Spreading Your Time and Money Using Adjuvants

By Helen M. Stone

Although adjuvants may not be the most glamorous horticultural topic, getting to know these useful additions can aid you by cutting labor and material costs while enhancing chemical efficacy. Webster's Dictionary defines an adjuvant as, "A substance added to a prescription to aid the operation of the principal ingredient." In simple words, adjuvants can make your "plant prescriptions" work better.

Technically, then, surfactants, spreaders, stickers and wetting agents can be thought of as adjuvants. They are added to emulsifiable concentrates, flowables, wettable powders, soluble powders and other chemicals during the mixing process. They can extend, enhance, concentrate, reduce drift or disperse the liquid formulation to make it more effective. However, used incorrectly, they can cause phytotoxicity or even damage plant roots.

Water is a unique compound because of a phenomenon called hydrogen bonding. Hydrogen atoms in the water molecule have a strong attraction to other hydrogen atoms in other water molecules. However, these charged hydrogen atoms also have a strong inclination to bond to other surfaces with an opposite charge. Organic matter and the minerals in soil cause the molecules to "attach" themselves, making them available to absorptive plant roots.

Some surfaces are considered "hydrophobic." Plant leaves are often coated with a natural waxy surface or have small "hairs" to minimize water loss. However, this surface also causes the water molecules to bond together tightly on the leaf surface, resulting in water "beading." If a chemical is mixed with the water, it will not be distributed evenly over the plant leaf. Adjuvants allow these bonds to "relax." The water/chemical mixture can then be dispersed evenly over the leaf surface.

Surfactants are one of the largest groups of adjuvants. The term surfactant is shorthand for "surface active agents." Surfactants reduce the surface tension of the water drops, causing them to flatten out instead of beading up. This results in greater coverage. Spreaders and wetting agents are surfactants.

Nonionic surfactants have no electrical charge and are generally compatible with most pesticides and herbicides. They can make a water droplet "flatten" to cover six times the area of a droplet of plain water.

As well as the component that causes the release of surface tension (the alkyl polyoxylkanes or similar compounds), a nonionic surfactant also should contain fatty acids. The fatty acids cause the mixture to adhere better to the leaves. Alkyl polyoxylkanes will reactivate the first time the plant becomes wet from irrigation, rainfall or dew, causing the pesticide to wash off the leaves. The fatty acids prevent this, and the compound will stay where it is put after it dries.

A new family of nonionic surfactants, the organosilicones, is the latest in adjuvant technology. Organosilicones came on the scene about six years ago. The new chemistry caused a great deal of excitement, because a water droplet could be dispersed to cover 15 to 16 times the area than without the surfactant. However, early organosilicones were extremely dangerous to the eyes (most had a "Danger" signal word), had a high potential for phytotoxicity and evaporated so quickly that the pesticide had little or no residual action. Manufacturers have thoroughly researched these initial problems, and products are now available that have greatly reduced or eliminated them.

Because the leaves of the plants are thoroughly covered, pesticide action is enhanced. Therefore, where two sprays may have been necessary to achieve control, sports turf managers might be able to do the job with a single spray. In addition, since a drop of pesticide solution covers 16 times the area of a solution without an organosilicone surfactant, the total amount of spray solution to achieve complete

coverage can be dramatically reduced. This can result in substantial savings when spraying acres of turf in an athletic field or park.

Organosilicones do not require fatty acids to adhere. The compound breaks down within 24 hours, so additional rewetting will not cause the pesticide to wash off the leaves. For this reason, be sure to use the pesticide immediately or shortly after mixing. Some organosilicones even contain an ultraviolet light screen, so pesticide degradation by sunlight is slowed.

Stickers cause the pesticide to adhere more firmly to the leaves. They are primarily used if rain is expected after spraying. Spreader/sticker combinations are often sold together. However, remember that the more a compound spreads, it will generally stick that much less.

Drift control agents keep spray droplets from breaking apart during application. The larger and heavier drops stay on target more consistently and are less likely to be blown away by light winds. In addition, evaporation is reduced.

Buffering agents control the pH of the mixture. Many pesticides are designed to work at a pH of 7 (neutral). If your water is above or below that pH, the effectiveness of the formulation can be greatly reduced. Buffering agents will eliminate this problem. Foam suppressants are self-explanatory. They can reduce foaming both in the tank and at the nozzle tip.

Selecting for Success

Your first reference point when selecting the appropriate adjuvant is to read the label of the chemical you are applying. More than 200 chemicals have label requirements for some type of adjuvant. Some chemicals' labels require the use of an adjuvant. Others specifically prohibit the use of adjuvants. Some state that you may use an adjuvant. Considering the benefits, unless a label specifically states that an adjuvant should not be used, it makes economic sense to add a surfactant (spreader/sticker).

The wide array of available adjuvants can make selection a confusing process. There are more than 4,000 named adjuvants, with approximately 300 companies manufacturing them. Unfortunately, studies have shown that many are not effective, or do not live up to their claims. There have been materials touted as adjuvants that are 92-percent plain water!

How can this be? The main problem is that, unlike pesticides, adjuvants do not require EPA registration. This means that manufacturers can call a wide range of formulations adjuvants and be within their legal limits.

For example, alcohol can be legally called an adjuvant. Also seen on labels as isopropanol (IPA), alcohol evaporates very quickly and is relatively ineffective as a spreader.

Your best defense against an ineffective product is to educate yourself about adjuvants. Ask questions about alcohol percentage, fatty acids and the actual formulations of the adjuvants you are considering for purchase. Read label rates.

Finally, ask about support materials. A reputable manufacturer will be happy to provide you with literature that explains exact formulations. Manufacturer's representatives should be able to answer any questions to your satisfaction. The bottom line is that the right adjuvant can help your spray program become more effective and less costly. ❑