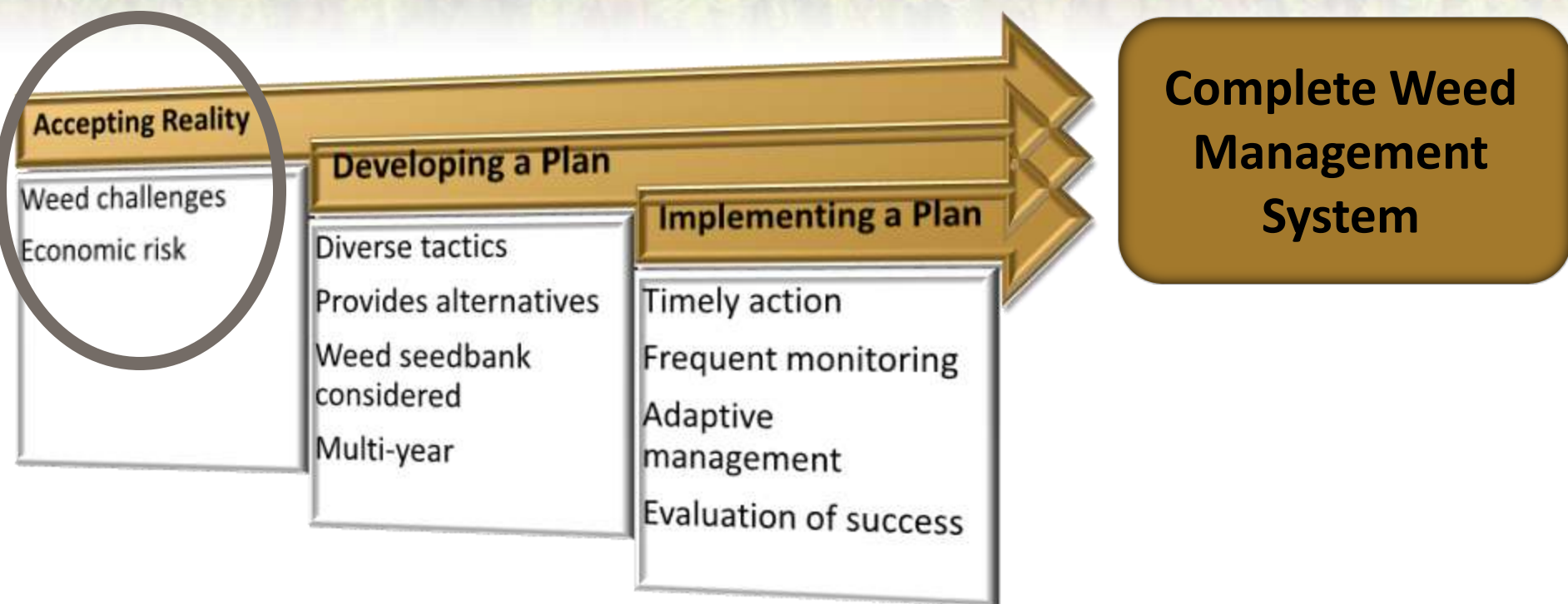




# **BUILDING A COMPLETE WEED MANAGEMENT SYSTEM**

Bryan Young





*The*  
**BIG 3**  
*WEEDS*

### COMMON WATERHEMP

*Amaranthus rudis*

SHOWN RESISTANCE TO:



### PALMER AMARANTH

*Amaranthus palmeri*

SHOWN RESISTANCE TO:



### HORSEWEED (Marestail)

*Coryza canadensis*

SHOWN RESISTANCE TO:



### GIANT RAGWEED

*Ambrosia trifida*

SHOWN RESISTANCE TO:



### COMMON RAGWEED

*Ambrosia artemisiifolia*

SHOWN RESISTANCE TO:



### COMMON LAMBSQUARTERS

*Chenopodium album*

SHOWN RESISTANCE TO:



### KOCHIA

*Kochia scoparia*

SHOWN RESISTANCE TO:



### ITALIAN RYEGRASS

*Lolium multiflorum*

SHOWN RESISTANCE TO:



### BARNYARD GRASS

*Echinochloa crus-galli*

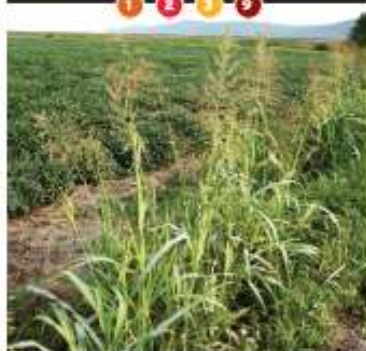
SHOWN RESISTANCE TO:



### JOHNSONGRASS

*Sorghum halepense*

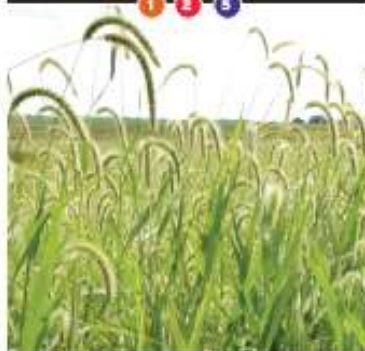
SHOWN RESISTANCE TO:



### GIANT FOXTAIL

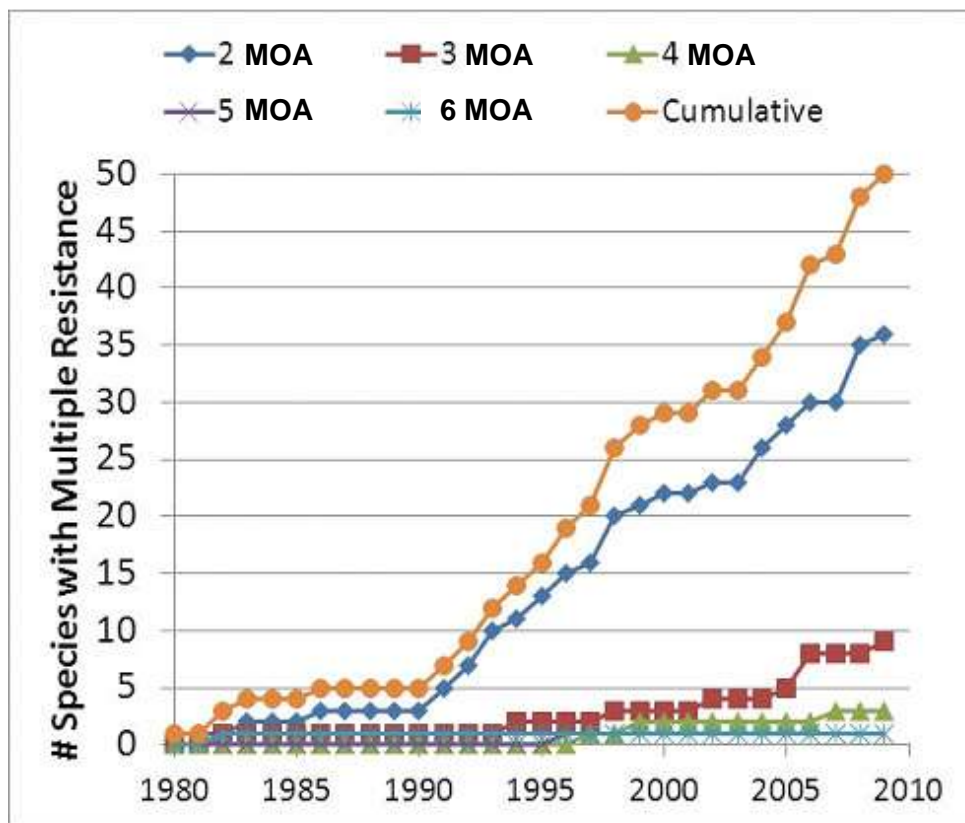
*Setaria faberii*

SHOWN RESISTANCE TO:



**FOR MORE INFORMATION  
TAKEACTIONONWEEDS.COM**

# Chronological Increase in Weeds with Resistance to Multiple Mechanisms of Action (MOA)



The number of weed species with resistance to more than one herbicide mechanism of action has increased drastically since 1990. Currently, 50 weed species with multiple forms of herbicide resistance have been confirmed.

## ***EXAMPLES WITH MORE THAN ONE FORM OF RESISTANCE***

### 2 Mechanisms of Action

Giant ragweed  
Palmer amaranth  
Common ragweed

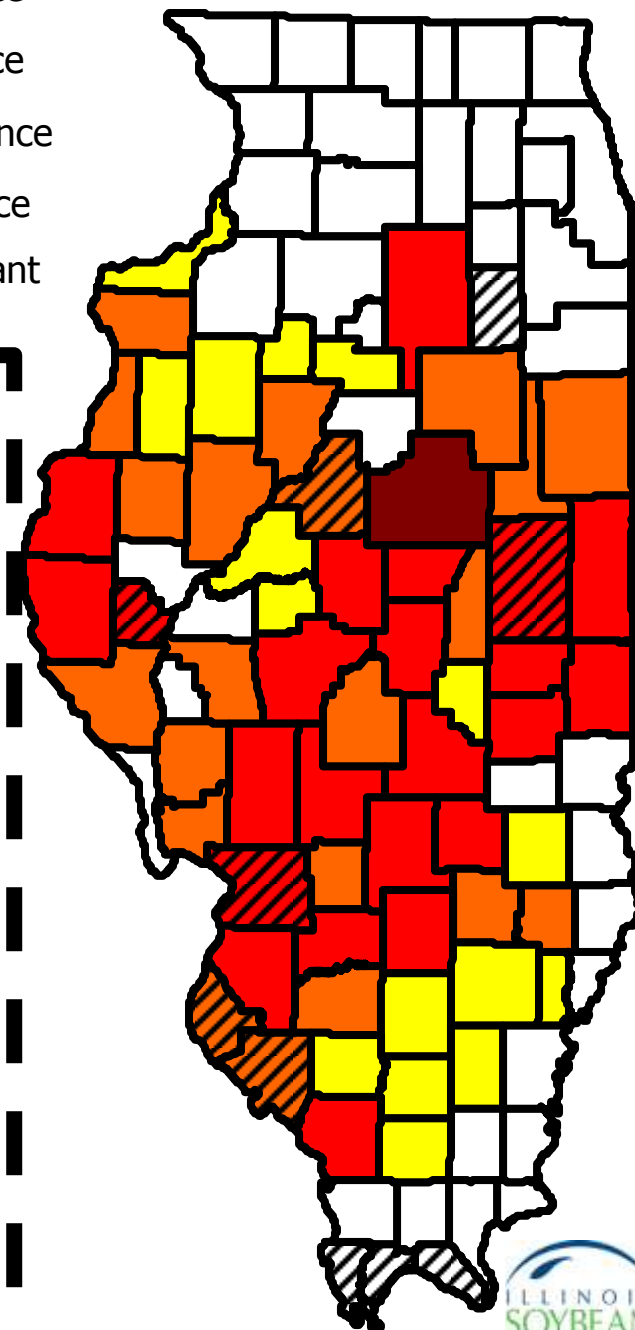
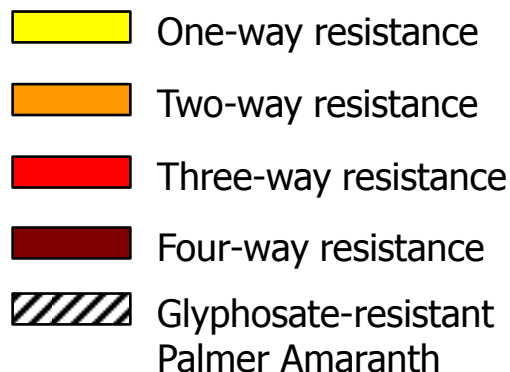
### 4 Mechanisms of Action

Waterhemp



Source: [www.weedscience.org](http://www.weedscience.org), Ian Heap, March 2011

# ***Status of Herbicide-Resistant Waterhemp In Illinois***



## **MOAs for Control of Waterhemp in Soybeans: 2013**

1. ALS-Inhibitors\*
2. EPSPS-Inhibitors\*
3. PPO-Inhibitors\*
4. Photosystem II-Inhibitors\*
5. Glutamine Synthesis-Inhibitors
6. Seedling Shoot or Root Inhibitors (residual only)

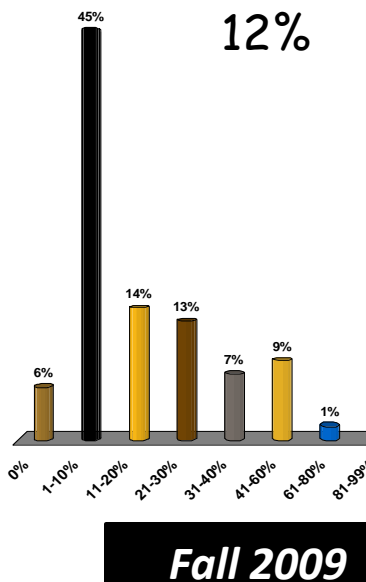
*\*Resistant waterhemp biotypes confirmed*

## **MOAs for Control of Waterhemp in Soybeans: 2015/2016???**

1. HPPD-Inhibitors\* – IL/IA/NE (2009)
2. Growth Regulators\* (2,4-D) - Nebraska (2009)

**NO NEW MODES OF ACTION... only current MOAs with new herbicide-resistant crop traits!**

# What percentage of your territory contains glyphosate-resistant waterhemp?

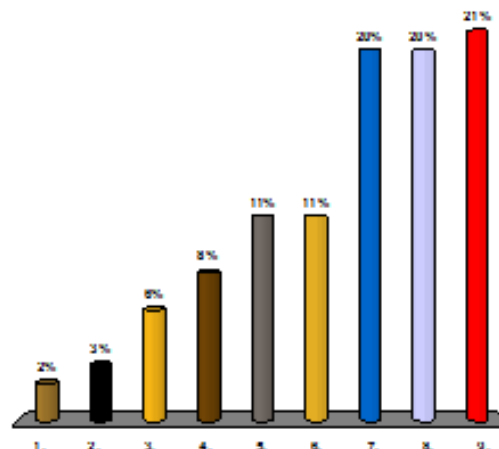


What percentage of your territory contains glyphosate-resistant waterhemp?

1. 0%
2. 1-10%
3. 11-20%
4. 21-30%
5. 31-40%
6. 41-60%
7. 61-80%
8. 81-99%
9. 100%

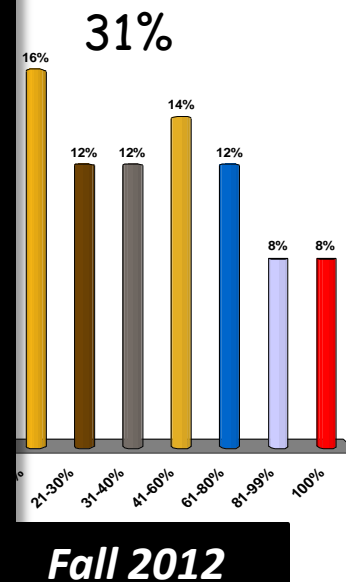
**PURDUE**  
UNIVERSITY  
Weed Science

**50%**



**Mean = 6.59**

**2013 SIFPC**



# ***PPO and Glyphosate-Resistant Waterhemp***



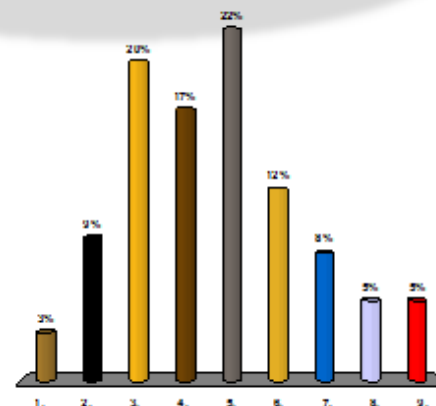
*Waterhemp 2011  
Jackson Co., IL*

# ***PPO and Glyphosate-Resistant Waterhemp***

What percentage of your territory contains  
glyphosate/PPO-resistant waterhemp?

1. 0%
2. 1-10%
3. 11-20%
4. 21-30%
5. 31-40%
6. 41-60%
7. 61-80%
8. 81-99%
9. 100%

***1/4 of Southern IL***



***Mean = 4.63***

***2013 SIFPC***

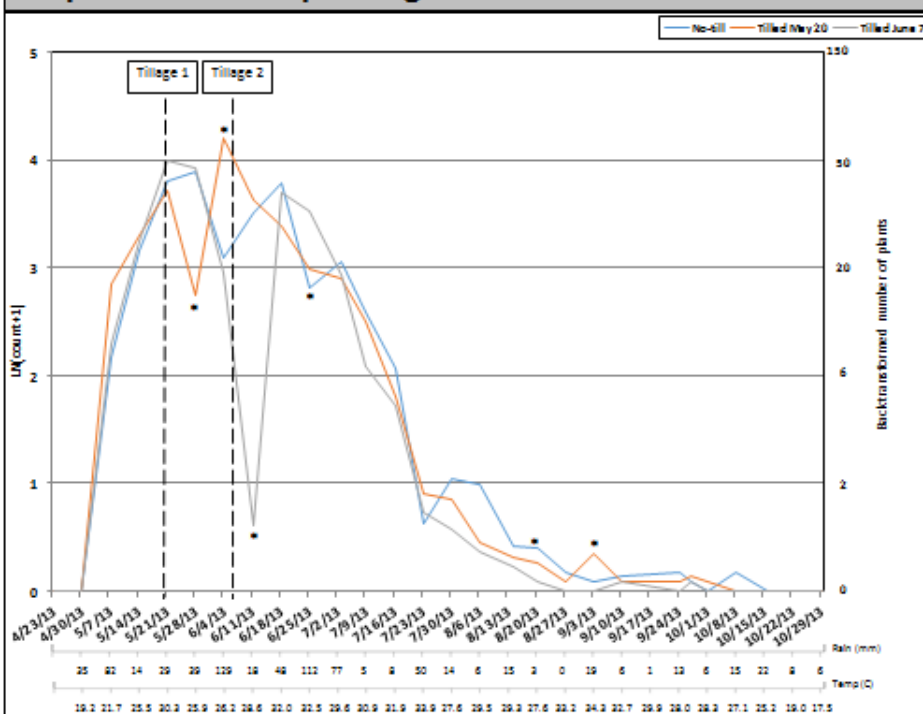
**PURDUE**  
UNIVERSITY  
Weed Science

*Waterhemp 2013  
Jackson Co., IL*



# Amaranth Emergence Patterns

**Graph 1. Waterhemp emergence in southern Illinois**



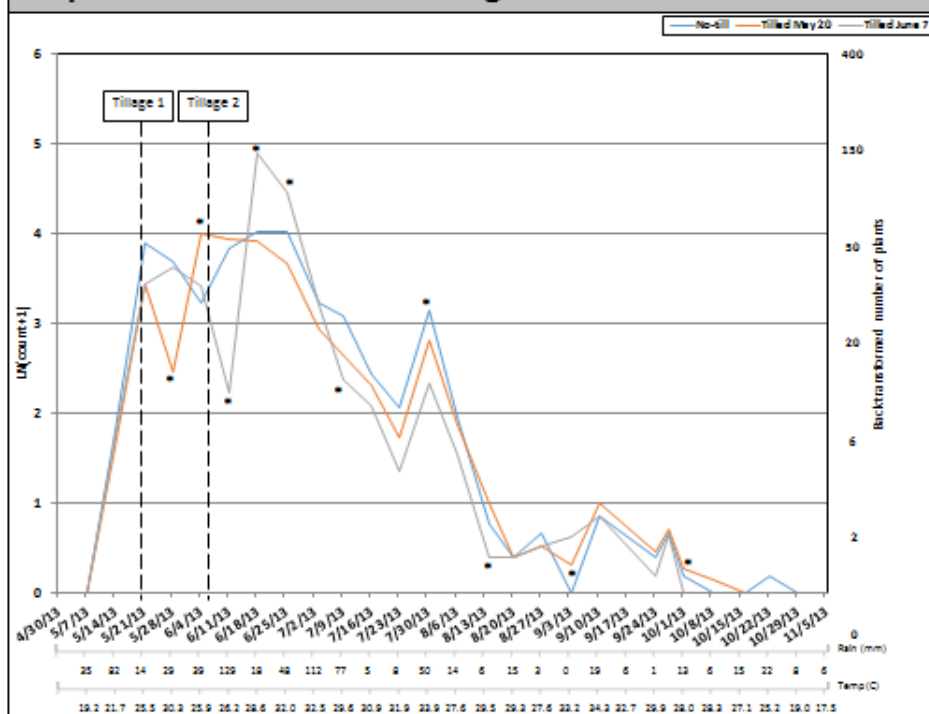
(\*) Statistical differences between number of plants per treatment:

5/25/13 - No-till = Tillage 2 > Tillage 1  
6/4/13 - Tillage 1 > No-till = Tillage 2

6/11/13 - No-till = Tillage 1 > Tillage 2  
6/25/13 - Tillage 2 > No-till

6/20/13 - No-till > Tillage 2  
9/5/13 - Tillage 1 > Tillage 2

**Graph 2. Palmer amaranth emergence in southern Illinois**



(\*) Statistical differences between number of plants per treatment:

5/25/13 - No-till = Tillage 2 > Tillage 1  
6/4/13 - Tillage 1 > No-till = Tillage 2  
6/11/13 - No-till = Tillage 1 > Tillage 2

6/20/13 - Tillage 2 > No-till = Tillage 1  
6/25/13 - Tillage 2 > No-till = Tillage 1  
7/2/13 - No-till > Tillage 2

7/20/13 - No-till > Tillage 2  
8/14/13 - Tillage 1 > Tillage 2  
8/25/13 - Tillage 2 > No-till

10/1/13 - Tillage 1 > Tillage 2

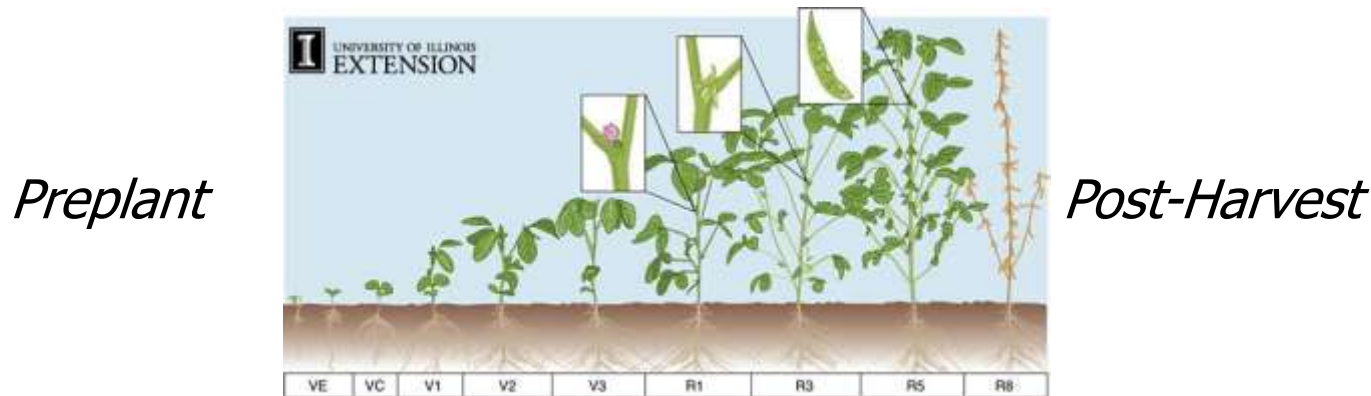
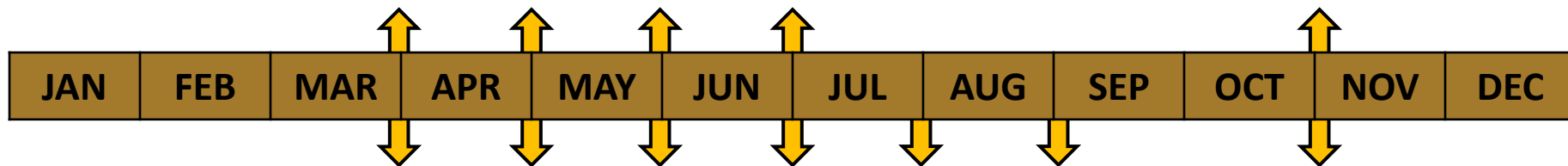
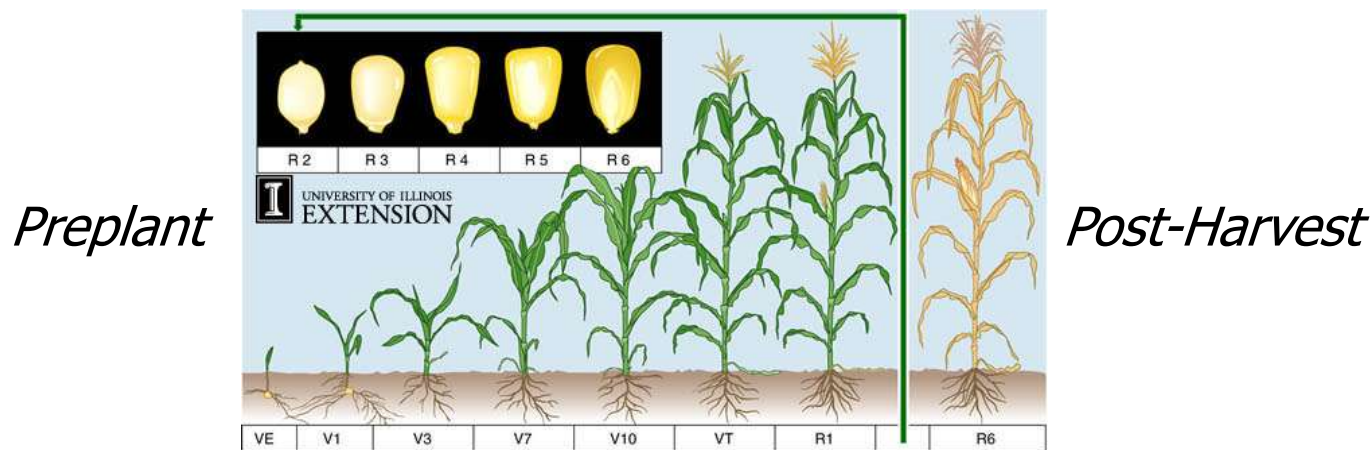
# Weed Emergence Patterns

Primary Period

Secondary Period

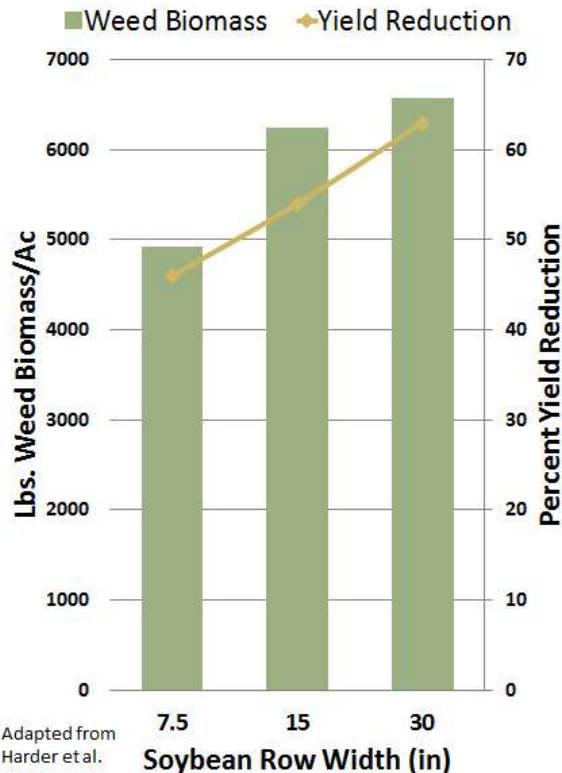
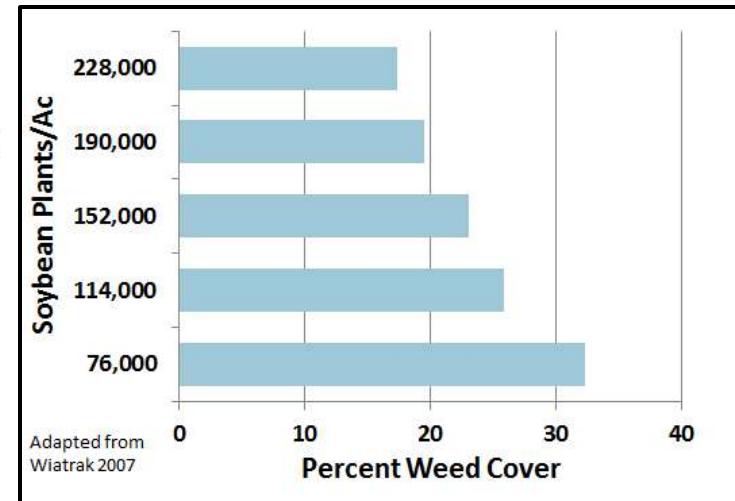
| Weed          | Fall | Early Spring | April | May | June | July | August |
|---------------|------|--------------|-------|-----|------|------|--------|
| Marestail     |      |              |       |     |      |      |        |
| Waterhemp     |      |              |       |     |      |      |        |
| Palmer        |      |              |       |     |      |      |        |
| Giant Ragweed |      |              |       |     |      |      |        |
| Morningglory  |      |              |       |     |      |      |        |

# Critical Times for Weed Management



# Cultural Weed Management

Definition: modified crop production practices that provide **enhanced crop growth** and **weed suppression**.



- Row Spacing
- Seeding Rate
- Planting Date
- Cover Crops
- Crop Rotations
- Cleansing Crops
- Sanitation of Equipment
- Balanced Soil Fertility
- Use of High-Quality Seed



15 inch rows



30 inch rows

Hartzler, ISU

# Weed Seed Management



# Developing Integrated Programs



***Palmer Amaranth***  
***Collinsville, IL***



***2011 – A commercial complaint***

# HERBICIDE CLASSIFICATION

REPEATED USE OF HERBICIDES WITH THE SAME SITE OF ACTION CAN RESULT IN THE DEVELOPMENT OF HERBICIDE-RESISTANT WEED POPULATIONS.

## by MODE OF ACTION

(effect on plant growth)

This chart groups herbicides by their modes of action to assist you in selecting herbicides (1) to maintain greater diversity of herbicides used (2) to rotate and/or combine herbicides with different sites of action to delay the development of herbicide resistance.



## by PREMIX

This chart lists premix herbicides alphabetically by their trade names so you can identify the premix's component herbicides and their respective modes of action groups. Refer to the Site of Action chart on the left for more information.

| SITE OF ACTION GROUP                      |                                    | NUMBER OF RESISTANT WEED SPECIES IN U.S. |                                 |
|---|------------------------------------|--|---------------------------------|
| SITE OF ACTION                            | CHEMICAL FAMILY                    | ACTIVE INGREDIENT                        | PRODUCT EXAMPLES (manufacturer) |
| <b>1. ACCRUE SYNTHESIS INHIBITORS</b>     |                                    |  |                                 |
| 1   | acetyl-coenzyme A (acCoA) synthase | chlorimifop                              | Discover ME                     |
|   |                                    | cyclofop                                 | Chlorflex                       |
|   |                                    | fenoxaprop                               | Bluestar, Trifluralin, others   |
|   |                                    | flazasulfuron                            | Flazulite 2.0                   |
|   |                                    | glyphosate                               | Roundup, others                 |
| 15  | acetolactate synthase (ALS)        | glufosinate                              | Roundup, others                 |
|   |                                    | glufosinate                              | Roundup, others                 |
| <b>2. ALLYLamine SYNTHESIS INHIBITORS</b> |                                    |  |                                 |
| 2   | acetolactate synthase (ALS)        | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   | acetolactate synthase (ALS)        | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   | acetolactate synthase (ALS)        | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   | acetolactate synthase (ALS)        | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
|   |                                    | glyphosate                               | Roundup, others                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
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|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
|   | glyphosate                         | Roundup, others                          |                                 |
| acetolactate synthase (ALS)               |                                    |  |                                 |

| SITE OF ACTION GROUP  |                   |            | SITE OF ACTION GROUP  |                   |            |
|-----------------------|-------------------|------------|-----------------------|-------------------|------------|
| PREMIX                | ACTIVE INGREDIENT | TRADE NAME | PREMIX                | ACTIVE INGREDIENT | TRADE NAME |
| ACRINOLACRYLIC AMIDES |                   |            | ACRYLAMIDES           |                   |            |
| ACRINOLACRYLIC AMIDES | 1 Benzyl ac       | Espino     | ACRINOLACRYLIC AMIDES | 1 Benzyl ac       | Espino     |
|                       | 2 Benzyl ac       | Espino     |                       | 2 Benzyl ac       | Espino     |
|                       | 3 Benzyl ac       | Espino     |                       | 3 Benzyl ac       | Espino     |
| ACRINOLACRYLIC AMIDES | 4 Benzyl ac       | Espino     | ACRINOLACRYLIC AMIDES | 4 Benzyl ac       | Espino     |
|                       | 5 Benzyl ac       | Espino     |                       | 5 Benzyl ac       | Espino     |
|                       | 6 Benzyl ac       | Espino     |                       | 6 Benzyl ac       | Espino     |
| ACRINOLACRYLIC AMIDES | 7 Benzyl ac       | Espino     | ACRINOLACRYLIC AMIDES | 7 Benzyl ac       | Espino     |
|                       | 8 Benzyl ac       | Espino     |                       | 8 Benzyl ac       | Espino     |
|                       | 9 Benzyl ac       | Espino     |                       | 9 Benzyl ac       | Espino     |
| ACRINOLACRYLIC AMIDES | 10 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 10 Benzyl ac      | Espino     |
|                       | 11 Benzyl ac      | Espino     |                       | 11 Benzyl ac      | Espino     |
|                       | 12 Benzyl ac      | Espino     |                       | 12 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 13 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 13 Benzyl ac      | Espino     |
|                       | 14 Benzyl ac      | Espino     |                       | 14 Benzyl ac      | Espino     |
|                       | 15 Benzyl ac      | Espino     |                       | 15 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 16 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 16 Benzyl ac      | Espino     |
|                       | 17 Benzyl ac      | Espino     |                       | 17 Benzyl ac      | Espino     |
|                       | 18 Benzyl ac      | Espino     |                       | 18 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 19 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 19 Benzyl ac      | Espino     |
|                       | 20 Benzyl ac      | Espino     |                       | 20 Benzyl ac      | Espino     |
|                       | 21 Benzyl ac      | Espino     |                       | 21 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 22 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 22 Benzyl ac      | Espino     |
|                       | 23 Benzyl ac      | Espino     |                       | 23 Benzyl ac      | Espino     |
|                       | 24 Benzyl ac      | Espino     |                       | 24 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 25 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 25 Benzyl ac      | Espino     |
|                       | 26 Benzyl ac      | Espino     |                       | 26 Benzyl ac      | Espino     |
|                       | 27 Benzyl ac      | Espino     |                       | 27 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 28 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 28 Benzyl ac      | Espino     |
|                       | 29 Benzyl ac      | Espino     |                       | 29 Benzyl ac      | Espino     |
|                       | 30 Benzyl ac      | Espino     |                       | 30 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 31 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 31 Benzyl ac      | Espino     |
|                       | 32 Benzyl ac      | Espino     |                       | 32 Benzyl ac      | Espino     |
|                       | 33 Benzyl ac      | Espino     |                       | 33 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 34 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 34 Benzyl ac      | Espino     |
|                       | 35 Benzyl ac      | Espino     |                       | 35 Benzyl ac      | Espino     |
|                       | 36 Benzyl ac      | Espino     |                       | 36 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 37 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 37 Benzyl ac      | Espino     |
|                       | 38 Benzyl ac      | Espino     |                       | 38 Benzyl ac      | Espino     |
|                       | 39 Benzyl ac      | Espino     |                       | 39 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 40 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 40 Benzyl ac      | Espino     |
|                       | 41 Benzyl ac      | Espino     |                       | 41 Benzyl ac      | Espino     |
|                       | 42 Benzyl ac      | Espino     |                       | 42 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 43 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 43 Benzyl ac      | Espino     |
|                       | 44 Benzyl ac      | Espino     |                       | 44 Benzyl ac      | Espino     |
|                       | 45 Benzyl ac      | Espino     |                       | 45 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 46 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 46 Benzyl ac      | Espino     |
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|                       | 48 Benzyl ac      | Espino     |                       | 48 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 49 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 49 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 52 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 52 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 55 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 55 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 58 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 58 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 61 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 61 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 64 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 64 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 67 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 67 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 70 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 70 Benzyl ac      | Espino     |
|                       | 71 Benzyl ac      | Espino     |                       | 71 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 73 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 73 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 76 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 76 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 79 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 79 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 82 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 82 Benzyl ac      | Espino     |
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| ACRINOLACRYLIC AMIDES | 85 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 85 Benzyl ac      | Espino     |
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|                       | 87 Benzyl ac      | Espino     |                       | 87 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 88 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 88 Benzyl ac      | Espino     |
|                       | 89 Benzyl ac      | Espino     |                       | 89 Benzyl ac      | Espino     |
|                       | 90 Benzyl ac      | Espino     |                       | 90 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 91 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 91 Benzyl ac      | Espino     |
|                       | 92 Benzyl ac      | Espino     |                       | 92 Benzyl ac      | Espino     |
|                       | 93 Benzyl ac      | Espino     |                       | 93 Benzyl ac      | Espino     |
| ACRINOLACRYLIC AMIDES | 94 Benzyl ac      | Espino     | ACRINOLACRYLIC AMIDES | 94 Benzyl ac      | Espino     |
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| ACRINOL               |                   |            |                       |                   |            |

# Primary Corn/Soybean Herbicide Sites of Action

| Group No. | Site of Action       | Mode of Action                                | Example    |
|-----------|----------------------|---|------------|
| 1         | ACC-ase              | Membrane integrity via lipid synthesis        | Poast Plus |
| 2         | ALS                  | Branched chain amino acid synthesis           | Classic    |
| 3         | Tubulin              | Cell division inhibition                      | Treflan    |
| 4         | Auxin binding site   | Mimic activity of auxin                       | 2,4-D      |
| 5         | D1 protein           | Photosynthesis via electron transfer in PS II | atrazine   |
| 9         | EPSPS                | Inhibition of shikimic acid pathway           | glyphosate |
| 10        | Glutamine synthetase | Photosynthesis via ammonium incorporation     | Liberty    |
| 14        | PPO                  | Photosynthesis via chlorophyll synthesis      | Cobra      |
| 15        | Unknown              | Very long chain fatty acid synthesis          | Dual       |
| 22        | Photosystem I        | Photosynthesis via electron transfer in PS I  | paraquat   |
| 27        | HPPD                 | Photosynthesis via carotene synthesis         | Callisto   |

***\*Eleven (11) primary sites of action***

# Examples of Mechanism of Action on Labels

GROUP 9 HERBICIDE

The product with this symbol on the label contains glyphosate, an active ingredient in Group 9; the mechanism of action is binding to the EPSP synthase enzyme resulting in inhibition of aromatic amino acid formation.

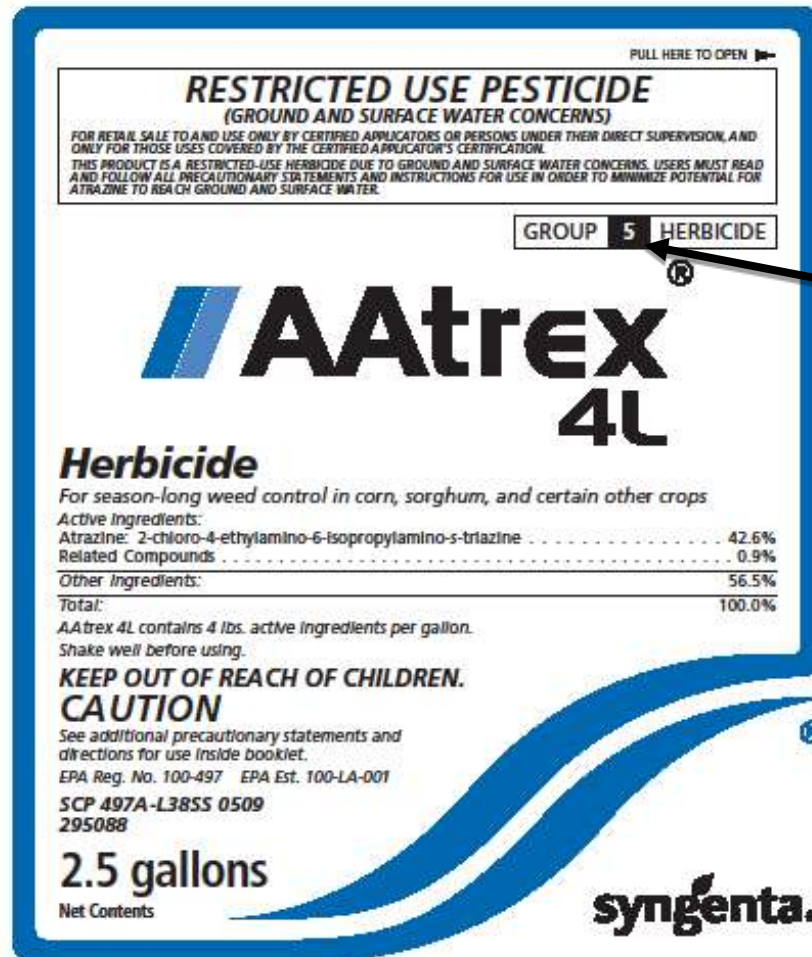
GROUP 5 HERBICIDE

The product with this symbol on the label contains atrazine, an active ingredient in Group 5; the mechanism of action is binding to the  $Q_8$ -binding niche on the D1 protein of the photosystem II complex in the chloroplast thylakoid membranes resulting in inhibition of photosynthesis.

15 9 27  
HERBICIDE

The product with this symbol contains s-metolachlor, glyphosate, and mesotrione, active ingredients with three different mechanisms of action, designated by Group 15 - inhibition of very long chain fatty acids resulting in inhibition of cell division; Group 9 - binding to the EPSP synthase enzyme and Group 27 – inhibition of 4-HPPD resulting in bleaching of the plants, respectively.

# Example of a Group Number on a Label



**Mechanism of  
Action Group  
Number**

| Weed          | Fall | Early Spring | April | May | June | July | August |
|---------------|------|--------------|-------|-----|------|------|--------|
| Marestail     |      |              |       |     |      |      |        |
| Waterhemp     |      |              |       |     |      |      |        |
| Palmer        |      |              |       |     |      |      |        |
| Giant Ragweed |      |              |       |     |      |      |        |
| Morningglory  |      |              |       |     |      |      |        |

## Corn Herbicide Programs

❑ Heavy reliance on the following:

- ▣ 15 – LCFAI (chloroacetamides)
- ▣ 5 – PSII (atrazine)
- ▣ 27 – HPPD (mesotrione, isoxaflutole, topramazone, etc.)
- ▣ 9 – EPSP synthase (glyphosate)

❑ Residual activity in PRE and POST applications

| Weed          | Fall | Early Spring | April | May | June | July | August |
|---------------|------|--------------|-------|-----|------|------|--------|
| Marestail     |      |              |       |     |      |      |        |
| Waterhemp     |      |              |       |     |      |      |        |
| Palmer        |      |              |       |     |      |      |        |
| Giant Ragweed |      |              |       |     |      |      |        |
| Morningglory  |      |              |       |     |      |      |        |

## Soybean Herbicide Programs

- ☐ Heavy reliance on the following:
  - ▣ 15 – LCFAI (chloroacetamides)
  - ▣ 14 – PPO (flumioxazin, sulfentrazone, fomesafen, lactofen, etc.)
  - ▣ 9 – EPSP synthase (glyphosate)
- ☐ Some reliance:
  - ▣ 5 – PSII (metribuzin)
  - ▣ 22-PSI (paraquat)
  - ▣ 10-GSI (glufosinate)
  - ▣ 3-Microtubule (pendimethalin)
  - ▣ 2-ALS (chlorimuron, cloransulam, etc.)

- ☐ Residual activity in PRE and POST applications

# Soybean Herbicide Options

|                         |                  | Primary Period              |       |             | Secondary Period |      |        |
|-------------------------|------------------|-----------------------------|-------|-------------|------------------|------|--------|
| Weed / MOA              | Fall             | Early Spring                | April | May         | June             | July | August |
| <b><i>Marestail</i></b> |                  |                             |       |             |                  |      |        |
| 9-EPSPS                 | Glyphosate       |                             |       |             |                  |      |        |
| 4-Auxin                 | 2,4-D<br>Dicamba | 2,4-D                       |       |             |                  |      |        |
| 1-ALS                   | Chlorimuron      | Chlorimuron<br>Cloransulam  |       |             |                  |      |        |
| 14-PPO                  | Saflufenacil     | Saflufenacil<br>Flumioxazin |       |             |                  |      |        |
| 5-PSII                  | Metribuzin       |                             |       |             |                  |      |        |
| 10-GSI                  |                  |                             |       | Glufosinate |                  |      |        |
| 22-PSI                  | Paraquat         |                             |       |             |                  |      |        |

*Planting  
Date*

# Soybean Herbicide Options

|                         |               |              | Primary Period                                      |                                      | Secondary Period |      |        |  |
|-------------------------|---------------|--------------|---|--------------------------------------|------------------|------|--------|--|
| Weed / MOA              | Fall          | Early Spring | April   | May                                  | June             | July | August |  |
| <b><i>Waterhemp</i></b> |               |              |   |                                      |                  |      |        |  |
| 15-LCFAI                | Not Effective |              | Metolachlor, acetochlor, dimethenamid pyroxasulfone |                                      |                  |      |        |  |
| 14-PPO                  |               |              | Flumioxazin<br>Sulfentrazone<br>Fomesafen           | Fomesafen<br>Lactofen<br>Acifluorfen |                  |      |        |  |
| 5-PSII                  |               |              | Metribuzin  |                                      |                  |      |        |  |
| 3-Microtubule           |               |              | Pendimethalin                                       |                                      |                  |      |        |  |
| 10-GSI                  |               |              |   | Glufosinate                          |                  |      |        |  |
| 22-PSI                  |               |              | Paraquat  |                                      |                  |      |        |  |
| 9-EPSPS                 |               |              |   | Glyphosate                           |                  |      |        |  |

*Planting  
Date*

# Soybean Herbicide Options

|                         |   | Primary Period   |   |  | Secondary Period                             |      |        |
|-------------------------|---|--|---|--|--|------|--------|
| Weed / MOA              | Fall  | Early Spring   | April   | May  | June   | July | August |
| <b><i>Marestail</i></b> |   |  |   |  |  |      |        |
| <b><i>Waterhemp</i></b> |   |  |   |  |  |      |        |
|                         |   | 28-14 DBP  | 14-0 DBP  | VE-V3  | Late POST                                    |      |        |
|                         | Roundup<br>2,4-D<br>Clarity<br>Distinct<br>Sharpen<br>Canopy EX | Roundup<br>2,4-D<br>Clarity Distinct<br>Sharpen<br>Canopy EX<br>Canopy 75DF<br>Sequence<br>Boundary<br>Sencor<br>Prowl | Roundup<br>Liberty<br>Sharpen<br>Paraquat<br>Canopy 75DF<br>Sequence<br>Boundary<br>Sencor<br>Warrant<br>Zidua<br>Valor XLT<br>Fierce<br>Authority*<br>Prefix | Roundup<br>Liberty<br>Sequence<br>Warrant<br>Zidua<br>Anthem<br>Outlook<br>Prefix<br>Flexstar<br>Cobra<br>Ultra Blazer | Roundup<br>Flexstar<br>Cobra<br>Ultra Blazer |      |        |

*Planting  
Date*

# Herbicide Program Evaluation

*Based on # of Herbicide Site of Action Groups*

**Crop:** Soybean

**Target Weeds:** Waterhemp (glyphosate- and ALS-resistant)

| Herbicide Program        | Group #   | # Effective on Waterhemp |
|--------------------------|-----------|--------------------------|
| No residual herbicide    |           |                          |
| followed by              |           |                          |
| Glyphosate - POST        | 9         | 0                        |
| Cobra - POST             | <u>14</u> | 1                        |
|                          |           |                          |
| <i>Total for program</i> | <i>2</i>  | <i>1</i>                 |

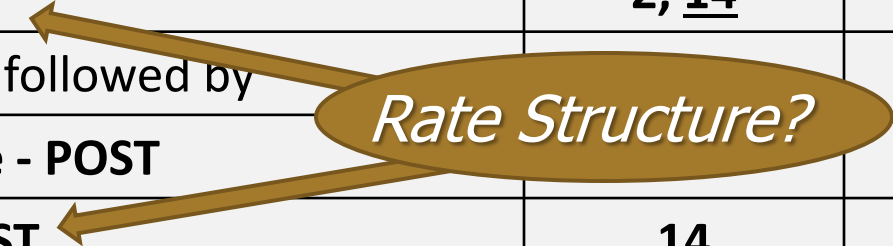
# Herbicide Program Evaluation

*Based on # of Herbicide Site of Action Groups*

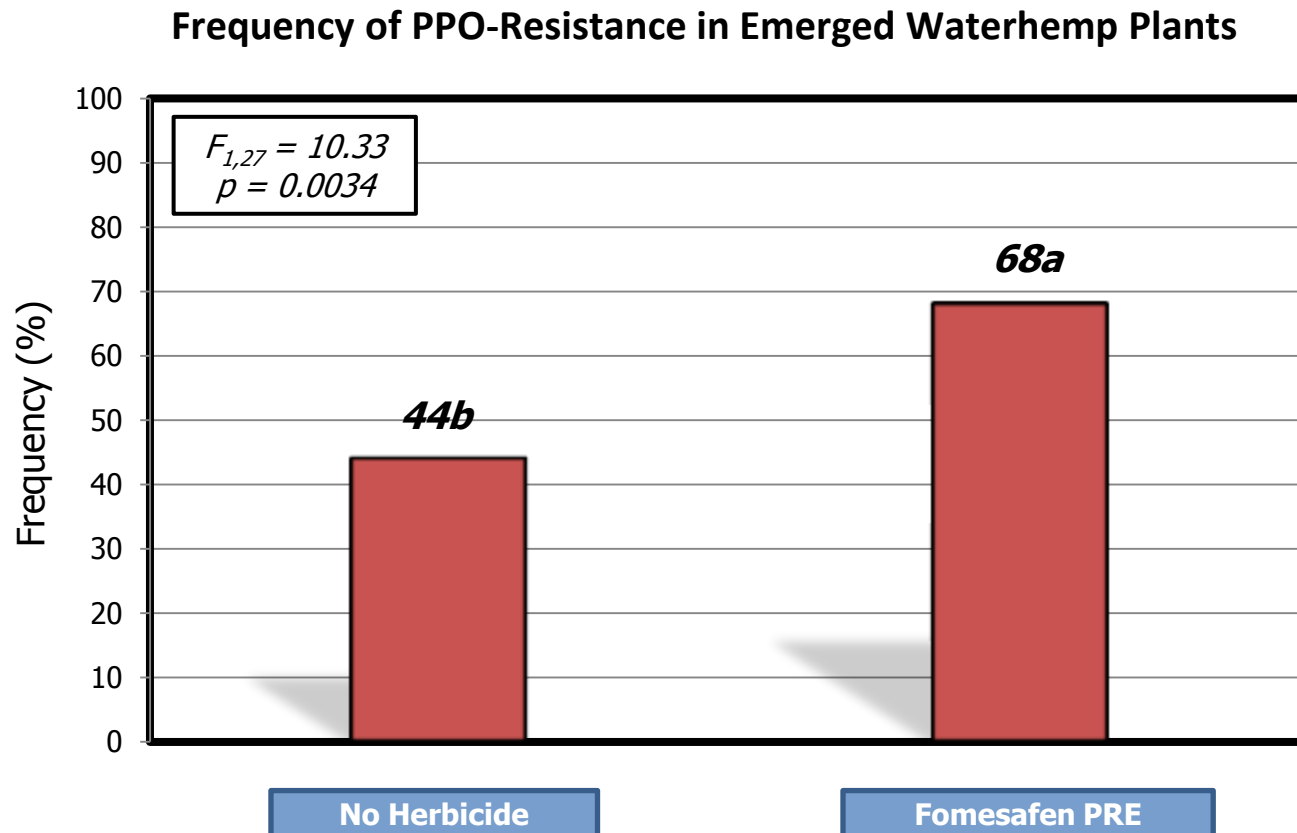
**Crop:** Soybean

**Target Weeds:** Waterhemp (glyphosate- and ALS-resistant)

| Herbicide Program        | Group #      | # Effective on Waterhemp |
|--------------------------|--------------|--------------------------|
| Envive-PRE               | 2, <u>14</u> | 1                        |
| followed by              |              |                          |
| Glyphosate - POST        |              | 0                        |
| Cobra - POST             | <u>14</u>    | 1                        |
|                          |              |                          |
| <i>Total for program</i> | <i>3</i>     | <i>1</i>                 |



# Selection of PPO-Resistant Waterhemp Using Soil Residual PPO Herbicides



2011-Canton Co. and 2012-Jackson Co.  
Genotypic evaluation based on presence of mutation

# Herbicide Program Evaluation

*Based on # of Herbicide Site of Action Groups*

**Crop:** Soybean (RR)

**Target Weeds:** Marestalk (glyphosate-resistant)

Waterhemp (ALS/PPO/glyphosate-resistant)

| Herbicide Program                                | Group #                                   | # Effective on Waterhemp |
|--|---|--------------------------|
| Glyphosate + Sharpen -<br>Burndown               | 9, 14                                     | not applicable           |
| followed by                                      |   |                          |
| Glyphosate + Authority First +<br>Boundary - PRE | 9, 2, <u>14</u> ,<br><u>15</u> , <u>5</u> | 3                        |
| followed by                                      |   |                          |
| Glyphosate + Prefix - POST                       | 9, 14, <u>15</u>                          | 1                        |
|  |   |                          |
| <b>Total for program</b>                         | <b>5</b>                                  | <b>3</b>                 |

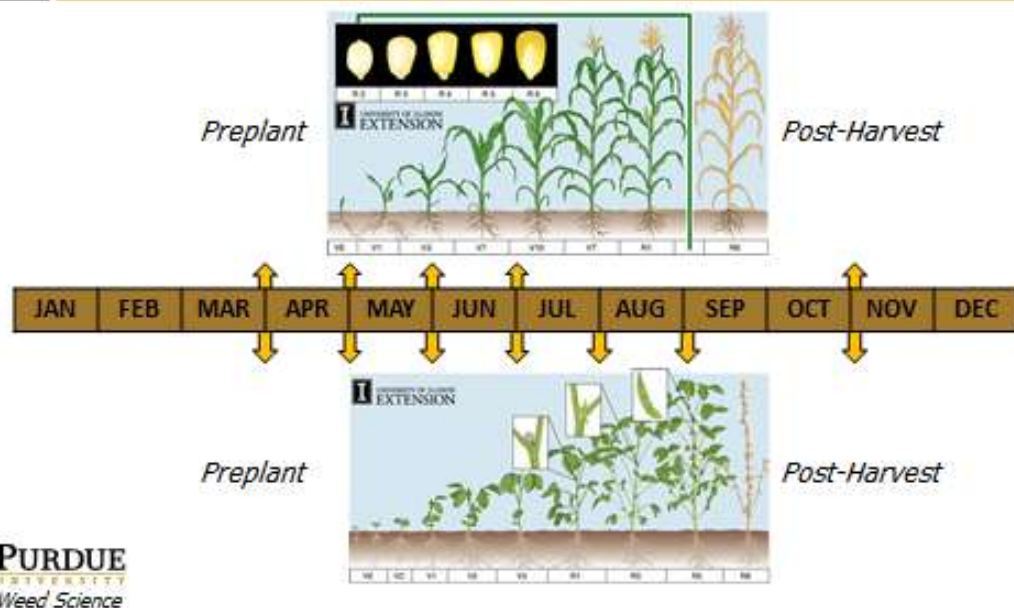
# Herbicide Program

*Based on # of Herbicide Applications*

**Crop:** Soybean (LL)

**Target Weeds:** Marestail (M)  
Waterhemp (W)

## Critical Times for Weed Management



### Herbicide Program

**Gramoxone + Sencor - Burndown**

followed by

**Authority First + Sequence - PRE**

**2, 14, 9, 15**

**2**

followed by

**Liberty + Prefix - POST**

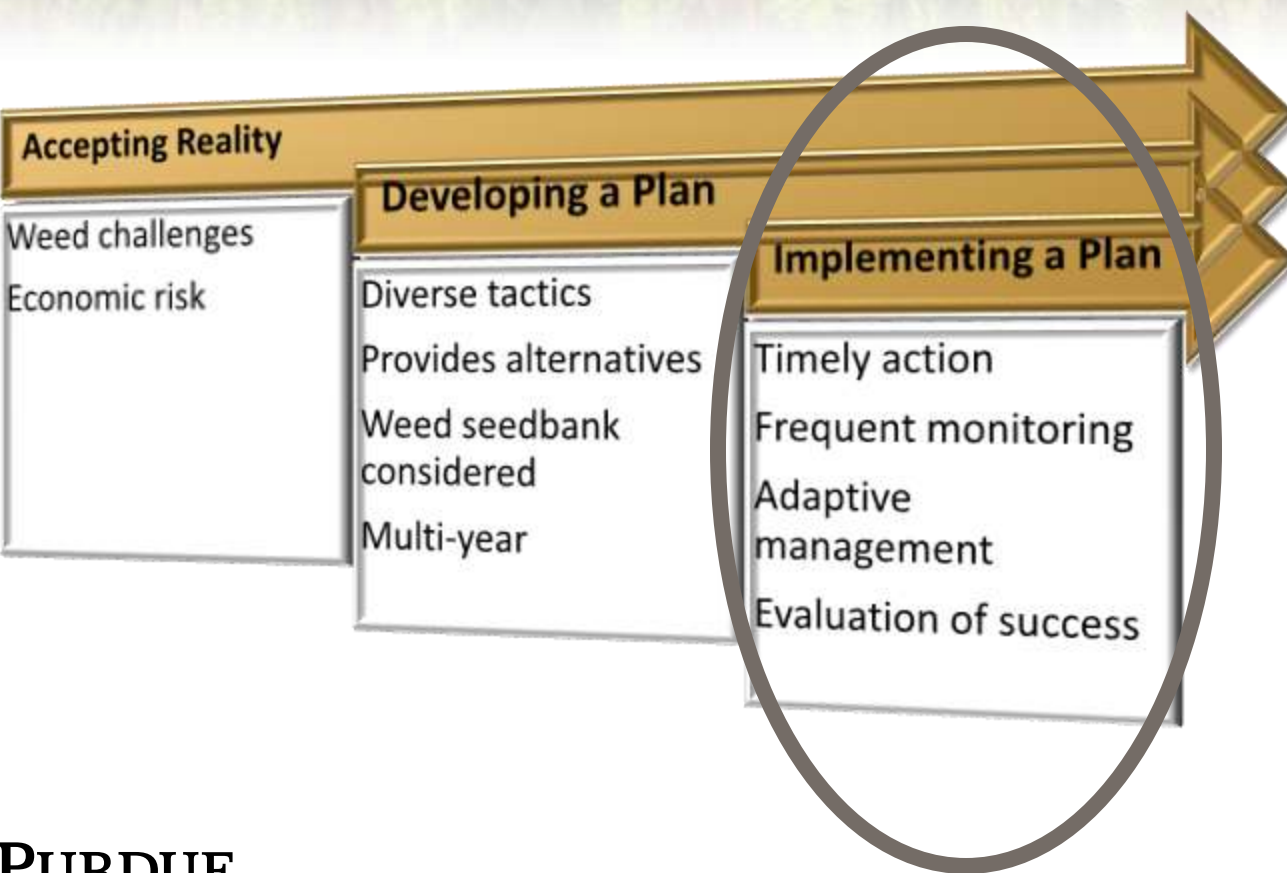
**10, 14, 15**

**2**

***Total for program***

**7**

**3**



**Complete Weed  
Management  
System**



*Authority XL 4 oz/A applied 28 DBP*



*Authority XL 4 oz/A applied 14 DBP*

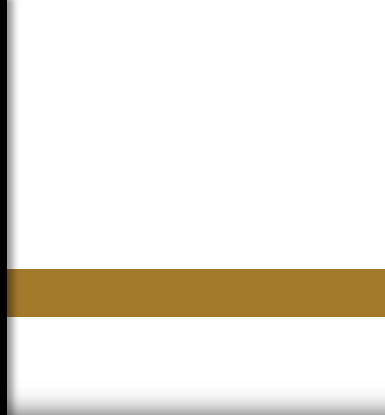


*Authority XL 4 oz/A applied at planting*



**Palmer Amaranth Control**  
*40% difference due to  
application method*





# Scout Fields





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# Summary

- ❑ Continue aggressive weed management strategies.
  - ❑ Consider:
    - Management from spring through fall
    - Crop rotation , tillage systems, and herbicide rotation
    - Management of weed seed
  - ❑ Full herbicide rates
  - ❑ Combinations of effective modes of action
    - Two (2) effective modes of action for each application
  - ❑ Requires careful management to minimize risk of crop response
  - ❑ Overlapping residuals!
- ❑ Don't ignore herbicide failure.
- ❑ Know your herbicide sites of action groups.

# *Thank You!*

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## *Questions?*





- ❑ The time has come to do our post-emerge application of Roundup on our soybeans. This spring we used a pre-emerge herbicide on our our fields. The soybean fields looked so clean we delayed longer than usual with our post emerge application. When we started spraying we realized the mistake we had made. The remaining weeds were 1 foot or taller. Too large for Roundup to do significant damage to. Many will burn down and then come back. Scouting the field one week later we already saw signs of new growth on waterhemp that looked dead from a distance. We also found 1 1/2 foot tall waterhemp that had little or no damage to the plant from our Roundup application of 38oz/acre



*Waterhemp 2013  
Jackson Co., IL*

# HERBICIDE PROGRAMS IN CORN AND SOYBEANS



Bryan Young

# WEED OUT RESISTANCE



## KNOW YOUR WEEDS

THE 11 BIGGEST RESISTANCE THREATS



FOR MORE INFORMATION  
TAKEACTIONONWEEDS.COM

### HERBICIDE GROUPS AND SITES OF ACTION

Herbicide Groups provide a range of information to help you select the right herbicide for your site. The site of action is the specific protein a herbicide binds to, resulting in disruption of a physiological process (mode of action) and plant death. Resistance management programs that include multiple herbicide Groups effectively control problem weeds and the herbicide groups in managing herbicide resistance. Herbicide Groups numbers are designations used by herbicide labels. This guide provides information on the herbicide Groups most commonly used in soybean production. Also, the most problematic herbicide-resistant weeds and the herbicide Groups they have evolved resistance to are highlighted.

KEY  
OF ACTION  
GROUP

| STATE OF ACTION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 | 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 | 1490 | 1491 | 1492 | 1493 | 1494 | 1495 | 1496 | 1497 | 1498 |
|-----------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-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# HERBICIDE CLASSIFICATION

REPEATED USE OF HERBICIDES WITH THE SAME SITE OF ACTION CAN RESULT IN THE DEVELOPMENT OF HERBICIDE-RESISTANT WEED POPULATIONS.

## by MODE OF ACTION

(effect on plant growth)

This chart groups herbicides by their modes of action to assist you in selecting herbicides (1) to maintain greater diversity of herbicides used (2) to rotate and/or combine herbicides with different sites of action to delay the development of herbicide resistance.



## by PREMIX

This chart lists premix herbicides alphabetically by their trade names so you can identify the premix's component herbicides and their respective modes of action groups. Refer to the Site of Action chart on the left for more information.

| SITE OF ACTION GROUP               |  | NUMBER OF RESISTANT WEED SPECIES IN U.S. |                                 |
|------------------------------------|--|--|---------------------------------|
| SITE OF ACTION                     | CHEMICAL FAMILY                                    | ACTIVE INGREDIENT                        | PRODUCT EXAMPLES (manufacturer) |
| 1. ACCRUE SYNTHESIS INHIBITORS     |  |  |                                 |
| 1                                  | acetyl-coenzyme A (acetyl-CoA) synthase inhibitors | chlorimifop                              | Declone®                        |
|                                    |  | cyclofop                                 | Chlorflex®                      |
|                                    |  | fenoxaprop                               | Bluestar® Trioxone, others      |
|                                    |  | glyphosate                               | Roundup®                        |
|                                    |  | glufosinate                              | Poast®                          |
| 15                                 | acetyl-coenzyme A (acetyl-CoA) synthase inhibitors | glyphosate                               | Roundup®                        |
|                                    |  | glufosinate                              | Poast®                          |
| 2. ALLYLamine SYNTHESIS INHIBITORS |  |  |                                 |
| 2                                  | acetolactate synthase inhibitors                   | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    | acetolactate synthase inhibitors                   | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    | acetolactate synthase inhibitors                   | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
| acetolactate synthase inhibitors   | acetolactate                                       | Roundup®                                 |                                 |
|                                    | acetolactate                                       | Roundup®                                 |                                 |
|                                    | acetolactate                                       | Roundup®                                 |                                 |
|                                    | acetolactate                                       | Roundup®                                 |                                 |
|                                    | acetolactate                                       | Roundup®                                 |                                 |
| 45                                 | acetolactate synthase inhibitors                   | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
| 9                                  | acetolactate synthase inhibitors                   | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
|                                    |  | acetolactate                             | Roundup®                        |
| 3. PEP SYNTHESIS INHIBITORS        |  |  |                                 |
| 3                                  | pep synthase inhibitors                            | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
| 14                                 | pep synthase inhibitors                            | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |
|                                    |  | pep synthase                             | Roundup®                        |

| SITE OF ACTION GROUP            |                            |            | SITE OF ACTION GROUP |                            |            |
|---------------------------------|----------------------------|------------|----------------------|----------------------------|------------|
| PREMIX                          | ACTIVE INGREDIENT          | TRADE NAME | PREMIX               | ACTIVE INGREDIENT          | TRADE NAME |
| ACCRUE SYNTHESIS INHIBITORS     |                            |            | ACCRUE COMPLETE      |                            |            |
| 4                               | acetyl-coenzyme A synthase | Declone    | 4                    | acetyl-coenzyme A synthase | Declone    |
|                                 | acetyl-coenzyme A synthase | Declone    |                      | acetyl-coenzyme A synthase | Declone    |
|                                 | acetyl-coenzyme A synthase | Declone    |                      | acetyl-coenzyme A synthase | Declone    |
|                                 | acetyl-coenzyme A synthase | Declone    |                      | acetyl-coenzyme A synthase | Declone    |
| 15                              | acetyl-coenzyme A synthase | Roundup    | 15                   | acetyl-coenzyme A synthase | Roundup    |
|                                 | acetyl-coenzyme A synthase | Roundup    |                      | acetyl-coenzyme A synthase | Roundup    |
|                                 | acetyl-coenzyme A synthase | Roundup    |                      | acetyl-coenzyme A synthase | Roundup    |
|                                 | acetyl-coenzyme A synthase | Roundup    |                      | acetyl-coenzyme A synthase | Roundup    |
| 9                               | allylamine synthase        | Roundup    | 9                    | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
| ALLYLAMINE SYNTHESIS INHIBITORS |                            |            | ALLYLAMINE COMPLETE  |                            |            |
| 5                               | allylamine synthase        | Roundup    | 5                    | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
|                                 | allylamine synthase        | Roundup    |                      | allylamine synthase        | Roundup    |
| 14                              | allylamine synthase        | Roundup    | 14                   | allylamine synthase        | Roundup    |
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# Outline



*New Herbicides for 2013*

*Status Report on Weeds*

*Building a Management System*

# Primary Corn/Soybean Herbicide Sites of Action

| Group No. | Site of Action       | Mode of Action                                | Example       |
|-----------|----------------------|---|---------------|
| 1         | ACC-ase              | Membrane integrity via lipid synthesis        | Poast Plus    |
| 2         | ALS                  | Branched chain amino acid synthesis           | Classic       |
| 3         | Tubulin              | Cell division inhibition                      | Treflan       |
| 4         | Auxin binding site   | Mimic activity of auxin                       | 2,4-D         |
| 5         | D1 protein           | Photosynthesis via electron transfer in PS II | atrazine      |
| 6         | D1 protein           | Photosynthesis via electron transfer in PS II | Basagran      |
| 9         | EPSPS                | Inhibition of shikimic acid pathway           | glyphosate    |
| 10        | Glutamine synthetase | Photosynthesis via ammonium incorporation     | Liberty       |
| 13        | DPX synthase         | Photosynthesis via carotene synthesis         | Command       |
| 14        | PPO                  | Photosynthesis via chlorophyll synthesis      | Cobra         |
| 15        | Unknown              | Very long chain fatty acid synthesis          | Dual          |
| 19        | Unknown              | Auxin transport                               | diflufenzopyr |
| 22        | Photosystem I        | Photosynthesis via electron transfer in PS I  | paraquat      |
| 27        | HPPD                 | Photosynthesis via carotene synthesis         | Callisto      |

# Primary Corn/Soybean Herbicide Sites of Action

| Group No. | Site of Action       | Mode of Action                                | Example       |
|-----------|----------------------|---|---------------|
| 1         | ACC-ase              | Membrane integrity via lipid synthesis        | Poast Plus    |
| 2         | ALS                  | Branched chain amino acid synthesis           | Classic       |
| 3         | Tubulin              | Cell division inhibition                      | Treflan       |
| 4         | Auxin binding site   | Mimic activity of auxin                       | 2,4-D         |
| 5         | D1 protein           | Photosynthesis via electron transfer in PS II | atrazine      |
| 6         | D1 protein           | Photosynthesis via electron transfer in PS II | Basagran      |
| 9         | EPSPS                | Inhibition of shikimic acid pathway           | glyphosate    |
| 10        | Glutamine synthetase | Photosynthesis via ammonium incorporation     | Liberty       |
| 13        | DPX synthase         | Photosynthesis via carotene synthesis         | Command       |
| 14        | PPO                  | Photosynthesis via chlorophyll synthesis      | Cobra         |
| 15        | Unknown              | Very long chain fatty acid synthesis          | Dual          |
| 19        | Unknown              | Auxin transport                               | diflufenzopyr |
| 22        | Photosystem I        | Photosynthesis via electron transfer in PS I  | paraquat      |
| 27        | HPPD                 | Photosynthesis via carotene synthesis         | Callisto      |

# Corn Herbicides



# CORN HERBICIDE PERFORMANCE RATINGS

CORN WEEDS

- E** EXCELLENT (≥91%)
- G** GOOD (81-90%)
- F** FAIR (65-80%)
- P** POOR (<65%)
- N** NONE
- U** UNKNOWN

## GRASSES

### PREPLANT or PREEMERGENCE

|  |   | CROP TOLERANCE | SITE OF ACTION <sup>a</sup> | Barnyardgrass | Cragras | Fall panicum | Footail, gr/gr | Footail, yellow | Johnsongrass (Seedling) | Quackgrass | Sandbur, field | Shattercane | Volunteer small grain | Wild oat | Wild proso millet | Wintersweet mulch | Woolly cupgrass | Yellow nutsedge |
|--|---|----------------|-----------------------------|---------------|---------|--------------|----------------|-----------------|-------------------------|------------|----------------|-------------|-----------------------|----------|-------------------|-------------------|-----------------|-----------------|
| Atrazine <sup>®</sup> (atrazine)   | ● | E              | 5                           | F             | P       | P            | F              | F               | P                       | F          | F              | P           | F                     | G        | P                 | P                 | P               | F               |
| Balance Flexor (isoxaflutole)  | ● | E              | 27                          | G             | F       | G            | G              | G               | F                       | F          | P              | P           | P                     | P        | G                 | P                 | F               | G               |
| Bicep II Magnum/Charger MAX ATZ <sup>®</sup> (S-metolachlor + atrazine)                                | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | P                     | F        | F                 | P                 | F               | G               |
| Bicep Lite II Magnum/Charger MAX ATZ Lite <sup>®</sup> (S-metolachlor + atrazine)                      | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | P                     | F        | F                 | P                 | F               | G               |
| Bullet/Lariat <sup>®</sup> (aladlor + atrazine)  | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | P                     | F        | F                 | P                 | P               | G               |
| Callisto (mesotrione)  | ● | E              | 27                          | N             | G       | N            | N              | N               | N                       | N          | N              | N           | N                     | N        | N                 | N                 | N               | N               |
| Capreno (thiencarbazone-methyl + tembotrione)  | ● | G              | 2,27                        | G             | G       | G            | G              | G               | G                       | U          | F              | G           | G                     | G        | G                 | U                 | F               | G               |
| Corvus (isoxaflutole + thiencarbazone)   | ● | G              | 27,2                        | E             | E       | G            | G              | G               | F                       | U          | F              | E           | F                     | F        | E                 | U                 | F               | G               |
| Degree (acetochlor)  | ● | E              | 15                          | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | F               | G               |
| Degree Xtra (acetochlor + atrazine) <sup>®</sup>   | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | F               | G               |
| Dimetric <sup>®</sup> DF 75% (metribuzin)  | ● | F              | 5                           | F             | F       | F            | F              | F               | P                       | P          | P              | P           | P                     | P        | P                 | P                 | P               | P               |
| Dual II Magnum/Charger MAX/Cinch (S-metolachlor)   | ● | E              | 15                          | E             | E       | E            | E              | E               | P                       | P          | P              | P           | P                     | P        | F                 | P                 | F               | G               |
| Eradicane - PPI (EPTC)   | ● | E              | 8                           | E             | E       | E            | E              | E               | F                       | F          | G              | F           | G                     | G        | F                 | P                 | G               | G               |
| G-Max Lite/Commit ATZ Lite (dimethenamid-P + atrazine) <sup>®</sup>                                    | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | G               | G               |
| Guardsman Max/Commit ATZ (dimethenamid-P + atrazine) <sup>®</sup>                                      | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | G               | G               |
| Harness/Confidence, Surpass or Topnotch (acetochlor)   | ● | E              | 15                          | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | F               | G               |
| Harness Xtra (5.6L)/Confidence Xtra (5.6L), Fulltime, Keystone/LA <sup>®</sup> (acetochlor + atrazine) | ● | E              | 15,5                        | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | F               | G               |
| Hornet <sup>®</sup> (doppyralid + flumetsulam)   | ● | G              | 4,2                         | N             | N       | N            | N              | N               | N                       | N          | N              | N           | N                     | N        | N                 | N                 | N               | N               |
| Lumax/Lexar (mesotrione + S-metolachlor + atrazine)  | ● | E              | 3,15,27                     | E             | E       | E            | E              | E               | P                       | P          | F              | P           | F                     | F        | F                 | P                 | F               | G               |
| Micro-Tech (alachlor)  | ● | E              | 15                          | E             | E       | E            | E              | E               | P                       | P          | P              | P           | P                     | P        | F                 | P                 | F               | G               |
| Outlook/Commit (dimethenamid-P)  | ● | E              | 15                          | E             | E       | E            | E              | E               | P                       | P          | P              | P           | P                     | F        | G                 | P                 | F               | G               |
| Prequel (nimsulfuron + isoxaflutole)   | ● | E              | 2,27                        | G             | F       | G            | G              | G               | F                       | P          | F              | P           | G                     | F        | G                 | P                 | F               | G               |
| Princep <sup>®</sup> (simazine)  | ● | E              | 5                           | G             | F       | P            | G              | G               | P                       | P          | P              | P           | U                     | U        | U                 | P                 | P               | U               |
| Prowl/Framework - PRE (pendimethalin)  | ● | G              | 3                           | E             | E       | E            | E              | E               | F                       | P          | F              | F           | P                     | F        | G                 | P                 | G               | P               |
| Python <sup>®</sup> (flumetsulam)  | ● | E              | 2                           | N             | N       | N            | N              | N               | N                       | N          | N              | N           | N                     | N        | N                 | N                 | N               | N               |
| Resolve Q <sup>®</sup> (nimsulfuron)   | ● | G              | 2                           | G             | F       | G            | G              | G               | F                       | P          | P              | F           | G                     | G        | P                 | P                 | P               | P               |
| SureStart/TripleFLEX <sup>®</sup> (acetochlor + flumetsulam + doppyralid)                              | ● | E              | 15,2,4                      | G             | E       | G            | E              | E               | P                       | P          | F              | P           | F                     | F        | G                 | P                 | F               | G               |
| Valor + Atrazine (flumioxazin + atrazine)  | ● | 14,5           | F                           | P             | P       | P            | F              | F               | P                       | F          | P              | P           | F                     | G        | P                 | P                 | P               | F               |
| Verdict (sulfenacil + dimethenamid-p)  | ● | E              | 14,15                       | E             | E       | E            | E              | E               | P                       | P          | P              | P           | P                     | P        | F                 | P                 | F               | G               |

# CORN HERBICIDE PERFORMANCE RATINGS

## BROADLEAVES

|                 | PREPLANT or PREEMERGENCE |            |             |                |                |                |                     |                |                |                |                      |                      |                |                   |                      |                |                 |                |                 |                   |                |            |                |                |                            |   |                  |
|-----------------|--------------------------|------------|-------------|----------------|----------------|----------------|---------------------|----------------|----------------|----------------|----------------------|----------------------|----------------|-------------------|----------------------|----------------|-----------------|----------------|-----------------|-------------------|----------------|------------|----------------|----------------|----------------------------|---|------------------|
| Bindweed, field | Bindweed, hedge          | Buffalobur | Burcucumber | Canada thistle | Cocklebur      | Horsenettle    | Jerusalem artichoke | Jimsonweed     | Knotweed       | Kochia         | Lambquarters, common | Morningglory, annual | Mustard        | Nightshade, black | Pigweed <sup>3</sup> | Purslane       | Ragweed, common | Ragweed, giant | Russian thistle | Smartweed, annual | Sunflower      | Velvetleaf | Waterhemp spp. | Wild buckwheat |                            |   |                  |
| P               | P                        | P          | F           | P              | G <sup>R</sup> | P              | P                   | G <sup>R</sup> | G              | G <sup>R</sup> | E <sup>N</sup>       | G <sup>R</sup>       | E              | E                 | E <sup>N</sup>       | E              | F <sup>G</sup>  | E              | E               | F <sup>G</sup>    | E              | F          | E <sup>N</sup> | E              | Atrazine <sup>R</sup>      |   |                  |
| N               | N                        | E          | F           | G              | N              | P              | N                   | N              | F              | G              | E                    | G <sup>R</sup>       | P              | F                 | E                    | G              | G <sup>R</sup>  | P              | F               | G                 | G              | F          | E              | G <sup>R</sup> | P                          | Balance Flexx   |                  |
| P               | P                        | P          | P           | P              | F              | G <sup>R</sup> | P                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | G               | G <sup>R</sup> | G <sup>R</sup>  | G                 | G <sup>R</sup> | F          | F              | E <sup>N</sup> | G                          | Bicep II Magnum <sup>R</sup>                            |                  |
| P               | P                        | P          | P           | P              | F              | P              | P                   | F              | F              | G <sup>R</sup> | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | F               | G <sup>R</sup> | F               | F                 | F              | F          | F              | G <sup>R</sup> | F                          | Bicep Lite II Magnum <sup>R</sup>                       |                  |
| P               | P                        | P          | P           | P              | F              | P              | N                   | G <sup>R</sup> | G              | G <sup>R</sup> | E <sup>N</sup>       | G                    | E              | E                 | E <sup>N</sup>       | G              | E <sup>N</sup>  | G <sup>R</sup> | G               | G <sup>R</sup>    | F              | F          | E <sup>N</sup> | F              | Bullet/Lariat <sup>R</sup> |   |                  |
| P               | F                        | P          | F           | G              | P              | F              | P                   | F              | P              | F              | G                    | E                    | F              | E                 | E                    | E              | G               | G              | G               | E                 | G              | E          | E              | F              | Callisto                   |   |                  |
| N               | N                        | G          | F           | G              | F              | P              | F                   | U              | G              | U              | G                    | E                    | E              | F                 | E                    | E              | P               | G              | E               | E                 | E              | E          | E              | F              | Capreno                    |   |                  |
| U               | U                        | G          | F           | U              | F              | U              | U                   | F              | U              | E              | E                    | F                    | E              | E                 | E                    | G              | E               | F              | F               | G                 | F              | E          | E              | P              | Corvus                     |   |                  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | P              | F              | G                    | P                    | P              | G                 | G                    | G              | F               | P              | P               | P                 | P              | P          | G              | E              | P                          | Degree  |                  |
| P               | P                        | P          | F           | P              | F              | G              | P                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | G               | G <sup>R</sup> | G <sup>R</sup>  | F                 | G <sup>R</sup> | F          | F              | E <sup>N</sup> | G                          | Degree Xtra <sup>R</sup>                                |                  |
| P               | F                        | F          | P           | F              | P              | F              | N                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | P              | G                 | E                    | P              | E <sup>N</sup>  | G              | E               | P                 | F              | G          | G              | F              | G <sup>R</sup>             | F   | Dimetric DF 75%  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | F              | P              | F                    | P                    | P              | G                 | G                    | F              | P               | P              | P               | P                 | P              | P          | G              | P              | P                          | Dual II Magnum  |                  |
| N               | N                        | F          | P           | N              | P              | N              | N                   | P              | P              | F              | F                    | F                    | G              | P                 | F                    | F              | P               | P              | P               | P                 | P              | P          | F              | F              | P                          | Eradicane- PPI  |                  |
| P               | P                        | P          | F           | P              | F              | G              | P                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | G               | E <sup>N</sup> | G <sup>R</sup>  | G                 | G <sup>R</sup> | F          | F              | E <sup>N</sup> | G                          | G-Max Lite <sup>R</sup> /Commit ATZ Lite                |                  |
| P               | P                        | P          | F           | P              | F              | G              | P                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | G               | E <sup>N</sup> | G <sup>R</sup>  | G                 | G <sup>R</sup> | F          | F              | E <sup>N</sup> | G                          | Guardsman Max <sup>R</sup> /Commit ATZ                  |                  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | P              | F              | F                    | G                    | P              | P                 | G                    | G              | F               | G              | P               | P                 | P              | P          | P              | G              | P                          | Harness/Confidence/Surpass                              |                  |
| P               | P                        | P          | F           | P              | F              | G              | P                   | P              | G <sup>R</sup> | G              | G <sup>R</sup>       | E <sup>N</sup>       | G              | E                 | E                    | E <sup>N</sup> | G               | E <sup>N</sup> | G <sup>R</sup>  | G                 | G <sup>R</sup> | F          | F              | E <sup>N</sup> | G                          | Harness Xtra (5.6L)/Confidence Xtra (5.6L) <sup>R</sup> |                  |
| N               | N                        | F          | P           | F              | G              | N              | N                   | G              | F              | G <sup>R</sup> | G <sup>R</sup>       | F                    | E <sup>N</sup> | G                 | G <sup>R</sup>       | E              | G               | E              | E               | G                 | E              | E          | G              | G <sup>R</sup> | F                          | Hornet <sup>R</sup>                                     |                  |
| P               | F                        | P          | F           | G              | P              | F              | E                   | G              | G              | E              | E                    | G                    | E              | E                 | E                    | E              | G               | F              | F               | G                 | E              | G          | E              | E              | G                          | Lumax/Lexar   |                  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | F              | P              | F                    | P                    | P              | G                 | G                    | F              | P               | P              | P               | P                 | P              | P          | G              | P              | P                          | Micro-Tech  |                  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | F              | P              | F                    | F                    | G              | P                 | P                    | G              | G               | F              | P               | P                 | P              | P          | G              | E              | P                          | Outlook/Commit  |                  |
| N               | N                        | E          | F           | G              | N              | F              | N                   | N              | F              | U              | G                    | E                    | G              | P                 | F                    | G              | G               | G              | P               | F                 | F              | G          | F              | E              | G                          | F   | Prequel          |
| P               | P                        | U          | P           | U              | F              | U              | U                   | G              | U              | G <sup>R</sup> | E <sup>N</sup>       | G                    | E              | E                 | E <sup>N</sup>       | E              | E <sup>N</sup>  | F              | U               | G <sup>R</sup>    | F              | F          | G <sup>R</sup> | U              | U                          | Princep <sup>R</sup>                                    |                  |
| N               | N                        | P          | P           | N              | P              | N              | N                   | P              | P              | G              | G                    | P                    | P              | P                 | G                    | P              | P               | P              | P               | F                 | P              | F          | G              | P              | P                          | Prowl/Framework - PRE                                   |                  |
| N               | N                        | F          | P           | N              | F              | N              | N                   | F              | F              | G <sup>R</sup> | G <sup>R</sup>       | P                    | E              | G <sup>R</sup>    | E <sup>N</sup>       | E              | F               | P              | E <sup>N</sup>  | G <sup>R</sup>    | F              | G          | E              | G <sup>R</sup> | P                          | Python <sup>R</sup>                                     |                  |
| U               | U                        | U          | U           | P              | F              | U              | U                   | F              | P              | F              | F                    | G                    | P              | F                 | G                    | G              | P               | P              | P               | P                 | P              | F          | P              | P              | F                          | Resolve Q <sup>R</sup>                                  |                  |
| N               | N                        | F          | P           | P              | G              | N              | N                   | G <sup>R</sup> | F              | G <sup>R</sup> | E <sup>N</sup>       | F                    | E              | G                 | E <sup>N</sup>       | E              | G <sup>R</sup>  | F              | G               | E <sup>N</sup>    | G              | E          | G              | G <sup>R</sup> | G                          | SureStart/TripleFLEX <sup>R</sup>                       |                  |
| P               | P                        | P          | P           | P              | N              | P              | P                   | P              | P              | E              | E                    | E                    | E              | E                 | E                    | E              | E               | E              | G               | E                 | E              | E          | E              | E              | E                          | E   | Valor + Atrazine |
| U               | U                        | E          | F           | P              | G              | E              | P                   | F              | G              | G              | E                    | G                    | E              | E                 | E                    | U              | G               | E              | E               | E                 | E              | E          | E              | E              | E                          | Verdict   |                  |

CORN WEEDS

# CORN HERBICIDE PERFORMANCE RATINGS

CORN WEEDS

- E** EXCELLENT (≥91%)
- G** GOOD (81-90%)
- F** FAIR (65-80%)
- P** POOR (<65%)
- N** NONE
- U** UNKNOWN

## GRASSES

### POSTEMERGENCE

|   |   |           |    |   |   |    |    |    |    |   |   |   |   |    |    |    |   |   |   |   |    |    |   |    |   |
|---|---|-----------|----|---|---|----|----|----|----|---|---|---|---|----|----|----|---|---|---|---|----|----|---|----|---|
| Accent Q <sup>R</sup> (nicosulfuron)                    | ● | GE 2      | GE | P | G | E  | GE | E  | G  | G | E | G | E | GE | F  | GE | F |   |   | P | P  | N  | F | F  |   |
| Aim (carfentrazone)                                     | ● | G 14      | P  | P | P | P  | P  | P  | P  | P | P | P | P | P  | P  | P  | P | P |   | U | U  | U  | U | P  |   |
| Atrazine <sup>R</sup> (atrazine)                        | ● | E 5       | F  | P | P | F  | F  | P  | F  | P | P | F | G | P  | P  | P  | F |   |   | F | F  | G  | F | P  |   |
| Basagran (bentazon)                                     | ● | E 6       | P  | P | P | P  | P  | P  | P  | P | P | P | P | P  | P  | P  | G |   |   | P | P  | P  | N | G  |   |
| Basis <sup>R</sup> (nimsulfuron + thifensulfuron)       | ● | G 2,2     | G  | F | G | G  | F  | G  | P  | P | F | E | G | F  | P  | P  | P |   |   | U | U  | P  | P | P  |   |
| Cadet (fluthiacet)                                      | ● | E 14      | N  | N | N | N  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | N | N  | N  | N | N  |   |
| Cadet + Glyphosate (fluthiacet + glyphosate)            | ● | E 14,9    | E  | E | E | E  | E  | E  | GE | E | E | E | E | E  | GE | E  | F |   |   | F | G  | G  | G | G  |   |
| Callisto <sup>R</sup> (mesotrione)                      | ● | E 27      | N  | G | N | N  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | P | P  | F  | F | P  |   |
| Callisto Xtra (mesotrione + atrazine)                   | ● | E 27,5    | N  | G | N | P  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | P | P  | F  | G | P  |   |
| Capreno (thiencarbazone-methyl + tembotrione)           | ● | G 2,27    | G  | G | G | G  | G  | G  | U  | F | G | G | G | G  | U  | F  | G | P |   | N | N  | G  | F | F  |   |
| Cornerstone 5 Plus/glyphosate** (glyphosate)            | ● | E 9       | E  | E | E | E  | E  | E  | GE | E | E | E | E | E  | GE | E  | F |   |   | F | G  | G  | G | G  |   |
| Dimetric DF 75% <sup>R</sup> (metribuzin)               | ● | G 5       | P  | P | P | P  | P  | P  | P  | P | P | P | P | P  | P  | P  | P |   |   | F | F  | E  | F | P  |   |
| Distinct/Status <sup>SR</sup> (dicamba + diflufenzopyr) | ● | GE 4,19   | P  | P | F | F  | P  | P  | P  | P | P | P | P | P  | P  | P  | P |   |   | F | G  | G  | F | G  |   |
| Halex GT (S-metolachlor + glyphosate + mesotrione)      | ● | E 15,9,27 | E  | E | E | E  | E  | E  | E  | E | E | E | E | E  | E  | E  | F |   |   | G | G  | E  | E | G  |   |
| Hornet WDG <sup>R</sup> (clopyralid + flumetsulam)      | ● | E 2,4     | P  | P | P | P  | P  | P  | P  | P | P | P | P | P  | P  | P  | P |   |   | P | P  | G  | N | GE |   |
| Ignite 280SL (glufosinate)                              | ● | E 10      | F  | G | G | F  | G  | E  | F  | F | F | F | G | G  | E  | F  | G | P |   | F | F  | G  | F | F  |   |
| Impact (topramezone)                                    | ● | E 27      | F  | G | F | G  | F  | G  | F  | P | P | P | P | F  | P  | G  | P | F | P |   | N  | P  | U | F  | P |
| Laudis (tembotrione)                                    | ● | E 27      | G  | F | G | P  | G  | F  | G  | U | F | G | G | G  | U  | G  | P |   |   | N | N  | G  | N | F  |   |
| Lumax/Lexar (atrazine + S-metolachlor + mesotrione)     | ● | E 5,15,27 | E  | E | E | E  | E  | P  | P  | F | P | F | F | F  | P  | F  | P | F |   | P | P  | GE | F | G  |   |
| Moxy (bromoxynil)                                       | ● | E 6       | N  | N | N | N  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | P | P  | G  | F | F  |   |
| Northstar (nimsulfuron + dicamba)                       | ● | G 2,4     | P  | P | F | P  | P  | GE | G  | P | E | U | P | P  | P  | P  | F |   |   | F | G  | F  | G | F  |   |
| Option <sup>R</sup> (foramsulfuron)                     | ● | GE 2      | GE | F | G | G  | F  | E  | G  | F | E | E | E | GE | F  | G  | P |   |   | P | P  | U  | G | F  |   |
| Permit <sup>R</sup> (halosulfuron)                      | ● | E 2       | P  | P | P | P  | P  | P  | P  | P | P | P | P | P  | P  | P  | E |   |   | P | P  | P  | F | P  |   |
| Realm Q <sup>R</sup> (nimsulfuron + mesotrione)         | ● | E 2,27    | G  | G | G | GE | G  | G  | G  | F | G | G | G | G  | F  | G  | F | G |   | P | P  | F  | F | F  |   |
| Resolve Q <sup>R</sup> (nimsulfuron)                    | ● | E 2       | F  | G | F | F  | G  | G  | F  | F | G | G | F | F  | F  | F  | P | P |   | U | U  | P  | P | F  |   |
| Resource (flumidoxac-pentyl)                            | ● | G 14      | N  | N | N | N  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | P | P  | P  | P | N  |   |
| Sequence (glyphosate + S-metolachlor)                   | ● | E 9,15    | E  | E | E | E  | E  | E  | GE | E | E | E | E | E  | GE | E  | F |   |   | F | G  | G  | G | G  |   |
| Spirit <sup>R</sup> (primisulfuron + prosulfuron)       | ● | G 2,2     | P  | P | P | P  | P  | G  | G  | P | G | U | P | P  | P  | P  | F |   |   | P | F  | G  | G | F  |   |
| Starane Ultra (fluroxypyr)                              | ● | GE 4      | N  | N | N | N  | N  | N  | N  | N | N | N | N | N  | N  | N  | N |   |   | F | GE | F  | F | P  |   |

# CORN HERBICIDE PERFORMANCE RATINGS

## BROADLEAVES

CORN WEEDS

|                              | Cocklebur      | Dandelion | Hemp dogbane | Horseshoe | Jerusalem artichoke | Jimsonweed     | Knottweed | Kochia         | Lambsquarters, common | Milkweed, common | Milkweed, honeyvine | Morning glory, annual | Morning glory, biennial | Mustard        | Nightshade, black | Pigweed        | Poleweed | Prickly sida <sup>4</sup> | Purslane | Ragweed, common | Ragweed, giant | Russian thistle | Smartweed, annual | Smartweed, swamp | Sunflower      | Violet leaf    | Water hemp     | Wild buckwheat |                              |
|------------------------------|----------------|-----------|--------------|-----------|---------------------|----------------|-----------|----------------|-----------------------|------------------|---------------------|-----------------------|-------------------------|----------------|-------------------|----------------|----------|---------------------------|----------|-----------------|----------------|-----------------|-------------------|------------------|----------------|----------------|----------------|----------------|------------------------------|
|                              | POSTEMERGENCE  |           |              |           |                     |                |           |                |                       |                  |                     |                       |                         |                |                   |                |          |                           |          |                 |                |                 |                   |                  |                |                |                |                |                              |
| Accent Q <sup>R</sup>        | P              | P         | P            | P         | P                   | G              | N         | F <sup>R</sup> | P                     | P                | P                   | F                     | P                       | G <sup>R</sup> | N                 | G <sup>R</sup> | P        | P                         | N        | P               | P              | P               | G                 | P                | P              | P              | P              | P              | Accent Q <sup>R</sup>        |
| Aim                          | F              | U         | P            | U         | P                   | FG             | U         | G              | GE                    | P                | P                   | FG                    | P                       | G              | GE                | GE             | U        | F                         | U        | F               | F              | F               | F                 | P                | P              | E              | G              | P              | Aim                          |
| Atrazine <sup>R</sup>        | E <sup>R</sup> | F         | P            | P         | P                   | E <sup>R</sup> | G         | G <sup>R</sup> | E <sup>R</sup>        | P                | P                   | E                     | P                       | E              | E                 | E <sup>R</sup> | U        | GE                        | F        | E <sup>R</sup>  | FG             | FG              | E <sup>R</sup>    | P                | E              | GE             | GE             | G              | Atrazine <sup>R</sup>        |
| Basagran                     | E              | P         | P            | P         | P                   | E              | P         | F              | F                     | P                | P                   | F                     | P                       | E              | P                 | P              | U        | G                         | E        | FG              | P              | F               | P                 | E                | P              | GE             | GE             | P              | Basagran                     |
| Basis <sup>R</sup>           | PF             | P         | P            | P         | P                   | P              | N         | P              | GE                    | P                | P                   | P                     | P                       | E <sup>R</sup> | P                 | E <sup>R</sup> | U        | P                         | N        | P               | P              | P               | E                 | U                | F              | FG             | G <sup>R</sup> | F              | Basis <sup>R</sup>           |
| Cadet                        | PF             | U         | U            | U         | U                   | PF             | U         | P              | FG                    | U                | U                   | F                     | U                       | P              | F                 | G              | U        | P                         | U        | P               | P              | P               | P                 | P                | P              | E              | F              | PF             | Cadet                        |
| Cadet + Glyphosate           | E              | F         | FG           | FG        | G                   | E              | G         | GE             | E                     | F                | F                   | G                     | P                       | E              | G                 | E              | FG       | FG                        | E        | GE              | GE             | FG              | GE                | F                | GE             | E              | GE             | G              | Cadet + Glyphosate           |
| Callisto                     | G              | F         | PF           | G         | PF                  | E              | F         | F              | E                     | PF               | PF                  | F                     | P                       | E              | E                 | E              | G        | F                         | E        | GE              | GE             | E               | E                 | F                | E              | E              | E              | F              | Callisto                     |
| Callisto Xtra                | E              | G         | PF           | G         | PF                  | E              | F         | G <sup>R</sup> | E                     | PF               | PF                  | G                     | P                       | E              | E                 | E              | G        | F                         | E        | GE              | G              | E               | E                 | F                | E              | E              | E              | G              | Callisto Xtra                |
| Capreno                      | GE             | P         | P            | F         | U                   | E              | F         | GE             | E                     | P                | P                   | F                     | F                       | E              | E                 | E              | U        | F                         | P        | GE              | G              | E               | E                 | P                | GE             | E              | E              | FG             | Capreno                      |
| Comestone 5 Plus/glyphosate  | E              | F         | FG           | FG        | G                   | E              | G         | G <sup>R</sup> | GE                    | F                | F                   | F                     | P                       | E              | G                 | E              | FG       | FG                        | E        | G <sup>R</sup>  | G <sup>R</sup> | FG              | GE                | F                | GE             | G              | G <sup>R</sup> | F              | Comestone 5 Plus/glyphosate  |
| Dimetric DF 759 <sup>R</sup> | E <sup>R</sup> | F         | P            | U         | G                   | E <sup>R</sup> | E         | G <sup>R</sup> | G <sup>R</sup>        | P                | P                   | PF                    | P                       | G              | GE                | E <sup>R</sup> | P        | U                         | G        | E <sup>R</sup>  | G <sup>R</sup> | F               | E <sup>R</sup>    | P                | E              | G <sup>R</sup> | G <sup>R</sup> | G              | Dimetric DF 759 <sup>R</sup> |
| Distinct/Status <sup>R</sup> | E              | G         | F            | FG        | E                   | E              | E         | G <sup>R</sup> | E                     | PF               | PF                  | E                     | PF                      | G              | G                 | E              | E        | G                         | E        | E               | E              | E               | E                 | FG               | E              | G              | E              | E              | Distinct/Status <sup>R</sup> |
| Halex GT                     | E              | G         | G            | E         | G                   | E              | E         | E              | E                     | F                | F                   | F                     | PF                      | E              | E                 | E              | E        | G                         | E        | E               | GE             | E               | E                 | F                | E              | E              | E              | G              | Halex GT                     |
| Hornet WDG <sup>R</sup>      | E              | G         | F            | P         | G                   | FG             | N         | F <sup>R</sup> | FG                    | F                | F                   | FG                    | P                       | E              | F                 | FG             | P        | F                         | E        | E               | E              | F               | GE                | P                | E              | E              | F              | FG             | Hornet WDG <sup>R</sup>      |
| Ignite 280SL                 | GE             | G         | PF           | U         | F                   | E              | G         | G              | GE                    | PF               | P                   | GE                    | P                       | E              | E                 | G              | PF       | GE                        | G        | GE              | GE             | G               | GE                | P                | E              | G              | FG             | FG             | Ignite 280SL                 |
| Impact                       | G              | PF        | P            | U         | U                   | E              | U         | GE             | E                     | P                | U                   | F                     | U                       | GE             | E                 | E              | U        | F                         | U        | G               | G              | GE              | G                 | U                | E              | GE             | E              | P              | Impact                       |
| Laudis                       | GE             | P         | P            | P         | U                   | E              | U         | GE             | E                     | P                | P                   | F                     | F                       | GE             | E                 | E              | U        | F                         | P        | E               | G              | E               | E                 | P                | E              | E              | E              | F              | Laudis                       |
| Lumax/Lexar                  | G              | G         | U            | G         | F                   | GE             | G         | GE             | E                     | U                | U                   | G                     | P                       | E              | E                 | E <sup>R</sup> | G        | U                         | E        | GE              | G              | FG              | E                 | U                | E              | E              | E              | G              | Lumax/Lexar                  |
| Moxy                         | E              | P         | P            | F         | P                   | E              | G         | G              | GE                    | P                | P                   | G                     | P                       | FG             | E                 | FG             | P        | P                         | P        | E               | F              | G               | E                 | P                | E              | G              | P              | GE             | Moxy                         |
| Northstar                    | E              | F         | F            | G         | G                   | E              | U         | GE             | E                     | PF               | PF                  | G                     | P                       | E              | G                 | G              | FG       | FG                        | E        | E               | E              | G               | E                 | F                | E              | G              | E              | E              | Northstar                    |
| Option <sup>R</sup>          | F <sup>R</sup> | U         | U            | U         | U                   | FG             | U         | F <sup>R</sup> | G <sup>R</sup>        | P                | P                   | P                     | P                       | GE             | F <sup>R</sup>    | G <sup>R</sup> | F        | P                         | G        | F <sup>R</sup>  | F <sup>R</sup> | F <sup>R</sup>  | F                 | U                | F <sup>R</sup> | G              | P              | P              | Option <sup>R</sup>          |
| Permit <sup>R</sup>          | E <sup>R</sup> | U         | PF           | F         | P                   | PF             | U         | G <sup>R</sup> | G                     | PF               | P                   | F                     | P                       | E <sup>R</sup> | P                 | GE             | G        | F                         | U        | GE              | FG             | P               | G                 | U                | E <sup>R</sup> | E              | G <sup>R</sup> | P              | Permit <sup>R</sup>          |
| Realm Q <sup>R</sup>         | G              | G         | PF           | G         | PF                  | E              | F         | FG             | E                     | PF               | PF                  | FG                    | P                       | E              | E                 | E              | G        | F                         | E        | G               | G              | E               | E                 | F                | E              | E              | E              | FG             | Realm Q <sup>R</sup>         |
| Resolve Q <sup>R</sup>       | F <sup>R</sup> | FG        | P            | P         | P                   | F              | N         | G <sup>R</sup> | F <sup>R</sup>        | P                | P                   | F                     | P                       | E <sup>R</sup> | P                 | GE             | U        | U                         | F        | F               | P              | G               | F                 | P                | P              | FG             | F <sup>R</sup> | F              | Resolve Q <sup>R</sup>       |
| Resource                     | PF             | N         | N            | N         | N                   | F              | N         | N              | PF                    | N                | N                   | PF                    | N                       | N              | N                 | F              | N        | F                         | N        | F               | PF             | N               | N                 | N                | N              | E              | F              | N              | Resource                     |
| Sequence                     | E              | F         | FG           | FG        | G                   | E              | G         | G              | GE                    | F                | F                   | F                     | P                       | E              | G                 | E              | FG       | FG                        | E        | G <sup>R</sup>  | G <sup>R</sup> | FG              | GE                | F                | GE             | G              | G <sup>R</sup> | F              | Sequence                     |
| Spirit <sup>R</sup>          | GE             | G         | PF           | F         | F                   | G <sup>R</sup> | G         | E <sup>R</sup> | G <sup>R</sup>        | F                | P                   | P                     | F                       | P              | E <sup>R</sup>    | GE             | G        | F                         | F        | E <sup>R</sup>  | E <sup>R</sup> | GE              | E                 | F                | G <sup>R</sup> | GE             | P              | P              | Spirit <sup>R</sup>          |
| Starane Ultra                | FG             | F         | E            | F         | F                   | F              | G         | E              | P                     | P                | G                   | E                     | U                       | F              | P                 | P              | F        | U                         | E        | E               | GE             | F               | P                 | P                | FG             | G              | P              | FG             | Starane Ultra                |

# Soybean Herbicides



# SOYBEAN HERBICIDE PERFORMANCE RATINGS

## BROADLEAVES

Bindweed  
Buffalobur  
Burdock  
Canada thistle  
Cocklebur  
Copperleaf, hophornbeam  
Hemp sesbania  
Horsenettle  
Jerusalem artichoke  
Jimsonweed  
Kochia  
Lambquarters, common  
Morningglory, annual  
Mustard  
Nightshade, black  
Pigweed  
Prickly sida  
Ragweed, common  
Ragweed, giant  
Russian thistle  
Sicklepod  
Smartweed, annual  
Spurred anoda  
Sunflower  
Velvetleaf  
Venice mallow  
Waterhemp spp.  
Wild buckwheat

## PREPLANT or PREEMERGENCE

|   |   |    |   |                 |    |    |   |   |                |                |                 |                 |                 |                |                 |    |                 |                 |                |    |                |    |                |                |                |                |    |                                |                              |                    |
|---|---|----|---|-----------------|----|----|---|---|----------------|----------------|-----------------|-----------------|-----------------|----------------|-----------------|----|-----------------|-----------------|----------------|----|----------------|----|----------------|----------------|----------------|----------------|----|--------------------------------|------------------------------|--------------------|
| F | F | F  | P | F               | FG | P  | F | P | P              | G              | G               | E               | GE              | GE             | GE              | E  | FG              | F               | F              | GE | P              | F  | GE             | F              | F              | G              | F  | GE                             | F                            | ● Authority Assist |
| P | P | PF | P | F               | GE | G  | P | F | GE             | GE             | E               | GE              | GE              | GE             | E               | G  | GE              | F               | G              | U  | GE             | G  | F              | FG             | G              | E              | PF | ● Authority MTZ DF             |                              |                    |
| F | F | F  | F | GE              | G  | G  | P | P | E              | E              | E               | GE              | E               | E              | E               | G  | GE              | G               | E              | G  | GE             | GE | GE             | GE             | GE             | E              | FG | ● Authority XL                 |                              |                    |
| P | F | P  | P | F               | G  | E  | N | P | F <sup>R</sup> | F              | E               | P               | F               | G              | E               | F  | G <sup>R</sup>  | F               | FG             | FG | G              | E  | F <sup>R</sup> | F              | G              | GE             | F  | ● Boundary                     |                              |                    |
| F | U | F  | F | G <sup>R</sup>  | GE | GE | P | U | GE             | G <sup>R</sup> | E <sup>R</sup>  | G               | E               | P              | E <sup>R</sup>  | G  | G <sup>R</sup>  | F <sup>R</sup>  | F              | FG | E              | GE | G              | G              | FG             | F <sup>R</sup> | F  | ● Canopy <sup>R</sup>          |                              |                    |
| U | U | F  | F | G <sup>R</sup>  | P  | P  | P | U | G              | G <sup>R</sup> | E <sup>R</sup>  | P               | G <sup>R</sup>  | P              | G <sup>R</sup>  | F  | F <sup>R</sup>  | F               | F <sup>R</sup> | U  | G              | U  | G <sup>R</sup> | G              | F              | F <sup>R</sup> | P  | ● Canopy EX <sup>R</sup>       |                              |                    |
| P | P | P  | N | PF              | PF | P  | N | P | G              | GE             | G               | P               | P               | PF             | P               | E  | G               | P               | F              | PF | G              | E  | P              | E              | E              | P              | P  | ● Command                      |                              |                    |
| P | F | PF | P | F <sup>R</sup>  | GE | E  | N | P | G <sup>R</sup> | G <sup>R</sup> | E <sup>R</sup>  | P               | GE              | P              | E <sup>R</sup>  | E  | E               | PF              | G              | FG | G <sup>R</sup> | E  | F              | G              | E              | G <sup>R</sup> | F  | ● Dimetric DF 75% <sup>R</sup> |                              |                    |
| N | P | P  | N | P               | P  | P  | N | N | P              | P              | F               | P               | P               | G              | G               | P  | P               | P               | P              | P  | P              | P  | P              | P              | P              | P              | G  | P                              | ● Dual II Magnum/Charger MAX |                    |
| U | U | PF | U | GE <sup>2</sup> | G  | G  | U | U | E              | G              | GE <sup>2</sup> | GE <sup>2</sup> | GE <sup>2</sup> | G <sup>R</sup> | GE <sup>2</sup> | G  | GE <sup>2</sup> | F <sup>2</sup>  | G              | F  | GE             | U  | E <sup>2</sup> | G              | G              | G <sup>R</sup> | U  | ● Envive/Enlite <sup>2R</sup>  |                              |                    |
| P | F | F  | P | GE <sup>2</sup> | PF | P  | N | P | GE             | P              | GE <sup>2</sup> | G               | G <sup>R</sup>  | P              | GE <sup>2</sup> | PF | E <sup>R</sup>  | GE <sup>2</sup> | F <sup>R</sup> | PF | G              | P  | E <sup>R</sup> | G <sup>R</sup> | E <sup>R</sup> | P              | P  | ● FirstRate <sup>R</sup>       |                              |                    |
| P | G | F  | P | G               | G  | G  | P | P | GE             | G              | E               | GE              | E               | E              | E               | G  | E               | GE              | FG             | G  | GE             | G  | G              | G              | E              | GE             | P  | ● Gangster                     |                              |                    |

# SOYBEAN HERBICIDE PERFORMANCE RATINGS

## BROADLEAVES

|  | Bindweed                 | Buffalobur | Burcucumber | Canada thistle | Cocklebur      | Copperleaf, hophornbeam | Hemp sesbania | Horsenettle | Jerusalem artichoke | Jimsonweed     | Kochia         | Lambsquarters, common | Morningglory, annual | Mustard        | Nightshade, black | Pigweed        | Prickly sida   | Ragweed, common | Ragweed, giant | Russian thistle | Sicklepod | Smartweed, annual | Spurred anoda  | Sunflower | Velvetleaf     | Venice mallow  | Waterhemp spp. | Wild buckwheat |                                     |                         |                          |                |
|--|--------------------------|------------|-------------|----------------|----------------|-------------------------|---------------|-------------|---------------------|----------------|----------------|-----------------------|----------------------|----------------|-------------------|----------------|----------------|-----------------|----------------|-----------------|-----------|-------------------|----------------|-----------|----------------|----------------|----------------|----------------|-------------------------------------|-------------------------|--------------------------|----------------|
|  | PREPLANT or PREEMERGENCE |            |             |                |                |                         |               |             |                     |                |                |                       |                      |                |                   |                |                |                 |                |                 |           |                   |                |           |                |                |                |                |                                     |                         |                          |                |
|  | P                        | P          | P           | N              | P              | F                       | P             | N           | N                   | G <sup>R</sup> | F              | E <sup>R</sup>        | P                    | E              | F                 | E <sup>R</sup> | G              | E               | P              | U               | P         | G <sup>R</sup>    | P              | P         | F              | G              | G <sup>R</sup> | G              | ● Lorox DF/Linex <sup>R</sup> - PRE |                         |                          |                |
|  | N                        | P          | P           | N              | P              | P                       | P             | N           | N                   | P              | P              | F                     | P                    | P              | G                 | G              | N              | P               | P              | P               | P         | P                 | P              | P         | P              | P              | G              | P              | ● Micro-Tech/Intro                  |                         |                          |                |
|  | P                        | F          | E           | F              | P              | G                       | G             | P           | P                   | G              | F              | E                     | E                    | U              | E                 | E              | E              | E               | G              | G               | G         | P                 | E              | F         | G              | E              | G              | F              | F                                   | ● OpTill <sup>R</sup>   |                          |                |
|  | N                        | P          | P           | N              | P              | P                       | P             | N           | N                   | P              | P              | F                     | P                    | P              | G                 | G              | N              | P               | P              | P               | P         | P                 | P              | P         | P              | P              | G              | P              | ● Outlook/Commit                    |                         |                          |                |
|  | P                        | F          | F           | P              | P              | P                       | P             | P           | F                   | F              | F              | P                     | F                    | G              | P                 | E              | G              | G               | P              | F               | G         | F                 | P              | U         | F              | U              | F              | F              | F                                   | G                       | P                        | ● Prefix       |
|  | P                        | P          | P           | N              | P              | P                       | P             | N           | N                   | P              | G              | G                     | P                    | P              | P                 | G              | P              | P               | P              | F               | P         | P                 | P              | P         | P              | P              | P              | G              | P                                   | ● Prowl/Framework       |                          |                |
|  | P                        | F          | P           | N              | F <sup>R</sup> | P                       | P             | N           | N                   | F              | G              | E                     | E                    | F              | E                 | E              | E              | G               | F              | G <sup>R</sup>  | F         | G                 | E <sup>R</sup> | P         | G              | F              | G <sup>R</sup> | G              | F                                   | G                       | F                        | ● Pursuit Plus |
|  | P                        | F          | P           | P              | F <sup>R</sup> | F                       | P             | N           | P                   | F              | G <sup>R</sup> | E <sup>R</sup>        | P                    | E <sup>R</sup> | F                 | G <sup>R</sup> | E <sup>R</sup> | E               | F              | G <sup>R</sup>  | P         | G                 | E <sup>R</sup> | P         | F              | G <sup>R</sup> | G              | E              | G <sup>R</sup>                      | P                       | ● Python <sup>R</sup>    |                |
|  | P                        | F          | F           | P              | G <sup>R</sup> | F                       | P             | N           | P                   | G              | P              | E <sup>R</sup>        | F                    | E <sup>R</sup> | G <sup>R</sup>    | E <sup>R</sup> | E              | G               | E              | F <sup>R</sup>  | U         | F                 | G              | F         | E <sup>R</sup> | F              | F              | P              | P                                   | ● Scepter <sup>R</sup>  |                          |                |
|  | P                        | P          | P           | N              | P              | P                       | P             | N           | N                   | P              | G              | G                     | P                    | P              | F                 | G              | P              | P               | P              | F               | P         | P                 | P              | P         | P              | P              | P              | G              | P                                   | ● Sonalan - PPI         |                          |                |
|  | F                        | F          | F           | P              | G              | G                       | P             | P           | P                   | G              | G              | E                     | G                    | G              | G                 | E              | F              | G               | E              | G               | E         | P                 | F              | G         | E              | G              | E              | G              | P                                   | ● Sonic/Authority First |                          |                |
|  | F                        | U          | P           | N              | P              | F                       | P             | P           | P                   | F              | G              | E                     | E                    | G              | P                 | F              | G              | F               | P              | P               | E         | U                 | F              | U         | P              | F              | F              | G              | P                                   | ● Spartan               |                          |                |
|  | P                        | P          | P           | N              | P              | P                       | P             | N           | N                   | P              | G              | G                     | P                    | P              | P                 | G              | P              | P               | P              | F               | P         | P                 | P              | P         | P              | P              | P              | G              | P                                   | ● Trust - PPI           |                          |                |
|  | P                        | F          | N           | N              | N              | G                       | G             | P           | P                   | G              | E              | G                     | E                    | F              | G                 | E              | E              | G               | F              | G               | P         | F                 | G              | F         | E              | P              | F              | G              | E                                   | P                       | ● Valor <sup>R</sup>     |                |
|  | P                        | F          | F           | F              | G              | E                       | G             | P           | P                   | E              | G              | E                     | G                    | E              | E                 | E              | G              | G               | F              | G               | G         | G                 | E              | E         | G              | G              | G              | G <sup>R</sup> | F                                   | G                       | ● Valor XLT <sup>R</sup> |                |
|  | U                        | E          | F           | P              | G              | U                       | U             | P           | F                   | G              | E              | E                     | G                    | E              | E                 | E              | G              | E               | G              | E               | U         | E                 | U              | E         | E              | G              | E              | E              | ● Verdict                           |                         |                          |                |

UNIVERSITY OF ARIZONA

Weed Science

## BROADLEAVES

## SOYBEAN WEEDS

# SOYBEAN HERBICIDE PERFORMANCE RATINGS

## BROADLEAVES

Canada thistle  
Cocklebur  
Copperleaf, Hophornbeam  
Dock, curly  
Hemp dogbone  
Horsenettle  
Jerusalem artichoke  
Jimsonweed  
Kodua  
Lambsquarters, common  
Milkweed, common  
Milkweed, honeyvine  
Morningglory, annual  
Mustard  
Nightshade, black  
Pigweed<sup>3</sup>  
Pokeweed  
Prickly sida  
Ragweed, common  
Ragweed, giant  
Russian thistle  
Smartweed, annual  
Smartweed, swamp  
Sunflower  
Velvetleaf  
Venice mallow  
Waterhemp spp.  
Wild buckwheat

## POSTEMERGENCE

|   |                |                |                |   |   |   |   |   |   |                |                |                |   |   |                |   |                |                |                |                |                |   |                |                |                |                |                |                |   |                |                          |                            |                               |                                 |                        |                                       |                |
|---|----------------|----------------|----------------|---|---|---|---|---|---|----------------|----------------|----------------|---|---|----------------|---|----------------|----------------|----------------|----------------|----------------|---|----------------|----------------|----------------|----------------|----------------|----------------|---|----------------|--------------------------|----------------------------|-------------------------------|---------------------------------|------------------------|---------------------------------------|----------------|
| P | E <sup>R</sup> | P              | F              | F | P | P | P | P | P | P              | P              | G              | E | P | E <sup>R</sup> | P | P              | U              | G              | E <sup>R</sup> | E <sup>R</sup> | P | G              | E              | U              | E <sup>R</sup> | E              | E              | P | P              | ● Front Row <sup>R</sup> |                            |                               |                                 |                        |                                       |                |
| N | N              | P              | N              | N | N | N | N | N | N | N              | N              | N              | N | N | N              | N | N              | N              | N              | N              | N              | N | N              | N              | N              | N              | N              | N              | N | N              | N                        | ● Fusilade DX <sup>R</sup> |                               |                                 |                        |                                       |                |
| N | N              | P              | N              | N | N | N | N | N | N | N              | N              | N              | N | N | N              | N | N              | N              | N              | N              | N              | N | N              | N              | N              | N              | N              | N              | N | N              | N                        | ● Fusion <sup>R</sup>      |                               |                                 |                        |                                       |                |
| P | P              | F <sup>R</sup> | P              | U | U | P | P | P | P | G              | E              | U              | U | P | E <sup>R</sup> | P | E <sup>R</sup> | P              | F              | P              | P              | P | P              | G              | E              | P              | F <sup>R</sup> | G              | F | P              | P                        | ● Harmony SG <sup>R</sup>  |                               |                                 |                        |                                       |                |
| F | G              | E              | G              | U | P | F | U | F | E | G              | G              | P              | F | P | G              | E | E              | E              | G              | E              | P              | F | G              | G              | E              | G              | G              | E              | P | E              | E                        | E                          | F                             | G                               | F                      | G                                     | ● Ignite 280SL |
| P | G              | E              | U              | P | P | P | F | G | E | P              | F              | P              | P | P | F              | G | G              | E              | E              | U              | N              | G | E              | F              | G              | P              | P              | F              | P | F              | P                        | F                          | F                             | E <sup>R</sup>                  | P                      | ● Phoenix <sup>R</sup>                |                |
| N | N              | N              | N              | N | N | N | N | N | N | N              | N              | N              | N | N | N              | N | N              | N              | N              | N              | N              | N | N              | N              | N              | N              | N              | N              | N | N              | N                        | N                          | N                             | ● Poast/Poast Plus <sup>R</sup> |                        |                                       |                |
| P | G              | E <sup>R</sup> | P              | P | F | P | F | F | G | G              | G <sup>R</sup> | P              | F | P | P              | F | G              | E <sup>R</sup> | E <sup>R</sup> | E <sup>R</sup> | U              | P | F <sup>R</sup> | F <sup>R</sup> | G <sup>R</sup> | G              | U              | G <sup>R</sup> | G | E              | F                        | P                          | P                             | F                               | ● Pursuit <sup>R</sup> |                                       |                |
| P | F              | G              | E <sup>R</sup> | P | F | P | P | F | F | G              | G <sup>R</sup> | G <sup>R</sup> | P | P | P              | F | G              | E <sup>R</sup> | E <sup>R</sup> | E <sup>R</sup> | U              | P | F <sup>R</sup> | F <sup>R</sup> | G <sup>R</sup> | G              | U              | E <sup>R</sup> | G | E              | F                        | G                          | P                             | F                               | ● Raptor <sup>R</sup>  |                                       |                |
| P | F              | E              | U              | P | P | F | F | G | E | P              | P              | P              | P | U | G              | E | G              | E              | U              | P              | G <sup>R</sup> | F | G              | P              | G              | U              | F              | F              | F | E <sup>R</sup> | P                        | ● Reflex <sup>R</sup>      |                               |                                 |                        |                                       |                |
| N | P              | F              | P              | N | N | N | N | F | N | P              | F              | N              | N | F | N              | N | F              | N              | F              | F              | P              | F | P              | P              | N              | P              | E              | N              | F | N              | ● Resource               |                            |                               |                                 |                        |                                       |                |
| G | E              | P              | P              | P | P | F | E | F | F | P              | P              | F              | E | P | P              | U | G              | F              | G              | P              | F              | U | E              | U              | G              | E              | G              | E              | P | F              | ● Rezult <sup>R</sup>    |                            |                               |                                 |                        |                                       |                |
| P | E <sup>R</sup> | P              | U              | P | P | P | P | P | P | P              | P              | P              | P | P | P              | P | P              | E <sup>R</sup> | P              | P              | P              | P | U              | P              | P              | E <sup>R</sup> | P              | P              | P | F              | ● Scepter <sup>R</sup>   |                            |                               |                                 |                        |                                       |                |
| N | N              | N              | N              | N | N | N | N | N | N | N              | N              | N              | N | N | N              | N | N              | N              | N              | N              | N              | N | N              | N              | N              | N              | N              | N              | N | N              | N                        | N                          | ● Select/Section <sup>R</sup> |                                 |                        |                                       |                |
| P | E <sup>R</sup> | P              | P              | F | P | P | F | G | E | F <sup>R</sup> | G              | P              | F | P | F              | G | E <sup>R</sup> | P              | E <sup>R</sup> | P              | P              | G | E <sup>R</sup> | F <sup>R</sup> | F <sup>R</sup> | G              | E              | U              | G | E <sup>R</sup> | G                        | E                          | P                             | F                               | P                      | ● Synchrony XP <sup>R</sup> (non STS) |                |
| P | G              | E              | U              | U | P | F | F | E | P | F              | P              | P              | U | P | G              | E | G              | E              | U              | P              | G              | E | F              | G              | P              | G              | E              | P              | F | G              | P                        | F                          | F                             | E <sup>R</sup>                  | F                      | ● Ultra Blazer <sup>R</sup>           |                |