



PESTICIDE SPRAY ADJUVANTS

Adjuvants are chemical or biological materials that are commonly used to improve efficacy or the application characteristics of a pesticide [e.g. fungicide, herbicide, insecticide, or pesticide mix] that is applied to crops. The adjuvant may either be a component in a container of pesticide product [formulation adjuvant], or be added by the user to the spray solution in the spray tank [spray adjuvant]. Simply stated, an adjuvant is a material that is used to enhance the action of the active ingredient(s) in a pesticide that is(are) applied to a crop.

Articles titled “[Spray Adjuvants](#)” authored by Dr. Winand Hock of Pennsylvania State Univ. [PennState Extension] and “[Understanding adjuvants used with agricultural chemicals](#)” by Jordan Schuler [Univ. of Wisconsin Extension] provide a detailed summary of spray adjuvants and how/when they should be used. Major points from these articles follow.

- The first step in selecting an adjuvant for use with any pesticide is to check the pesticide’s label for the manufacturer’s recommendation. If the label specifies a specific type of adjuvant must be used, then the directions on the label must be followed.
- Adjuvants are designed to perform functions that involve the mixing and application of pesticides, such as buffering, dispersing, emulsifying, spreading, sticking, and wetting. They can also reduce evaporation, foaming, spray drift, and volatilization.
- Spray adjuvants are of two classes—i.e. activators and special-purpose.
- Activators include surfactants, oils, and nitrogen-based fertilizers. They are designed to improve the activity—e.g. increasing the absorption and reducing the surface tension of the pesticide on the target—of the applied pesticide.
- Surfactants physically change the properties of the spray solution and spray droplets. The goal when using surfactants is to reduce the surface tension of spray droplets so that they remain in contact with the target longer.
- Surfactants are classified as either nonionic [NIS—nonionic surfactant], anionic [negative charge], and cationic [positive charge]. NIS’s are the ones that are commonly used with pesticides.
- The three types of oil-based adjuvants [generally used to increase the penetration of pesticide spray droplets and reduce surface tension] are crop oils, crop oil concentrates [COC’s—more commonly used with insecticides and fungicides], and methylated seed oils [MSO’s—generally used to increase a pesticides’s ability to penetrate the targeted pest].

- Nitrogen-based fertilizers—e.g. ammonium sulfate [AMS] and urea ammonium sulfate—are used to improve herbicide activity. They should only be used with herbicides when recommended by the herbicide label.
- Some points to consider when choosing a labeled adjuvant are: 1) Choose the least toxic adjuvant that will do the intended job; 2) If a specific brand of adjuvant is listed on the pesticide label, then use that brand; 3) follow the adjuvant mixing instructions and recommendations on the label of the pesticide that is used; and 4) Follow the instructions on the adjuvant label when using them.
- Do not assume that an adjuvant is always needed. If the pesticide label does not specify using an adjuvant, then the manufacturer has deemed no benefit, or even adverse effects, from its use.

In agricultural applications, most adjuvants are used with herbicides. Thus, the following section of this White Paper presents information about herbicide adjuvants, and resources that can be used to find information about the myriad herbicide adjuvants that are available.

In an article titled “[The Confusing World of Adjuvants](#)” [June 2020] on the Arkansas Row Crops blog site, Dr. Tommy Butts, Extension Weed Scientist, presents a concise summary of why adjuvants are used with herbicides, and the types that are used for a specific purpose.

- He presents graphical information derived from information in [Chapter 7](#) of a dissertation by Dr. Cody F. Creech at the Univ. of Nebraska that shows that adding MSO to a dicamba spray mix that was applied to common lambsquarter resulted in the greatest retention of the herbicide on the weed leaf surface when compared to other tested adjuvants that included an NIS, silicone-based adjuvant, COC, and a drift reduction agent. This can result in increased weed control by the applied herbicide.
- Dr. Butts also presents results from research conducted at the Univ. of Arkansas that shows that adding a water conditioning agent such as AMS to herbicide solutions can result in increased weed control by some herbicides, especially when “hard” water is used as the carrier.
- Finally, producers should read each herbicide label and follow the recommendations provided by the manufacturer for adjuvant selection with each herbicide that is used. If tank-mixing herbicides, Dr. Butts states that the first option is to select a common adjuvant that is recommended on labels of all herbicides used in the mix. If there is no adjuvant overlap between or among labels,



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then typically a nonionic surfactant or crop oil concentrate should be used to increase herbicide activity while minimizing potential crop injury.

Drs. Bryan Young and Fred Whitford [Purdue University] and Joseph Matthews [Southern Illinois University] have published the 13th Edition of [Compendium of Herbicide Adjuvants](#). This publication contains 779 entries from 38 companies, organizes adjuvant products by type [nonionic surfactants, crop oil concentrates, etc.], and provides the product name, manufacturer or distributor, principal functioning agents, and use rates for each listed product. The information for each listed adjuvant is based on descriptions provided by the manufacturer or distributor. A compendium index can be used to find specific adjuvant products by their trade names.

All of the information in the compendium plus updates to the compendium information for each adjuvant can be found on the [Compendium Website](#). Producers and consultants can use the information in this compendium and the associated website to find adjuvant products that will ensure the optimum efficacy of applied herbicides. This is an important element in the quest to delay or prevent the development of herbicide resistance.

In an April 2023 [Brownfield Ag News](#) article titled “[Innvictis Crop Care Launches New Adjuvant Technology](#)” by Rhiannon Branch, information about the newest adjuvant technology from [Innvictis Crop Care](#) is presented. This new technology will be available for the 2023 growing season, and is being marketed in a line of seven multi-functional, full strength [Inntero](#) adjuvants.

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