ROUNDUP READY PLUS™
WEED MANAGEMENT SOLUTIONS

DICAMBA BASICS

NEED TO KNOW: Connecting the Dots

ROUNDUP READY® XTEND CROP SYSTEM

Using dicamba herbicides on dicamba-tolerant soybeans and cotton can improve control of tough-to-manage broadleaf weeds and provide another herbicide option for post-emergent weed control. The following offers an introduction to dicamba, how it differs from 2,4-D, and how it fits within the Roundup Ready® Xtend Crop System, which will be an integral part of Monsanto's soybean strategy. The strategy aims to help deliver higher yield potential and peace of mind to farmers through advanced genetics and traits, combined with comprehensive weed management solutions.

Key Points to Remember

1. Dicamba is a selective herbicide used to control a wide spectrum of broadleaf weeds.
2. Dicamba mixed with glyphosate is an effective combination because it offers two modes and sites of action for enhanced weed control.
3. Dicamba comes in a variety of formulations.
4. Dicamba and 2,4-D have some similarities, but they also have significant differences.

1 Wide Spectrum of Control

Dicamba is a selective benzoic acid herbicide used to control a wide spectrum of broadleaf weeds. It has a broad application window and can be used as a pre-, post-, and burndown herbicide. Dicamba is rapidly absorbed by plant leaves, stems, and roots, and works as an auxin agonist by mimicking naturally-occurring plant hormones (i.e., auxins) that regulate many plant processes, such as protein synthesis and cell growth. Higher concentrations of dicamba can induce rapid, abnormal cell growth and development in the stems, petioles, and leaves of sensitive plants. Dicamba can also limit transpiration and photosynthesis. This lack of functioning leads to irregular call growth, leaf drop, and lethal starvation, resulting in plant death. One of the most widely used herbicides in corn crops, dicamba is registered for use in agriculture, as well as other applications (e.g., turf, ornamental, and lawn/garden). It is used to control weeds in pastures, range land, and non-crop areas.

2 Dicamba + Glyphosate

Dicamba was chosen for the Roundup Ready® Xtend Crop System because it pairs well with glyphosate, a non-selective herbicide. Glyphosate and dicamba have similar, rapid uptake and translocation profiles, and they are both xylem- and phloem-mobile. They offer different modes of action, which help bring robust broadleaf weed control to dicamba-tolerant soybeans, maintain greater diversity of herbicide use, and reduce the potential for developing herbicide resistance.

3 Various Formulations

A number of different dicamba formulations exist in today's marketplace. The formluations—different in their physical properties and potential to volatilize—have evolved over time. Dimethylamine (DMA) salt and dicamba acid are two of the oldest and most volatile formulations. Diglycolamine (DGA) salt was introduced in the mid-1990s, and it presented a significant reduction in volatility. Innovations in dicamba chemistries continue today.

Low-volatility advancements in dicamba chemistry formulations is a key component of the Roundup Ready Xtend Crop System. Monsanto is developing two low-volatility herbicide formulations for use in the Roundup Ready Xtend Crop System. The first, to be branded Roundup® Xtend, will be a premix of glyphosate and dicamba. The second, to be branded XtendiMax™, will be a straight-goods dicamba formulation that can be used as a tank-mix partner.

This information is for educational purposes only and is not an offer to sell Roundup® Xtend, XtendiMax™, or Roundup Ready® 2 Xtend. Roundup® Xtend, XtendiMax™, and Roundup Ready® 2 Xtend are not yet approved for sale or use anywhere in the United States.

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4 Dicamba vs. 2,4-D

Dicamba and 2,4-D may have similar effects on weeds to which they are applied, but they also greatly differ in several ways: (1) dicamba controls more weeds than 2,4-D, and it is more effective on problem weeds likes marestail and morningglory; (2) fewer weeds are reported resistant to dicamba than 2,4-D, and (3) dicamba has a longer residual effect in the soil than 2,4-D. Dicamba has potential for residual control up to 14 days.*

Herbicide	Mode of Action	Site of Action
Glyphosate (non-selective)	Amino Acid Synthesis Inhibitor	EPSP Synthase Inhibitor (an essential amino acid found in the plant's chloroplast; required to produce vital plant proteins)
Dicamba (selective)	Growth Regulator (synthetic auxin)	Specific site unknown (but presumed to be an auxin receptor on the outside of the plant cell membrane)

*Small seeded broadleaf weeds, including waterhemp, lambsquarter, and Palmer pigweed. Results vary, depending on rainfall and soil type. For best results, combine with a recommended residual broadleaf product.

Estimated Relative Efficacy on Selected Resistant/Tough Weeds

Weed	Dicamba % Weed Control Potential	2,4-D % Weed Control Potential
Marestail	80-90%	60-70%
Common Chickweed[1/4]	90 -100%	70-80%
Common Ragweed[1/2/3/4]	90 -100%	80-90%
Palmer Pigweed[4]	90 -100%	80-90%
Common Lambsquarters[1/2/3/4]	90 -100%	80-90%
Curly Dock[4]	70-80%	40-50%
Velvetleaf[1/2/3/4]	90-100%	80-90%
Black Nightshade[1/2/3]	80-90%	70-80%
Waterhemp[1/2]	80-90%	80-90%
Bindweed spp.[1]	80-90%	70-80%
Smartweed[1/2/3/4]	80-90%	60-70%
Common Cocklebur[1/2/3/4]	90-100%	80-90%
Canada Thistle[1/2/3]	80-90%	60-70%

1. Weed Control Guide for Ohio and Indiana
2. Herbicide Guide for Iowa Corn and Soybeans
3. Penn State Agronomy Guide
4. Weed Control Manual for Tennessee

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