

# Management of Palmer amaranth in Illinois

**Aaron G. Hager**

Associate Professor and Extension  
Weed Science Specialist  
Department of Crop Sciences  
N-321 Turner Hall  
(217) 333-4424  
hager@illinois.edu



Palmer amaranth is a weed species that must be thoughtfully and carefully managed; simply attempting to control Palmer amaranth often leads to ineffective herbicide applications, substantial crop yield loss, and increasing weed infestations. Ignored or otherwise not effectively managed, Palmer amaranth can reduce corn and soybean yield to near zero.

The weed science program at the University of Illinois has developed the following recommendations for management of Palmer amaranth in agronomic crops. The goals of the recommendations are twofold: 1) to reduce the potential for Palmer amaranth to negatively impact crop yield, and 2) to reduce Palmer amaranth seed production that ultimately augments the soil seed bank and perpetuates the species.

Three general principles of Palmer amaranth management include:

1. Prevention is preferable to eradication. Prevention refers to utilizing tactics that prevent weed seed introduction *and* weed seed production. Palmer amaranth is not native to Illinois, so populations discovered in the state originated from seed that was moved into the state. Once Palmer amaranth populations become established, utilize all tactics to prevent seed production.
2. It is not uncommon for annual herbicide costs to at least double once Palmer amaranth becomes established. There is not a single soil- or foliar-applied herbicide that will provide adequate control of Palmer amaranth throughout the entire growing season. At least three to five herbicide applications per growing season are common in areas where Palmer amaranth is well established.
3. Control of Palmer amaranth should not be less than 100 percent. The threshold for this invasive and extremely competitive species is zero. A few surviving plants can produce enough seed to completely shift the weed spectrum in a field in less than five years.

## Species Biology: Germination and emergence of Palmer amaranth

Multiple Palmer amaranth emergence events are possible throughout the growing season. Previous research has demonstrated that Palmer amaranth seed has a higher germination rate than most other *Amaranthus* species (including waterhemp), and demonstrates a germination percentage higher than waterhemp at both low and high temperatures. These germination and emergence characteristics help explain why Palmer amaranth can seemingly “displace” waterhemp from a field within only a few years after its introduction.

## Recommendations based on Palmer amaranth germination and emergence characteristics:

Be certain to control all emerged Palmer amaranth plants before planting corn or soybean. Burndown herbicides or thorough tillage are effective tactics to control emerged Palmer amaranth plants before planting. Glyphosate will not control glyphosate-resistant Palmer amaranth and growth regulator herbicides (such as 2,4-D or dicamba) are most effective on Palmer amaranth plants less than 4 inches tall. If preplant scouting reveals Palmer amaranth plants taller than 4 inches, consider using tillage instead of herbicides to control the plants.





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Use all available tactics to prevent Palmer amaranth seed introduction and production.



Apply a full rate (based on label recommendations for soil texture and organic matter content) of an effective, soil-residual herbicide within 7 days before planting or within 3 days after planting. Soil-applied herbicides that demonstrate control or suppression of Palmer amaranth include triazines, HPPD inhibitors, dinitroanilines, chloroacetamides, and protox inhibitors. Do not apply less than the rate recommended by the product label. In soybean, products containing sulfentrazone (Authority) or flumioxazin (Valor) have provided effective control of Palmer amaranth. Application rates of products containing these active ingredients should provide a minimum of 0.25 lb sulfentrazone/acre or 0.063–0.095 lb flumioxazin/acre.

### Species Biology: Palmer amaranth growth rate

The growth rate and competitive ability of Palmer amaranth exceed those of other *Amaranthus* species. Palmer amaranth also demonstrates the fastest rate of height increase. Palmer amaranth plants can grow 2 to 3 inches *per day* under good growing conditions. The effectiveness of most foliar-applied herbicides dramatically decreases when Palmer amaranth plants are taller than 4 inches.

Do not rely solely on glyphosate to control Palmer amaranth. Glyphosate resistance appears to be relatively common among Palmer amaranth populations in Illinois.

### Recommendations based on Palmer amaranth growth rate:

1. Begin scouting fields 14–21 days after crop emergence. This interval is recommended even for fields previously treated with a soil-residual herbicide.
2. Foliar-applied herbicides must be applied before Palmer amaranth plants are taller than 4 inches. Postemergence herbicides that control or suppress Palmer amaranth include synthetic auxin herbicides, diphenylethers, glufosinate, glyphosate, and HPPD inhibitors. Be sure to adjust spray volume and pressure to obtain thorough coverage of target vegetation.
3. Consider including a soil-residual herbicide during the application of the foliar-applied herbicide. A soil-residual herbicide applied with the foliar-applied herbicide can control additional Palmer amaranth emergence and allow the crop to gain a competitive advantage over later-emerging weeds.
4. Fields should be scouted 7–14 days after application of the foliar-applied herbicide to determine:
  - a. herbicide effectiveness
  - b. if the soil-residual herbicide included with the POST application is providing effective control
  - c. if additional Palmer amaranth plants have emerged

If additional Palmer amaranth plants have emerged, make a second application of a foliar-applied herbicide before Palmer amaranth plants are 4 inches tall.

### Species Biology: Palmer amaranth seed production

Palmer amaranth is dioecious, meaning Palmer amaranth is an obligate outcrossing species. Outcrossing species tend to have more genetic diversity than self-pollinated species, which can hasten the evolution of herbicide resistance. Transfer of herbicide-resistance traits via pollen can quickly spread these traits across the landscape. Female Palmer amaranth plants can produce several hundred thousand to over one million seeds per plant.

### Recommendations based on Palmer amaranth seed production:

Physically remove any remaining Palmer amaranth plants before the plants reach the reproductive growth stage. Plants should be severed at or below the soil surface and carried out of the field.