

Glenn Nice

Bill Johnson

Tom Bauman

*Purdue Extension Weed Science*

## 2008 Indiana Weed Science Update

In the winter months Bill, Tom, and I spend time traveling around the state of Indiana providing information and continuing education credit hours for Indiana's Pesticide Applicators. In many cases we present information concerning new herbicides and changes of existing herbicides. Keeping up on herbicides and their regulations is a full time job in itself. If you should happen to miss one of these presentations, but would like to read up on new events in herbicide and weed science, this article is a companion to the "2008 Weed Control Update".

Magnum [s-metolachlor at 2.09 lb ai/gal] and Callisto [mesotrione at 0.209 lb ai/A]. It is being marketed as an early postemergence product for glyphosate-resistant corn that will have some residual control of grasses and broadleaves. Starting with a clean seed bed by using a burndown application of glyphosate + 2,4-D or Gramoxone Inteon [paraquat] is recommended. Apply on emerged weeds that are less than 2 to 4 inches tall, if weeds are larger, mix with atrazine. Halex GT can be applied at 3.6 to 4 pt/A in corn from emergence to 30 inches tall or up to

Products are not considered to be labeled in Indiana if not marked so on the National Pesticide Retrieval System database for the Office of the Indiana State Chemist

<http://state.ceris.purdue.edu/htbin/stalphap.com>

### Corn and Soybean

**Rage D-Tech – FMC** [Labeled in Indiana]

Rage D-Tech is labeled for the burndown market before corn and soybean. It is a premix of Aim [carfentrazone at 0.13 lb ai/gal] and 2,4-D ester at 5.92 lb ai/gal. Applications of 8 oz/A can be applied at least 3 days before planting corn or 9 to 16 floz/A 7 days before planting corn or soybean. An increased rate of 17 to 24 floz/A can be applied at least 14 days before planting soybean. Rage D-Tech will have burndown activity on several broadleaf weeds such as lambsquarters, horseweed (marestail), and ragweed.

**Table 1. Halex GT ingredient breakdown**

Halex GT	Glyphosate	Callisto	Dual II Magnum
3.6 pt/A	0.9 lb ae/A 27 floz/A Touchdown Total	3 floz/A	1 pt/A

the 8-leaf stage, which ever occurs first. For a rate comparison see table 1. Halex GT is not recommended for preplant or before the crop emerges. The use of NIS and AMS is recommended, using COC is not.

**Laudis – Bayer CropSciences**  
[label pending in Indiana]

Laudis is a new herbicide in corn being marketed as an alternative mode of action for use in Roundup Ready or Liberty Link systems. The active ingredient, tembotrione is in the class of herbicides that inhibit HPPD enzyme in plants. The mode of action is similar to that in Callisto [mesotrione]; tembotrione has more activity on the grasses. Laudis use rates will be 3 floz/A and when used

### Corn

**Halex GT – Syngenta** [Labeled in Indiana]

Halex GT is a three way mix of glyphosate at 2.09 lb ai/gal [Touchdown Total] plus Dual

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with Liberty 2 floz/A. COC or MSO is recommended when a tank-mix partner does not already have an adjuvant. The use of AMS or 28% UAN is also recommended. Laudis can be tank-mixed with atrazine, Liberty, or glyphosate. There does not appear to be any insecticide interactions with Laudis. Rotation restrictions are similar to other herbicides in this class and are listed in table 2.

of an other tank-mix partner (Table 3 and 4). Optimum efficacy can be expected when applied to weed less than 6 inches tall.

### Resolve and Require Q – DuPont [Labeled in Indiana]

Resolve DF (dry flowable, granules that easily disperse in water) is labeled for use in Indiana, but also available in Indiana are Resolve Q

and Resolve SG. Resolve Q is a premix of rimsulfuron and thifensulfuron; ingredients found in Basis and Harmony GT, and the crop safener isoxadifen. It is a water-dispersible herbicide going to be marketed as a tank mix partner in a postemergence Roundup Ready or glyphosate-tolerant corn system that can provide some residual

**Table 2. Laudis rotation restrictions**

Rotation Interval	Crop
None	Corn (field, seed, sweet, and pop)
120 days	Cereal grains (not sorghum), sugarcane
8 months	Soybeans
10 months	Sorghum, cotton, peas, potatoes, snap beans, canola, alfalfa, and tomatoes
18 months	Sugar beets, dry beans, cucurbits, sunflowers, all other crops.

Laudis by itself has fair activity on grasses and excellent activity on broadleaves such as giant ragweed, lambsquarters, and velvetleaf. If targeting grasses, glyphosate tank-mixes are recommended or the use

control. Additional surfactants will not be necessary when used with a glyphosate product with a built in surfactant. Resolve SG is 25% rimsulfuron alone formulated as a soluble granule. Resolve SG will

**Table 3. Some of the weeds listed on the Laudis label.**

Weed	Laudis at 3 floz/A	Laudis at 3 floz + atrazine at 0.5 lb ai/A	Maximum weed size (inches)
Annual Morningglory	PC	C	6
Barnyardgrass	C	C	5 or 6 with atrazine
Common chickweed	C	C	6
Common cocklebur	C	C	6
Common ragweed	C	C	6
Dandelion	PC	PC	6
Easter black nightshade	C	C	6
Giant or yellow foxtail	C	C	3 or 4 with atrazine
Giant ragweed	C	C	6
Horseweed (marestail)	PC	C	6
Jimsonweed	C	C	6
Lambsquarter	C	C	6
Shattercane	C	C	6 or 8 with atrazine
Velvetleaf	C	C	6
Waterhemp	C	C	6

Information listed here is based on research and outreach extension programming at Purdue University and elsewhere.

The use of trade names is for clarity to readers of this site, does not imply endorsement of a particular brand nor does exclusion imply non-approval. Always consult the herbicide label for the most current and update precautions and restrictions. Copies, reproductions, or transcriptions of this document or its information must bear the statement

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be labeled only for medium to fine textured soils in field corn with more than 1% organic matter. Allow 3 weeks between applications of Resolve SG and postemergence applications of other rimsulfuron products (Basis, Steadfast, and Clarion). Resolve SG can be applied preplant or preemergence to corn at 0.5 to 2 oz/A or postemergence to corn with less than 6 collar leaves (12 inches tall). For postemergence weed control, apply when grasses are 1 to 2 inches and broadleaves are 1 to 3 inches tall. The label lists barnyardgrass, henbit, foxtail control preemergence and common chickweed, pigweed, and shepherd's purse control postemergence (table 5).

Require Q is a premix of rimsulfuron, dicamba [Banvel, Clarity], and isoxadifen. Like Resolve Q, it is being marketed as a postemergence product in a Roundup Ready corn system. Require Q will provide some residual activity in a glyphosate system and add the growth regulator mode of action to the application. It will be applied at 4 oz/A to corn between V2 (4 inches tall) and V7 (20 inches tall). When used with glyphosate with built in adjuvant systems, additional adjuvants are not required.

**Select Max – Valent** [Updated Label pending]

In 2006, the problem of what to do in a glyphosate-tolerant corn replant situation became an issue. At that time the graminicides were not labeled for replanting into corn, having rotation restrictions that were 30 days or longer. In 2007, Indiana and other states applied for and received a Section 18 to use Select Max [clethodim at 0.97 lb ai/gal] seven days before replanting damaged corn. In 2008, Select Max is expected to have the full federal label that will allow use in glyphosate-tolerant corn replant scenarios. Applications are expected to be applied at 6 oz/A to corn that

is up to 12 inches tall. Replanting will be permitted after 6 days. The use of NIS at 0.25% + AMS 17 lb/100 gals is required.

**Soybean**

**Authority MTZ and Authority Assist – FMC** [Authority Assist Label pending]

Authority [sulfentrazone], now available from FMC as Spartan 4F, was good to excellent preemergence on pigweed, lambsquarter, smartweeds, morningglory, and

**Table 6. Authority MTZ rate structure (oz/A) in a Roundup Ready system\***

Soil Texture	Organic matter	
	1 to 2%	2 to 4%
Coarse	8	8 to 10
Medium	8 to 10	10 to 12
Fine	10 to 12	12 to 14

\*Do not use on soils with less than 1% organic matter. Use higher rate within perspective soil type in the fall.

black nightshade. Last year we reported that Authority First, a premix of Authority and FirstRate [cloransulam] was released. FMC has two other products using sulfentrazone in this series.

Authority MTZ is a premix of Authority and Sencor [metribuzin at 27%]. Authority MTZ can be applied fall or spring at rates from 8 to 14 oz/A (table 6). No more than 12 oz/A should be use on soils with pH greater than 7.5. The addition of metribuzin will improve ragweed control over sulfentrazone alone. Table 7 lists premix advantages.

Authority Assist [Indiana label pending at time of writing] is a premix of Authority and Pursuit [imazethapyr]. Rates are expected to be 4 to 12 oz/A. The addition of Pursuit in this mix will improve the residual control of giant foxtail and shattercane over sulfentrazone alone.

**Table 5. Some of the weeds listed on the Resolve SG label**

**Preemergence**

- Barnyardgrass
- Henbit
- Common purslane
- lambsquarter
- Volunteer wheat
- Pigweed\*

**Postemergence**

- Barnyardgrass
- Common chickweed
- Pigweed
- Annual bluegrass
- Henbit
- Shepherd's purse
- 4 inch shattercane
- Kochia
- Wild radish

\*Suppression of Palmer amaranth.

**Table 7. Premix packaged partner advantages compared to sulfentrazone alone.**

Sulfentrazone [Authority]	Excellent preemergence on Lambsquarter, morningglory, pigweed. Good on smartweed, black nightshade and fair on velvetleaf
+ cloransulam [Authority First]	Increased preemergence control of ragweeds, cocklebur, velvetleaf, and marestalk (horseweed). The added ingredient will add some postemergence control of ragweeds, burcucumber, horseweed (marestalk).
+ metribuzin [Authority MTZ]	Suppression of annual grasses and increased waterhemp activity.
+ imazethapyr [Authority Assist]	Increased grass activity; good on emerged shattercane, giant foxtail, and seedling johnsongrass and fair on yellow foxtail and fall panicum.

marstail, ragweeds, and waterhemp. It will also provide suppression of some annual grasses such as foxtail. The addition of 2,4-D LVE is recommended with emerged lambsquarter, wild garlic, and horseweed (marestalk). The use of 0.5 lb ai/A of 2,4-D requires a 7 days waiting period before planting soybean, if more than 0.5 lb ai/A is used then 30 days is required.

**Canopy EX – DuPont** [Labeled in Indiana]

Canopy EX is a premix of Classic [chlorimuron] plus Express [tribenuron], and was originally labeled for use in the fall and 45 days before planting in soybean. Label changes in 2007 now allow you to use Canopy EX 7 days before planting soybean. Canopy EX can be used at 1.5-2.2 oz/A on fields with a composite soil pH of 7.0 or less, but on soils with unknown pH or higher than 7.0 the rate is 1.1 oz/A. Canopy EX provides burndown and residual control on annual bluegrass, common chickweed, henbit, shepherd’s-purse and other winter annuals. The addition of 2,4-D is recommended for wild garlic, lambsquarters, and horseweed (marestalk) control.

**Envive – DuPont** [Labeled in Indiana]

Envive is a premix of Valor [flumioxazin], Classic [chlorimuron], and Harmony GT [thifensulfuron]. Envive will provide burndown with some residual activity. It can be applied to medium and fine soils with 0.5 to 5% organic matter at a rates of 2.5 to 5.3 oz/A prior to planting up to 3 days after planting, but before soybean emergence. Rate is soil pH dependant. If pH is not known use 2.5 oz/A only. Envive will control nightshade, lambsquarter, pigweeds, emerging

**Prefix – Syngenta** [Labeled in Indiana]

Prefix is a premix of Dual II Magnum [s-metolachlor at 4.34 lb ai/gal] and Reflex [fomesafen at 0.95 lb/gal]. Prefix can be applied up to 15 days before planting or before soybeans emerge. Due to the fomesafen component, Prefix’s rate structure is broken down into regions. Indiana is covered by two such regions with I-70 being the boundary between two regions; regions 2 (south of I-70) and 3 (North of I-70). See table 8 for rates. Use of lower rates is required soils with low soil residue levels or organic matter is less than 3%. Prefix will provide early-season control of annual grass such as crabgrass and foxtails; and common ragweed, jimsonweed, pigweeds, horseweed (marestalk) and waterhemp.

**Table 8. Prefix use rates for regions 2 (South of I-70 Indiana) and 3 (North of I-70 Indiana) in pts/A.**

Soil Texture	Region 2	Region 3
Coarse	2 to 2.5	2 to 1.25
Medium	2.5 to 2.75	2.25 to 2.5
Fine	2.75 to 3	2.5

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[www.greenbook.net](http://www.greenbook.net)

and

[www.cdms.net](http://www.cdms.net)

Some labels of the products listed in this article are not currently available at the time of writing.

## Wheat

### **Prowl H2o - BASF** [Labeled in Indiana]

Prowl H2o can now be applied in wheat postemergence from the 1st-leaf stage until before the flag leaf is visible at 1.5 to 3 pt/A. Rate is dependent on soil texture. Prowl H2o will not control emerged weeds but can be tank mixed with other herbicides that do. Prowl H2o will provide residual control of annual grasses, lambsquarter, pigweeds, and waterhemp.

## Glyphosate Products

### **Duramax and Durango DMA** – **Dow AgroSciences** [Labeled in Indiana]

New glyphosate products from Dow AgroSciences, Duramax and Durango DMA are a new formulation of a dimethylamine (DMA) salt of glyphosate. Both products contain 4 lbs acid glyphosate and can be used on glyphosate-tolerant corn or soybean. Durango DMA will be the competitively priced brand with local service while Duramax will be priced with a premium service package.

### **Roundup PowerMAX - Monsanto** [Label pending in Indiana]

Replacing Roundup Original MAX is Roundup PowerMAX, a new formulation using the potassium salt and the CROPSHIELD surfactant system found in Roundup WeatherMax. Roundup PowerMAX contains 4.5 lb ae/gal of the glyphosate acid.

## Genetics

### **Growth Regulator Tolerant Traits – Monsanto and Dow AgroSciences**

In this glyphosate world the appearance of resistance or new found tolerance to glyphosate has caused many reactions, some sensational, others mundane. Not in the least, it has caused several

companies to think about their responses to nature's adaptation to our most used herbicide. One such solution is the complicated process of introducing new herbicide tolerant traits allowing the use of herbicides previously unable to be used in a particular crop before.

Many of the weeds that have made the glyphosate resistant or tolerant list, such as giant ragweed, horseweed (marestail), common ragweed, or lambsquarters are typically sensitive to the growth regulator herbicides. The addition of 2,4-D has become common practice in glyphosate burndowns around the mid-west to control unruly horseweed (marestail). Presently growth regulators are not used postemergence in soybean due to the sensitivity of soybean to these herbicides. It is often said that if soybean gets a 'whiff' of dicamba or 2,4-D it 'puckers.'

Two companies are leading the charge on growth regulator tolerance traits. The first to report was Monsanto working on a dicamba tolerant trait to accompany glyphosate-tolerant soybean. However, this year at the Farm Progress Show, Dow AgroSciences reported that they too are working on a line of genetics that will be tolerant to 2,4-D, "as well as the aryloxyphenoxypropionates," (Fusion, Fusilade DX, Assure II) the grass herbicides commonly know as the 'fops.'

These traits are expected to accompany the Roundup Ready trait, and in some case the Liberty Link traits. These lines of genetics are presently going through evaluation. Access to these products on the market is anticipated in a few years.

The use of the growth regulator herbicides in soybean would add a valuable mode of action that is not presently available for soybean postemergence. Not to mention decrease the anxiety of a grower standing cross the road looking at his neighbor's field of corn wondering if his soybean are going to pucker

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this year. However, if there is a substantial increase in growth regulator use in the state of Indiana, vigilance will have to be maintained to assure sensitive areas such as vineyards, greenhouses, and other specialty crops are not caught in the cross fire.

**Liberty Link Soybean – Bayer CropSciences**

Liberty Link corn has been available for some time, but this has been a technology not available for soybean in the past. Bayer CropSciences is anticipating the launch of Liberty Link soybean in the near future. This will provide an alternative mode of action to the glyphosate market.

**HPPD Inhibitor Tolerance – Bayer CropSciences**

Bayer CropSciences has entered into a partnership with Mertec LLC and M.S. Technologies LLC to develop HPPD Inhibitor tolerant soybean in combination with glyphosate tolerance. Long term plans are to link the tolerant traits above with Liberty Link traits in a triple herbicide tolerant stack. This line of genetics will allow the use of Balance Pro [isoxaflutole], Liberty [glufosinate] and the new Laudis [tembotrione] herbicides in soybean.

**Optimum GAT – Dupont**

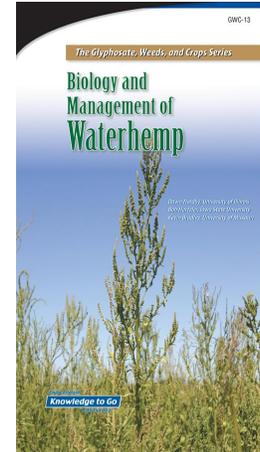
Dupont though Pioneer is expected to release new stacked traits with their Herculex XTRA insect protection traits. The Optimum GAT trait will provide glyphosate tolerance combined with added ALS tolerance both in corn and soybean.

The products are soon to be available on the market, but corn is in advanced development stage and soybean is in pre introduction.

**Articles and Publications**

The Glyphosate Stewardship series [http://www.glyphosateweedsrops.org/Pubs.html] has three new publications; “Biology and Management of Common Lambsquarters” [GWC-11], “Biology and Management of Giant Ragweed” [GWC-12], and “Biology and Management of Waterhemp [GWC-13].” This web site and series of publications provide information regarding the development of problematic weeds in the glyphosate system.

Also available on the Purdue University Weed Science Site this past year is a series about several surveys conducted in the state of Indiana Table 9.



**Figure 1. The newest addition to the Glyphosate Stewardship Series: “Biology and Management of Waterhemp.”**

**Projected Launch of New Weed Management Transgenics\***

Liberty Link soybean	2009
Optimum GAT soybean	2009
Optimum GAT corn	2010
RR2 Yield soybean	2009
Dow Herbicide Tolerant corn	2012
DHT soybean	2013
Dicamba-resistant soybean	2013

\*Mark Loux, The Ohio State University

**Table 9. Weed Science Surveys available on the Purdue Weed Science Web Page.**

1. Problematic Plants in Indiana
2. Burndown and Application Timing
3. The Perception of Glyphosate-Resistance