What Do Glyphosate-Resistant Weeds Mean For You?

Dr. Kevin Bradley
Assoc. Professor, Div. Plant Sciences and State Extension Weed Scientist
Kristin Payne
Graduate Research Assistant, Div. Plant Sciences

Perhaps no single event in the history of agriculture has changed weed management to the extent that Roundup Ready crops have. In 2009, approximately 89% of the soybean acreage, 70 to 80% of the cotton acreage, and at least 40 to 50% of the corn acreage was planted with Roundup Ready varieties in Missouri. It seems clear from our increasing adoption of Roundup Ready crops over the past decade that most of our acreage will be in some kind of continuous Roundup Ready cropping system at least in the foreseeable future, whether it be Roundup Ready soybean followed by Roundup Ready corn, or Roundup Ready soybean followed by Roundup Ready cotton. This scenario represents a tremendous selection pressure that will continue to be placed on weeds to develop resistance to glyphosate.

In recent years a number of glyphosate-resistant weed biotypes have been identified in Missouri and surrounding states. These resistant species have been identified primarily in locations where a Roundup Ready crop, most often soybean or cotton, has been planted continuously without rotation and where repeated applications of glyphosate have been made year after year. Some of the more recent examples of these species include glyphosate-resistant horseweed or marestail, common ragweed, giant ragweed, palmer amaranth, and waterhemp.

In my opinion, the increasing number of sites in which we have identified glyphosate resistance in either waterhemp or palmer amaranth should be very concerning for soybean growers in Missouri. The pigweeds (i.e., waterhemp and palmer amaranth) are some of our most common and troublesome weeds encountered in soybean production and have shown their ability to adapt to other herbicide chemistries (ALS-inhibitors, PPO-inhibitors, triazine herbicides) in the past. In a targeted survey we conducted last year, we identified 45 separate glyphosate- resistant waterhemp populations across 28 counties in Missouri (Figure 1). Although there weren't many samples taken from the boot heel region, we also identified both glyphosate- resistant waterhemp and glyphosate-resistant palmer amaranth populations in Scott and Mississippi counties, respectively (Figure 1).

So, if you have or suspect you have a glyphosate-resistant weed present what can you do about it? First, if you decide to stay with soybeans you must rotate to an alternative herbicide that is effective on your resistant weed species and acts at a site-of-action different from glyphosate. In soybeans, this usually means you will need to use a preemergence herbicide. In our research, we have observed that preemergence soybean herbicide treatments like AuthorityFirst and the other Authority-based products, Sonic, Prefix, Boundary, Dual II Magnum, and Valor will all provide good control of glyphosate-resistant waterhemp, although a postemergence follow-up treatment will usually be required due to the nature of waterhemp germination. In addition to these preemergence herbicide options, the postemergence PPO-inhibiting herbicides like Phoenix, Cobra, Ultra Blazer, Flexstar, etc. should also provide good control of glyphosate- resistant waterhemp and palmer amaranth in soybeans, but there are some PPO-resistant pigweed populations still present in Missouri so in these situations applications of these herbicides would also be ineffective. Another option if you decide to stay with soybeans is to utilize LibertyLink soybeans and Ignite. However, even if a grower chooses to utilize this new technology, I would still start with a preemergence herbicide and follow this with a timely application of Ignite.

Second, if you have a glyphosate-resistant weed like waterhemp or palmer pigweed you can rotate away from soybeans altogether. For example, rotate to a conventional corn hybrid and use alternative herbicides in this system for at least one year or perhaps two in an attempt to reduce the glyphosate-resistant weed seedbank. In our research with glyphosate-resistant waterhemp, we have found that most prepackaged atrazine mixtures will provide excellent control of glyphosate-resistant waterhemp in corn. Additionally, we have observed excellent control of glyphosate-resistant waterhemp in corn with postemergence herbicides like Distinct, Status, Callisto, Impact, and others.

Glyphosate and Roundup Ready crops have simplified weed management in soybeans dramatically over the past decade. They have enabled us, for the most part, to achieve excellent weed control at an economical price. In order to preserve the utility of this technology, growers must be willing to adapt and change their practices when situations like glyphosate resistance arise. In fields where glyphosate-resistant weeds are suspected or are present in only small areas, paying a little more now through the use of an alternative herbicide or different cropping system will be much better than allowing these weeds to proliferate and develop into a much bigger problem in the long run. Δ

DR. KEVIN BRADLEY: Assoc. Professor, Div. Plant Sciences and State Extension Weed Scientist, University of Missouri
KRISTIN PAYNE: Graduate Research Assistant, Div. Plant Sciences, University of Missouri

Figure 1. Confirmed glyphosate-resistant waterhemp and palmer amaranth populations present in Missouri as of 2009.