



UNIVERSITY OF GEORGIA
EXTENSION

San Jose Scale

A Pernicious and Persistent Pest of Peaches



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San Jose scale, *Comstockaspis perniciosus* (Comstock), is a pest of peaches, nectarines, plums, and other tree fruits including apples, pears, and cherries. San Jose scale is considered a secondary pest in many regions of the U.S., but since the early 2000s, it has become one of the most common and destructive pests to the peach industry in the Southeast.

Adult female San Jose scales are yellow, circular, sac-like insects (Figure 1A). They secrete and live beneath a 1/16-inch, round protective covering that is gray-brown and made up of concentric rings surrounding a raised bump near the center (see top photo). Adult males are tiny, golden-brown, two-winged insects, about 1/25 inch long with a narrow, dark band across the abdomen (Figure 1B). They mature under elongate, oval, waxy coverings, about 1/24-inch long with a raised, dark bump near



Figure 1. Example of A) an adult female with her protective covering removed and B) a winged male.

one end. The mobile stage of San Jose scale immatures, known as “crawlers,” are yellow, somewhat oval, and very small at about 1/100-inch long (Figure 2).

Biology

San Jose scales overwinter beneath their protective, waxy coverings primarily in immature life stages that are nearing adulthood. During warmer Southeastern winters, mature females also overwinter. Scale insects remain inactive until sap flow begins in the spring and development resumes as temperatures reach 51 °F. Females remain stationary beneath their waxy covering throughout their lives. The males are tiny, winged insects that seek out female scale insects to mate. In central Georgia, the males emerge from beneath their scale covering in early spring, and four to five weeks after mating (approximately early April), females give live birth to the immature scales (crawlers).

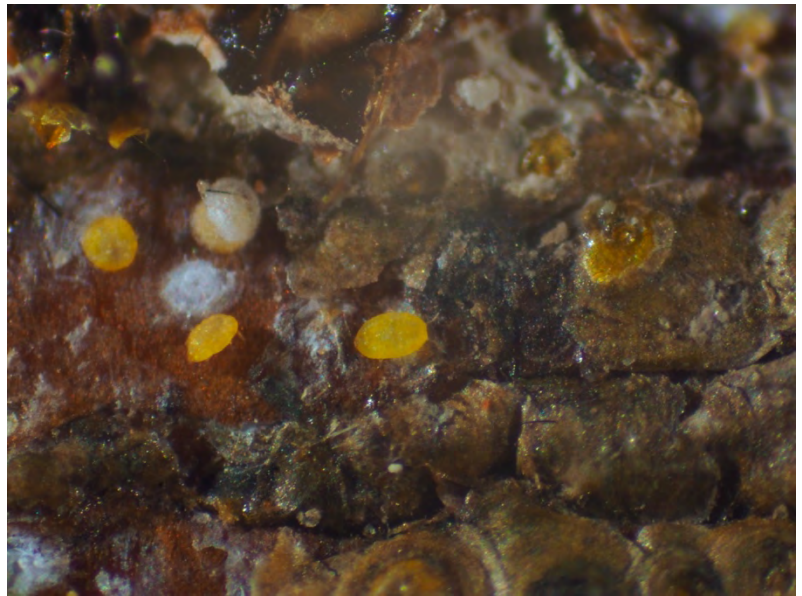


Figure 2. San Jose scale crawlers.

San Jose scales have a very high reproductive potential. Females produce about 10 crawlers per day for two to three weeks, depending on the outdoor temperature at that time. Crawlers emerge from under the female scale covering and move to new sites of infestation on bark, leaves, or fruit. The crawlers can walk considerable distances (2-4 meters) for their size and can also be blown by the wind. It is possible for scale crawlers to be windblown into orchards from adjacent hedgerows, wooded borders, or orchards. Within one day after emerging from under the scale covering, the crawlers settle, insert their mouthparts into the plant, and begin to feed. Within two to three days of settling, crawlers begin to secrete a white waxy covering (the “white cap” stage), which eventually turns black and is known as the “black cap” stage. The protected nymphs pass through several molts before maturing to the adult stage. There are four or more generations of San Jose scales per year in much of the Southeast. Serious infestations can develop between harvest and the onset of winter. This is especially true when abundant late-summer rainfall promotes succulent growth favorable for scale development.

Symptoms and signs

Scales damage plants directly through feeding injury or indirectly through the production of honeydew that can result in sooty mold growth on leaves and fruit. Scales feed by inserting their piercing/sucking mouthparts and withdrawing nutrients directly from the plant. In peaches, feeding damage can cause leaf chlorosis, twig or limb die-back, or even tree death if scale populations reach high levels. At high enough populations, San Jose scales cover branches, creating a bumpy, gray, “scaly” surface compared to the smooth brown bark of an uninfested branch (Figure 3). San Jose scales prefer to feed on branches, but at high populations, the crawlers settle and



Figure 3. Comparison of similarly aged peach tree limbs, A) healthy, uninfested and B) infested with San Jose scale.

feed on the fruit. This type of feeding injury to the peach fruit produces small, red lesions that look like measles on the skin (Figure 4). Fruit injury from San Jose scale does not damage the flesh of the fruit, but the cosmetic appearance can be rather unappealing. Management is needed when scale lesions were present on fruit the previous year or when scales are found on wood during pruning.

Management

Cultural control

Trees and fruit should be inspected frequently for the presence of scale insects. Because scales blend in well to peach bark and are generally hard to see, marking heavily infested trees when scale insects are detected can help to readily monitor scale development during the season. Additionally, pruning infested branches and suckers can reduce scale abundance. Good pruning practices and careful tree training can also open up the canopy to facilitate better spray coverage.

Chemical control

The most common and effective scale management option is with two horticultural oil applications made during tree dormancy to kill overwintering scales. In a commercial orchard, two dormant horticultural oil applications should be applied to every acre, every year. Applying horticultural oil is also advised for residents and homeowners, but use can be determined year-to-year based on scale abundance. Horticultural oil kills San Jose scale by smothering the scale under their protective coverings, so complete coverage of the tree(s) with dilute sprays is critical in order to reach all the nooks and crannies of the tree(s) to effectively manage them.

The first oil application should be made early in the dormant season beginning just after 95% of the leaves have fallen or early in the winter to reduce the burden of scale on the dormant trees. When the trees are fully dormant, a rate of 2-4% oil solution in water can be applied, but if applied prior to full dormancy, a reduced rate of 1-1.5% oil solution should be used. The second oil application is recommended for spring as a delayed dormant spray as the flower buds begin to swell and break, but before 5% pink bud. In order to reduce the risk of phytotoxicity to the buds, a reduced oil solution rate of 0.75-1.5% should be used for the delayed dormant sprays.

Because complete coverage of the tree(s) is critical for effective management of San Jose scale, it's necessary to apply the oil solution at high gallonage in order to maximize coverage. When the trees are full grown and not pruned, aim for 150-200 gal/acre of the oil solution, particularly for areas with a history of scale pressure. If applying the oil spray to trees that have already been pruned, reducing the rate to 100 gal/acre may be sufficient to get effective coverage. Insecticides may be included with the delayed dormant spray to increase the efficacy of the spray for managing San Jose scale. For specific management and insecticide recommendation for commercial growers, please check out the annually updated [Southeastern Peach, Nectarine, and Plum Pest Management and Culture Guide](#). For homeowner San Jose scale recommendations, please see the "Orchards and Fruits" section of the [Georgia Pest Management Handbook: Home and Garden Edition](#).

Even after applying two dormant sprays with horticultural oil, additional within-season San Jose scale management may be necessary in many areas of Georgia. Because horticultural oils have the potential to burn leaves and damage fruit, within-season management focuses on insecticides targeting the scale crawlers. While San Jose scale crawlers can be found on trees nearly all season long in Georgia, there are three distinct peaks of activity we can target to maximize our management efficacy. These peaks are generally early May, late June, and mid-August, but because San Jose scale development is dependent on climate, the yearly variation in temperature



Figure 4. San Jose scale damage on a peach fruit.

can considerably change the timing of scale crawler activity. As such, we can estimate the growth and development of scale using the accumulation of average daily temperatures, known as growing degree-days, based on the lower and upper temperature thresholds for San Jose scale development of 51 °F and 90 °F, respectively. Using the [degree day calculator](#) from the [University of Georgia Weather Network](#) and the biofix of Feb. 1, we can more accurately predict when the crawlers will be active (Figure 5).

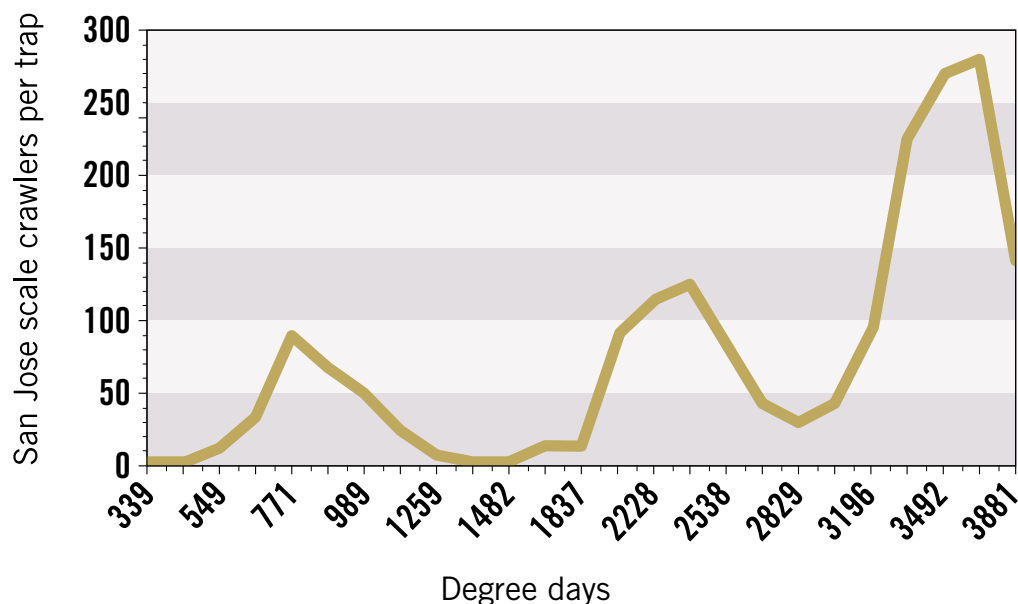


Figure 5. San Jose scale crawler activity throughout the growing season, illustrating the three main peaks of activity and abundance. Degree-days begin accumulating starting Feb. 1 using a base of 51 °F and a max of 90 °F.

In addition to growing degree-days, targeting San Jose scale crawler activity can be improved by visually monitoring for crawlers on infested trees. Crawler activity can also be assessed by regularly checking new shoot growth in infested trees, as the crawlers will be concentrated on new growth. To monitor crawler activity, create a trap by wrapping scale-infested branches first with black electrical tape and then clear double-sided sticky tape (Figure 6). Using a hand lens or loupe, check the tape for scale crawlers frequently. While there is no threshold to initiate spray timing, plan to target management when the number of scale crawlers caught on the tape traps substantially increases.



Figure 6. Monitoring trap for sampling San Jose scale crawlers.

Once crawler activity begins to increase, consider management with a contact insecticide or an insect growth regulator. After the crawlers have already settled and/or you cannot find active crawlers in a block with a history of scale, it may be best to treat with a systemic insecticide. Alternatively, biological insecticides and diatomaceous earth have both showed efficacy at suppressing San Jose scale. For specific insecticide recommendation for commercial growers, please check out the annually updated [Southeastern Peach, Nectarine, and Plum Pest Management and Culture Guide](#). And for homeowner San Jose scale recommendations, please see the “Orchards and Fruits” section of the [Georgia Pest Management Handbook: Home and Garden Edition](#).

Nonchemical control

Along with good pruning practices, destroying nearby alternative hosts such as plum trees, abandoned peach blocks, and other alternate hosts may reduce the immigration of scales into the orchard. Burning and properly disposing removed trees and limbs infested with scale is also important.

Biological control

There are a number of predators and parasitoid wasps that feed on or attack San Jose scale (Figure 7). These insect natural enemies may help naturally reduce scale populations in the Southeast, but generally they do not provide enough control to prevent damage when scale populations are high. At this time, natural control is only considered a supplement to chemical control. Note that using insecticides, particularly pyrethroids, during the growing season can significantly impact natural enemies, disrupting the natural control of many orchard pests, San Jose scales, and mites.



Figure 7. Example of a lady beetle adult feeding on San Jose scale on a peach branch.

References

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