

Identification of Palmer Amaranth, Waterhemp, and Other Pigweed Species

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Palmer amaranth (*Amaranthus palmeri*) and waterhemp (*Amaranthus tuberculatus*) are two species of the *Amaranthus* family that have enveloped the corn and soybean growing landscape of the United States over the past decade. Herbicide-resistant Palmer amaranth (Figure 1) first began infesting Western Kentucky along the Mississippi and Ohio rivers in the early 2000s and has spread along the rivers and into the uplands over the last two decades. The introduction and spread of waterhemp had not been as widespread in Kentucky, although a rapid spread of waterhemp over the last five to 10 years has been noted, especially in Central Kentucky.

Both *Amaranthus* species can be difficult to control in soybean and corn due to herbicide resistance. Resistance to ALS-inhibiting herbicides, glyphosate, and PPO-inhibiting herbicides has been confirmed in both Palmer amaranth and waterhemp in the state of Kentucky. ALS and glyphosate resistance is assumed to be widespread across most Kentucky populations, while PPO-inhibiting resistances are still spreading in both species. Atrazine resistance has been suspected in some isolated Palmer amaranth populations although the event has not been confirmed.

The first step in effectively managing or controlling both species is to properly identify them when they first invade your fields. Early management decisions when Palmer amaranth and waterhemp first invade is key to long-term control.

Identification

Palmer amaranth and waterhemp belong to the *Amaranthus* family, which is often referred to as the pigweed family. An additional pigweed species that is common across Kentucky is smooth pigweed (*Amaranthus hybridus*). It has been occasionally confused for Palmer amaranth or waterhemp or in worse case scenarios Palmer and waterhemp have been misidentified as their less troublesome cousin smooth pigweed. Redroot pigweed (*Amaranthus retroflexus*) closely resembles smooth pigweed but this *Amaranthus* species is not commonly found in Kentucky. Another pigweed found in Kentucky is spiny amaranth (*Amaranthus spinosus*), but this species is primarily associated with pastures, livestock feeding areas, and other non-cropland sites.

Species within the *Amaranthus* family share several characteristics which can make individual species difficult to identify. In general most pigweeds grow upright with diamond to oblong to lanceolate shaped leaves arranged alternately along the stem with the presence of petioles. A key feature that separates pigweeds from similar looking plant families is the indentation or notch in the leaf tip. While these features are shared amongst pigweed species there are a few distinctions that can help separate the identification of smooth pigweed, Palmer amaranth, and waterhemp.

A number of characteristics can be used to differentiate the three *Amaranthus* species including leaf shape, apical



Figure 1. Palmer amaranth.

meristem patterns, leaf watermarks, and leaf tip hairs; although these characteristics can vary within a species population and often cause more confusion than clarification. Furthermore, stem color among pigweeds can vary from light to dark green or be reddish and often varies within a species population. Thus, stem color cannot be used as a reliable identification feature of pigweed species.

Figure 2 (on Page 2) can be used to assist in distinguishing the three species within a few steps.

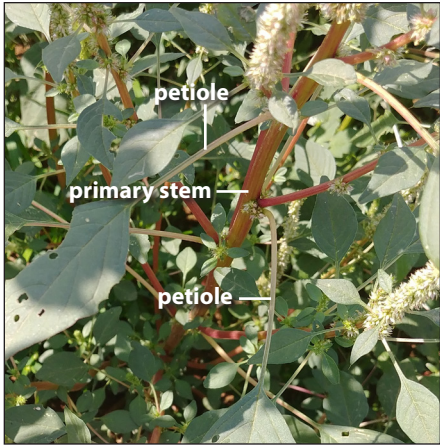
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Figure 2.
Amaranthus Identification Chart

Pigweed Species

- Ovate to lanceolate leaves
- Alternate leaf arrangement
- Notched leaf tip



Petiole: Stem-like structure that connects the leaf to the primary stem.

Presence of Hairs
Look for hairs on the newest growth at the top of the plant. The use of a handheld magnifying lens and/or holding the plant up to a light source can help highlight the fine dense hairs if present.

YES

NO

Petiole Length
The petiole is the stem-like structure that connects the leaf to the main stem of the plant. When looking at petiole length, observe the petioles lower on the plant, as upper petioles remain shorter on both species.

Short Petiole:
Petiole shorter than the length of the leaf blade.

Long Petiole:
Petiole as long or longer than the length of the leaf blade.

Smooth Pigweed

Waterhemp

Palmer Amaranth



Spiny Amaranth: The presence of spines or spine-like structures can lead to misidentification of Palmer amaranth as spiny amaranth.

- Spiny amaranth contains sharp spines along the stems and more specifically the base of leaf petioles; Palmer amaranth has stiff bracts on female seed heads that resemble sharp spines.
- Key differences between these species include not only the location of spines, but also the habitat in which the two species are generally found.