CROP FOCUS

DUPONT PIONEER

Weed Management in LibertyLink® and Glyphosate-Tolerant Soybeans

Soybean Weed Management Systems

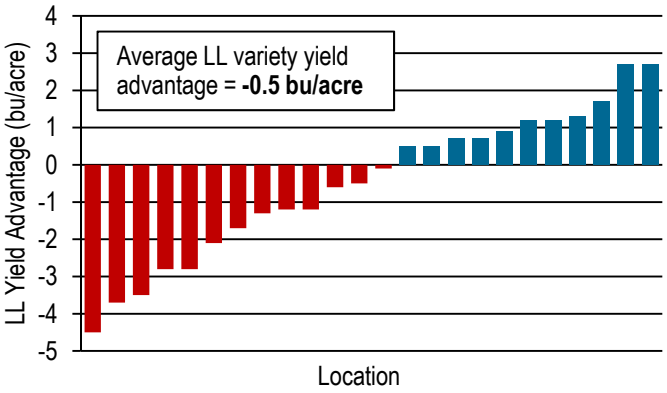
- Glyphosate-resistant soybeans have been the industry standard where growers desire a broad spectrum, non-selective, post-emergence weed control option.
- An alternative post-emergence weed control system is soybean varieties with the LibertyLink® gene paired with glufosinate (Liberty®) herbicide.
- Glyphosate and glufosinate are both broad spectrum herbicides, but have some important differences.

Choose Genetics First

- The first step in growing profitable soybeans is choice of variety.
- Herbicide resistance provides options for protecting yield potential, but does not make yield. Thus, herbicide resistance needs to be a secondary consideration after genetics.
- Choose soybean varieties based on yield potential, disease resistance, and agronomics.

Yield of LibertyLink and Glyphosate-Tolerant Varieties

- Yield trial data does not indicate that LibertyLink (LL) soybean varieties have an inherent yield advantage over glyphosate-tolerant (GT) varieties.
  - Iowa State University soybean yield trials in 2012 and 2013 included LL varieties at 24 testing locations.
  - Comparisons between LL varieties and GT varieties of the same relative maturity at each location indicate that average yield of LL varieties is similar to that of GT varieties.



Yield advantage of LL soybean varieties over GT varieties of the same relative maturity at 24 Iowa State University testing locations, 2012-2013 (Source: www.croptesting.iastate.edu).

Weed Control Efficacy

Weed efficacy ratings* and maximum recommended weed height** (inches) for treatment with glyphosate (1.125 lb ae/acre) and glufosinate (0.53 lb ae/acre) for key broadleaf and grass species.

	Glyphosate		Glufosinate	
Broadleaf Weeds	Control	Height	Control	Height
Burcucumber	8	18”	7	10”
Cocklebur	9	36”	9	14”
Marestail	8	18”	8	1-3”
Morningglory spp.	7	6”	9	8”
Palmer amaranth	9	24”	8	4”
Common lambsquarters	9	20”	8	6”
Giant ragweed	8	18”	8	12”
Velvetleaf	8	12”	8	4”
Common waterhemp	9	12”	8	5”

	Glyphosate		Glufosinate	
Grass Weeds	Control	Height	Control	Height
Barnyardgrass	9	9”	8	5”
Crabgrass	9	12”	8	5”
Giant foxtail	9	20”	9	12”
Yellow foxtail	9	20”	7	4”
Goosegrass	9	12”	7	3”
Seedling Johnsongrass	10	24”	8	5”
Rhizome Johnsongrass	9	F	7	TP
Annual ryegrass	9	12”	6	TP
Quackgrass	9	8”	6	3”

S = suppression, TP = two passes (22 fl oz/A fb 22 fl oz/A), F = fall.

*Weed Control Rating: 8-10 = Good (80 to 100% control), 6-7 = Fair (60 to 70% control), 5 or less = Poor (Less than 60% control)

Average of Univ. of Arkansas, Auburn Univ. (AL), Univ. of Illinois, Univ. of Kentucky, Mississippi State Univ., Univ. of Missouri, Univ. of Nebraska, The Ohio State Univ., Ontario Ministry of Agric., Food and Rural Affairs, and Pennsylvania State Univ. Extension Weed Control Guides for 2011-12. Each state guide did not include all the herbicides or weeds presented in this table.

**From Liberty® herbicide and Roundup WeatherMax® product labels. See product labels for additional weed species and application rates. Always refer to the product label for the most current product information and follow application instructions on product label.

Weed efficacy rating* advantage for glyphosate compared to glufosinate on several key noxious weed species.

	Quackgrass	Field Bindweed	Canada Thistle	Horsenettle	Cocklebur	Eastern Black Nightshade	Sunflowers	Shattercane	Milk Thistle	Wild Mustard
Glyphosate	9	7	9	7	9	8	9	10	6	9
Glufosinate	6	6	6	6	9	8	9	8	-	8
Advantage	3	1	3	1	0	0	0	2	-	1

Weed efficacy rating* advantage for glyphosate tankmixed with a PPO (Group 14) herbicide compared to glufosinate on several difficult to control weed species.

	Waterhemp (Gly resistant)	Palmer Amaranth	Common Lambsquarters	Velvetleaf	Giant Ragweed	Burcucumber	Honeyvine Milkweed	Marestail (Gly resistant)	Morningglory	Kochia
Glyphosate	5	9	9	8	8	8	7	5	7	9
Gly + PPO	9	9	9	9	9	8	-	5	9	10
Glufosinate	8	6	8	8	8	7	6	9	9	8
Advantage	1	3	1	1	1	1	1	-4	0	2

Weed Height

- Glyphosate is generally labeled for control of larger weeds than glufosinate.

Application Timing

- Liberty® herbicide can be applied broadcast on LL soybeans from emergence up to, but not including, bloom (R1).
- Glyphosate can be applied from emergence through flowering (R2), and can often be applied to larger weeds.

Carrier Volume

- Liberty herbicide should be applied at 15-40 GPA and 30-40 psi.
- Glyphosate should be applied at 5-40 GPA.
  - Because it is a translocated herbicide, glyphosate can be sprayed at lower volumes than Liberty herbicide, which has limited translocation in the plant.

Glyphosate vs. Glufosinate

Mode of Action:

- Despite their similar-sounding names, glyphosate and glufosinate are very different herbicides.
  - Glyphosate inhibits EPSP synthase, which blocks production of aromatic amino acids.
  - Glufosinate inhibits glutamine synthetase, a key enzyme involved in nitrogen metabolism.

Translocation:

- Glyphosate is translocated throughout plants.
  - Spray coverage less critical.
  - Very effective for controlling perennials.
- Glufosinate has limited translocation in plants.
  - Spray coverage is more critical.
  - Not as effective against perennials; burns tops, but plants may re-grow from roots or rhizomes.

Management Considerations

- Glufosinate and LL soybeans are post-emergence weed management options for situations where weed resistance to glyphosate, ALS-inhibitors, and PPO-inhibitors has eliminated all other post-emergence treatment options for the soybean crop.
- The limited range of LL soybean varieties currently available means limited options for disease resistance and agronomic traits.
- Where possible, the use of a pre-emergence herbicide or a PPO-inhibitor post-emergence in conjunction with glyphosate, may allow growers to still plant highest yielding soybean varieties with best disease resistance packages and other important traits for their fields.
- Be aware that spray coverage and application timing are much more critical for glufosinate than with glyphosate.
- Glufosinate is less effective than glyphosate on some common weed species such as foxtails, and generally must be applied to smaller weeds to achieve control. Glufosinate is more effective on annual morningglory.
- Glyphosate generally performs better than glufosinate on perennial weeds, such as rhizome johnsongrass and Canada thistle.
- Control of volunteer corn
  - Glufosinate antagonizes Group 1 ACCase inhibitor herbicides (e.g. Assure® II, Select®, Fusilade®).
  - Liberty herbicide will not provide control of volunteer corn in fields where corn hybrids with LL stacked traits were planted the previous season.