

Waterhemp Management in Soybeans



Waterhemp Biology

- Although several summer annual weeds may be more competitive, waterhemp gains a competitive advantage through the sheer number of plants infesting an area. Season-long competition by waterhemp (more than 20 plants per square foot) has been shown to reduce soybean yield by 44 percent. Waterhemp that emerged as late as the V5 stage in soybeans can reduce yields up to 10 percent.
 - Waterhemp compensates for small seed size by having a higher relative growth rate than most weeds or crops — typically between 1 and 1 1/4 inches per day during the growing season. This allows waterhemp seedlings to acquire more sunlight than other weeds.
 - Waterhemp emerges throughout the growing season, and a higher percentage of plants can emerge later in the season than is typical with most other summer annual weeds. This emergence pattern allows waterhemp to avoid many pre-emergent herbicides and often allows this weed to flourish after postemergent applications of nonresidual herbicides like glyphosate.
 - Waterhemp is a prolific seed producer and able to produce as many as 1.5 times more seeds than most other pigweed species. Waterhemp plants generally produce about 250,000 seeds per plant, although some plants can produce 1 million or more seeds under optimal conditions in noncompetitive environments.
 - Like most weeds, waterhemp seeds remain viable in the soil for several years. Research has shown that only 1 to 12 percent of waterhemp seeds remain viable in the soil seedbank after four years.
- Waterhemp has a remarkable ability to adapt to control tactics and has evolved resistance to many different classes of herbicides. To date, waterhemp has evolved resistance to six herbicide classes, including Group 5 (e.g., triazines like atrazine and simazine), Group 2 (e.g., ALS-inhibiting herbicides like Pursuit® and Classic®), Group 14 (e.g., PPO-inhibiting herbicides like Ultra Blazer®, Cobra® and Flexstar®), Group 9 (e.g., glyphosate), Group 27 (e.g., HPPD-inhibiting herbicides like Callisto®, Laudis® and Impact®) and Group 4 (e.g., 2,4-D).
 - Many populations in the Midwest now exhibit multiple herbicide resistances that include several herbicide families. For example, Group 2 and 9 (e.g., ALS inhibitors and glyphosate, respectively) resistance in waterhemp is fairly common, and in many states resistance to as many as five herbicide groups now occurs in some waterhemp populations.

Management Steps

Follow the steps below to achieve optimal control of herbicide-resistant waterhemp populations. In addition, cultural practices that enhance the competitiveness of the crop, such as narrow row spacings and optimal soybean planting populations, will improve the consistency of these herbicide programs.

1. Soon before or after soybean planting, apply a full rate (according to label guidelines for soil type and organic matter content) of an **effective** pre-emergent, soil-residual herbicide.
 - **Why invest in a soil-residual herbicide?** A waterhemp population resistant to both Groups 14 and 9 herbicides (e.g., PPO inhibitors and glyphosate, respectively) would not be controlled by these postemergent soybean herbicides in Roundup Ready (RR) or conventional soybean systems. Waterhemp is competitive with soybeans and the application of an effective, soil-applied residual herbicide will protect soybean yield from early-season interference.
 - **Why use a full rate instead of a reduced (“setup”) rate?** Waterhemp emergence extends late into the growing season. The later waterhemp emergence can be delayed, the greater the potential to achieve maximum

Genetic Diversity and Herbicide Resistance in Waterhemp

- Because waterhemp is dioecious, meaning there are male and female flowers on separate plants, there is potential for greater genetic diversity within a population than for most agronomic weeds. This genetic diversity increases the potential for evolving and spreading novel herbicide-resistance genes and other ecological traits that improve waterhemp survival in agronomic systems.

or near-maximum soybean yield and improve the success of postemergent herbicide treatments.

- Depending on the herbicide-resistance profile, effective soil-residual herbicides may include: Authority® First, Authority Assist, Authority MTZ, Authority XL, Bound-ary®, Dual II Magnum® (or other metolachlor products), Enlite®, Envive®, Fierce, Gangster®, Outlook®, Prefix™, Sencor®, Sonic®, Treflan, Valor®, Valor XLT, Warrant™ and Zidua®.
- 2. In conventional or RR soybeans:** If Group 9 (e.g., glypho-sate) resistance in waterhemp is known or suspected and there is no reason to believe the population is also resistant to Group 14 (e.g., PPO-inhibitors) herbicides, apply a Group 14 herbicide like Cobra, Flexstar, Phoenix® or Ultra Blazer® to waterhemp not more than 3 to 4 inches in height.
- In RR soybeans, glyphosate can also be applied in combination with a Group 14 herbicide, depending on the spectrum of other weeds present in the field.
 - The size of the waterhemp at the time of application is a critical determinant of the level of waterhemp control achieved, as Group 14 herbicides are most effective against waterhemp 4 inches or less in height.
 - Group 14 herbicides like Flexstar and Cobra should be applied in a minimum of 15 gallons of water per acre. In dense weed/crop canopies, 20 to 40 gallons of water per acre should be used to ensure thorough spray coverage.
 - If Prefix has been applied pre-emergence, do not apply Flexstar or any fomesafen product after emergence due to label restrictions.
 - If Group 14 resistance is also known or suspected in the waterhemp population, the only additional options for waterhemp control include: 1) applying an overlapping residual herbicide prior to the emergence of any subsequent waterhemp germination events, 2) inter-row cultivation or (3) hand roguing.

Regardless of the herbicide resistances in waterhemp, the addition of an effective overlapping residual herbicide to the postemergent herbicide is likely to reduce or eliminate waterhemp emergence for the remainder of the season. Effective overlapping residual herbicides include but are not limited to Group 15 herbicides such as Anthem™, Cinch®, Dual II Magnum, Outlook, Prefix, Warrant and Zidua.

In LibertyLink soybeans: Remember that it is critical to apply an effective, pre-emergence soil-residual herbicide as outlined in Step 1. Then, apply Liberty (Group 10 herbicide) to waterhemp no more than 3 to 4 inches in height.

- The waterhemp size at the time of the application will be an important determining factor in the level of waterhemp control achieved.
 - Liberty should be applied in a minimum of 15 gallons of water per acre. In dense weed/crop canopies, 20 to 40 gallons of water per acre should be used to ensure thorough spray coverage.
 - Apply Liberty using nozzles and pressures that generate medium (250-350 micron) spray droplets. Do not use nozzles that produce coarse sprays.
 - The addition of an overlapping residual herbicide to the post-emergence Liberty treatment is likely to reduce or eliminate waterhemp emergence for the remainder of the season. Effective overlapping residual herbicides include but are not limited to Group 15 herbicides such as Anthem®, Cinch, Dual II Magnum, Outlook, Prefix, Warrant and Zidua.
- 3. Scout the field within seven to 14 days after the initial postemergent application to determine treatment effectiveness. If there are still surviving plants present, rogue these plants from the field *before* they reach a reproductive stage of growth.**

For more information and links to additional resources, visit www.TakeActionOnWeeds.com.

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