



## Horticultural Oils – What a Gardener Needs to Know

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### Introduction

As long as humans have been raising plants for food, they have been trying to control pests. Sulfur compounds were applied as far back as 2500 B.C. In 350 B.C., Romans used oil and ash for pest control. The Chinese used soap to control pests in 1100 A.D. By the 1880s in the U.S., horticultural oils were used regularly as dormant sprays on fruit trees. Horticultural oils continue to be applied today for pest control.

### What Are Horticultural Oils?

Horticultural oils are pesticides that control insects, mites and some plant diseases. They are specifically designed to control plant pests. Commercially available horticultural oils are highly refined petroleum products that are filtered and distilled to remove compounds that can harm plants. They are 92 percent to 99 percent pure. After distillation and filtration, they are then formulated with a mixing agent (emulsifier) to blend with water for ease of application. In addition to petroleum-based products, plant-based horticultural oils are also available. These may contain soybean, cottonseed, sesame, neem or other oils. However, plant-based horticultural oils are less refined and may burn plants more readily (phytotoxicity).

### List of Terms

**Delayed Dormant Oil** – Oil applied when buds are showing 1/16 to ½ inch of green.

**Dormant Oil** – Oil applied to woody plants during dormant stage of growth (winter) before buds open in the spring at a higher concentration than summer oil. Refers to season of application.

**Horticultural Oil** – A pesticide used to control insects, mites and some diseases. May be petroleum- or plant-based.

**Nonselective** – Kills all insects, including beneficial insects.

**Phytotoxicity** – Plant injury due to a toxic effect by a compound.

**Summer Oil** – Oil applied when plants are in leaf at a lower concentration than dormant oil. Sometimes called superior oils. Refers to season of application.

**Superior Oil** – Oil that doesn't contain sulfur and can be applied when plants are in leaf. Also called supreme oil.

**Supreme Oil** – Highly refined oil. Similar to a superior oil.

Historically, horticultural oils were called “dormant” oils because they were sprayed only when plants, particularly fruit and shade trees, were in a dormant stage of growth before buds opened in the spring. As refining processes improved, “superior” oils were developed. These were lighter weight than the previous dormant oils and contained no sulfur. These were less likely to burn plants than traditional dormant oils. Because of this, superior oils mixed in the proper concentration can be applied, with some precautions, during the growing season when plants are in full leaf. They are also called “summer” oils, referring to the time of year for treatment. The term “dormant” no longer refers to the type of oil, but instead now refers to the seasonal timing of the application. “Supreme” oil is another term for superior oil.

Some common brand names of petroleum-based horticultural oils are Volck®, Sunspray® or Ultra-Fine®. An example of a plant-based oil is Garden Safe® Neem Oil Extract.

### **What Pests Are Controlled?**

Oils are most effective against exposed eggs, immature stages and soft-bodied adult insects. These include scales, aphids, whiteflies, mealybugs, thrips, leafhoppers and arachnids, such as spider mites, on fruit or shade trees and on many ornamental plants. Oils are also used to control diseases such as powdery mildew, downy mildew, rust and leaf spot.

Besides being insecticides, horticultural oils can also be used as fungicides. The oil reduces the ability of the fungi to grow. By killing insects that spread viruses, viral diseases can be reduced.

### **How Do Oils Work?**

Oils control insects with direct contact. The insect must be present for the oil to work. Complete coverage of the insect population is required for the treatment to be effective. The oil has no effect after it has dried. When horticultural oils are sprayed onto the plant, the oil covers any exposed insects or eggs and suffocates them by clogging their breathing tubes.

### **Neem Oil**

Neem is a naturally occurring botanical pesticide found in seeds from the neem tree. It is made up of many components, but azadirachtin is the most active insecticidal ingredient. It reduces insect feeding, growth and egg laying. It also acts as a repellent. It is effective against immature stages of insects.

Neem seed oil without the azadirachtin works as a protectant against insects, mites and fungi. It reduces fungal infection by preventing spore germination and penetration.

Neem oil, with or without azadirachtin, is practically non-toxic to birds, mammals, bees (if applied late evening or early morning when bees are inactive) and plants, but is slightly toxic to fish and other aquatic animals.

Neem products may be registered for fruits, herbs and vegetables in addition to woody plants.

Repeat applications may be needed at seven- to 10 day intervals for fungi and more often for insects.

(Cranshaw & Baxendale, 2013; NPIC, 2012; Pundt, 2000; UC IPM, 2012.)

This is a nonselective process, with the oil killing almost any insect it covers and reducing hatching success. In addition, the oil may disrupt how an insect feeds or interfere with cell membranes or normal metabolism. In the winter, dormant sprays only kill overwintering insects and exposed eggs.

### **What Are the Advantages to Using Horticultural Oils?**

- Oils are relatively safe for humans and wildlife.
- While they are nonselective, smothering most insects they contact, including beneficial insects, oils evaporate quickly, degrade rapidly and leave no toxic residue. This makes them less disruptive to beneficial insect populations than chemical insecticides.
- Since the mode of action is mechanical (smothering) rather than chemical, there is less likelihood of insects developing resistance to the oils.
- Oils generally need no special equipment for application, other than standard garden sprayers.
- Some formulations have been approved by the Organic Materials Review Institute and can be used by organic gardeners.

### **What Are the Disadvantages to Oils?**

- Horticultural oils can cause skin or eye irritation to humans.
- They are toxic to fish and some are toxic to bees unless sprayed in early morning or late evening.
- They can burn sensitive plants.
- Spraying with oil at a dormant concentration after bud break when leaves have emerged may kill the young leaves, so the correct rate must be used at the appropriate time of year.
- Since the oil does not work once it dries, it has little residual effect; new infestations are not controlled by a previous application.
- Blue-colored evergreens can lose their blue color because the oil removes the bluish material from the needles.
- Horticultural oils should not be used during temperatures in the 90s, or on drought-stressed plants or new transplants.
- Oils should not be applied during freezing temperatures.
- They should only be applied when plant surfaces are dry, but plants are well irrigated.
- They should not be used on new growing shoots except as mentioned under "Dormant or Delayed Dormant Application."
- Fall treatments may cause winter injury.
- Oils cannot be combined with sulfur products or sprayed within 30 days of a sulfur application.

## **Dormant or Delayed Dormant Application**

There are two methods for dormant horticultural oil application. One is to apply it before the buds break or show any color. However, this can speed up spring bud development, making buds more susceptible to frost and cold temperature damage. The second method is the delayed dormant application. This occurs when buds are open at the tip showing 1/16-inch to ½-inch of green leaf tissue.

Dormant oil should not be sprayed 48 hours before or after a freeze occurs or is predicted.

Usually a higher rate of oil is mixed and applied during dormant or delayed dormant than with a summer application. The proper rate is listed on the label.

**Always read and follow all label directions for proper timing and rates** dependent on the stage of the life cycle of the pest. Apply only when the pest is present.

Sufficient water must be mixed with the oil to cover all the bark cracks and crevices. According to University of Nebraska-Lincoln Extension, a 20-foot-tall tree will probably require 4 gallons of water for complete coverage.

### **Sensitive Plants\***

- Junipers
- Cedars
- Maples — particularly Japanese and red
- Redbud
- Smoke tree
- Spruce — particularly dwarf Alberta

\*Other plants may also be sensitive. Test a small portion of the infested plant prior to spraying the entire plant to determine if the plant is sensitive. Different plants exhibit sensitivity at different times of the year.

### **Conclusion**

Horticultural oils work well to control insect pests and, if used properly, can be a less toxic approach than chemically based insecticides.

A dormant or delayed dormant application can kill many of the overwintering insect pests that would normally plague plants in the late spring, such as aphids. Treating in the winter or early spring can save time and avoid later plant problems.

Summer applications at the correct rate provide excellent pest control with the least amount of damage to beneficial insects or the environment.

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