

CHEMICALS FOR ARBORISTS OTHER THAN PESTICIDES¹

by Larry J. Kuhns

Surfactant and spray adjuvant are terms that are frequently misused and misunderstood. The cause of this problem is the large number of materials available that fall into these categories but have great differences in activity. My objective is to define these terms for you and list the specific types of chemicals available and their recommended uses.

First, an *adjuvant* is a chemical used to aid in the operation or improve the effectiveness of a pesticide. By using the proper adjuvant it is often possible to use certain chemical pesticides in a tank mix that otherwise would not be compatible.

Surfactant is an abbreviation of 'surface active ingredient'. It refers to materials that are active on the surface of water molecules, wettable powders, emulsions, or any other component of a spray mix. Most adjuvants are surfactants. But these are general terms and should not be used in recommendations. Too often instructions will read, "add a surfactant" to your tank when applying a certain pesticide. This is not enough, you must know what type of surfactant. The surfactants for which arborists have the most use are wetting agents (also called spreaders), stickers, compatibility agents, crop oil concentrates, anti-transpirants, and foam suppressants.

A *wetting agent* is a substance which when added to a liquid increases its spreading and penetrating power by lowering the surface tension of the liquid. Its effectiveness is measured by the amount it increases the spread of a liquid over a surface. Leaf and stem surfaces have a waxy cuticle covering them. This surface, like wax on a car, repels water to varying degrees, depending on the plant species. When spray droplets bead up on the leaf surface, like water on a recently waxed car, a considerable area is left unprotected. A wetting agent lowers the surface tension of spray solutions and causes them to spread over the entire plant surface.

Incomplete wetting is mainly a problem with wettable powders, as emulsifiable concentrates already contain an emulsifying agent which also acts as a wetting agent.

In addition to increasing the coverage of pesticides, wetting agents have many other uses. They will improve the penetration of water in heavy, compacted soils, limiting runoff and reducing the length of time they need to be irrigated. They help insecticides penetrate thick layers of thatch to improve control of turf insects. Wetting agents limit or prevent dew formation on grass, which may be useful to golf courses that have heavy early morning use. They are also very useful for wetting peat moss or other hard to wet soil-less growing media.

There is a tendency to overuse a material like wetting agents that have a wide range of uses. There are several limits or restrictions on their use that must be understood. First, use of excessive amounts may cause plant injury or insufficient pesticide residue. Also, some materials either do not need a wetting agent added, like emulsifiable concentrates, while others already have them included. It is very important that you read the label on your pesticides. They will indicate whether or not a wetting agent is included.

Spreader are nothing more than wetting agents, while *spreader-stickers* include a material that increases the retention of sprays on plants by resisting the effects of wind, water, mechanical, and chemical action. Most stickers produce an elastic film on leaves which slowly releases the pesticide as it breaks down or is chewed on by a pest. The obvious benefit of spreader-stickers is they hold the pesticide in place longer, reducing the number of applications that are needed.

Compatibility agents are chemicals that allow you to use pesticides and/or fertilizers in a tank mix that otherwise would separate, making proper application impossible. Incompatibility problems

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often occur when a fertilizer or emulsifiable concentrate is included in a tank mix. Fertilizers affect the pH of the mixture and many chemicals are affected by the phosphorous in them. Emulsifiable concentrates often repel wettable powders and cause them to settle out of the mixture.

Over agitation of a tank mix, especially the last half of the volume, may cause flocculation; binding of the particles to each other and settling out. Adding pesticides in the wrong sequence can cause incompatibility problems. The proper sequence is wettable powders, flowables, water solubles, and emulsifiable concentrates.

The compatibility agent can be added before the pesticides, or premixed with the pesticides, then added. The pesticides and compatibility agent would be premixed if they were going to be added to a fertilizer solution that was especially high in phosphorous.

It is a good idea to keep some of this material on hand because it may get you out of trouble someday. It has some effect on a mixture even after a compatibility problem occurs. For instance, it could be used to open a sprayer plugged up with a pesticide that settled out. Another use would be if you prepare a tank mix and then have rain or mechanical problems and have to wait a day to spray. Adding a compatibility agent to the mixture will help keep the materials in suspension.

A *crop oil concentrate* increases pesticide activity by increasing the penetration of the pesticide into plant tissues. It also has the properties of a wetting agent and provides even distribution of the pesticide over the plant surface. Crop oil concentrates are most useful when applying systemics which are active after they enter the plant.

Foam suppressants do exactly what their name states: they prevent the foaming that sometimes occurs when preparing a spray solution. They eliminate the mess created when a material produces a lot of foam that pours out of the tank when you are trying to fill it. Foam suppressants come in aerosol spray cans, and a little goes a long way. A few short bursts of spray in the water before mixing, or on the foam after, will eliminate the problem.

Anti-transpirants are materials that form a film

over leaves which permits the passage of oxygen and carbon dioxide, while resisting the movement of water out of the plant. There are many different uses for anti-transpirants. They may be used to prevent winter burn of evergreens. In an overwintering house only one application is needed because the plants are protected from the weathering effects of wind and rain. Outdoors, two applications are needed to provide protection throughout the winter. Though anti-transpirants provide some protection, they can not totally compensate for poor plant placement. A holly planted on a windy exposed site will stand winterburn in northern states.

Anti-transpirants can be used to reduce transplant shock when moving trees that are in leaf. Some people recommend dipping the tops of evergreen seedlings in a solution containing an anti-transpirant prior to planting. When doing this, extreme caution must be used to assure none of it gets on the roots.

When shipping trees and shrubs, anti-transpirants can help prevent desiccation between waterings. They have also been used to help Christmas trees maintain their needles after cutting. Where air pollution, salt sprays, or animal urine is a problem, anti-transpirants can be used to help protect the plants.

They should not be sprayed on blue varieties of evergreens (junipers, spruce, etc.) because the chemical that gives them the blue color will dissolve and the plants will end up green.

Anti-transpirants are thick materials that may be hard to mix in cold water. To make their mixing easier, premix them in warm water before adding them to the spray tank. It is important to flush and clean a sprayer immediately after applying an anti-transpirant to avoid clogging nozzles and screens. It will dry quickly.

As you can see, the terms adjuvant and surfactant include a variety of chemicals with a wide variety of applications. To make the best use of them and your pesticides, make sure you understand all of the materials that are available to you and what they will do.

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