



## **The Chem Gro Crop Watch, Issue #13, 10/4/19**

Nicholas Paulsmeyer, CCA, Sales Agronomist, [npaulsmeyer@chemgroil.com](mailto:npaulsmeyer@chemgroil.com), 217-430-1440

### **The Herbicide Trait Conundrum**

Remember the good old days when the only options we had in both corn and soybeans was either conventional or Roundup Ready? Unfortunately, those days have passed with the evolution of resistance to pesticides and it is that very same resistance that is a driving factor behind the new traits we have in our corn and soybeans. Recently, the herbicide trait market has had an increase in the number of different herbicide traits available to the grower. All of these systems have different names and what can be applied to them differs between each system. Unlike the other traits available to grower's, herbicide traits have life or death consequences for our crops as not all of these systems are compatible with the others. In order to understand these systems, we need to first get a better understanding of how our herbicides work before we can break down the individual herbicide trait platforms.



### **Herbicide 101**

Herbicide resistance is the main reason for the shift in agriculture to new herbicide trait platforms with unique chemicals available for usage in each. This term "herbicide resistance" is not a new word nor is it a new idea that we have made up in the past few years. The idea of

resistance goes back to Charles Darwin's theory of evolution where only the most fit species will survive. Weed scientists today recognize that resistant genes have always existed in small numbers and the very act of applying the pesticides we use in the field selects for that resistance. Over time, we eliminated all of the weeds which could not stand our herbicides and we ended up leaving ourselves with the resistant weeds we know today. Our herbicides work by binding to specific enzymes in the plant. These enzymes are responsible for key life processes in the plant and are what we call the "site of action" of that herbicide. A broader term for herbicide's is the "mode of action" which describes how it kills a weed. Overall, there are 30 different herbicide sites of action with many of them sharing a common mode of action. Now it must be noted that weeds become resistant to sites of actions and not modes of action so a herbicide with a similar mode of action to another might still be effective at attacking a herbicide resistant weed. I mentioned earlier that there are 30 different sites of action today. Currently there are only a handful of sites of action that we can use on our crops and be effective at killing the weeds we are targeting. This is the reason why many of the herbicide traits developed for agriculture are focused towards soybeans as they have a very limited number of herbicides which can be applied to them that can kill the weeds we are targeting.

## The herbicides

Now that you have a basic understanding of how a herbicide works and why it is that we have introduced some of the traits we have introduced, it is time to review some of those herbicides which are unique to their systems.

- **Glyphosate (Roundup)**- Roundup or glyphosate is the most widely used herbicide in the world. Glyphosate is a broad-spectrum herbicide meaning it has activity on grass, broadleaf, and sedge weeds. It is also systemic and can move throughout the targeted plant. Glyphosate is a group 9 herbicide and targets that shikimate pathway in plants which produces amino acids, which are ring shaped. Blocking the production of these amino acids starves the plants and leads to their death. Glyphosate has no residual and can be used before any crop has emerged but the Roundup ready trait needs to be added to allow for over-the-top application.
- **Glufosinate (Liberty)**- Liberty was the next broad-spectrum herbicide trait to be added to our crops and was to be the solution to the ever-growing glyphosate resistant problem. Liberty is a broad-spectrum contact herbicide which is a group 10 herbicide that targets the glutamate synthase enzyme of plants. Glutamate synthase allows for the transportation of nitrogen in the plant. Once it is blocked, a plant can no longer move nitrogen and a toxic buildup of nitrogen as well as an interruption of photosynthesis causes a localized death in plant cells. If enough of the chemical hits growing points in the target weed, the weed will succumb to the effects of the chemical. This trait can be found in any Liberty Link traited crop and like Roundup, Liberty has no residual activity and can be used before any crop that has not emerged.
- **Dicamba (Engenia and XtemdiMax)**- Dicamba is a chemical we have been using on corn since sometime in the 50's and has had various names such as Banvel and Clarity. Dicamba is a selective herbicide with a limited amount of residual and only attacks broadleaves. Dicamba is systemic and belongs to the group 4 herbicides, which mimics the activity of natural plant hormones called auxins. When exposed to chemicals of this group, broadleaves grow uncontrollably leading to complications in the plants ability to

adequately supply nutrients to its cells. Only recently have we been able to apply dicamba to our broadleaf crops such as cotton and soybeans due to the insertion of a gene which helps the plant break down dicamba. Along with this gene are the low volatility formulations of dicamba which are meant to reduce the risk of damage to other soybeans and cotton which are not tolerant of dicamba. This herbicide tolerant trait can be found in any soybean under the Xtend soybean system.

- **2,4D (Enlist Duo and Enlist One)**- 2,4 Dichlorophenoxyacetic acid or 2,4D for short is the oldest herbicide to be used on a large scale in agriculture. Like Dicamba, 2,4D can be used in corn, is a selective herbicide with only broadleaf activity, is a group 4 herbicide, and has a small amount of residual in the soil. Like our dicamba tolerant system, the 2,4D tolerant system is due to an inserted gene which allows broadleaves like cotton and soybeans to tolerate the effects of 2,4D. In corn, the gene allows for a wider application window and results in less issues with brittle stocks. There are many 2,4D products out on the market but Enlist Duo and Enlist One are the only products out so far which utilize a different salt form of 2,4D to reduce volatility and are approved for use with the 2,4D tolerant Enlist herbicide system.
- **Isoxyflutole (Alite 27)**- Like both Dicamba and 2,4D, Isoxyflutole was first used in corn under the trade name Balance, which is what I will refer to it in this section as for the obvious reasons that it is much easier to pronounce. Balance is a group 27 herbicide and works by inhibiting the production of pigments in the plant. These pigments help perform photosynthesis and loss of pigments leads to the starvation of the plant. Balance has a long residual life in the soil, and as it breaks down in the soil it leads to the release of yet another group 27 chemical which is easily taken up through the roots of plants, giving this chemical some real merit as a pre emerge herbicide. It should be noted that this group is new to soybeans with GT27 traited soybeans and its intended herbicide, Alite 27, has not been approved yet.

### Trait platforms

As of today, these are the current trait platforms that have been released and which of these chemicals you can apply to them. It must be noted that all chemicals that can be applied to the conventional form of that crop can be applied to the traited form. All traited platforms are labeled for pre and post emerge usage unless specified.

Corn			
Trait	Glyphosate	Glufosinate	Comments
	X		
		X	
	X	X	Additional tolerance to 2,4D and added tolerance to volunteer corn herbicides from the “Fop Family of herbicides.

Soybean						
Trait	Glyphosate	Glufosinate	Dicamba	2,4D	Isoxyflutole	Comments
	X					
		X				
	X		X			
	X	X	X			These soybeans are not available as of yet.
	X	X		X		
	X	X			X	Isoxyflutole Applications only labeled for pre applications.

### Final Thoughts

Whatever your decision on seed traits may be, be sure to communicate with us which direction you are going as each system has unique features which might end in disaster if applied to the wrong trait platform. If you are still unsure what you can apply to your fields, contact your seed dealer or bring in a seed tag to us and we will help you find out what we can do for your crops. Like always, my job is to give you the best advice possible, what you do with it is up to you.