

Cottony-Cushion Scale (*Icerya purchasi*)

The University of Arizona \$ College of Agriculture \$ Tucson, Arizona 85721 (part of the publication "Citrus Arthropod Pest Management in Arizona")

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DESCRIPTION AND LIFE HISTORY: The cottony-cushion scale is an infrequent pest of Arizona citrus. Cottony-cushion scales prefer humid conditions and are most often problem in groves planted on heavier soils or in groves with large and/or closely planted trees where a great deal of tree shading occurs. Cottony-cushion scales spread by crawling from tree to tree, via wind, on bird's feet, on machinery, and with labor crews. Unlike most other scales, the cotton-cushion scale retains its legs and is mobile throughout its life. However, like most scales, only the male is capable of flight.

The adult female scale has a reddish-brown body, black legs and antennae. Tufts of short, black hairs occur in parallel rows along the edge of the body. However, the most distinguishing characteristic of this scale is the large, elongated, grooved cottony-white egg sac. The egg sac (10 to 15 mm in length) becomes 2 to 2.5 times as long as the body of the female. Each egg sac will contain 600 to 1,000 bright-red, oblong eggs.



Figure 26. The adult female cottony-cushion scale is easily recognizable by the white, fluted egg sac.

The eggs will hatch within a few days of being laid under warm conditions, but may require as long as several

months under cool conditions. Newly hatched nymphs are bright red with black legs and antennae. Within two weeks they will begin to develop a light-yellow cottony substance on their dorsum, which becomes denser with age. First and second-instar nymphs settle on leaves and twigs, and are most prevalent in the inner canopy.

On the leaves, the nymphs align themselves along the midrib and veins. Later instars and adults will move to larger twigs and branches, and the trunk. They rarely infest the fruit. The cottony-cushion scale will pass through three nymphal instars before molting to an adult, requiring about 30 days under warm conditions. Generally, there are 3 to 4 generations produced per year in Arizona.



Figure 27. Second instar cottony-cushion scale.

The male cottony-cushion scale is minute, red and winged. It is rarely seen. Third instar male nymphs form pupae within which the male develops its wings.

DAMAGE: Cottony-cushion scale extracts plant sap from leaves, twigs, and branches, reducing tree vigor. If infestations are heavy, leaf and fruit drop can occur along with twig dieback. It also secretes honeydew, which

promotes the growth of sooty mold that may discolor fruit and block photosynthesis.



Figure 28. First instar cotton-cushion scale nymphs (left) can be distinguished from first instar vedalia beetles (right) primarily by noting the lack of visible antennae on the vedalia beetle (photo courtesy of Beth-Grafton Cardwell, University of California, Davis).

MONITORING: Monitoring for cottony-cushion scale should begin in early spring by examining the inner canopy twigs and branches. If present during the spring, less disruptive insecticides (spinosad, abamectin) for citrus thrips control should be considered. Inclusion of narrow range oil with thrips insecticide applications will aid in suppressing cottony-cushion scale. Insecticide treatments should only be applied if populations are high and there is no evidence of biological control. Insecticide applications should be timed with the emergence of the 1st instar crawlers for the best efficacy.

In most cases, vedalia beetle, *Rodolia cardinalis*, can be found in groves where cottony-cushion scale is found. Care should be taken to not confuse first instar cottony-cushion scale with early instar vedalia beetle larvae. Although similar in size and color, the scales will have black legs and antennae, whereas the vedalia beetle larvae will have red legs and no visible antennae. Later instar vedalia beetles are gray in color.

CONTROLS:

Cultural:

- **Pruning & hedging.** Hedging trees to prevent touching between trees will help prevent within-grove spread of infestations. Additionally, pruning will aid in opening up the canopy to maximize spray penetration and coverage.

- **Equipment Sanitation.** Thorough cleaning of equipment and harvest materials will help prevent the spread of scales from infested groves to others.

Biological: Natural enemies such as the vedalia beetle and lacewings can effectively control cottony-cushion scale.



Figure 29. Adult vedalia beetle.

- **Vedalia Beetle.** The vedalia beetle, *Rodolia cardinalis*, was introduced from Australia into California the early 1890s. The adult and larva feed on all stages of the scale. Female beetles lay eggs underneath the scale or attached to the egg sac. Young larvae move into the egg mass and feed on eggs. Later, the larvae feed on all scale stages. The vedalia beetle is susceptible to pyriproxyfen, buprofezin, and broad-spectrum insecticides. When the beetles are present, chemical control is not usually justified since the vedalia beetle will ultimately control most cottony-cushion scale infestations.

Commonly used Chemicals: Although a commonly occurring pest, chemical treatment is rarely needed for cottony-cushion scale in Arizona. Use of selective insecticides for citrus thrips control will often prevent problems by preserving natural enemies. If a heavy population of cottony-cushion scale occurs and few biological control agent are present, insecticides may be necessary, but release of vedalia beetles or lacewing larvae a few weeks following the last application is recommended to reestablish biological control. Adequate chemical control is difficult to achieve but is most effective if applications are started when 1st instars are prevalent. The addition of narrow range spray oil with the insecticide and high spray volumes (greater than or equal to 200 gal per acre) will increase control. Since cottony-cushion scale populations can be clumped in distribution within a grove, it is not usually necessary to treat an entire grove. Hand-gun sprayers can be useful if targeting individually infested trees, and can deliver high volumes at high pressures which will help maximize

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control. However, follow-up applications are often necessary.

•**Chlorpyrifos.** 28 day PHI at rates exceeding 3 lbs-ai per acre or 14 days PHI for rates of 3 lbs-ai per acre or less. Chlorpyrifos (LORSBAN) is an organophosphate that is sometimes used in Arizona for control of mealybugs and whiteflies. However, Lorsban does exhibit limited activity towards control cottony-cushion scale. Chlorpyrifos is applied at an average rate of 4 to 6 lb-ai per acre. Thorough coverage is need for chlorpyrifos to be most effective. It is toxic to bees and should not be applied during daylight hours during bloom. Additionally, chlorpyrifos is toxic to predatory insects and mites, and parasitoids. Do not apply more than 10 lbs-ai per acre per season. The restricted entry interval for chlorpyrifos is 1 day.

•**Methidathion.** 14 day PHI. Methidathion (SUPRACIDE) is an organophosphate that is labeled for use in Arizona citrus for control of California red scale. However, methidathion does exhibit good activity towards cottony-cushion scale. Methidathion is applied at 0.25 to 0.5 lbs-ai per 100 gal. For adequate control, spray volumes of 800 to 1,200 gallons per acre may be required. Thorough coverage is need for methidathion to be most effective. It is toxic to bees and cannot be applied during bloom. Additionally, methidathion is toxic to predatory insects and mites, and parasitoids, although these effects are short lived. Methidathion is not labeled for use with oils in Arizona. Do not apply more than 5 lbs-ai per acre per season. Do not exceed 2 applications per growing season, and allow at least 45 days between applications. The restricted entry interval for methidathion is: 48 hours when applied at rates less than or equivalent to 2.0 lbs-ai per acre, and 14 days when the rate exceeds 2.0 lbs-ai per acre.

•**Malathion.** 7 day PHI. Malathion is an organophosphate insecticide that has shown efficacy towards cottony-cushion scale. The labeled rate for malathion in citrus for control of scales is 1.0 to 2.0 lbs-ai per 100 gal. For adequate control, spray volumes of 800 to 1,200 gallons per acre may be required. Thorough coverage is need for malathion to be most effective. Do not apply when trees are in bloom. Malathion is toxic to insect predators and parasitoids, but is short lived. The restricted entry interval for malathion is 12 hours.

•**Pyriproxyfen.** 1 day PHI. Pyriproxyfen (ESTEEM) is an insect growth regulator current being used in Arizona citrus for whitefly and California red scale control.

However, pyriproxyfen has demonstrated activity towards cottony-cushion scale. It acts by sterilizing the adults and can cause nymphal mortality. It should be applied when a majority of the scales are small nymphs. It is applied at rate of 0.11 lbs-ai per acre. It is fairly selective, and although it is not known to disrupt parasitoid activity; it can negatively impact vedalia and other lady beetle species, as well as lacewing larvae. Pyriproxyfen drift has been implicated in causing cottony-cushion scale outbreaks where the vedalia beetles were disrupted but the dose was too low to affect the scales. Do not exceed 0.17 lbs-ai per acre per season. Do not exceed two applications per season. Allow at least 21 days between applications. The restricted entry interval for pyriproxyfen is 12 hours.

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