Observations of Japanese Maple Scale Activity

and Recommendations for Their Management in Tennessee Nurseries

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PHOTO 1 Adult Japanese maple scale, about 1–2 mm long.

Japanese maple scale (JMS) is an armored scale that was first introduced to the eastern United States in the early part of the 20th century. Adult JMS are off-white and oyster-shaped, measuring only 1–2 mm long (Photo 1). For these reasons, JMS are difficult to see, especially on trees and shrubs that have light colored or mottled bark. Often, JMS are unnoticed until large bark areas are covered (Photo 2). Adult JMS are also fairly cold tolerant and have been spreading southward into warmer states, including Tennessee.

Symptoms of a scale infestation include branch dieback, leaf yellowing, leaf wilting, stunted growth and reduced flowering, all leading to plant death. Individual female scales lay about 25 eggs that are protected beneath the waxy scale body. With at least two generations per year in warmer regions of the U.S., the reproductive potential of JMS is enormous. Within three years, a single male and female scale can produce millions of new scales.

Under natural conditions, scale predators, parasites, disease and sub-optimal environmental conditions limit scale population size. However, field and container areas in nursery production often provide

optimal scale habitat due to a lack of natural predators and the close proximity of suitable hosts.

The host plant range of Japanese maple scale includes trees and shrubs in nearly 30 genera representing 13 plant families. Among them are *Acer, Amelanchier, Camellia, Carpinus, Cercis, Cladrastis, Cornus, Cotoneaster, Euonymus, Fraxinus, Gleditsia, Hamamelis, Ilex, Itea, Ligustrum, Magnolia, Malus, Oxydendrum, Prunus, Pyracantha, Pyrus, Rosa, Salix, Stewartia, Styrax, Syringa, Tilia, Ulmus* and *Zelkova*.

Lifecycle and activity

In Tennessee and southward, JMS lifecycle and activity patterns are not completely understood, complicating management decisions. In Middle Tennessee, scale crawlers (Photo 3) first appear in early May, about when Japanese lilacs (*Syringa reticulata* 'Ivory Silk') flower. The small, purple crawlers emerge and seek feeding sites on plant surfaces. Crawlers are the only JMS life-stage capable of infesting new plants and may be transferred to new hosts by wind and by dispersing onto adjacent, touching plants. Like other species of armored scales, JMS may also be capable of transport on other flying insects or birds.

Crawlers take two to three days to settle, begin feeding and initiate secretion of a waxy surface coating within just a few days. **The crawler stage is most vulnerable and is the stage optimally targeted for contact pesticide control**. The fact that JMS crawlers rapidly secrete their surface wax protection complicates this limited window of opportunity.

Our research

In early 2014, we initiated a first-year scale evaluation in order to monitor and record the JMS activity pattern in a typical Tennessee field nursery. Weekly crawler monitoring helped confirm that JMS has two peaks of crawler emergence — thus two generations per year — in Middle Tennessee. The first, very pronounced generation began the second week of May and peaked the third week of May 2014, between 801-927 growing degree-days (GDD). The second generation

PHOTO 2 Large bark areas covered by Japanese maple scale.

PHOTO 3 Japanese maple scale crawlers appear in early May.

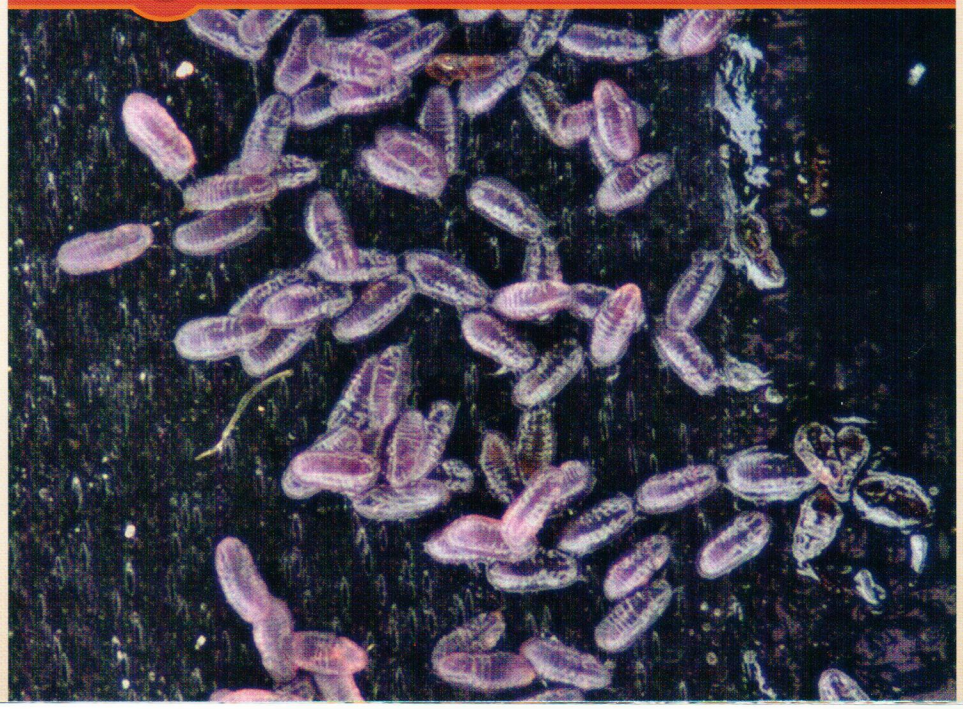
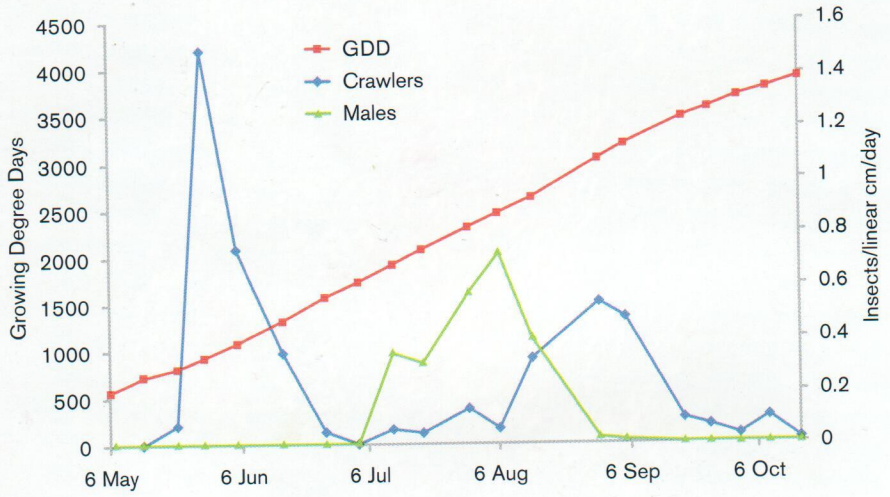


CHART 1 Peak periods of Japanese maple scale crawlers.



involved emergence of fewer crawlers and peaked the last week of August 2014, between 2615-3024 GDD. Importantly, these two generations include overlapping life stages.

While crawler numbers decreased sharply in July, some crawlers remained active throughout the summer, between peaks (Chart 1). In fact, JMS crawlers were active for a total of 24 weeks in Middle Tennessee, from the second week of May to mid-October. A flight of male scales was also noted in July and peaked between 2,306-2,441 GDD. An early season male flight was also detected the first week of April 2015.

Insecticide trial

In addition to monitoring seasonal JMS activity, we tested the ability of a selection of insecticides, including both soil-applied systemic drenches and contact insecticides, to reduce scale numbers. Products chosen were based on current industry recommendations, insecticides currently used by Tennessee growers and suggestions of industry collaborators. Treatments were applied across two plots of field-grown, 2.5" diameter 'Kwanzan' cherry trees. To assess insecticide efficacy, branch samples were taken at 30-day intervals post-treatment, and scales were scored as alive or dead after flipping the scale cover and viewed with a microscope.

Product evaluations

In late March, a 2% dormant oil spray was applied to runoff on randomly selected trees using a backpack sprayer. Thirty days after the dormant oil spray, the percentage of live scale was reduced from 58% to 14% (a 75% total reduction). Systemic insecticide drenches, including Kontos®, Safari® or Discus®, which were applied in April, had mixed results on reducing scale numbers. For example, trees drenched with Kontos®, a spirotetramat product, did not experience a subsequent reduction in the percentage of live scales during the monitoring period. Safari®, a dinotefuran product, suppressed scales for the first 60 days of monitoring, yet the product failed to suppress the second generation of crawlers,

which began emerging between 60 and 90 days after the systemic drench. Discus® suppressed scales compared to controls, to below 10% live counts by the end of the 120 day monitoring period (Chart 2).

Insecticides applied in early June and that targeted crawlers, also yielded mixed results. Fulcrum®, a pyriproxifen insect growth regulator, reduced the percentage of live scales by the end of the season, compared with controls, and fewer than 5% live scales remained. Foliar Safari® application suppressed scale establishment for the first 60 days but again offered no control after the emergence of the second generation of crawlers, as observed with the drench. Applications of 1% summer oil, of M-Pede® insecticidal soap and Kontos® each failed to reduce the percentage of surviving scales (Chart 3).

Interestingly, applications of summer oil and M-Pede® both yielded a 75% increase in crawler numbers during the week following treatment. Following all other treatments, including the controls, crawler numbers began to decline. Summer oil and M-Pede® achieve insecticidal control by mechanically limiting and reducing waxy scale covers. In turn, this treatment may have enabled more crawlers to emerge following the application. Summer oil is often suggested as an adjuvant to complement the application of growth regulators, and it improves surface coverage of the product. From our observation, an additional reason to apply a growth regulator in combination with summer oil when treating JMS would be to facilitate rapid emergence of crawlers from beneath the adult scale covering. Enhanced emergence would enable more crawlers to be contacted by the growth regulator.

CHART 2 Efficacy of spring-applied Japanese maple scale treatments.

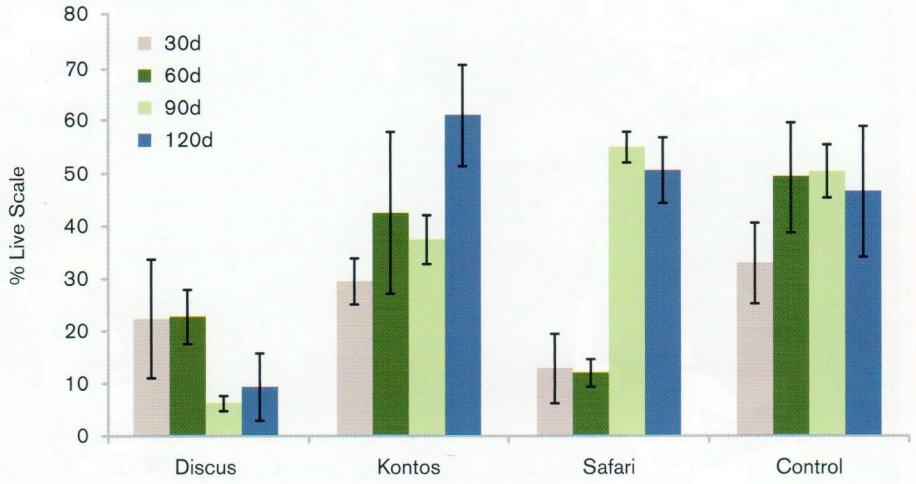
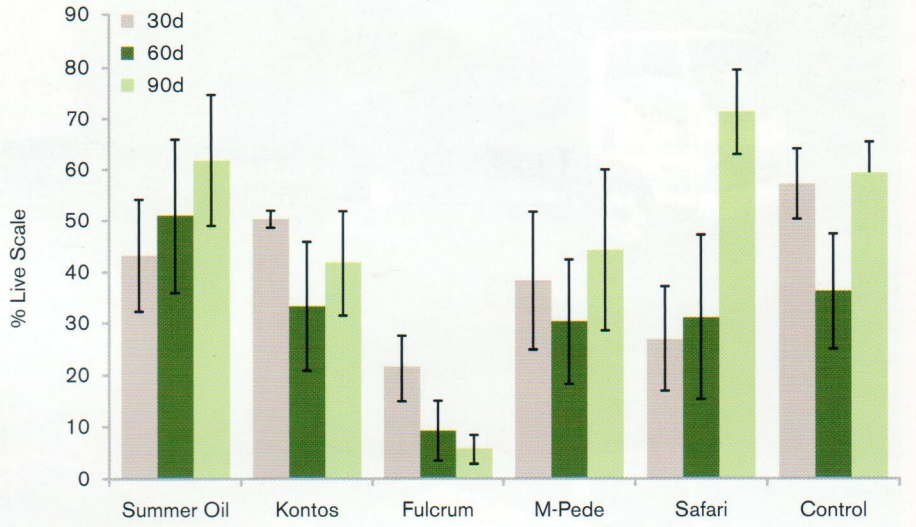


CHART 3 Efficacy of summer-applied Japanese maple scale treatments.



Summary

No individual tested product offered 100% JMS control, yet JMS management may be enhanced when two or more effective treatments are used in combination to target both adults and crawlers. For optimal control, use dormant oil in late fall or early spring, followed later with a growth regulator combined with summer oil. Systemic neonicotinoids can suppress JMS, especially on thick evergreen hosts with canopies that are difficult to penetrate with contact insecticides, but care must be taken not to exceed a.i. limitations in the field (Discus N/G at 0.62 lb./acre/year). Dormant oils are highly recommended because they are relatively inexpensive, easy to use in rotation with other products, aid in preventing the development of insecticide resistance and are a low-toxic, environmentally friendly product.

We plan to continue testing other products, so long as sufficient numbers of scale-infested plants are available. For more information and to participate in JMS trials, please contact Karla Addesso at (931) 815-5155 or **kaddesso@tnstate.edu**.