

Japanese Maple Scale in the Nursery

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Scale insects are serious and damaging pests to trees, shrubs and herbaceous plants. A scale infestation will reduce plant growth, vigor, and yields. There are hundreds of different species of scale and scale-like insects, but only a fraction of them are of economic concern. Some species of scale secrete a waterproof waxy shell that protects them from the environment and water based insecticides, making them difficult to control. In Tennessee nurseries, landscapes, and orchards, there are many different species of scale that you may encounter, but one of the most common and problematic is the Japanese maple scale (*Lopholeucaspis japonica*).

Japanese Maple Scale:

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. Since then, it has spread to many areas of the country, including Tennessee. The reproductive potential of JMS is enormous. In three years, at two generations per year, a single male and female scale have the potential to spawn millions of new scales. Under natural conditions, scale predators, parasites, disease and sub-optimal environmental conditions prevent scale numbers from reaching these levels. Nursery production fields and container yards often provide better habitat for scales due to a lack of natural predators from generic wide spectrum pesticide sprays, and close proximity of suitable hosts.



Image 1 (top). The individual Japanese maple scales are oyster-shaped, 1-2 mm long, and off-white in color.

Image 2 (bottom). If left, un-treated, Japanese maple scale populations can increase exponentially to where nearly the entire surface of the bark is covered.

Japanese maple scale has several characteristics which make it a successful insect pest. One of its advantages is its wide host range, which allows it to spread and establish easily in landscapes and nurseries. The scale's known host range includes trees and shrubs in more than 16 genera in 13 families, including: *Acer*, *Amelanchier*, *Camellia*, *Carpinus*, *Cercis*, *Cladrastis*, *Cornus*, *Cotoneaster*, *Euonymus*, *Fraxinus*, *Gledistia*, *Hamamelis*, *Ilex*, *Itea*, *Ligustrum*, *Magnolia*, *Malus*, *Oxydendrum*, *Prunus*, *Pyracantha*, *Pyrus*, *Rosa*, *Salix*, *Spirea*, *Stewartia*, *Styrax*, *Syringa*, *Tilia*, *Ulmus*, *Zelkova*. Other woody ornamentals are likely to act as hosts.

Japanese maple scale is small, measuring only 1-2 mm long. It is off-white in color and oyster-shaped (**Image 1**). Because of its small size and color, JMS can be difficult to see on many trees and shrubs, particularly those with light colored or mottled bark. Often, JMS goes unnoticed until large areas of the bark are covered (**Image 2**). The scale is also fairly cold tolerant, and has been spreading southward into warmer states in recent years. In colder climates the scale has one generation per year, but it can have two in warmer climates, allowing the populations to increase more rapidly following introduction.

Lifecycle and Activity in Middle Tennessee:

The lifecycle and activity pattern of JMS in the southeastern United States is not completely understood. This makes management decisions difficult. Each female scale lays approximately 25 eggs which are protected under their waxy armor. In middle Tennessee, the first eggs start hatching in early May coinciding with the blooming of Japanese lilac (*Syringa reticulata* 'Ivory Silk') and oakleaf hydrangeas. From the eggs, small, purple, wingless juveniles called crawlers emerge (**Image 3**) to seek out new feeding sites on the surface of the plant. This is the only stage of JMS that is capable of infesting new plants. The crawlers may be transferred to new plants by wind or walking onto adjacent, touching plants. Other species of armored scales have been shown to hitch rides on other flying insects or birds present on infected plants, suggesting another possible means of JMS dispersal.



Image 3. A strong hand lens or dissection microscope is required to see the Japanese maple scale juveniles, also called crawlers.



Image 4. A good hand lens is required to see the winged males. To the naked eye, they can look like specs of debris or tiny gnats on the sticky trap.

Two to three days after the crawlers hatch, they will settle, begin feeding, and start secreting their wax armor. The crawler stage is the most vulnerable stage of the armored scale life cycle and therefore the stage often targeted for control with contact pesticides. The rapid secretion of wax by JMS is an additional characteristic which makes it a challenging pest to control. Many armored scales remain in the unprotected crawler stage for a week or more, allowing more time for direct exposure to the environment. Japanese maple scales have a very short window of vulnerability, both to harmful natural conditions and contact insecticides.

Recent research out of TSU's Nursery Research Center has confirmed that JMS has two crawler emergence peaks (two generations) per year in middle Tennessee fields. Both crawlers and winged males (**Image 4**) were monitored by placing sticky traps made of yellow vinyl tape coated in a thin layer of petroleum jelly (**Image 5**) on infested limbs and branches. The first generation of crawlers was very pronounced, beginning the second week of May and peaking the third week of May, between 801-927 growing degree days (base 50). The second generation was less pronounced and peaked the last week of August between 2615-3024 growing degree days. The two generations are overlapping, and while crawler numbers decreased sharply in July, there were still small numbers of crawlers active throughout the summer between peaks (**Chart 1**). Japanese maple scale crawlers were active for a total of 24 weeks, from the second week of May to mid-October. In 2014, we detected a flight of males in July which peaked between 2306-2441 growing degree days. An early spring male flight was observed in 2015 in the first two weeks of April, and began before 360 growing degree days. In middle Tennessee, JMS appears to overwinter as immature second instars, not mated females. Preliminary work at TSU's Nursery Research Station suggests that JMS may begin activity much earlier in container production held under winter cover.

Control:

An annual application of dormant oil has been shown to provide good control for the majority of scale species with complete coverage. In our evaluation, 30 days after dormant oil was sprayed, the percent of live JMS significantly fell from around 60% to 15% (**Table 1**). However, many nursery growers have reported that a single, annual, application of dormant oil is only providing satisfactory JMS control after years of observations. Other scale species that have only one generation per year might be effectively controlled with this one annual application of dormant oil, but JMS has two generations per year. JMS is also small, able to hide in bark fissures and under mulch and leaf litter around the root zone. The individual scales that escape



Image 5. Simple sticky traps are used to monitor the Japanese maple scale, and other scale species, to determine when the mobile crawlers become active.

the dormant oil spray are able to reproduce not just once, but twice, meaning that by the end of the season, JMS populations can potentially rebound to the level they were prior to the dormant oil spray. Dormant oil sprays are still effective and recommended but for JMS, but another control method should be employed to gain control of the infestation.

From our foliar insecticide sprays, one of the most effective chemicals for reducing the scale population was to spray an insect growth regulator (IGR) such as Fulcrum® (pyriproxifen being the active ingredient). IGRs work best on scale when sprayed directly on the crawlers, thus confirming the importance of monitoring your scale infestation by setting sticky traps and waiting for the crawlers to emerge. IGRs are also less toxic to beneficial insects like lady beetles, lacewings, and honey bees because these insects are already in their adult stage. Other IGRs include Distance® and Talus®. A 0.5-1% summer oil application is recommended in combination with the IGRs because it aids in the spread of the chemicals. Additionally, we have shown that an oil application will loosen the scale covers, allowing for a more synchronous emergence of crawlers - bringing more of them in direct contact with the IGR.

JMS can also be managed through the use of soil applied systemic drenches. Discus® (imidacloprid being the active ingredient) provided the best results from our systemic soil drenches at the end of our first year of monitoring. Imidacloprid drenches do significantly reduce the number of live scales but they do not completely eliminate them in the first year. By year two, however, imidacloprid treated trees had no visible signs of JMS. For thick evergreen plants like hollies and southern magnolias which are difficult to penetrate with dormant oil, a systemic drench may further reduce the scale population. Pesticide trials for this insect are ongoing, and new findings will be added to this publication as they become available.

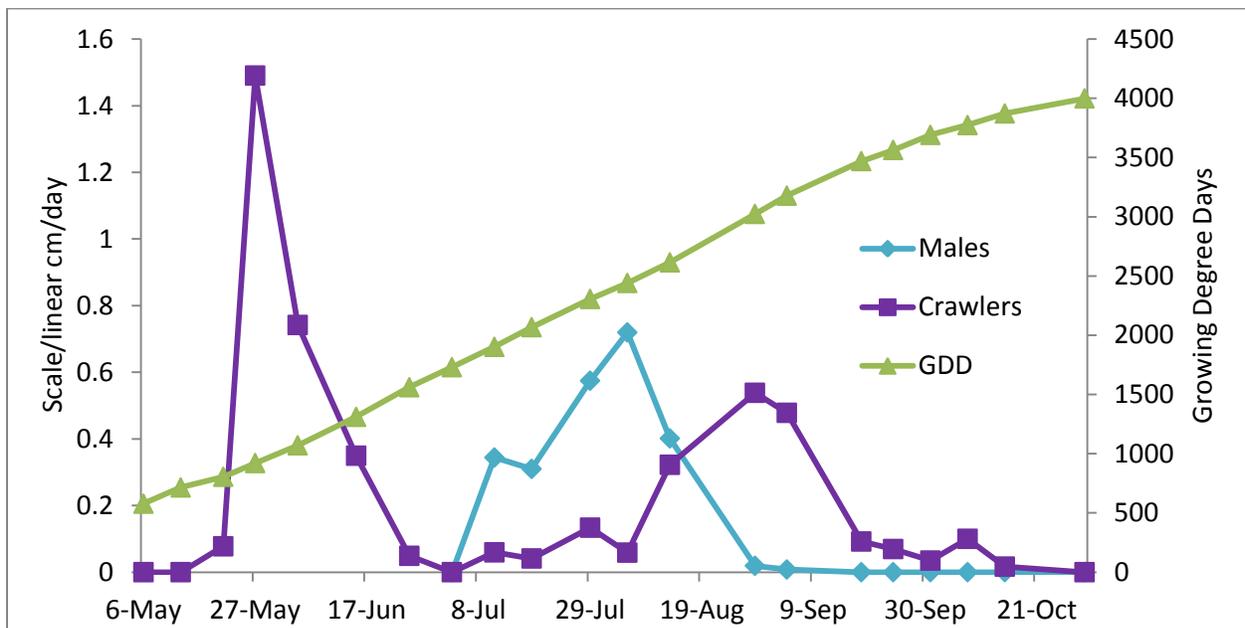


Chart 1. In 2014, the first generation of JMS crawlers (purple line) began to emerge between May 13th and May 21st (805 GDD) in McMinnville, TN with peak activity occurring the following week (921 GDD). Note that the second generation of crawlers overlapped slightly with the first generation; it peaked between August 13th and August 29th (3,000 GDD). Winged males

(blue line) began to emerge between April 6th and April 13th (350 GDD) (obtained through 2015 monitoring – not displayed on the chart above) and again on July 3rd.

Table 1. Chemical Treatment Evaluations

Product	Application Timing	Stage Effectuated	Control Level
Dormant Oil	Spring/Fall above 60°F	Adults/2nd instars	Good for suppression; fall application will increase winter mortality; spring application will suppress first generation reproduction
Insect Growth Regulator (Fulcrum, Distance, etc.)	Summer; peak crawler activity in late May/ late August	Crawlers	Excellent; IGRs prevent immature crawlers from reaching adult stage
Chlorpyrifos (Duraguard ME, etc.)	Summer; peak crawler activity in late May/ late August	Crawlers	Very Good; control equivalent to IGRs in one trial
Imidacloprid (Discus N/G, etc.)	Spring drench	Adults/Crawlers	Very Good; slow acting suppression in first year; control in second; may prevent crawler establishment
Dinotefuran (Safari SG 20, etc.)	Spring drench	Adults/Crawlers	Quick suppression of first generation; ineffective after 90 days in field trees; use in combination with other control methods; summer trunk sprays were ineffective
Summer Oil	Summer; peak crawler activity in late May/ late August	Crawlers	Poor; use 0.5 - 1% oil in combination with IGRs and other insecticides to loosen scale covers; ineffective control when used alone
Insecticidal Soap (M-Pede, etc.)			No control observed

Acetamiprid (Tristar 8.5 SL)	Summer; peak crawler activity in late May/ late August	Crawlers	Poor; killed natural enemies, populations rebounded
Spirotetramat (Kontos)	Spring Drench	Adults/Crawlers	No control observed
Cyantraniliprole (Mainspring)	Spring Drench	Adults/Crawlers	No control observed
Chlorantraniliprole (Acelepryn)	Spring Drench	Adults/Crawlers	No control observed

For additional information, contact your local nursery specialist office at:

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College of Agriculture, Human and Natural Sciences
3500 John A. Merritt Blvd., Box 9635
Nashville, TN 3720 -1561
<http://www.tnstate.edu/extension>

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Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade, brand, or active ingredient names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar and suitable composition, nor does it guarantee or warrant the standard of the product. The author(s) and Tennessee State University assume no liability resulting from the use of these recommendations.



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