



UNIVERSITY OF MINNESOTA  
EXTENSION

# Focus on Ag

February 2011

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Vol. 5 No. 1



Dear Ag Producer,

In this newsletter, you'll find the latest weed control evaluations for corn and soybeans conducted by the University of Minnesota Applied Weed Research team. For the most part, the herbicide treatments included in the evaluations are for a Roundup Ready® system and they include a variety of preemergence herbicides, sequential treatments and tank mix partners.

The key word here is "variety," or better yet, diversity. To maintain Roundup's (glyphosate) effectiveness in the long-term, weed management programs need to diversify. Dr. Ford Baldwin, retired Weed Scientist from University of Arkansas, recently wrote in a Delta Farm Press article, "... there are only two places to be regarding the Roundup Ready resistance freight train. You can be out in front and try to out-run it with a better mix of crop, herbicide and trait diversity, or you can attempt to pick up the pieces after the train has run you over." The enclosed evaluations include a number of herbicide diversification strategies for you to consider that both performed well and had high returns.

Producers in Dakota County have an added challenge of balancing these recommended strategies with groundwater concerns. Preemergence (PRE) herbicides form the foundation of a diversification strategy, but many of these contain groundwater restrictions or advisories. Which scenario carries more risk? Is it the risk of losing glyphosate as a weed management tool or the risk of herbicide leaching into groundwater? I posed this question to Dr. Jeff Gunsolus at the University of Minnesota and his rationale is this: If we let glyphosate resistant weeds get ahead of us and we build significant weed populations in the seed bank, then we lose the ability to **judiciously** use and apply PRE residual herbicides. This has already occurred in the southern US, where they have moved into overlapping applications of PRE herbicides.

Knowledge is power. To help balance the challenge of maintaining glyphosate effectiveness with protecting groundwater, this edition offers a few tools that I hope you find useful: 1) Herbicide evaluations and diversification strategies, 2) Access to a mapping tool to determine if your fields are in a groundwater sensitive area, and 3) Reference tables of herbicides with groundwater restrictions or advisories.

With best wishes for outrunning the freight train!

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# Integrated Weed Control

February 2011

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## Maintaining Roundup's® Long-term Effectiveness: Diversify, diversify, diversify

As Roundup® (glyphosate) use has increased, so have concerns about its long-term effectiveness. In this region, weed scientists are hearing from an increasing number of producers that are making more applications of Roundup® at higher rates just to achieve the same or even less control. In addition, glyphosate resistant weeds have been identified in Minnesota (giant ragweed, common ragweed and tall waterhemp). The University of Minnesota Applied Weed Science team recommends several strategies to maintain long-term viability of this powerful herbicide and to lower the risk of weeds developing resistance to it:

### ● **Diversify your weed management program**

- Integrate preemergence herbicides, sequential herbicides and/or tank-mix partners into your weed control program
- Rotate modes of action (MoA) of herbicides. These are now printed on the labels, so they're easy to check. There is also a handy MoA chart available that was developed by weed scientists at several universities ([http://www.glyphosateweeds crops.org/Info/MOA\\_063008.pdf](http://www.glyphosateweeds crops.org/Info/MOA_063008.pdf)). While it was printed in 2008, it's still a good reference and contains most of the herbicides found in the enclosed evaluations.
- And yes! Consider inter-row cultivation!

### ● **Focus glyphosate use where it has the greatest value in your cropping system**

- Consider adding alternative technologies (Liberty Link)
- Consider using conventional herbicides in a crop that has other effective weed control options
  - Corn has more broad-spectrum POST options than soybeans
  - Start with the conventional herbicides early in the operation and use glyphosate as a back-up plan

### ● **Focus on early-season weed control**

- Know your weeds! Choose the right product at the right time to improve

herbicide effectiveness, crop yield and keep weed populations low.

## Herbicide evaluation and diversification options

The first insert summarizes herbicide combinations that were evaluated by the Applied Weed Science team for both corn and soybeans in 2010. They include a number of sequential and tank mix options that complement glyphosate in tolerant (GT) corn and soybeans.

Product application rates, percent control of several different weeds, yields, herbicide costs and returns are included for each of the herbicide treatments evaluated. Weed control percentages and yields that are highlighted in yellow are equivalent to the weed-free check. Highlighted returns over weed control costs are equivalent to the highest returning herbicide treatment.

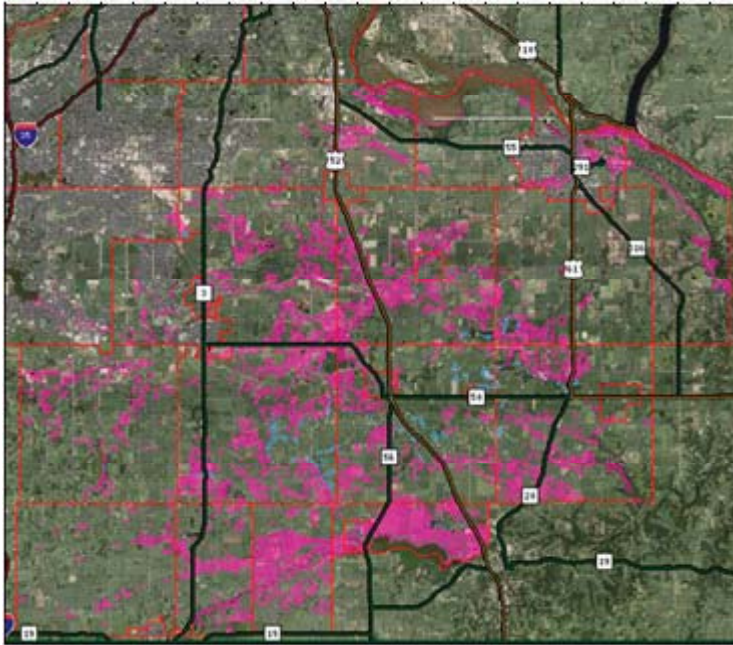
In the 2010 evaluation for soybeans, all herbicide treatments yielded equally well. The differences in returns were simply due to herbicide costs. As a group, the sequential PRE / POST III (6"weeds) herbicide combinations consistently had high returns. In the 2010 corn evaluation, all treatments yielded equally well except for the POST II (V3) tank mixes and the Harness/Ignite (LibertyLink) treatment. Of the nine highest returning treatments, five included a pre-emergence herbicide.

The second insert, "Diversification Options" breaks out weed control for the individual corn and soybean herbicides that were used to complement glyphosate in the evaluations. The five weeds included in these tables were chosen because they have been the most difficult to control in a Roundup Ready® system. The insert can help identify individual herbicides that may be the most effective against problem weeds in your fields.

## Herbicide conundrum

Preemergence herbicides are an important part of the strategy to keep glyphosate effective in the long-run. However, many of the PREs have groundwater restrictions or advisories based on conditions that are common in Dakota County. Do you have fields with coarse-textured soil and shallow groundwater? If so, they are in a groundwater sensitive area and label restrictions or advisories may apply. While you know your soil types, finding reliable information on the depth to groundwater is more difficult. We developed an on-line mapping tool that quickly and easily identifies groundwater sensitive areas within Dakota County. These areas are shown in pink on the map and combine sandy soils (sandy loams and loamy sands) with shallow groundwater (<30 feet). You can access the mapping tool through the agriculture pages on the Dakota County website at [www.dakotacounty.us](http://www.dakotacounty.us) and search "agriculture."

**Figure 1.** On-line mapping tool showing groundwater sensitivity (pink) based on soil type and depth to groundwater in Dakota County.



## Herbicide restriction and advisory reference

The following tables are not meant to be comprehensive, but they do include herbicides from the 2010 corn and soybean weed control evaluations that contain restrictions or advisories for groundwater (surface water not included). **Read the label, as it is the final authority.** Table 1 focuses on application **restrictions** where herbicides **cannot** be applied if certain conditions exist. Please note that restrictions based on "sand" don't apply in Dakota County, since the County doesn't have any soils that are classified strictly as "sand." Groundwater advisories, however, would apply for these herbicides. The application **restrictions** that do apply in Dakota County include herbicides that contain alachlor (Micro-Tech and IntRRo) or acetochlor (Harness/Surpass & others, Surestart, Warrant).

**Table 1.** Herbicides with application restrictions related to soil type and depth to groundwater. List is not comprehensive, but includes herbicides found in 2010 Corn and Soybean Herbicide Evaluations insert. Chemicals in bold in herbicide combinations trigger the application restriction.

Trade name	Chemical name	Soil and Groundwater Conditions for Restriction	Restricted in Dakota County	Restriction Comments
Authority Assist	<b>sulfentrazone</b> + imazethypyr	Sand with < 1% OM <sup>1</sup>	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County.
Authority First/Sonic	<b>sulfentrazone</b> + cloransulam	Sand with < 1% OM	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County.
Clarity/Banvel	dicamba	Sands with <3.0% OM <b>AND</b> shallow groundwater	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County.
Harness/Surpass/Breakfree/others	acetochlor	Sands with <3.0% OM <b>OR</b> Loamy sand with <2.0% OM <b>OR</b> Sandy loam with <1.0% OM <b>AND</b> < 30 ft. to groundwater	<b>Yes</b>	Requires 150 ft. application setback from wells. See mapping tool for areas potentially affected.
Micro-Tech/IntRRo	alachlor	Soils highly permeable (loamy sands & sandy loams) <b>AND</b> <30 ft. to groundwater	<b>Yes</b>	Application restricted. See mapping tool for areas affected.
Outlook	dimethanamid	Sands with <3.0% OM <b>AND</b> < 30 ft to groundwater	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County.
Integrity/Verdict	saflufenacil + <b>dimethanamid</b>	Sands with <3.0% OM <b>AND</b> < 30 ft to groundwater	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County
Spartan	sulfentrazone	Sand with < 1.0% OM	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County
Status/Distinct	diflufenzopyr + <b>dicamba</b>	Sands with <3.0% OM <b>AND</b> shallow groundwater	No <sup>2</sup>	No soils classified as simply "sand" in Dakota County
Surestart	<b>acetochlor</b> + flumetsulam + chlopyralid	Sands with <3.0% OM <b>OR</b> Loamy sand with <2.0% OM <b>OR</b> Sandy loam with <1.0% OM <b>AND</b> < 30 ft. to groundwater	<b>Yes</b>	Requires 150 ft. application setback from wells. See mapping tool for areas potentially affected
Warrant	acetochlor (encapsulated)	Sands with <3.0% OM <b>OR</b> Loamy sand with <2.0% OM <b>OR</b> Sandy loam with <1.0% OM <b>AND</b> < 30 ft. to groundwater	<b>Yes</b>	Requires 150 ft. application setback from wells. See mapping tool for areas potentially affected

<sup>1</sup>OM=Organic matter

<sup>2</sup>Groundwater advisories do apply on permeable (coarse-textured) soils with shallow groundwater.

Groundwater advisories generally state that the herbicide has properties that make it susceptible to leaching, particularly on coarse-textured or permeable soils where groundwater is shallow. Judicious use of these herbicides is strongly encouraged. Table 2 includes herbicides from the 2010 weed control evaluations that contain a groundwater advisory.

It seems as though we've listed every herbicide from the evaluations into one of these two lists. That's not quite the case. Table 3 is a summary of PRE and POST herbicides from the Diversification Options insert for corn and soybeans that contain neither a restriction nor an advisory.

## Summary

Glyphosate is a powerful herbicide, but maintaining its effectiveness will require a diverse weed management strategy. If that isn't challenging enough, diversification strategies in Dakota County need to be balanced against groundwater concerns. My hope is that this edition has offered some useful tools for both balancing those concerns and outrunning the freight train!



**Table 2.** Herbicides with groundwater advisories related to permeable (coarse-textured) soils and shallow groundwater. List includes herbicides from 2010 Corn and Soybean Herbicide Evaluations insert. The mapping tool can be used to identify sensitive areas of sandy soils with shallow groundwater (<30 ft).

Trade name	Chemical name(s) <sup>1</sup>
Aatrex, others	atrazine
Boundary	metolachlor
Camix	mesotrione + <b>metolachlor</b>
Capreno	thiencarbazono + <b>tembotrione</b>
Cobra/Phoenix	lactofen
Dual	metolachlor
FirstRate	cloransulam
Flexstar	fomesafen
Fusion	fenoxaprop + <b>fluazifop</b>
Gangster	flumioxazin + <b>cloransulam</b>
Halex GT	<b>metolachlor</b> + glyphosate + mesotrione
Hornet	flumetsulam + chlopyralid
Laudis	tembotrione
Lumax	<b>metolachlor</b> + <b>atrazine</b> + mesotrione
Optill	<b>imazethypyr</b> + <b>saflufenacil</b>
Permit	halosulfuron
Prefix (S. MN)	metolachlor + fomesafen
Pursuit	imazethypyr
Sencor	metribuzin
Sharpen	saflufenacil
Ultra Blazer	acifluorfen

<sup>1</sup>Chemical names in **bold** in herbicide combinations trigger environmental advisory.

**Table 3.** Common herbicides and their chemical names from the 2010 weed control evaluations and Diversification Options insert that do not contain groundwater restrictions or advisories.

Corn		Soybeans	
Herbicide	Chemical name(s)	Herbicide	Chemical name(s)
<b>Preemergence</b>		<b>Preemergence</b>	
Callisto	mesotrione	Enlite	flumioxazin + thifensulfuron + chlorimuron
<b>Postemergence</b>		Prowl	pendimethalin
Aim	carfentrazone	Treflan	trifluralin
Buctril	bromoxynil	Valor	flumioxazin
Cadet	fluthiacet	<b>Postemergence</b>	
Callisto	mesotrione	Cadet	fluthiacet
Impact	topramezone	Classic	chlorimuron
Option	foramsulfuron	Harmony GT	thifensulfuron
Resolve Q	rimsulfuron + thifensulfuron	Raptor	imazamox
Resource	flumiclorac pentyl ester	Resource	flumiclorac pentyl ester
Ignite (LibertyLink corn)	glufosinate	Synchrony	chlorimuron + thifensulfuron
		Ignite (LL soybean)	glufosinate

# Additional Resources

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## For more information

- Glyphosate, Weeds and Crops ([www.glyphosateweeds crops.org](http://www.glyphosateweeds crops.org))
- University of Minnesota Applied Weed Science (<http://appliedweeds.cfans.umn.edu>)
- Delta Farm Press (for a look at herbicide resistance in the Southern US) (<http://deltafarmpress.com/herbicide-resistance>)

## Calendar of Events

### ● 5th Annual Crops Day – Take Charge!

Tuesday, March 8, 9 a.m.-1:30 p.m., Dakota Electric Association

- The Phosphorus Guideline Conundrum, *Dr. John Lamb*
- Integrated Weed Management, *Dave Nicolai*
- SWCD & NRCS Update, *Brad Becker and Michelle Wohlers*
- Take Charge of Your Inputs: A historical perspective on inputs that pay, *Lisa Behnken*
- Energy Conservation Programs, *Michael Hoy*
- Lunch and Trade Show
- Southeast Irrigators Association Meeting

Free event, but please preregister by March 3 by contacting Phyllis Bongard (651-480-7757 or [bonga028@umn.edu](mailto:bonga028@umn.edu)). Sponsored by Dakota Electric Association, Southeast Irrigators Association, Kimmes-Bauer Well Drilling, University of Minnesota Extension, and Dakota County Water Resources Department.

The information given in this publication is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the University of Minnesota Extension is implied.

## What's inside?

- Integrating Weed Control
- Crops Day - March 8, 9 a.m.-1:30 p.m.

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