

# Improving Pest Management with IPM: A Case Study with Armored Scale

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As the days get longer and time gets shorter it is easy to forget some basic IPM principles. This is especially true when pest managers are unclear how IPM will improve pest control and result in more attractive plants and more satisfied clients. To try and make this connection, we will examine how IPM improves, and is essential for, control of euonymus and tea scale. Armored scale have a reputation as being difficult to manage on nursery and landscape plants. This reputation is perpetuated by management attempts that are not timed or applied properly, or use inappropriate products. Learning to manage armored scale effectively provides a case study in Integrated Pest Management because disregarding these principles to save time could actually increase scale abundance and damage.

I chose these scale species because they occur on similar plant species, have similar lifecycles, are managed in a similar manner, and occur on some of the most common plants grown and installed in North Carolina. Euonymus scale, *Unaspis euonymi*, occurs primarily on *Euonymus* sp. but can be found on other broadleaf evergreens such as camellia, gardenia, and holly. Female euonymus scale is small (1/16th inch), dark gray, and oyster shaped (figure 1). They occur on the underside of leaves and on the trunk and stems of host plants. Female Tea scale, *Fiorinia theae*, are small (1/16th inch), dark gray, and boat shaped (figure 2). They are found primarily on camellias but also hollies and euonymus. Tea scale feeds primarily on the underside of leaves and do not infest plant stems. The males of both

species are softer and white (figures 1, 2). They are typically more abundant than females. Although they do not feed or directly damage plants their white ashy appearance is very noticeable.

Female scale feed by inserting microscopic, thread-like mouth parts into the plant and sucking out fluids. This results in yellow splotches on the top of leaves wherever there is a scale feeding underneath. Over time feeding by these species will result in leaf drop, a general unhealthy, discolored appearance, and the death of branches or entire plants.

## **Monitoring:**

Monitoring includes scouting to determine if pests are present and when they are active or vulnerable. Euonymus and Tea scale are relatively easy to scout because they make yellow blotches on the tops of leaves. However, scale covers, like turtle shells, do not disappear when the insect dies. Therefore, the first thing to do is flip the over female covers to determine if the scales are alive. A live female will be an orange blob that releases juice when you smash it. If no live scales are present it is important to educate clients that these will eventually weather away but require no further treatment.

When pests or damage are detected it is essential to identify the pest correctly. This is especially important for scale insects because many products labeled for soft scale are not labeled for and are not effective for armored scale. Therefore, time and money will be wasted if pests from these groups are confused.

## **Decision making:**

Deciding if intervention is

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required will start with whether live scales are present. If just a few leaves have scales, as indicated by yellow spots, picking these leaves off could prevent an outbreak and any further treatment. For larger, established infestations more aggressive intervention will be required. You will have to decide which chemical or other intervention to use and when to apply it.

The hard waxy cover protects scale from contact with insecticides. Therefore, if they are mistaken for another pest, such as whitefly, and treated with a contact insecticide the scales will live to produce another generation later that year. Crawlers can be killed easily because they are small and unprotected by a cover. Thus, nearly all products specifically target this stage. Monitoring and knowledge of the insects lifecycle will help determine when crawlers are present.

Euonymus scale overwinters as adult females which lay eggs under the cover then die. Eggs hatch and crawlers emerge from under the cover and move about the plant in April or May. At this point the whole population is extremely vulnerable because the crawlers are exposed and all the adults

have died. Tea scale has overlapping generations so crawlers and adults are present almost all the time. Thus applications will kill crawlers but may leave some adults. Follow up later in the year to determine if the population is growing.

Euonymus and Tea scale have 2 – 3 generations per year. Therefore, if crawlers are not present when you miss the spring emergence you will have another opportunity later in the summer. Euonymus scale crawlers emerge about every 60 days.

### Intervention:

Scales are often treated with broad spectrum insecticides such as pyrethroids or organophosphates that kill beneficial insects. Horticultural oil is very effective at killing crawlers as long as it hits them. Therefore, coverage is important with these oil products.

Some newer products are available that offer systemic activity for longer control and are softer on beneficial (Table 1). Systemic or translaminar activity allows the product to be absorbed into plant tissue. Product that lands on top of the leaves will be absorbed into the tissue and kill insects feeding

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below. Others can be applied as a drench to be taken up by the roots. Thus, it reduces the need for thorough coverage on difficult to spray plant parts such as the underside of leaves. It also means that some products will kill those adult scales that are so well protected from contact insecticides.

Another intervention option is removing problem plants. Plants that are severely damaged from years of scale infestation or that require yearly treatment to keep scale free may not be worth the work. Consider replacing with a newer *Euonymus* variety that is more resistant to scale or with another plant altogether. Research has found *Euonymus fortunei* to be less susceptible to scale infestations than *E. japonicas* and *E. kiatschouicus* species. In addition, variegated *Euonymus* varieties increase scale fecundity and survival more so than green varieties.

#### Conserving beneficial insects:

Conserving beneficial insects is not just an environmentally responsible thing to do. It can improve control of pests such as scale. Research at the University of Maryland documented that organophosphate insecticides, diazinon (Diazinon) and chlor-

pyrifos (Dursban), drastically reduced the abundance of predators and parasitoids in home landscapes. Many of the affected parasitoids specialize on killing scale insects. These contact insecticides could not penetrate waxy covers to kill scales but did kill natural enemies that specialize on killing scales. The result was an increase in scale infestations where these products were applied over the long-term. That is not to say that these products could not kill scale if used properly. A single application when crawlers were present would have killed most of the scale. However, repeated calander-based, 'preventative' applications had the opposite effect.

Remember, an insecticide application will never kill every individual of a pest population. It won't kill resistant individuals or those that were in a flower head or other hard to reach place on the plant. It is the job of natural enemies to clean up after and between insecticide applications. Otherwise, a few individuals that escape an insecticide application can rapidly reach damaging levels.

Hopefully, it is clear how some effort monitoring and identifying *Euonymus* and Tea scale will

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ultimately save time, money, and plants in the long run. The same concepts outlined here also apply to other armored scale species. Although they will have a different lifecycle and window of vulnerability the products will be the same. There are many pests that cannot not be managed effectively without applying IPM principles. Remember cool season mites from last month's article? Scouting is essential because by the time damage appears in summer, the mites are long gone.

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Recommendations for the use of chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products does not imply endorsement by the North Carolina Cooperative Extension Service nor discrimination against similar products not mentioned. Individuals who use chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label.

**Table 1.** Some of the insecticides labeled for use on armored scale in ornamental systems that are more compatible with beneficial insects than pyrethroid and organophosphate products.

Active ingredient	Trade name	Scale stages affected	Labeled location <sup>1</sup>	Activity	Compatible with beneficials
acetamiprid	TriStar	Crawler, adult	G, N, L	Translaminar Systemic	Yes
buprofezin	Talus	Crawler	G, N, L	Contact	Yes
dinotefuran	Safari	Crawler, adult	G, N, L, I	Systemic	Yes
pyriproxyfen	Distance	Crawler	G, N, L, I	Translaminar Systemic	Yes

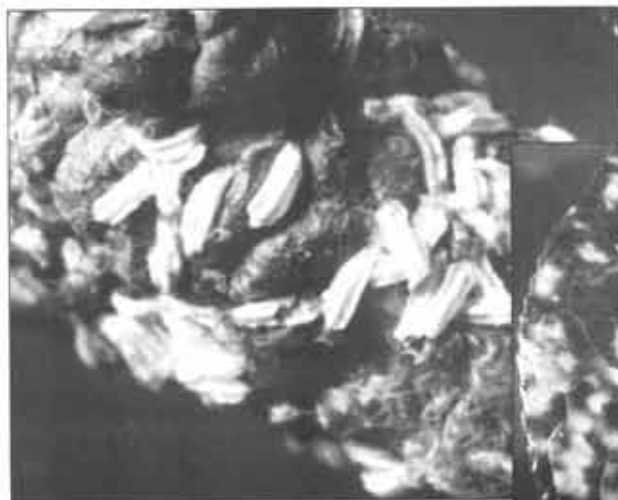


Figure 1. Female (gray) and male (white) *Euonymus* scale.



Figure 2. Adult female (gray) and male (white) tea scale with crawlers (tiny yellow).

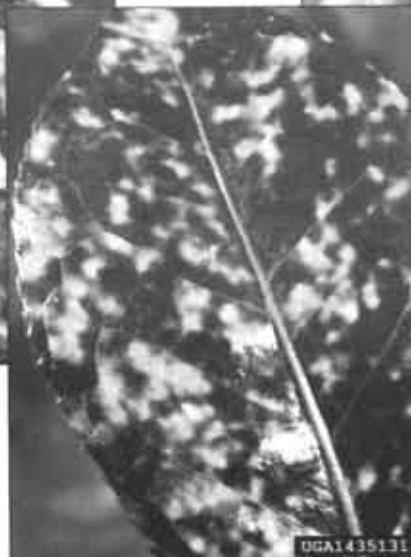


Figure 3. Typical yellow leaf blotches that result from *Euonymus* and Tea scale feeding.