

Adjuvants and Surfactants

By David Cordray

Herbicides are expensive. Invasive weeds are everywhere, and your available time to go after them is in short supply. We also can't always choose the ideal time to apply herbicides. Our schedule, prolonged periods of dry weather, hot weather, low humidity, cold weather, high winds, large plants, impending rain, etc., may require us to apply herbicides in less-than-ideal conditions. The best bet for increasing the effectiveness of your herbicide application, during a broader range of environmental conditions, is to use adjuvants.

An adjuvant is a substance you add to the spray tank mixture, or it may already be integrated into the manufacturer's herbicide formulation, with the goal to improve herbicidal activity or application characteristics. Adjuvants can improve herbicide performance by influencing a number of factors involved in herbicide absorption and spray applications. Some of these factors include conditioning the water, dissolving the waxy coating on a leaf surface for better penetration, spreading on the leaf surface for better area coverage, sticking to the leaf surface to avoid spray droplet bounce off, and minimizing small droplet formation for spray drift reduction. For example, when spraying invasive weeds mixed with nearby good plants, we want our herbicide solution to stick to the target plant, quickly absorb into the leaf tissue, kill the weed, and minimize depositing any herbicide onto good plants.

The world of adjuvants is confusing. There are a wide variety to choose from, and they are not regulated by the EPA. The most effective adjuvant will vary with each herbicide, and the need for an adjuvant will vary with environment, weeds, and herbicide used.

How to know what to use? No worries! Like any good restoration practitioner, you read the herbicide label! The label will tell you what type or types of adjuvants to use, how much, and how to mix it in the spray solution. Keep in mind that the label may recommend different concentrations of adjuvants with different plant species, as well as different growth stages of the plant. Using adjuvants beyond labeled rates may cause damage to non-target plants.

Adjuvants generally consist of surfactants, oils and fertilizer. One of the more common adjuvants recommended by many of the herbicides we use is a non-ionic surfactant (NIS). The term non-ionic means it does not have an electrical charge and will not interact with hard water magnesium and calcium ions. A surfactant is simply defined as an additive that reduces the surface tension between the spray droplet and the leaf surface. The main function of an NIS is to increase spray retention, and to a lesser degree, may influence herbicide absorption. Silicone NIS surfactants reduce spray droplet surface tension, which allows the liquid to run into the leaf's stomata (tiny openings in the epidermis). This "stomatal flooding" enhances herbicide absorption. Methylated vegetable or seed oils (MSO) adjuvants are more aggressive in dissolving wax and leaf cuticle (outer layer of tissue) than NIS, resulting in faster and greater herbicide absorption. MSO adjuvants are usually required for grass-selective herbicides. Some of the most advanced adjuvants combine both a silicone NIS with an MSO for fast and maximum herbicide uptake.

Can I use household soaps and detergents? The short answer is – only if it's on the herbicide label. The practical answer is hard water and soap will form scum that plugs equipment. Soft water and soap will form lots of suds. And most household soaps have low concentration levels of surfactants, while most agricultural surfactants are in the 80 – 90% concentration range.

In summary, read the herbicide label for the recommended type

and concentration of adjuvant for the targeted plant species and growth stage. Buy the adjuvant that meets the label requirements, and follow the label mixing instructions. When choosing among the many adjuvant brands that meet the herbicide label requirements, choose the adjuvant that best matches your application needs, such as drift reduction, rapid uptake, leaf adherence, etc. If there are any questions, consult the herbicide manufacturer.