

## Dry Weather and Herbicide Carryover to Wheat

With dry conditions in many areas resulting in poor corn and soybean crops, more winter wheat may be planted on these acres. However, the potential for injury to wheat resulting from corn and soybean herbicide carryover under dry conditions needs to be considered. Wheat should not be planted this fall in fields where the probability of herbicide carryover is high.

### Dry Conditions and Herbicide Carryover

Corn and soybean herbicides with residual soil activity have the greatest potential for causing carryover injury to wheat that may be planted in the fall. Moisture and time is needed for degradation of these herbicides. Dry conditions and long periods without rain can slow the degradation of residual herbicides. Table 1 lists the rotational restrictions in months following the application of various corn and soybean herbicides prior to planting wheat. When conditions are dry, other factors should also be considered when determining the risk of herbicide carryover injury to wheat.

### Factors that Influence Herbicide Carryover

- Amount of Moisture and Timing of Rainfall** - The amount of rainfall received during the first few weeks following soil residual herbicide application in corn and soybeans is one of the most important factors that will influence herbicide carryover to wheat. Fields receiving normal rainfall during this time will be much less likely to have wheat injury from herbicide carryover. When adequate rainfall is not received during this time, the chemical and microbial processes needed to degrade herbicides in the soil will be reduced. Herbicides can become adsorbed to soil particles increasing the potential for herbicide carryover. Rainfall occurring later in the season will have much less effect on herbicide degradation than if it had occurred near the time of herbicide application.
- Soil Characteristics** - Soils high in clay and organic matter content will adsorb more herbicide onto soil colloids. Herbicides bound to soil colloids cannot be taken up by plants, move through the soil profile, or easily degrade. Wheat can be injured when water displaces soil-bound herbicide residues later in the season. Soils high in pH can also slow the degradation of atrazine and some of the ALS-inhibiting herbicides like chlorimuron. These herbicides will persist longer in the soil because the rate of chemical hydrolysis slows at higher soil pH values. Dry conditions help to increase herbicide adsorption to soil colloids, and decrease the chemical hydrolysis of herbicides.

**Table 1.** Restrictions when rotating to wheat for corn and soybean herbicides endorsed in the Roundup Ready PLUS™ Weed Management Solutions platform.<sup>1</sup>

HERBICIDE	ACTIVE INGREDIENT	MONTHS AFTER APPLICATION
Degree® Harness®	acetochlor	4
Degree Xtra® Harness® Xtra Harness® Xtra 5.6L	acetochlor atrazine <sup>2</sup>	4
TripleFLEX® Herbicide	acetochlor flumetsulam clopyralid	4
Impact®	topramezone	3
Authority® Assist	sulfentrazone imazethapyr	4
Authority® First	sulfentrazone chloransulam	4
Authority® MTZ	sulfentrazone metribuzin	4
Authority® XL	sulfentrazone chlorimuron	4
Cobra® Phoenix®	lactofen	none
Flexstar®	fomesafen	4
Select MAX®	clethodim	1
Valor® SX <sup>3</sup> Gangster®	flumioxazin	3
Valor® XLT	flumioxazin chlorimuron	4
Warrant® Herbicide	acetochlor	4

<sup>1</sup> Listed corn herbicides in gray background, and soybean herbicides in white background. General guidelines only, herbicide performance and carryover potential are variable and dependent upon soil and environmental conditions.

<sup>2</sup> Guidelines for atrazine at 1 LB ai/A is 3 months, and 2 LB ai/A is 15 months.

<sup>3</sup> Guidelines for Valor with 1 inch rainfall/irrigation at ≤ 2 oz/A is 1 month, 2-3 oz/A is 2 months, and ≥ 3 oz/A is 3 months.

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- **Type of Herbicide** - There is a greater risk of wheat injury from carryover of corn herbicides than from soybean herbicides. Corn herbicide products with the greatest risk of carryover to wheat contain the active ingredient atrazine. Under extreme drought conditions, wheat planted after a corn crop that has been treated with atrazine during the season should be considered at risk for atrazine carryover injury. The likelihood of soybean herbicide carryover to wheat is lower, but still possible, in a year with little rainfall.
- **Herbicide Rate and Timing of Application** - Under dry conditions, there is a greater chance of wheat injury from carryover when using higher rates and making later applications of herbicides. Carryover problems in wheat are more likely in fields where atrazine was applied at 2 lbs. a.i./acre or more. There is also greater potential for wheat injury the later in the season that atrazine was applied. Many herbicide products that contain atrazine recommend rotating to only corn or sorghum when applications are made after June 10. Postemergence applications of fomesafen (the active ingredient in Flexstar®) in soybeans with little to no rainfall following treatment can be a potential risk for herbicide carryover injury to wheat.
- **Practices that minimize stress to wheat seedlings** during establishment can reduce problems from carryover of low concentrations of herbicides.

### Conducting a Bioassay

A soil bioassay can be conducted to help predict the potential for herbicide carryover injury to wheat. Collect soil samples from the field where carryover is suspected several weeks before planning to plant wheat. Gather samples from across the field at soil depths up to 6 inches. Mix the soil samples together and place the soil into pots. Plant wheat in the pots and wait for seedlings to germinate in order to observe any herbicide carryover injury that may occur. Injury symptoms should become apparent within 10 to 14 days after seedling emergence. Comparison should be made with wheat planted at the same time in pots with soil samples collected from a field or location where herbicide carryover is not a concern. If injury appears, there will likely be herbicide carryover injury to wheat planted in the field.

### Follow Labels and Consider Other Factors

It is important to follow the plant-back and rotation restrictions on herbicide labels and consider the impact of drought on herbicide carryover in order to grow a healthy wheat crop.

### Management Considerations to Help Reduce the Risk of Herbicide Carryover

- **Tillage** can help dilute the herbicide concentration in the tilled zone. Dilution can help to decrease the potential for herbicide carryover injury to wheat, but will not eliminate the potential for injury to occur.
- **The date of wheat planting** should be delayed as late as practical in fields where herbicide carryover is suspected.

**Sources:** Bradley, K. 2012. Consider herbicide carryover potential before planting wheat or forage grasses this fall. University of Missouri IPM Program. <http://ipm.missouri.edu>; Sprague, C. 2012. Dry conditions will likely impact herbicide carryover to rotational crops. Michigan State University Extension. <http://msue.anr.msu.edu>; Witt, W. and Martin, J. 1999. Herbicide carryover to wheat. University of Kentucky Wheat News Vol. 3, No. 3. <http://www.ca.uky.edu>;

**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.

**ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.** Degree®, Harness®, TripleFLEX® Herbicide, and Warrant® Herbicide are not registered in all states. Degree®, Harness®, TripleFLEX® Herbicide, and Warrant® Herbicide may be subject to use restrictions in some states. Degree Xtra® and Harness® are restricted use pesticides and are not registered in all states. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local Monsanto dealer or representative for the product registration status in your state. Degree Xtra®, Degree®, Harness®, Roundup Ready PLUS™, TripleFLEX®, and Warrant® are trademarks of Monsanto Technology LLC. Leaf Design™ is a servicemark of Monsanto Company. Flexstar® is a registered trademark of a Syngenta group company. Authority® is a trademark of FMC Corporation. Gangster®, Select Max®, and Valor® are registered trademarks of Valent U.S.A. Corporation. All other trademarks are the property of their respective owners. Impact® is a registered trademark of Amvac Chemical Corporation. ©2012 Monsanto Company. 08142012TED