



Recommendations for Management of Glyphosate-Resistant Waterhemp in Illinois Soybean

Illinois farmers have another adversary to consider in their annual battle against weeds. Glyphosate-resistant waterhemp is poised to bring new challenges to agronomic cropping systems in Illinois, and it might be especially troubling for soybean producers. Weed scientists at the University of Illinois have developed specific recommendations to help farmers better manage this problem in the 2008 soybean crop. The progressive four-step program was developed using data describing waterhemp biology, ecology and control. The steps are specific to herbicides, but weed management practitioners should strongly consider utilizing other cultural practices that increase the competitive ability of the soybean crop.

Step 1: Apply a *full rate* (according to label guidelines for soil type and organic matter content) of a soil-residual herbicide *no sooner than 7 days before planting*.

Considerations:

- Why invest in a soil-residual herbicide? A waterhemp population resistant to both PPO inhibitors and glyphosate would not be controlled by any postemergence soybean herbicides. Waterhemp is competitive with soybean; previous research has shown that waterhemp can cause up to 40 percent soybean yield loss.
- Why use a full rate instead of a reduced (“set-up”) rate? Waterhemp germination and emergence extend late into the growing season. The later into the season that waterhemp emergence can be delayed, the greater the potential to achieve maximum or near-maximum soybean yield.

Step 2: The initial post-emergence application of glyphosate (alone at 0.75 to 1.0 pound acid equivalent per acre) must be made when waterhemp is *3 to 5 inches tall*.

Considerations:

- Why use glyphosate alone instead of tankmixed with a PPO-inhibitor? Limited data and the potential for significant antagonism with these tankmixes suggest glyphosate alone.
- Increasing the glyphosate application rate from 0.75 to 1.5 lb ae/acre (the maximum rate allowed by label)

did not *consistently* improve control of a confirmed glyphosate-resistant waterhemp population in 2007 field research trials (Table 1).

- Susceptible waterhemp less than 5 inches tall is very sensitive to 0.75 lb ae glyphosate. Waterhemp plants that survive 0.75 or 1.0 lb glyphosate acid when treated at 5 inches or less should be closely monitored.

Step 3: Fields *must* be scouted 7 days after the initial glyphosate application to determine treatment effectiveness. If waterhemp control is inadequate and retreatment is necessary, consider applying a PPO-inhibiting herbicide (lactofen, fomesafen, or acifluorfen) at a full labeled rate (with recommended additives) as soon as possible.

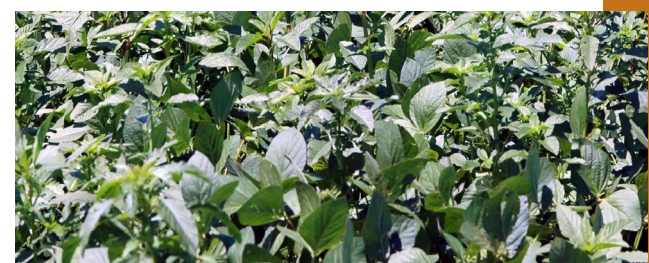
Considerations:

- In 2007 field research, glyphosate-resistant waterhemp plants continued to grow at near-normal rates following treatment with glyphosate. If 7 to 10 days elapse before lack of control becomes obvious, glyphosate-resistant waterhemp plants might grow an additional 6 to 8 inches.
- PPO-inhibiting herbicides are the only remaining herbicide options for control of glyphosate-resistant waterhemp. Waterhemp control with PPO-inhibitors is optimized when full rates are applied to small plants (5 inches or less).

Step 4: Re-scout the treated field within 10 to 14 days. If plants treated with a second herbicide application might survive, rogue these surviving plants from the field *before* they reach a reproductive growth stage.

Table 1. Response of a glyphosate-resistant waterhemp population to labeled in-crop application rates of glyphosate (University of Illinois, 2007).

| Glyphosate rate (fl oz) | Waterhemp size (inches) | Percent control (Days after treatment) | | |
|-------------------------|-------------------------|--|----|----|
| | | 7 | 14 | 21 |
| 22 | 4 | 30 | 43 | 33 |
| 44 | 4 | 40 | 47 | 50 |



corn

| Weed control plan | Program (rate/A) | Mode of Action | | Notes |
|------------------------------------|---|-----------------------------|---------------|---|
| | | Specific* | Program Total | |
| Two-pass GT system | Lumax® (2 qt.) pre followed by Lumax (1 qt.) plus Touchdown Total® (24 oz.) post | 27, 15, 5 27, 15, 5 9 | 4 | Where glyphosate-resistant weeds are suspected, use full labeled rates of pre-emergence, residual herbicides to manage waterhemp. These programs manage glyphosate-resistant, ALS-resistant and PPO-resistant weeds, including waterhemp, Palmer pigweed, lambsquarters, velvetleaf and ragweed. |
| | Lexar® (2.5 qt.) pre followed by Lexar (1 qt.) plus Touchdown Total (24 oz.) post | 27, 15, 5 27, 15, 5 9 | 4 | |
| | Lumax (2 qt.) pre followed by Northstar® (5 oz.) post | 27, 15, 5 2, 4 | 5 | |
| | Lexar (2.5 qt.) pre followed by Northstar (5 oz.) post | 27, 15, 5 2, 4 | 5 | |
| One-pass GT or conventional system | Lumax (2.5-3 qt.) pre | 27, 15, 5 | 3 | |
| | Lexar (3-3.5 qt.) pre | 27, 15, 5 | 3 | |
| One-pass GT system | Halex™ GT (3.6 pt.) plus AAtrex® post | 27, 15, 9 5 | 4 | |
| Two-pass conventional system | Lumax (1.5-2 qt.) pre followed by Lumax (1 qt.) post | 27, 15, 5 27, 15, 5 | 3 | |
| | Lexar (2-2.5 qt.) pre followed by Lexar (1 qt.) post | 27, 15, 5 27, 15, 5 | 3 | |
| | Lumax (2.5-3 qt.) pre followed by Northstar (5 oz.) post | 27, 15, 5 2, 4 | 5 | |
| | Lexar (3-3.5 qt.) pre followed by Northstar (5 oz.) post | 27, 15, 5 2, 4 | 5 | |
| | Bicep II Magnum® (1.6-2.1 qt.) pre followed by Callisto® (3 oz.) plus AAtrex post | 5, 15 27 5 | 4 | |

soybeans

| Weed control plan | Program (rate/A) | Mode of Action | | Notes |
|-------------------|--|------------------|---------------|---|
| | | Specific* | Program Total | |
| GT system | Prefix™ (2-3 pt.) pre followed by Touchdown Total (24 oz.) post | 14, 15 9 | 3 | Where glyphosate-resistant weeds are suspected, use full labeled rates** of pre-emergence, residual herbicides to manage waterhemp. These programs are the best weed control options possible, but may not provide 100 percent control. For waterhemp resistant to PPO, ALS and glyphosate herbicides a pre-emergence herbicide is your best option. Consider cultivation to control resistant weeds. |
| | Boundary® 6.5EC (1.5-3 pt.) pre followed by Touchdown Total (24 oz.) plus Flexstar® (1-1.5 pt.) post | 5, 15 9 14 | 4 | |

**Maximum rate allowed according to soil texture classification and percent organic matter content and geographic area; refer to the product label for additional information.
Note: Use Gramoxone Inteon® tankmixed with phenoxy (such as 2,4-D) or residual herbicides as a glyphosate alternative burndown in corn or soybeans. Always refer to the product label for specific recommendations, precautions, restrictions and geographic rate limitations.

- *Numerical system to describe modes of action as designated by the Weed Science Society of America:
- 2 – ALS inhibition
 - 4 – Synthetic auxin
 - 5 – Photosystem II (PSII), different binding behavior than groups 6 & 7
 - 9 – EPSPS synthase inhibition (glyphosate)
 - 14 – PPO inhibition
 - 15 – Inhibition of a very long-chain fatty acid
 - 22 – Photosystem I electron diversion
 - 27 – Inhibition of HPPD

For more information, contact the Syngenta Customer Center at **1-866-SYNGENTA (866-796-4368)** or log on to **resistancefighter.com**.

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