BLACK SCALE

Integrated Pest Management for Home Gardeners and Landscape Professionals

Black scale, *Saissetia oleae*, is a soft scale insect native to southern Africa that is currently an agricultural and horticultural pest in southern Europe, North America, South America, Asia, Australia, and New Zealand. In North America, the insect is distributed in the southern and western United States as well as in Mexico and Central America. The insect was introduced to California before 1880 and has since become an economic pest primarily on olive, but it can also cause damage on citrus. Black scale is one of the more damaging soft scale pests in California and can be found on numerous hosts including almond, apple, apricot, aspen, bay, citrus, cottonwood, coyote brush, fig, fuchsia, grape, holly, maple, oleander, olive, palm, peppertree, pistachio, plum, pomegranate, poplar, privet, prune, rose, and strawberry tree.

Figure 1. Black scale adult with "H" ridge and third-instar nymph at rubber stage.

Figure 2. Black scales and honeydew.

IDENTIFICATION

The adult female black scale is the easiest of the life stages to identify based on size, shape, and color. Adult females are the largest of the life stages, with a body measuring up to 1/5 inch long and 1/8 inch wide. They are dark brown to black, convex in shape, and have a distinctive H-shaped ridge on their back (Figure 1). Black scale infestations are often associated with sooty mold fungus because the insect exudes sticky carbohydrate-rich honeydew on the plant surface that serves as a substrate for fungal growth (Figure 2). Because the first- and second-instar nymphs are sensitive to hot, dry conditions, black scale is more common in coastal regions or on trees with dense canopies that foster a cooler, more humid microclimate than found in the interior valleys.

LIFE CYCLE

Black scale has either one or two generations per year depending on climate (Figure 3). For example, in coastal California

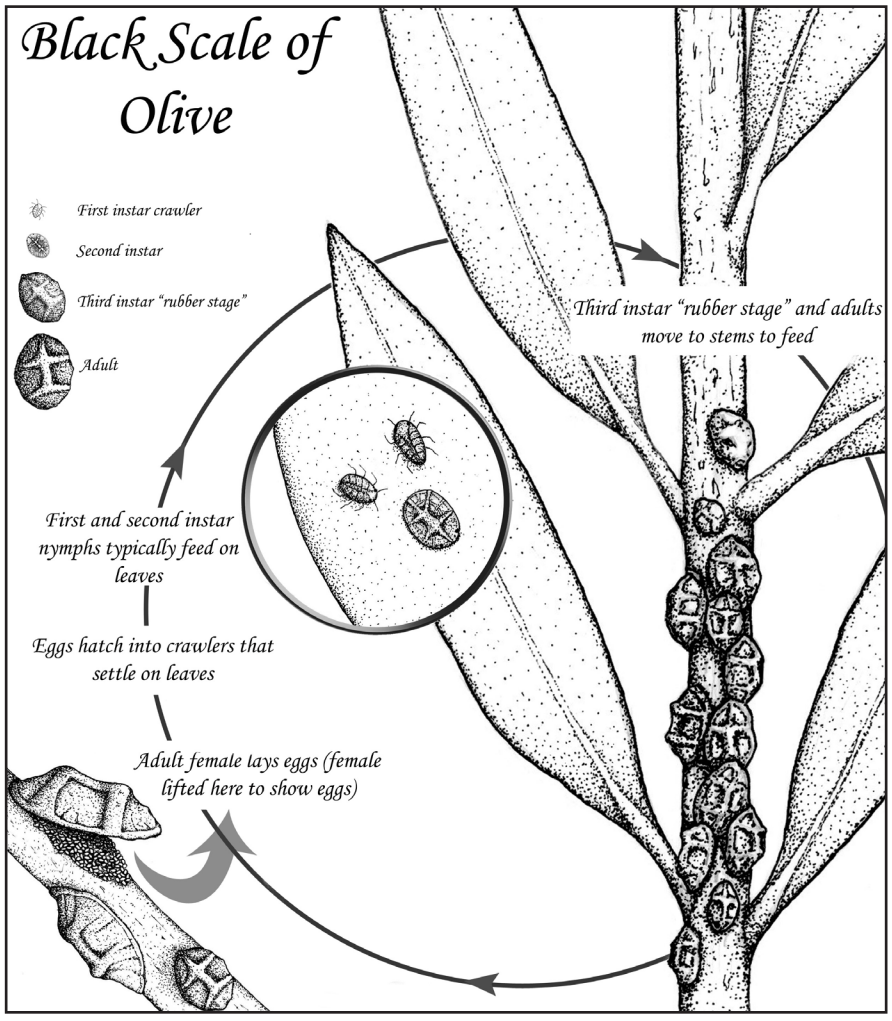

Figure 3. Life cycle of black scale.

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climates, black scale has two generations per year. In the inland areas of Southern California and in the San Joaquin Valley, the insect has only one generation per year, although a partial second generation can be found as well, especially in trees with dense canopies.

Although black scale males are known to occur, they have never been recorded in California and reproduction is parthenogenic, meaning the female black scale adult doesn't have to mate with a male to produce offspring. Mature females may produce more than 2,000 eggs each, and the egg color changes from pale yellow to orange as the eggs mature. Eggs are laid directly under the adult female body, and the subsequent egg hatch may take several weeks to complete.

First-instar nymphs (called "crawlers" until they settle and start to feed) are pale yellow to light brown and only 1/64 inch long, making them difficult to detect without a hand lens (Figure 4). After hatching from eggs, crawlers may spend up to seven days searching for a feeding site, typically on foliage. Black scales go through two more immature stages, or instars, before becoming adults, molting or shedding the cuticle between each stage. In the interior valleys, where there is one generation per year on olives, egg hatch is typically in May. The first molt occurs in the summer, around three to eight weeks after hatching, depending on temperature and host plant condition. There is little development during the summer, as summer heat hampers the scale's development and survival. For this reason, the second molt often occurs around two and a half to three months after egg hatch, revealing the third instar, a sexually immature adult.

Soon after the second molt, the third-instar nymphs tend to migrate from leaves to twigs, where they will typically overwinter. In spring, the late third instar begins to enlarge as her ovaries develop and is then commonly referred to as the "rubber stage." The rubber stage is 1/16 to 1/5 inch long, is ash gray to brown, and has a distinct H-shaped ridge on its back (Figure 1). By April most black scales have progressed to the rubber and adult stages. This is the period of rapid growth and when most honeydew is produced. The adult female's coloration changes from dark brown to black as she matures.

DAMAGE

Black scale can adversely affect plant vigor and productivity. The impact on productivity is perhaps most evident in olive trees where heavy scale infestations (Figure 5) may reduce return bloom and the size of next year's crop. Additionally, sooty mold colonization of honeydew deposits may reduce the plant's photosynthetic activity by effectively shading leaf surfaces from the sun, resulting in some defoliation. Honeydew and sooty mold detract from the aesthetic value of landscape plants and render harvest of fruit an unpleasant activity due to the sticky nature of the honeydew. In commercial orchards, sooty mold infestation may result in downgraded fruit quality. The honeydew may also attract tephritid fruit flies (i.e., olive fruit fly) and vinegar flies (i.e., *Drosophila* species) as well as other insects such as wasps and ants that use the honeydew as a food source.

MANAGEMENT

Management of black scale in the home landscape may be approached with combined cultural, biological, and chemical control strategies. In many cases biological control is sufficient unless broad-spectrum sprays for other pests have killed natural enemies. Few home gardeners in most parts of California need to spray for black scale.

Cultural Control

Because the second- and third-instar nymphs are susceptible to desiccation (extreme dryness), pruning the plant canopy may eliminate cool microclimates that promote black scale survival. If possible, prune out infested branches of the plant to physically reduce black scale populations on site. Pruning is the best cultural control practice available both in commercial orchards and in home landscapes.

Figure 4. Black scale crawler and eggs.

Figure 5. Heavy scale infestation on an olive branch.

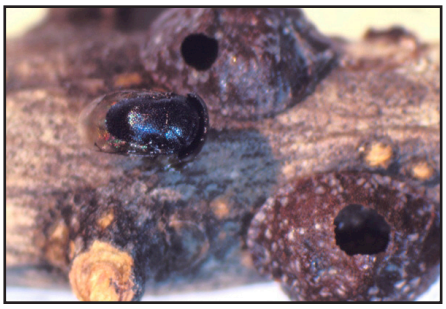

Figure 6. A parasitic wasp, *Scutellista caerulea*, emerging from a scale and two scales with exit holes.

Hand removal or crushing of scales on individual plants can also be an effective management tool in the landscape.

Biological Control

Efficacy of biological control for management of black scale may vary by region. In the southern San Joaquin Valley, biological control of black scale may be ineffective because the timing of the scale life cycle isn't conducive to insect parasitoid reproduction and development. However, in Northern California and the state's coastal areas, a number of parasitoids (tiny wasps, barely visible to the naked eye) may attack black scale, including *Scutellista caerulea* (Figure 6) and *Metaphycus*

helvolus (Figure 7), providing effective control in many landscapes. The presence of resident natural enemies in landscapes can be determined by observing mature female scales with a hand lens. Parasitized scales will have a small exit hole chewed by the adult parasite (Figures 6 and 8). To protect resident natural enemies, avoid using broad-spectrum persistent insecticides in landscapes.

Biological control of soft scales can often be inhibited by the activities of ants, which protect them from natural enemies. If ants are active, manage them by circling trunks with a sticky material such as Tanglefoot placed on trunk wraps, and prune to prevent bridges between plants that may allow ants to move from the ground or infested plants to vegetation above the sticky barrier. Ant baits may also be effective.

Chemical Control

A narrow-range mineral oil, applied at high spray volumes (beyond the point of runoff), may be utilized to manage black scale. A recent study also suggests that canola oil (1% by volume) may be utilized as a nonpetroleum-based product to manage black scale on olive. Oil essentially suffocates the insect and is most effective at the crawler stage (early first instar); therefore, monitoring of the insect population is essential for successful control. Because black scale attacks a diverse range of host plants, it is important to consider the potential for oil applications to cause phytotoxicity (damage to plants). Before widespread use in a landscape, test for potential phytotoxicity by applying oil to a small group of plants or plant parts.

If scale populations are high and there are few signs of parasitization, an oil application may be employed to manage black scale. In the San Joaquin Valley, a winter oil application may be effective when applied between November and late January—a timeframe when the rubber stage and adult insects aren't generally present. In both the Sacramento Valley and the San Joaquin Valley, a summer oil application may be applied when crawlers have hatched, generally from mid-May through August. To properly time a summer oil application, double-sided sticky traps can be suspended in the tree canopy to monitor for presence of crawlers. Oil applications must be completed before the insect enters the rubber stage or adult stage; thereafter, applications aren't effective. For more information about managing scales, see *Pest Notes: Scales* at http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7408.html.

Figure 7. The parasitic wasp *Metaphycus helvolus* laying an egg in a scale.

Figure 8. Dead black scales displaying parasitoid emergence holes.

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