

Managing Weed Escapes in Roundup Ready Corn

**By Jeffrey L. Gunsolus
Professor and Extension Agronomist – Weed Science
University of Minnesota**

Introduction

Soybean producers have rapidly adopted the glyphosate resistant trait in soybean and currently, many corn growers, plant breeders and agrichemical manufactures are wondering how widely the glyphosate resistant trait will be used by Minnesota corn producers.

Current agrichemical success in the commodity-based markets of corn and soybean relies upon high volume sales. In order to obtain sales in the current market the herbicide and herbicide resistant crop (HRC) must result in a lowering of the cost of production to the crop producer and/or be perceived as an easier method of conducting weed management.

Currently, glyphosate and glufosinate are the key herbicide resistant corn (HRC) technologies being used in Minnesota. In soybean, approximately 75% of the 7 million soybean acres in Minnesota are glyphosate resistant. Glyphosate and glufosinate resistant corn each have approximately 8% of the 7 million corn acres in Minnesota. Both herbicides are broad-spectrum in effectiveness with no residual soil herbicide activity. This creates the opportunity for very effective weed control practices with no risk of herbicide-induced crop injury in the HRC or succeeding crop rotations.

From a weed science perspective, a primary concern of adoption of the HRC technology is the increase in the likelihood of weed species shifts or the development of herbicide resistant weeds with the ensuing loss of herbicide function. This is not an unprecedented concern.

I Have Used Herbicides for Years, Yet I Still Have Weed Control Problems

As new herbicide technologies come and go the phrase “I have used herbicides for years, yet I still have weed control problems” has been an often repeated phrase as the newest and latest herbicide begins to lose their effectiveness. This loss of effectiveness is often in direct proportion to product use (as indicated by increasing market share) and duration of time in the market place (generally within 5-7 years). The best example from the 1990’s was the widespread use of the ALS-inhibiting herbicides such as Accent, Pursuit, and Glean.

At first the weed control in most fields was excellent, however, within several years several tolerant species began to predominate in the field. Often these problems were solved with proper tank mixtures and adjuvants. After a period of time some weed

species were found to be resistant to several of the ALS herbicides and soon the effectiveness of the technology was compromised. In the early 1990's the use of Pursuit herbicide resulted in a lot of weed-free soybeans in Minnesota. The early warning signs of loss of herbicide effectiveness included an increase in populations of common lambsquarters and common ragweed. Tank mixtures with another ALS herbicide, Pinnacle, improved common lambsquarters control, however, to improve common ragweed control, addition of herbicides such as Cobra, Flexstar, or Blazer was necessary. Adoption of these tank mixtures often improved weed control but increased the risk of crop injury. Movement from nonionic surfactants to crop oil concentrates had much the same result. As the difficult to control weeds increased in frequency and density in farmers fields the simplicity of using Pursuit as the primary weed management tactic diminished.

Continued use of the ALS chemistry eventually resulted in the development of localized biotypes of weeds resistant to the ALS chemistry. Currently in Minnesota we have localized populations of the following species that are resistant to ALS chemistry: kochia, common cocklebur, waterhemp, wild oat, and green, yellow, and giant foxtail.

Obviously the development of the Roundup Ready corn and soybeans came at a good time to alleviate these weed control problems and reduce herbicide-induced crop injury symptoms and carry over.

What Can Experiences from the 1990's teach us today?

Weed species shifts and herbicide resistant weeds are the direct result of a lack of diversification in weed management systems. Too many ALS herbicides used in multiple crops resulted in a reduction in their performance.

With approximately 75% of the 7 million soybean acres in Minnesota planted to glyphosate resistant soybeans and the potential adoption of Roundup Ready corn the potential for a lack of diversification in weed management systems does, once again, exist.

Weed species shifts are a long-range risk, generally taking 5 to 7 years for significant weed species shifts to occur. The temptation of the short-term gains of using the Roundup Ready technology across all corn and soybean acres is strong and short-term gains are often adopted because "a dollar today is worth more than a dollar tomorrow".

Are All Roundup Ready Crops Created Equal?

From a weed scientist's perspective, much of my research over the last 10 years would indicate that the Roundup Ready trait has more weed control value in soybeans than corn primarily because soybeans can tolerate the presence of early-emerging annual weeds for a longer period of time than can corn.

In general, weeds that emerge with corn must be controlled within 2 to 5 weeks after weed emergence to prevent a yield loss due to weed competition. In general, soybeans

can tolerate 4 to 6 weeks of weed/crop competition. This extra 1 to 2 weeks can be very important when you are trying to control weeds over a large number of acres and you are at the mercy of wet fields and windy days limiting your field working days. Also, keep in mind that this period of crop tolerance to weed competition is decreased under high weed densities or environmental stresses such as low moisture or nitrogen levels. Another advantage for soybeans is due to differences in crop growth form and flexibility in row spacing that improves soybean ability to shade-out late-germinating weeds and prevent late-emerging weed escapes. This ability to reduce late-emerging weeds is important when using a herbicide that lacks soil-residual weed control.

So what does this have to do with Managing Weed Escapes in Roundup Ready Corn?

The main point of this article is that the best way to manage weed escapes in Roundup Ready Corn is to prevent weed escapes in the first place. Roundup does not provide perfect weed control. For example, during the summer of 2002 one of my most frequently asked questions involved the lack of common lambsquarters control by Roundup. The reason for this poor control is complicated. Lack of timely application, reduced rates of Roundup, an extended hot / dry weather pattern, and type and rate of adjuvant system all played a role.

Several strategies to prevent weed escapes are as follows:

1. Diversify your weed management strategies. If Roundup Ready soybeans are a good fit for your farming operation then consider other weed management tactics in your corn acres. There are many conventional herbicides as well as Liberty Link and Clearfield herbicide resistant crop/herbicide programs to choose from.
2. If you are going to use Roundup Ready Corn use a soil-applied grass herbicide at 50 to 100% of the labeled rate (depending upon existing weed density) at time of corn planting. Soil applied herbicides reduce the risk associated with failing to control early-emerging weeds in a timely manner and it reduces the number of late emerging weeds going to seed. The soil-applied herbicides also reduce the need to spray glyphosate under less than desirable conditions such as windy days or in areas surrounded by glyphosate sensitive crops.

Diversification of weed management tactics can also be accomplished by:

- a) Using different herbicide modes of action (see points 1 and 2 above)
- b) Being willing to use mechanical weed control when necessary.
- c) Diversifying your crop rotation to break up weed life cycles.

All of these strategies can contribute to the effective and strategic use of Roundup Ready corn in Minnesota and reduce the potential for weed escapes that result in weed species shifts and a decline in the performance of the herbicide.