Using Spray Additives with Herbicides
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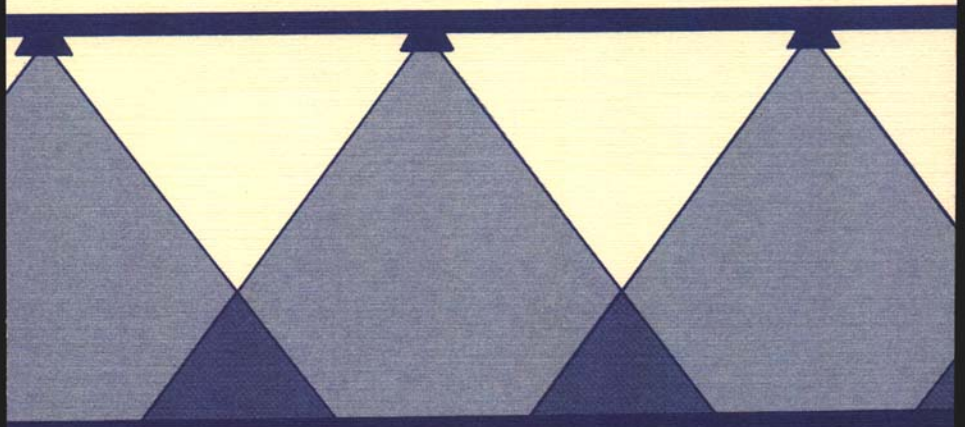

USING SPRAY ADDITIVES WITH HERBICIDES

- *types available*
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Using Spray Additives with Herbicides

Many spray additives are available for use with herbicides and the list is constantly growing and changing. This bulletin discusses the general categories of commonly used additives. For information on a specific spray additive, read the product label, or consult the manufacturer or the distributor. Be cautious of spray additives that claim to give unrealistic results.

Spray additives are commonly used to increase herbicide activity. Avoid indiscriminate use, however, because spray additives can reduce herbicide effectiveness or increase crop injury. Use only when needed and as recommended.

I. Types of Additives Available and When to Use Them

Along with the list of trade names, a variety of common terms are used to categorize different types of spray additives for pesticides. Definitions of the various additives are given below, as well as recommended uses.

Adjuvant describes any product added to a herbicide or pesticide to modify its performance. There are several types of adjuvants—spray modifiers, utility adjuvants and activator adjuvants. Any product may fit under more than one of these categories.

Spray Modifiers

Spray modifiers are adjuvants used to alter the physical characteristics of a spray solution. These include stickers, spreader-stickers, foaming agents and thickening agents.

Stickers increase the retention of a pesticide on plant leaves. They are more commonly used with fungicides and insecticides than with herbicides.

Spreader-stickers are combinations of a sticker and a spreader (surfactant) that together aid spreading and retention on plant leaves. This type of additive is occasionally used with foliar-applied herbicides, but is generally not the best choice. Activator adjuvants, discussed later, are generally preferred for increasing foliar-applied herbicide activity.

Foaming agents are designed to be used with specialized equipment that produces and applies a foam, usually for drift control.

Thickening agents, often called **drift control agents,** are designed to increase the thickness of the spray solution and thereby eliminate very small spray droplets that might drift. Thickening agents may be used with herbicides that present

a significant risk of drift injury (e.g., *Banvel*). However, always apply these herbicides under calm conditions and use proper application procedures, including pressure, gallonage and equipment.

Utility Adjuvants

Utility adjuvants are used to correct problems in the spray tank and include anti-foam agents and compatibility agents.

Anti-foam agents eliminate foaming in the spray tank, occasionally a problem, especially if soft water is used in combination with vigorous agitation. Anti-foam agents are not necessary if foaming problems do not exist.

Compatibility agents are most commonly used to aid in mixing herbicides with liquid fertilizer. Many herbicides can be mixed with liquid fertilizer without compatibility problems; however, problems may occur, especially in cold weather.

Test herbicide-fertilizer compatibility

Use the following procedure to check the compatibility of herbicides and liquid fertilizers before combining the two materials in the spray tank.

1. Add ¼ tsp (1.2 ml) of a compatibility agent to a 1-qt jar.

2. Pour 1 pt of liquid fertilizer into the jar. Pour 1 pt of fertilizer into a clean 1-qt jar. Mark the jar containing the compatibility agent.

3. Add the desired herbicide to both jars at a rate that will give a concentration similar to the concentration that will be used in the spray tank (see Table 1).

4. Gently shake the jars and allow to stand 1 hour, then observe the mixtures.

5. Allow the jars to stand 24 hours, and observe the mixtures again.

If the mixture does not separate either as a precipitate or as an oily layer, a mixture has formed that can be readily applied. If it does separate but shaking reforms the mixture, the combination can be applied with vigorous agitation. The one day waiting period will point out problems that may occur if the mixture is allowed to stand overnight without agitation. Do not use combinations that form precipitates or distinct droplets even with shaking. The jar with the compatibility agent will indicate whether such an additive will help mix the herbicide and the fertilizer. *Be sure to repeat this procedure whenever a different batch of liquid fertilizer is used or when the herbicide formulation is changed.*

Table 1.
Testing herbicide-fertilizer compatibility (1 pt mixture)

Gallons of Liquid Fertilizer Per Acre	**Herbicide Application Rate**					
	Liquid Herbicides			**Wettable Powders**		
	1 qt/A	*2 qt/A*	*4 qt/A*	*1 lb/A*	*2 lb/A*	*4 lb/A*
	—Teaspoons of Herbicide/Pint of Fertilizer[a]—					
10	2.4	4.8	9.6	3.5	7.1	14.2
20	1.2	2.4	4.8	1.8	3.5	7.1
40	0.6	1.2	2.4	0.9	1.8	3.5
60	0.4	0.8	1.6	0.6	1.2	2.4
80	0.3	0.6	1.2	0.4	0.9	1.8

[a]1 teaspoon = 4.9 ml.

Activator Adjuvants

Activator adjuvants are commonly used to increase the activity of foliar-applied herbicides and include surfactants, crop oils and crop oil concentrates.

Surfactants reduce the surface tension of water and therefore enhance wetting and spreading of the spray solution on leaf surfaces. They also aid in dispersing and emulsifying herbicides in water. They are often called surface active agents, spreaders or wetting agents, and are usually non-ionic.

Crop oils increase the effectiveness of certain herbicides, such as atrazine applied postemergence. They are a combination of phytobland (non-toxic) oil and 1 to 2 percent surfactant. The surfactant aids the formation of a stable emulsion (cloudy mixture) when the crop oil is added to the spray tank. Crop oils are generally used at a rate of 1 gal/acre. In recent years their use has decreased and they have been almost entirely replaced by crop oil concentrates.

Crop oil concentrates are also combinations of phytobland oil and surfactants. Unlike crop oils, however, crop oil concentrates generally contain 15 to 20 percent surfactant. Research in Michigan and elsewhere has shown that the rate of crop oil concentrate generally needed is 1 qt/acre—about one fourth that of crop oil. Crop oil concentrate increases the activity of herbicides by: 1) increasing the wetting and spreading of the spray solution on the leaf surface; 2) dissolving the waxy surface (cuticle) of the leaf to allow easier uptake of the herbicide; and 3) increasing the time that the leaf surface remains wet, therefore increasing herbicide penetration.

Several crop oil concentrates are commercially available. They can be divided into two general categories: petroleum oil based and vegetable oil (usually soybean oil) based. Research has shown little or no difference between these

two categories. Differences exist among individual brands, however. Some herbicide manufacturers provide a list of approved crop oil concentrates for use with their herbicides. These lists are helpful guides and should be used if available. Otherwise, select a brand of crop oil concentrate that contains at least 10 percent surfactant and emulsifiers.

When are spray additives needed?

Spray additives, such as non-ionic surfactants or crop oil concentrates, enhance the activity of foliar-applied herbicides. There have been many claims that spray additives increase the activity of soil-applied herbicides, but research does not support these claims. However, spray additives such as non-ionic surfactants may help prevent plugged nozzles and screens.

Not all foliar-applied herbicides require a spray additive. About 80 percent of all herbicides are formulated with surfactants already included. With certain herbicides, such as *Paraquat/Gramoxone, a* non-ionic surfactant should be added to the spray tank with the herbicide. With others, such as *Roundup,* a non-ionic surfactant is included in the herbicide formulation and does not need to be added to the spray tank, except in specific situations listed on the label, such as low spray volume (See Table 2). Other herbicides that are applied to weed foliage, such as *Basagran,* are most effective when a crop oil concentrate is added to the spray mixture.

Recommended rates of crop oil concentrate are given per acre. Surfactants, on the other hand, are recommended on a percentage volume basis such as ¼ percent (equivalent to 1 qt/100 gal of spray). Table 2 lists herbicides and herbicide combinations that should be applied with a non-ionic surfactant or crop oil concentrate and the correct rates to be added. Herbicide labels often allow the use of either a non-ionic surfactant or a crop oil concentrate, but usually one is a better choice than the other.

Table 2.

Foliar-applied herbicides requiring addition of non-ionic surfactants or crop oil concentrates, and recommended rates of application[a].

Herbicide	Non-Ionic Surfactant[b]	Crop Oil Concentrate
Paraquat/Gramoxone	½ - 1 pt/100 gal	—
Roundup (low spray volume)	2 qt/100 gal	—
Roundup (high spray volume)	—	—
Basagran	—	1 qt/acre
Blazer	1 pt/100 gal	—
Basagran-Blazer	—	1 pt/acre
Fusilade	—	1qt/acre
Fusilade 2000	—	1qt/acre
Hoelon	—	1qt/acre
Poast	—	1qt/acre
Atrazine	—	1qt/acre
Bladex	c	—

[a] Spray additive recommendations are based on current herbicide label specifications and are subject to change. Consult the herbicide label before adding any spray additive.

[b] Recommended rates of non-ionic surfactant are based on products with 85 percent or greater surfactant in the formulation. Use products with lower levels of surfactant at proportionately higher rates to obtain similar results.

[c] Use non-ionic surfactant at 2 qt/100 gal with Bladex 4L as a pre-emergence treatment to increase burndown in no-till corn. Otherwise, spray additives could cause excessive corn injury when used with postemergence applications.

II. Mixing Herbicides and Additives in the Spray Tank

As with herbicides, add spray additives to the spray tank a cording to the mixing instructions on the label. In most cases, add non-ionic surfactants, anti-foaming agents or compatibility agents to the spray tank first, before herbicid

When adding herbicides to a spray tank, fill the tank appro imately one-half full with water or liquid fertilizer and main- tain constant agitation while adding each herbicide. Unless otherwise stated on the herbicide label, follow these steps:

1. Add wettable powders and/or dispersible granules (dry flowables—DF, dispersable soluble granules—DS, etc.) firs Form a slurry prior to addition to obtain a uniform mixture with wettable powders.

2. Add aqueous liquid and/or flowable herbicides second.

3. Add emulsifiable concentrate herbicides third.

4. Add crop oil concentrates last.

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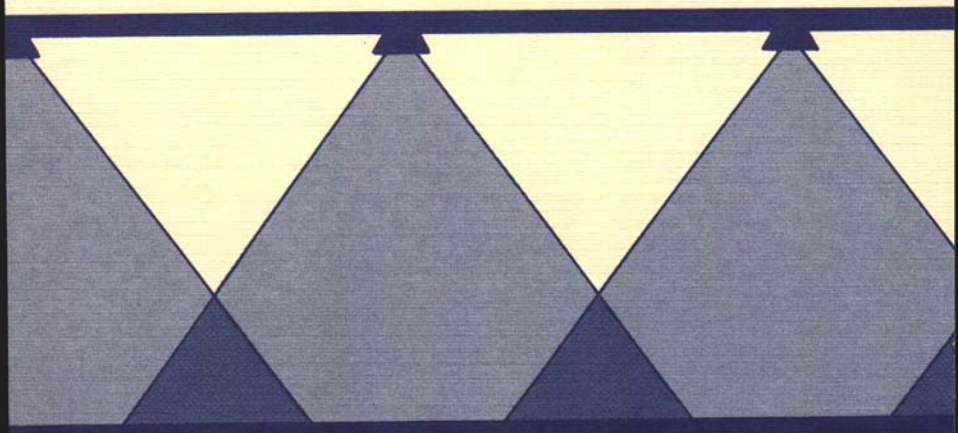

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