



PROACTIVE WEED MANAGEMENT

What You'll Learn...

- Proactive weed management is the timely use of herbicides and cultural practices to control weeds and minimize the risk of herbicide-resistant weed development.
- Strategies that use residual herbicides along with timely post-emergence applications, multiple sites of action, and maintaining good weed control throughout the season will help reduce the risk of herbicide-resistant weed pressure on the farm.
- Implementing effective proactive weed management strategies can help to minimize the spread of glyphosate-resistant weeds, and the increased costs associated with their control.

Herbicide-resistant Weeds

Weed populations naturally contain individual plants (biotypes) that are more tolerant to a herbicide. Repeated use of any herbicide by itself will expose weed populations to selection pressure which may result in the survival of individual plants with greater tolerance or resistance to the repeatedly used herbicide. If these plants are not controlled by another herbicide or cultural practice, the herbicide-resistant biotype can reproduce and spread.

Effect of Glyphosate-resistant Weeds

The development of resistant weed species and weed shifts typically increase control costs, when compared with previously susceptible weed populations.¹ If not properly managed, a small isolated glyphosate-resistant weed patch can soon spread across an entire field and potentially into neighboring fields. Depending on the crop, a limited number of post-emergence (POST) herbicide options may be available for in-crop control of glyphosate-resistant weeds. In some fields, growers have resorted to applying herbicides with hooded sprayers or hiring crews to hand hoe the weeds. Advancements have been made in hooded sprayer technology; however, weeds within the row will still need to control. Depending on the region and weed

density, hand-hoeing weeds can be very expensive. These measures add costs to production, but still can be a part of managing weeds successfully.

The development of herbicide resistant weeds is not restricted to certain regions or as a result of raising certain crops. Growers are faced with the challenge of dealing with and learning to manage herbicide-resistant weeds with many herbicide groups. Implementing effective management strategies, will not only benefit your fields, but will also minimize the risk of spreading weeds to neighboring fields or farms.

Proactive Weed Management Strategies

An economic analysis of weed management strategies shows that proactive strategies are particularly important for tough-to-control weeds such as waterhemp, giant ragweed and common lambsquarters.²

- **Using Herbicides with Residual Activity and Multiple Sites of Action in the Same Growing Season.** Residual herbicides can provide early-season weed control and allow for better timing of POST herbicide applications. A soil residual herbicide should always be incorporated into a weed management program for corn, soybean, and cotton production. Incorporating other herbicides with multiple sites of action into glyphosate POST programs can help to reduce weed population shifts.
- **Applying Herbicides at Full Rates.** Herbicides should be applied at their full labeled rate, as lower rates may allow weed escapes or may "select" for herbicide tolerance.
- **Eliminating Weeds Prior to Planting.** Weeds will begin to compete with a crop for water, nutrients, and sunlight at emergence. It is best to start the season with a weed-free field. Once a crop is established, fewer herbicide options may be available to control certain weed species.

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- **Controlling Weeds When They Are Small.** POST applications should be made before weeds reach 4 inches tall because larger weeds are more difficult to control.
- **Maintaining Good Weed Control Throughout the Season.** Providing excellent weed control, especially until canopy closure, can help provide clean fields through harvest. Weeds present at or above the crop canopy are more likely to outcompete and reduce crop yield potential. Any weed that sets seed will contribute to the seed bank in that field and may result in seed being transported to other fields via harvest equipment. Residual herbicides applied preplant and pre-emergence (PRE) may not provide effective weed control throughout the crop growing season. Overlapping residuals with approved in-crop applications of residual herbicides can pick up where PRE treatments begin to break down.
- **Using Glyphosate Best Management Practices.** Glyphosate applications should always be made at the right time and the right rate. To reduce the selection pressure for resistant plant biotypes, herbicides with different sites of action or tillage should always be incorporated into a weed management program. Growers that have implemented season-long weed control programs by including a preplant or PRE residual herbicide followed by an early POST herbicide in a Roundup Ready® Technology system are reducing the risk of selecting for herbicide-resistant weed pressure on their farm.
- **Scouting and Monitoring Fields.** After herbicide applications, always scout fields to ensure weed control. If any escapes are found, either spot spray or remove the weed by hand. If the escaped weed has already set seed, the best option is to bag the weed

and remove it from the field. Always clean machinery before moving between fields to prevent the spread of weed seed. Weeds in ditch banks, field borders, and along roadsides should also be controlled as weeds can easily spread into adjacent fields.

- **Rotating to Other Crops.** Rotating crops allows for different weed management and cultural practices. Crop rotation can allow for tillage, the use of other cultural practices, and the use of different herbicide programs which can help prevent certain weed species from becoming dominant in a field.

The Economics of Delaying Managing Herbicide Resistant Weeds. Proactive approaches will protect yield potential, which must be taken into account in any economic analysis. A proactive weed management plan helps minimize the risk of developing weed resistance on your farm. Being diligent in your activities can go a long way to maintaining your profitability.

Roundup Ready PLUS® Crop Management Solutions were developed by Monsanto in conjunction with leading academics and industry partners to help growers improve weed control, especially to improve control of tough-to-manage and glyphosate-resistant weeds. The Roundup Ready PLUS® web site includes weed management recommendations by crop and by geography, including the use of residual herbicides that provide multiple sites of action for controlling tough weeds, and other weed control resources. Visit the website at www.RoundupReadyPLUS.com.

Sources: ¹Mueller, T.C., Mitchell, P.D., Young, B. G., and Culpepper, A.S. 2005. Proactive versus reactive management of glyphosate-resistant or -tolerant weeds. *Weed Technology* 19(4):924-933. Weed Science Society of America. ²Boerboom, C. and Mitchell, P. 2005. Can proactive herbicide resistance management pay? *Wisconsin Crop Manager*. University of Wisconsin. <https://aae.wisc.edu/>. Web sources verified 01/06/18.

For additional information, contact your local seed representative. Developed in partnership with Technology Development & Agronomy by Monsanto.

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Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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