

San Jose Scale Insect Pest of Fruit Trees

San Jose scale, *Quadraspidiotus perniciosus*, is a major insect pest of apples, cherries, peaches, pears, and plums in the Pacific Northwest and Midwest portions of the U.S. This insect pest can cause substantial economic damage if populations are not managed. San Jose scale is native to China and was introduced into the U.S. in the 1870s. San Jose scale developed resistance to lime sulfur in 1914, which was the first documented case of an insect developing resistance to an insecticide. This publication provides information on the biology and damage associated with San Jose scale and management strategies that can be used to mitigate plant damage.

Biology

In spring, adult winged males mate with adult females that are wingless, legless, yellow, and ½ inch (12.7 mm) in length. After mating, each female scale can produce about 400 live first-instar nymphs (crawlers) over a six-week period, with the nymphs emerging from under the edge of the scale covering. The yellow first-instar nymphs move around on the bark and leaves before settling down to feed by inserting their stylet-like mouthparts into plant tissues and withdrawing plant fluids. During feeding, the nymphs secrete a waxy covering over the body that hardens and protects them from environmental conditions (e.g., temperature and sunlight) and insecticides. Nymphs are present from spring through summer although this depends on temperature and geographic location.

First-instar nymphs develop into a white cap stage, acquiring a white waxy covering, and then transition to a black cap stage as the waxy covering turns gray-black. After the second-instar nymph, females shed the old skin or covering again before reaching maturity. Mature female scales are disk-shaped with concentric rings of gray-brown wax radiating from a small white knob in the center of the body (Figure 1). Males undergo a prepupal and pupal stage before becoming winged, nonfeeding mature adults. Because San Jose scale is a hard scale, there is no honeydew, the clear, sticky liquid associated with soft scales.

The San Jose scale life cycle can be completed in approximately 30 days, depending on temperature. During the summer, all life stages can be present on a tree simultaneously. Typically, there are two generations per year. First-generation nymphs are present in June, while second-generation adults are present from July through September. San Jose scale overwinters as an immobile immature (second-instar nymph or black cap stage) on the tree (Figure 2).

Damage

San Jose scale nymphs and adults feed on branches, leaves, and fruit by withdrawing plant fluids with their stylet-like mouthparts. San Jose scale feeding reduces plant vigor, growth, and yield. New infestations usually start near the base of new growth, but over time branches can be covered



Figure 1. San Jose scale female. (Photo: Raymond Cloyd)



Figure 2. San Jose scale overwinters as a second instar nymph or black cap stage. (Photo: Raymond Cloyd)

completely if infestations are extensive (Figure 3). San Jose scale infestations can kill branches or the entire tree, depending on the age and size of the tree. San Jose scale feeds on mature fruit (Figure 4) and young fruit, leaving indentations or blemishes surrounded by a red to purple halo. This damage can reduce the quality and marketability of the fruit.

Management

Prune out branches heavily infested with San Jose scale and remove them from the vicinity. Pheromone traps containing a chemical lure can be placed within the apple orchard when apple trees reach the pink stage of flower bud development. These pheromone traps will attract the winged males, which helps to monitor San Jose scale activity. Pheromone traps should be checked weekly after placing them within the apple orchard.

Placing double-sided sticky tape around randomly selected branches can help detect the presence of nymphs in spring, which will assist in timing insecticide applications. Approximately 4 to 6 weeks after bloom, check the double-sided sticky tape for the presence of small, yellow nymphs using a 10- or 16-power hand lens. Later in the growing season, use the hand lens to look for adults.

Spray applications of a 2% dormant oil insecticide are effective in managing populations of the San Jose scale as long as the branches and trunk are thoroughly covered. Apply dormant oil insecticides before or after bud break, but prior to flowers opening, and before trees are heavily infested with San Jose scale.

Contact insecticides need to be applied when the nymphs are active, so that the nymphs come in contact with the insecticide spray residues. Thorough coverage of leaves and branches increases the chances of nymphs coming into contact with insecticide spray residues. Multiple or repeat applications are necessary to ensure exposure of all nymphs, which do not emerge from underneath the female covering at the same time. Management of San Jose scale populations on mature (older) trees can be a challenge because of the difficulty of obtaining thorough coverage with insecticide spray applications. In addition, insecticides have no effect on San Jose scale adults.

A number of natural enemies, including parasitoids and predators, will attack San Jose scale. However, natural enemies usually do not regulate San Jose scale populations sufficiently to reduce plant damage. In addition, insecticide applications may kill natural enemies inadvertently when used to suppress populations of the San Jose scale.



Figure 3. San Jose scale on branch of apple tree. (Photo: Raymond Cloyd)



Figure 4. San Jose scale feeds on mature fruit. (Photo: Raymond Cloyd)

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