

FEATURES

Compatible tools

Horticultural oils and soaps play important roles in reducing pest pressure and lowering risks for a biological control program.

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Brown soft scale (*Coccus hesperidum*), a soft scale, on a fern.

Photos by SD Frank

There are many insecticides and miticides on the market and more new products are delivered each year. Each new product may offer improved efficacy, lower human toxicity or both as selling points compared to older products. Increasingly, new insecticides and miticides also strive for compatibility with biological control programs by combining efficacy against pests with safety for natural enemies.

These are great strides and most products arriving on the market lately are much safer for everyone and everything involved than the old organophosphates, organochlorines and other products they replace. However, the rapid introduction of these advanced insecticides and miticides should not overshadow horticultural oils and insecticidal soaps that have always been, and continue to be, essential tools in an IPM program.

Horticultural oils and insecticidal soaps have been used for decades, even centuries, to manage pests in all sorts of crops. Horticultural oils are refined petroleum products. If you have been in the business for a while you may recall learning about dormant oils, which were only applied to dormant plants in winter, and summer oils which were lighter weight and applied during the growing season. This is not the case anymore. Today, most horticultural oils are highly refined to improve mixing

and application, and to reduce phytotoxicity. The same horticultural oil can be applied to dormant plants and growing plants, just at a higher rate to dormant plants.

Insecticidal soaps are potassium salts of fatty acids. I don't know what that means either, but I know they are different from soap you use to wash your face or your dishes. Yes, there are many recipes online to make your own insecticidal soap, but to have confidence in the efficacy and crop safety of what you are spraying, it is worth purchasing the real thing. An advantage of insecticidal soaps and horticultural oils is that they are relatively inexpensive. So, spring for a reputable product.

The process

Horticultural oil kills insects and mites primarily by coating them and clogging their spiracles, which are pores they use to breathe. With clogged spiracles the pests die of suffocation. Insecticidal soaps disrupt cell membranes in the pests but also suffocate them. Thus, these are strictly contact pesticides. If you don't coat the pest it will not die. Therefore, thorough coverage of plants and pests is essential for efficacy. This can be improved by small droplet size such as from an airblast sprayer that coats the top and bottom of leaves and also forces droplets into the nooks and crannies of bark, leaf junctures and other places where pests hide.

We have come to rely on systemic or translaminar, long-lasting, pesticides for managing insect pests like aphids, whiteflies and mealybugs. Horticultural oils and insecticidal soaps are not systemic or long-lasting. In fact, once oil or soap dries on a plant it has no killing power. So why use them?

The advantages of horticultural oils and soaps comes from their low cost, safety for people and natural enemies, and, in many cases, good efficacy. The human safety of these products means that restricted entry intervals (REI) can be four hours or less, depending on the product and label, so you can get back to work sooner. Another advantage of their safety is that they can be integrated into biological control programs. They do not leave a toxic residue on plants so natural enemies can be released the day after an application is made. This allows you to reduce pest populations and start clean to give natural enemies the best chance to perform. In addition, many natural enemies are less susceptible to oils and soaps than the pests you target. So even spot applications with natural enemies present should kill more pests than predators.



Euonymus scale (*Unaspis euonymi*) on euonymus leaves.

Targeted pests

Every pesticide has disadvantages. Horticultural oils and soaps are primarily effective against small, soft and slow arthropods. Luckily this includes a lot of the key pests you battle including aphids, whiteflies, mealybugs, thrips, spider mites and scales. Horticultural oils and soaps are less effective against large or hard-bodied pests like beetles and caterpillars. However, even for the ideal soft and slow pest like aphids, timing is important. This is because it is easier to reduce small populations than large populations and easier to kill small young pests than older ones that may be less

susceptible (this applies to all pesticides). For example, horticultural oil or soap will be better at killing young spider mites than older ones. Even though young and old mites are both relatively soft and slow, young mites have a softer exoskeleton and less hair to block the product and are easier to suffocate because they are smaller. Think about mealybugs. They get waxier as they get older and are thus better protected. Not mention that heavy mealybug infestations contain so many bugs that they are layered on top of each other and have found their way into every hidden spot on the plant so more of them are protected from your application.

Horticultural oils and insecticidal soaps are effective against a similar array of pests. Remember small, soft and slow. Scale insects are a unique group of pests that are frequent targets of oil and soap applications but even though they are small and slow may be covered in tough armor. Recent research from Cliff Sadof's lab at Purdue University shows that the type of scale insect matters when choosing between horticultural oil or insecticidal soap. The reason has to do with scale insect morphology which we should cover very quickly.

Scale insects are common pests that feed on plant fluids. The most common types are armored scales that have a hard, waxy cover and soft scales that have, you guessed it, a softer cover. Scale insects do not move much. Armored scales move once in their life as newly hatched nymphs called crawlers. These tiny scales crawl from beneath their mother's armor, with no cover at all, to find a place to feed. Then they settle, insert their mouthparts into the plant, and start sucking out juices. Many soft scales can move a little as adults, but they still have tiny unprotected crawlers that hatch from eggs and have to find a place to settle and feed.

What does this mean for management? Armored scales like euonymus scale, pine needle scale, false oleander scale and many others have a cover with a high percentage of wax. Wax repels water. Thus, horticultural oil is more effective against armored scales than soap which does not cling to or penetrate armored scales' waxy covers. In contrast, insecticidal soaps often perform better on soft scales. Their covers contain less wax and more sugars from the honeydew they produce. Thus, the water and soap solution can coat and penetrate them better than an oil solution that would be repelled by the water content of soft scale covers.



Gloomy scale

(*Melanaspis tenebricosa*) coated in oil on a red maple trunk.

IPM toolbox

The critical thing for managing scale insects and most pests is classic IPM techniques of scouting, monitoring, and record keeping to determine when pests are present and in susceptible life stages.

So even though armored and soft scales have different susceptibility to horticultural oils and insecticidal soaps they both have tiny unprotected crawlers. These can be killed by anything. In the wild, rain is one of the greatest causes of scale crawler mortality. So, if you are monitoring for scales and notice when eggs are hatching any product will do. Then you may want to follow up with another application in a week or two to reduce the abundance of those that hatched after your first application.

Horticultural oils and insecticidal soaps can be valuable tools in your IPM toolbox. They may not be as effective or long lasting as other more toxic pesticides, but the price is right. Oils and soaps have important roles to play in reducing pest pressure and lower risks for you and your workers and your biological control program.

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