Weighing In On Scale

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Scales are among the most devastating and difficult to control of all insect pests, and magnolia scale (*Neolecanium cornuparvum*) is no exception. Native to the eastern United States where it is widely distributed, magnolia scale is prone to sudden and dramatic outbreaks that can quickly overwhelm, weaken, and even kill susceptible plants. The most important hosts of magnolia scale are star magnolia (*Magnolia stelleta*), lily magnolia (*M. liliiflora*), and their hybrids. Saucer magnolia (*Magnolia* × *soulangeana*) can also be severely infested. Magnolias native to the United States are much more resistant, perhaps because they have developed natural defenses by virtue of their shared evolutionary history. Cucumber tree magnolia (*M. acuminata*) and southern magnolia (*M. grandiflora*) can be infested but are rarely damaged, while sweetbay magnolia (*M. virginiana*), bigleaf magnolia (*M. macrophylla*), and umbrella magnolia (*M. tripetala*) are rarely colonized.

Figure 1. First instar nymphs, or "crawlers," in search of suitable feeding sites upon hatching from eggs contained within the body of their mothers. The crawler stage of scale insects is most susceptible to insecticides. (Dan Herms)

Life history

Magnolia scale has one generation per year, with females maturing and producing eggs from mid-summer through mid-fall. Eggs are held internally, creating the illusion that they give birth to living young. As with many species of scales, these newly hatched nymphs (first instars) are the only mobile life stage, and are thus

termed "crawlers" (see Figure 1). In Wooster, Ohio, crawler emergence begins in early August (about 2050 degree-days, base temperature of 50 °F (10 °C)) and continues well into October. Crawlers are very difficult to detect, appearing on small twigs and branches as very small (1/25in (1.02mm) in length) flattened, oval flakes that vary in color from yellow to reddish-brown.

Upon emergence, crawlers set out in search of a suitable feeding site, often settling to feed on the same twig or branch as their mother. They become immobile once they insert their mouthparts into the plant, spending their entire life at the spot they initiate feeding. The vast majority of crawlers are unable to establish for various reasons and die without ever feeding. As adult females are immobile, infestations probably spread most often when crawlers are carried on the feet of birds from one plant to another.

After over wintering as first instars, nymphs molt and begin growing about the time leaves begin emerging in spring (when large quantities of nutrients are mobilized by the plant in the sap). Growth is rapid as scales increase their size by several orders of magnitude in just a few weeks. Copious amounts of honeydew are produced during this growth spurt. They become quite conspicuous (for a scale insect) as they mature, appearing as large, oval, convex bumps on twigs and branches. Twigs can be completely encrusted when populations are high.

Figure 2. Magnolia scales are covered to varying degrees by a white waxy material that disappears as they mature and produce eggs. (Dan Herms)

As they mature, scales can vary in color from pinkish to purplish to brown, depending on the degree to which they are covered with a white, waxy material that disappears as eggs are produced by mature females, which are brown (see Figure 2). Males mature earlier than females and do not grow as large. They emerge as small gnat-like insects in late spring to mate with immature females. Females continue to grow through the summer, maturing in August—October. Adult females can obtain a diameter of 0.5in (1.3cm), making it the largest species of scale occurring in the United States. They die in the fall after reproducing, leaving behind their hollow, brown shell (exoskeleton) that may

continue to adhere to the plant for many months.

Host impact

Magnolia scale feeds on sap extracted from twigs and small branches by means of sucking mouthparts inserted through the bark into the phloem tissue. Plant sap contains high concentrations of sugars but low concentrations of protein and other nutrients. Consequently, magnolia scales must extract great quantities of sap to obtain the nutrition they need. Much of this sap is excreted as a clear, sticky substance known as "honeydew" that coats twigs, leaves, and other objects beneath feeding sites. The black fungus, commonly known as "sooty mold," that often colonizes honeydew can be quite unsightly, but is generally harmless to plants (although, in extreme cases it can interfere with photosynthesis by blocking light). (See Figure 3.) Sooty mold can become a nuisance when it coats cars and patio furniture, and is often the first sign of the infestation that people notice. Yellow jackets, other wasps, and ants are often attracted to the honeydew, upon which they feed see Figure 4).

The large quantity of energy-rich sap consumed by high populations of magnolia scale represents a severe energy drain on even mature plants. Stress imposed by this energy drain can result in small, yellowing leaves, twig dieback, and a thinning canopy. When left unchecked, even mature plants can be killed by high populations.

Figure 3. A black fungus, commonly known as sooty mold, grows on honeydew and provides a good sign that magnolia scale is feeding somewhere above. Although unsightly, the fungus itself is generally harmless, although it can interfere with photosynthesis by blocking light penetration to the leaf. (Dan Herms)

Figure 4. The sugar-rich honeydew excreted by magnolia scale and other sap-sucking insects provides a highly attractive food source for ants, yellow jackets, and other insects. (Dan Herms)

Generally, though, plants can tolerate low to moderate infestations fairly well, which provides time to implement a management program before plants are severely injured.

Management

As with all insect pests, effective management of magnolia scale requires a good monitoring program so infestations are detected before they build to damaging numbers. Plants should be regularly inspected for signs and symptoms of infestations. The absence of foliage makes winter a good time to observe the large brown shells on twigs and branches that are the remnants of the previous generation of adults. Close inspection is required to observe the small over wintering nymphs, and a good hand lens can be a great help. Magnolia scale nymphs grow rapidly in spring, becoming much more obvious. The presence of sticky honey dew on and beneath plants is a good sign of the existence of an infestation. Low populations are often clustered on one or a few branches that can be pruned without distorting the growth habit of the plant.

Natural enemies do not seem to effectively suppress high populations of magnolia scales, which is unusual for a native insect pest, making insecticide treatments necessary to maintain plant health. As with all scales, timing is critical. Their waxy covering and exoskeleton provides them with substantial protection, rendering conventional insecticides and horticultural oils ineffective during much of the growing season. The crawler stage is quite susceptible to many insecticides, but the protracted period of crawler emergence dictates multiple applications from late summer through mid-fall. Biorational products such as insecticidal soap and horticultural oil can be very effective provided thorough coverage is obtained. However, because these products lack residual activity, applications must be repeated every 7–10 days throughout the 8–10 week period of crawler emergence to be effective. Insecticides with longer residual activity, such as synthetic pyrethroids, require fewer applications.

In theory, at least, it may be possible to achieve effective control with one optimally-timed application in October just as crawlers have completed emergence but before they enter dormancy, which probably reduces their susceptibility to insecticides. This window of opportunity is probably short, but research is still required to determine optimal timing. No matter what product is used, thorough coverage of all twigs and small branches is essential, as many crawlers settle in protected areas such as bark crevices, or under the shells of dead scales.

A more practical option may be a dormant application of horticultural spray oil targeted at over wintering nymphs in the spring before budbreak, a strategy that has proven effective for related species. A single application should be very effective if coverage is thorough. Applications

can be made in late winter or early spring as long as the temperature is above freezing at the time of application.

Soil injections or soil drenches with a product containing the systemic insecticide imidacloprid (for example, Merit, or Bayer Advanced Tree and Shrub Control) have proven effective against soft scales such as magnolia scale. Treatments can be made anytime the soil is not frozen, but mid-October and mid-November is probably best, allowing sufficient time for uptake and control of nymphs as they begin feeding the following spring. In the spring, the earlier the application is made, the better as 4-5 weeks may be required for sufficient uptake to occur.

Soil drenches can be applied around the base of the trunk (within 6-12in (15.25–30.5cm) where high concentrations of fine roots facilitate uptake) using a bucket or watering can. Any mulch that may be present should be pulled back first to facilitate infiltration. A small earthen dike can prevent run off from sloped surfaces and concentrate infiltration near the trunk. The amount to apply is based either on plant height (for shrubs), or trunk diameter (for trees). Imidacloprid has very low vertebrate toxicity, however (as with any insecticide) the safety precautions and usage rates outlined on the label must be followed.

In summary, magnolia scale can have a devastating impact on susceptible species. Successful management of this pest can be challenging, but it is possible. The key is a vigilant monitoring program coupled with well-timed insecticide applications, when necessary.

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