitor plants in full sun, surrounded by little vegetation, or large amounts of impervious surface (road, parking lot, building) more intensively (Dale et al. 2016). Plants in these locations

may be more heavily infested and damaged by scale insects (Meineke et al. 2013).

## Intervention

### Cultural Control

Prevent scale insect infestations and avoid the expense of long-term management by planting ornamental plants in appropriate locations (Dale et al. 2016). Stress from drought, heat, or sun exposure is associated with scale insect outbreaks. Reducing plant stress by proper planting and irrigation can reduce susceptibility to infestation and damage by certain scale insect pests. Excessive nitrogen fertilizer may increase scale abundance by making the plant more nutritious to scales and reducing the plant's natural defenses (Herms 2002).

### Biological Control

Most native and some exotic scale insect pests are attacked by a number of parasitoid wasps, which often keeps them below damaging levels (Ehler 1995, Dale and Frank 2014; Meineke et al. 2014). Other natural enemies such as lady beetles (Figure 8), lacewings, and predacious midges may also provide supplemental control of scale populations. However, biological control in urban landscapes may struggle due to warmer temperatures, lack of alternative resources, or lack of vegetation refuges for natural enemies (Raupp et al. 2010; Meineke et al. 2014). To maximize potential biological control, provide habitat for natural enemies and reduce temperatures by increasing the amount and diversity of plants in the landscape.



Figure 8. Multicolored Asian lady beetle, *Harmonia axyridis*, predator of scale insects.

Credits: A.G. Dale

### Mechanical Control

High-pressure water sprays can remove armored scales and scale covers from bark and reduce populations without the

need for chemical control. Consider water sprays when deciduous trees are dormant for the winter, and make sure water pressure is not damaging tree bark or leaves. This is less of an option in regions where trees do not go dormant, but with care and attention it may be done successfully.

## Chemical Control

Controlling scale insects with insecticides is often expensive and can take several years to see results. When plants are heavily infested, consider costs and benefits of treatment compared to plant replacement with another plant species.

Foliar insecticide applications should coincide with crawler emergence for best control. This is challenging for many scale insect species because crawlers gradually emerge over several weeks to a few months, or generations overlap. Therefore, broad-spectrum contact insecticides such as pyrethroids may not be effective and could make infestations worse by killing natural enemies (Raupp et al. 1992).

Horticultural oils and dormant oils kill insects by smothering them and breaking down cell membranes. Horticultural oils can also penetrate scale covers. These products can be applied during crawler emergence or when trees are dormant to kill overwintering scales in more temperate regions. Oils may be more practical when treating trees that are smaller in size so that full coverage is achievable. Additional information on horticultural oils, insecticidal soaps, and other natural products can be found at <http://edis.ifas.ufl.edu/in197>. Most oils should not be used when temperatures are very warm. Be sure to follow label instructions to avoid damaging plant tissue.

Trunk sprays or soil drenches of systemic insecticides such as dinotefuran and acephate may provide effective, season-long control of many scale insects. However, care must be taken to avoid applications to flowering plants or at times when pollinators are foraging. Always follow pollinator protection instructions on insecticide labels. Acetamiprid is a systemic insecticide that can be applied to foliage or bark and is less toxic to beneficial insects than other neonicotinoids. Insect growth regulators such as pyriproxyfen and buprofezin are also foliar applied products that provide effective control and are safer for beneficial insects. With all products, thorough coverage of plant material is critical for insect control. Several products can also be applied as soil drenches, which are picked up systemically and reduce non-target risks and concern over plant coverage. Table 1 lists currently labeled insecticides available for scale insect control on landscape plants. Remember to always

follow label directions and local ordinances when using insecticides.

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Table 1. Armored scale insect management.

Active Ingredient	Trade Name	IRAC Class	Activity	Labeled site	Notes
Acephate	Orthene	1B	Contact & translaminar	G, N, L	Target crawlers
Acetamiprid	TriStar	4A	Translaminar systemic	G, N, L	
Buprofezin	Talus	16	Contact	G, N, L	
Dinotefuran	Safari, Zylam	4A	Systemic	G, N, I, L	
Horticultural oil	Several	–	Contact	G, N, I, L	Thorough, frequent applications
Insecticidal soap	Several	–	Contact	G, N, I, L	Thorough, frequent applications
Spirotetramat	Kontos	23	Contact, systemic	G, N, I	
Pyriproxyfen	Distance	7C	Translaminar	G, N, I, L	

\*The use of trade names is for example, not comprehensive, and does not imply endorsement or discrimination of other similar products.  
 \*Always read and follow the label-specific instructions. The label is the law.  
 \*G (greenhouse), N (nursery), I (interiorscape), L (landscape)  
 \*Follow local pesticide use ordinances

Table 2. Soft scale insect management.

Active Ingredient	Trade Name	IRAC Class	Activity	Labeled site	Notes
Acephate	Orthene	1B	Contact & translaminar	G, N, L	Crawlers
Acetamiprid	TriStar	4A	Translaminar systemic	G, N, L	
Buprofezin	Talus	16	Contact	G, N, L	
Cyantranilprole	Mainspring GNL	28	Translaminar systemic	G, N, I, L	
Dinotefuran	Safari	4A	Systemic	G, N, I, L	
Horticultural oil	Several	-	Contact	G, N, I, L	Thorough, frequent applications
Imidacloprid	Merit	4A	Systemic	G, N, I, L	
Imidacloprid	Marathon II, 60 WP		Systemic	G, N, I	
Insecticidal soap	Several	-	Contact	G, N, I, L	Thorough, frequent applications
Pyriproxyfen	Distance	7C	Translaminar	G, N, I, L	
Spinetoram + Sulfoxaflor	Xxpire	4C & 5	Translaminar systemic	G, N, L	Not for residential use
Spirotetramat	Kontos	23	Contact, systemic	G, N, I	
Thiamethoxam	Flagship 25 WG	4A	Translaminar systemic	G, N, I	

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