

Spray Adjuvants: Matching the Spray with the Goal

by Vicki Robb

"The most expensive spray is the one that fails to accomplish the purpose for which it is applied." According to an article in the *Journal of Arboriculture*, "Spray Adjuvants Are Management Tools," part of the problem with matching the spray with the goal has been the consistency regarding the use of certain words and terms, and what they mean. Dan Shemon, from Benham Chemicals, provided information from the *Journal* which defines the numerous words that are related to spray adjuvants as well as some guidelines for matching the appropriate type of spray with the desired results. The definitions are not "dictionary precise" but relate directly to spraying and the role of the adjuvant.

Spreader, Wetting Agent and Surfactant

are synonymous terms referring to a broad group of surface active agents. Chemicals that reduce the surface tension of spray solutions so droplets spread out, covering a greater surface area. The word surfactant is coined from the phrase SURface ACTive AgeNT. Spreading action is especially important for achieving good spray coverage on waxy or pubescent (hairy) plant parts, for getting spray into cracks and other small openings such as leaf sheaths and under bark scales, and to help move systemic chemicals or contact herbicides through waxy cuticles into the plant tissue. Surfactants are divided according to their chemical reactivity and may or may not be labeled as nonionic, anionic or cationic, or combinations like nonionic/anionic blends. Nonionic surfactants do not ionize in water, they are essentially non-reactive. Anionic surfactants ionize into negatively charged ions in water, they are negatively reactive. Cationic surfactants ionize into positively charged ions in water, they are positively reactive. They are also phytotoxic and almost never used in spraying. Nonionic spreaders are the surfactant group most commonly recommended.

How Spreaders Work. A spreader (surfactant) molecule is somewhat like a tadpole: the "head" is soluble in aliphatic substances (oils, petrosolvent, etc.) and is water repellent (hydrophobic). The "tail" is insoluble in aliphatic substances and is water attracted (hydrophilic). In water, the water repellent "head" moves the molecule to and through the water surface, while the "tail" remains in the water. Wherever a molecule penetrates the surface, surface tension is broken and reduced. The greater the number of breaks, the more surface tension is reduced.

Pubescent (hairy) plants and plant parts have a special spraying problem; the surface tension of water sprays holds spray droplets on the hairs of pubescent plants and prevents wetting of the actual plant surfaces. The addition of a spreader will permit the droplets to move down the hairs, onto the leaf or plant surfaces.

High rates of spreader are as bad as low rates. Excessive spreader causes water sprays to run off or flow into depression areas of the sprayed surface, mainly off, onto the ground. Poor coverage and insufficient redistribution of the pesticides with reduced effectiveness can be the result.

Surfactants are called "emulsifiers" when they are used in aliphatic substances so they will mix with water.

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Emulsifiable oils are very special oils containing specially blended emulsifiers (about 1-2%) so they will mix with water. When an oil spray strikes the spray target, the oil separates out onto the sprayed surface while the water carrier and emulsifier run off onto the ground or evaporate away. The oil is then without emulsifier, is no longer water miscible, and is not readily washed off the spray target. (NOTE: Stickers, if used at high rates, can hold pesticide residues so tightly they are literally entombed and useless).

An adjuvant with both spreading and adhesive qualities is called a spreader/sticker. (NOTE: The greatest misrepresentation, confusion and misunderstanding in the whole subject of spray adjuvants is the promiscuous use of the term "spreader/sticker". Many products labeled "spreader/sticker" are nothing more than a nonionic spreader, having no adhesive quality whatsoever).

Acid adjuvants to lower the pH of alkaline spray solutions are called acidifying agents, acidifier or buffer. Defoamers or anti-foam agents are used to break or prevent foam formation in spray tanks. Every sprayer should have some defoamer with it at all times, just in case a foam problem develops. Defoamers are much cheaper than down time.

Drift control agents are adjuvants that reduce the breakup of sprays into fine droplets that can drift out of the spray zone. Spray drift is double jeopardy; first, it reduces the effectiveness of the spray application; second, it creates contamination hazards for adjacent properties, crops and people with a potential for serious legal implications.

Adjuvants that increase the amount of pesticide actually deposited on spray targets are called desposition aides and thickeners, and dispersants that maintain more uniform dispersions of chemicals in spray solutions are called suspending agents.

A functional knowledge of adjuvants is important in order for spray managers to obtain maximum benefits and returns from every dollar spent for spray chemicals.

Consider the Following When Making Your Decisions:

- Select adjuvants as carefully as pesticides. Read the pesticide labels and select adjuvants that meet label requirements and the conditions under which the spray will be applied and expected to perform.
- Buy spray adjuvants, as well as spray chemicals, from reliable, professional suppliers.
- Bottle test spray mixtures for compatibility. If anything in a spray mix is new or different (the water source, the pesticide mix, the brands of chemicals), test before mixing a full batch of spray.
- Check the spread of some drops of the spray mixture on the plants to be sprayed. Somewhat mounded spray drops that stay in place are what is wanted. High standing, round drops that fall off or shake off easily indicate the need for more spreader. Flat drops that tend to slide easily off of the plant surfaces, leaving a wet line, indicate too much spreader. For hairy plants, drops should flow down among the hairs but not readily flow off a vertical leaf surface.
- If a rain or heavy dew is likely before the next regular spray, use a sticker.
- If it is windy, the humidity low, or there is a temperature inversion near the ground, use a drift control agent.

- When using alkaline spray water, lower pH to below 7.0 with an acidifying agent. Lower the pH to about 6.0 if the spray must stand in the tank overnight or longer than a normal application time.
- When spraying a solar heat or ultraviolet radiation sensitive pesticide (a surprising number are), use an extender.

Credit: A Patch of Green, May/June 1993

MAGCS 42nd Turf Clinic Speakers

Photos by John Meyer



Don Ferreri



Dave Ward



Conner Shaw



Joseph O'Brien, GCSAA COO



Ed Hightower, NCAA Basketball Official