

# HOW HERBICIDES ARE BUILT CAN MAKE ALL THE DIFFERENCE

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## Understanding how formulations are built can play a key role in the success of weed control programs.

In the realm of weed management, the scenario we observed moving into the 2020 season was wrought with challenges. The fall of 2018 was wet in many geographies, starting a cycle of missed weed control opportunities during typical burndown windows. That fall led into the very wet spring of 2019, leading to millions of acres of prevented planting across several areas of the country. These factors have resulted in higher-than-normal weed pressure that calls for maximizing herbicide applications that can reset the stage for weed control.

This driving need to get weeds in check opens the door to conversations about choosing formulations that make the difference this season demands. To that end, I've been sharing a lot of fundamental lessons lately in herbicide chemistries because understanding how formulations are built can play a key role in the success of weed control programs.

### TAKE ANOTHER LOOK AT THE TOOLS IN OUR TOOLBOX

The weed management applications we tend to rely on fall into just a few WSSA mode of action groups. What's important to know is that there are some excellent alternative herbicide classes that can tack on advantages, such as flexibility and efficacy, especially in the face of resistance.

#### HERE'S A BASIC GROUP OVERVIEW:

##### GROUP 4 HERBICIDE

Herbicides such as 2,4-D, dicamba and fluroxypyr are foundational drivers for broadleaf control with a broad spectrum of weed species covered; however, there are other actives that give growers more of a rifle approach for specific troublesome weeds that can continue to add importance to overall weed management.

##### GROUP 14 HERBICIDE

This class featuring flumioxazin, sulfentrazone, saflufenacil, carfentrazone and oxyfluorfen may not always be viewed as burndown herbicides, but they carry a wide range of characteristics such as added residual control and contact post-emergence activity, especially on broadleaves. This group helps growers gain flexibility, efficacy and utility across cropping systems.

##### GROUP 2 HERBICIDE

ALS herbicides such as tribenuron and thifensulfuron are handy chemistries that are sometimes forgotten because some of our driver weeds like waterhemp and kochia have developed tolerance to this group; however, these products can be excellent for problematic winter weeds, including henbit and chickweed.

##### GROUPS 9 & 10 & 22 HERBICIDE

This category is home to foundational broad spectrum control tools, such as glyphosate, glufosinate and paraquat. Glyphosate goes out for broad coverage in most applications, but with the increasing incidence of resistance we're seeing more alternative use of glufosinate and paraquat in some geographies.

##### GROUP 6 HERBICIDE

Well known in wheat country, Group 6 bromoxynil is effective for bringing in another mode of action against small kochia. Bromoxynil and many combination labels with this active ingredient allow fallow use, so as we get farther west they can be important tools in countering resistance.

## UNDERSTAND YOUR FORMULATION

All herbicide formulations are not created equal. Many growers are well-accustomed to using group 4 growth regulator herbicides, such as 2,4-D or dicamba, in burndown applications so I'll focus on one as an example. While you may think "2,4-D is 2,4-D," there are elements of formulations in the background that we might not always think about.

### Choices in amine, ester and salt formulations present different properties that contribute significantly to performance.

So beyond the molecule, what's "bolted to the block" matters.

Bolted where? Well, all the active compounds in 2,4-D start out as acids, the raw ingredient that's effective in the plant. From that point, formulations are developed – esters, amines and salts – that deliver different features, such as handling and application ease, plant uptake or behavior in the spray tank. When these products are applied in the field, they ultimately convert back into the acid to deliver activity in the plant. You can think of acids as the building blocks – and the formulation differences, the esters, amines or salts, are built on to the herbicide molecule. The type of addition that's bolted onto the block really changes the properties of that herbicide, affecting important things like volatility, plant absorption, water solubility and how it performs from an efficacy standpoint.

The group 4 growth regulator herbicides you buy are generally formulated for spray solutions. Once a spray solution is applied to the target, it converts in the soil and in the plant. This conversion "back to acid" occurs within a few hours to a couple of days depending on moisture, temperature and formulation.

At that point the growth regulator herbicide begins to interfere with normal growth and you will notice those initial symptoms like twisting that show us the active is working. If the weeds are growing rapidly, these symptoms can show up fairly quickly – within a day or two. If the weather is cool and weeds are growing slowly, it may take longer.

## FORMULATIONS AFFECT MIXING, PREPLANT INTERVALS AND EFFICACY



### AMINES

Solutions formulated as amines are more water soluble, which can be handy in some situations.

Water soluble amines generally will have better root uptake and are often safer than their ester counterparts for in-crop application. As a burndown tool, amines may require longer preplant intervals. Amines can be less compatible with other products, including fertilizers and glyphosate potassium salts – and also more prone to hard water effects and wash-off. On the upside, amines have lower volatility and odor than esters and can work well when ester use is prohibited. These characteristics often make amines ideal in pasture weed control, especially as heat rises and we want to protect any adjacent sensitive crops. Two examples of Nufarm amine formulations include Weedar® 64 and WeedMaster®.

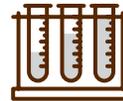


### ESTERS

Formulations that are esters are more common as preplant weed control solutions. In contrast to

amines, esters are not very water soluble, but the finished products still dissolve well because they are formulated as EC / emulsifiable concentrates. These oil-based formulations play better with hard water. Esters also tend to work better than amines in challenging conditions, such as cool and/or wet spring weather because they offer better leaf uptake in weeds and are less prone to wash from leaves. In addition, ester formulations are less likely to move into the root zone with

rainfall which is important for preplant applications. Some ester herbicides, like Nufarm's Spitfire®, offer compressed preplant interval options for unforgiving spring conditions. Another benefit of ester formulations can be found with 2,4-D active ingredient loading. While amines often cap out at around 4 lbs. per gallon, 2,4-D ester formulations, such as Nufarm's Weedone® LV6, can have up to 5.5 lbs per gallon of 2,4-D active ingredient to provide greater efficiency in handling and packaging. Ester drawbacks are more volatility than amines and a tendency to carry high odor levels. Another example of a Nufarm ester formulation is BurnMaster®.



### SALT VARIANCES

Formulation chemistry differences can even come into play with glyphosate. For example, Nufarm's Credit® Xtreme carries two salts in a single formulation, combining potassium and IPA (isopropylamine) salts of glyphosate. Potassium salt is excellent for higher loading and rainfastness, but can be less compatible with hard water and amine herbicides. IPA salt helps overcome the limitations of potassium to mix much better with amine herbicides and liquid fertilizers. So Credit Xtreme is one example of a formulation that gives operators the best of both worlds to gain an easy-handling, mix-compatible, high-load glyphosate option.

IPA SALTS  
+  
POTASSIUM SALTS  
=  
MIXED SALTS

The right selection of attributes in your herbicide formulations can enable growers to set the stage for weed control throughout the year. Understanding how formulations affect mixing, handling, preplant intervals and performance will help deliver the outcomes you need to eliminate weed competition across your crops.



[nufarm.com/uscrop](http://nufarm.com/uscrop)

For specific application rates, directions, mixing instructions and precautions, read the product label. Please visit [www.nufarm.com/uscrop](http://www.nufarm.com/uscrop) to download a full label.

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