

SPRAY ADJUVANTS ARE MANAGEMENT TOOLS

BY T.E. Whitmore

The dictionary defines an adjuvant as an additive used to help or improve. This is exactly how spray adjuvants work; they help or improve some phase of spraying between initial spray mixing and final activity of the spray after application.

Spray adjuvants are management tools to help get the greatest return out of each spray dollar. Adjuvants can be good or bad, helpful or injurious, cheap or expensive, depending on the way they are selected and used.

The most expensive spray is the one that fails to accomplish the purpose for which it is applied. The problem may be wash-off, poor timing, poor application, using the wrong pesticide, etc., OR, it could be an adjuvant problem; using the wrong adjuvant, failing to use one when it is needed or using one when it is not appropriate.

A lot of confusion swirls around spray adjuvants because so few people understand them. From the manufacturers and the people writing the labels and spray recommendations, through the suppliers to the user and his hired sprayman, the confusion continues. We don't even use a common terminology with which to discuss the subject, too often all spray adjuvants are just referred to as 'spreader-sticker.'

Beware of the man who says, "They're all alike," or "The manufacturer puts everything in his product to make it work at it's best," or worse yet, "Use whatever you have." What they are actually saying is, "I don't know," but won't admit it.

There are wide differences between adjuvants, even within the same class. Manufacturers try to make their products for best performance but cannot do so for all plants and all conditions. You need a spreader for spraying cabbage but not necessarily for grapes, apples or potatoes. You need a sticker if rain loss is a hazard, and so forth — more about that later.

It is a mystery why so many intelligent spray people sucker into buying a spray adjuvant from some housewife or farmhand from down the road; or whatever is on a bid. Too often it is a cleaning compound that may or may not be legal but has a spray adjuvant label written by some clown that

knows nothing about sprays or spraying.

Labeling

The labeling of spray adjuvants is basically unregulated and there is little consistency from one label to another. The one regulation that applies uniformly across the country is that all chemicals to be sprayed into the environment, must be cleared by the EPA. Otherwise they cannot be used legally in pesticide sprays.

Too often spray adjuvant products are misnamed, either purposely or out of ignorance. Labels may or may not show the chemistry and level of activity but even so it is not understood by most users and may be stated in misleading ways or terms. Some labels, for instance, show the active ingredient without giving the percentage, or level of activity. Then on the next line state something like, "Ingredients ineffective as spray adjuvants....73.5%" Did you understand that as the level of active ingredient? Most folks do, but read it again, that's the level of inert ingredients, stuff that won't do you one bit of good. You get only 26.5% good stuff.

Definitions

These definitions are not dictionary precise, they are geared to the subject of spraying but are accurate for that purpose.

Spreader, wetting agent, and surfactant. These are synonymous terms referring to a broad group of surface active agents; chemicals that reduce the surface tension of spray solutions so the spray droplets spread out and adsorb onto a greater surface area. This helps hold the pesticide on the sprayed surface.

Spreading action is especially useful in achieving complete spray coverage on waxy or pubescent (hairy) plant parts, for getting spray into cracks and crevices such as leaf sheaths and under bark scales and helping to move systemic or contact herbicides through waxy cuticles and into the plant tissue. Spreading action is especially important for post emergent herbicides.

Spreaderes are further divided according to their

chemical reactivity and may or may not be labeled as nonionic, anionic and very occasionally cationic, or combinations such as nonionic/anionic blends.

Nonionics do not ionize in water, are essentially non-reactive and can be readily used with most pesticides.

Anionics are negatively charged ions providing surface active properties and are negatively reactive in spray solutions.

Cationics are positively charged, are positively reactive and are very seldom found in spray adjuvants.

Pesticide residues from sprays applied with a nonionic spreader will wash off faster than the same pesticide sprayed without the spreader. Nonionic spreaders are stable chemical compounds that remain as a residue on plant surfaces after the spray dries; then re-activate each time free moisture is available and function as the detergents from which they are made, hastening wash-off.

Sticker. A sticking agent gives an adhesive effect after the spray has dried to protect spray residues from wash-off by rain, heavy dew or irrigation and loss by wind erosion, leaf abrasion, etc. *Unless an adjuvant has this adhesive quality, it is not a sticker even if it is called such on the label.*

Stickers also have a potential problem: If used at excessive rates, stickers can hold pesticide residues so tightly they are literally entombed and useless. This is especially true of the resin or plastic based stickers or when full rates of sticker are combined with pesticide products already containing an effective sticker.

Spreader-sticker. A product combining the effects of a spreader and a sticker. That is, having surfactant activity to get initial distribution and full coverage and an adhesive quality after the spray has dried.

NOTE: The greatest area of misrepresentation and misunderstanding in the whole subject of spray adjuvants is the promiscuous use of the term 'spreader-sticker.' Many products labeled as 'spreader-sticker' are nothing more than a simple spreader, having no adhesive quality whatsoever. *Unless a product has an adhesive quality it is not a sticker, no matter what it is called or how it is*

labeled.

Extender. A sticking agent with an additional quality to prolong the life of the pesticides, over and beyond just sticking them in place and keeping them there longer. NU-FILM-17[®], for instance, is an ultra-violet radiation screener that protects spray residues against heat and ultra-violet radiation which degrade many pesticides. This is the same principle evoked for people using a sun screening suntan lotion to protect against sunburn.

Here again, unless the adjuvant has a quality over and beyond the sticking function to prolong or 'extend' the activity of the pesticide residue, it is only a spreader-sticker.

Activator. An adjuvant which increases the effectiveness of other chemicals such as contact herbicides or systemics. To increase the contact with the plant surface and to facilitate the penetration of the chemicals into small openings and directly through the cuticular surfaces. Ortho X-77[®], for instance, increases the activity of PARAQUAT[®] or an application of 2,4D. Some products used without a spreader-activator will be much less effective than when used with one.

Most nonionic spreaders will function as activators for most applications but care should be taken to follow label instructions on the active pesticide before adding a spreader to the spray.

Compatibility agent. A product that facilitates the mixing of chemicals that do not mix smoothly in the spray tank. Any spray mixture that takes on a 'grainy' appearance or appears to curdle or separate has a compatibility problem and will not be as effective if it can be sprayed out. A compatibility agent can often be used to prevent such separation, if anticipated, and will sometimes enable re-mixing of a separated spray solution.

Acidifying agent or acidifier or buffer. An adjuvant to lower the pH of spray water. Alkaline spray water, even mildly alkaline, causes hydrolyzation of many pesticide chemicals into ineffective forms, some much more rapidly than others. Spray water pH should be around pH 6.0 for most pesticide chemicals.

Many Michiganders and other midwesterners will be surprised how much of the water available for spraying in this part of the world is alkaline, some of it quite alkaline with pH's above pH 9.0.

Defoamer. Adjuvants to break foam or to prevent its formation in the spray tank. Every sprayer should have some defoamer with it, just in case a foam problem exists. Defoamers are cheaper than down time.

Drift control agents. Sometimes called elasticizers, are adjuvants that reduce the breakup of spraying into fine droplets that drift out of the spray area and may contaminate adjacent properties or crops.

Deposition aids too. Not only do drift control agents keep sprays from breaking up into fine droplets that float away, but they also increase the amount of spray actually deposited onto the spray target. Runoff is also reduced and pesticide deposit increases of 25% to 35% are not uncommon.

Etc. There are other spray adjuvants used for special purposes. Usually their name specifies their primary uses. If a grower has a special need, the answer can frequently be found from an established and reliable chemical supplier.

Things To Remember and Do

1. Buy your spray adjuvants, as well as your spray chemicals from a reliable professional chemical supplier who will be there when you need him, who knows the broad range of agricultural chemicals and adjuvants and who keeps up with the constantly changing lines of products.

2. Bottle test your spray mixtures for compatibility. If anything in a tank is new or different, the water source, the brand(s) of chemicals or other factors, test before you mix a full batch of spray—it could save you a bundle of money.

3. Check the spread of some drops of the spray mixture on the plants to be sprayed. You want somewhat mounded spray drops that stay in place.

a. high standing, round drops that fall off or shake off easily indicate the need for a spreader.

b. flat drops that tend to slide off the surface too readily indicate too much spreader.

c. for pubescent (hairy) plants, the drops should flow down among the hairs but not readily flow off a vertical leaf surface.

4. If a rain or heavy dew is likely before the next

Table 1. Some examples of spray adjuvants currently available.

This list is by no means complete and is intended only to give examples of each type of spray adjuvant discussed in the text. With the exception of NU-FILM-17, which is the only true Extender (as defined above) available in the U.S. ag markets, other products are available in each category and worthy of consideration. The omission of any product was not intentional but space considerations prevent a complete listing. There are also many products out there to avoid.

Function	Products
Spreader	Adi Surfactant Buffer X Citowett Plus Ortho X-77 Regulaid Triton CS-7 Tronic
Spreader-Stickers	Bio-Film Bond Grower Service Nu-Film-P Plyac Triton B-1956
Spreader-Sticker-Extender	Nu-Film-17
Activators	Activator W Agricide Buffer X
Compatibility Agents	Blend Compex E-Z-Mix Spray-Aide Unite
Acidifiers	Buffer X Sorba Spray Spray-Aide
Defoamers	Fighter F Foam Fighter De Fome
Drift Control Agents and Deposition Aids	Mist Control Nalcotrol Orthotrol Target

scheduled spray, use a sticker. (NOTE: If the outside of your sprayer is easily or even readily washed off after a days spraying, more or better sticker is needed in your sprays since they will wash off of the sprayed plants just as readily.)

5. If it is windy, the humidity is quite low or you are spraying when there is an atmospheric temperature inversion near the ground, use a drift control agent.

6. When using alkaline spray water, lower the pH with an acidifying agent.

7. When spraying a sunlight or heat sensitive pesticide, use an extender.

Management tools

We're only talking about tools to better manage your spray programs and to make them more effective. Spray adjuvants are effective tools, when properly used, and very important to many spraying situations. They can help or hurt and much more care and attention should be given to their proper selection and use. The important thing is to get the job done right and get the most out of every spray dollar. The spray adjuvants are

an important part of your management equipment.

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ABSTRACT

SANTAMOUR, F.S., JR. 1982. **Which white birches are least susceptible to bronze birch borer?** Am. Nurseryman 156(11): 61-63.

Bronze birch borer has damaged many birches in recent years, but detailed, long-term research on susceptibility has been lacking. Several years ago, Dr. Knud E. Clausen and I reported on the four-year growth and survival of various seed sources of several of these species. Bronze birch borer (*Agrilus anxius*) began attacking these trees during their fifth growing season, and the insect population has remained extremely high since that time. In September, 1982, when trees were 10 years old, we surveyed the entire planting to obtain data on potential borer resistance. Survival after exposure to borer attack for each species is based on the number of trees that were alive in 1976. These tests have probably been the most extensive trials of white-barked birches for borer resistance ever conducted in the U.S. Our results clearly demonstrate that none of the major species can be relied on to provide the degree of borer resistance necessary for long-term utility in landscapes.