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Tall Waterhemp Management in Corn and Soybeans

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Tall waterhemp was discovered in soybean fields during the 2000 growing season in two central Michigan counties. Before this, tall waterhemp was not known to exist in production fields in the state. Is there any significance to this finding? Why might proper identification of this species be essential in developing appropriate weed management strategies?

Waterhemp Background/ Biology

Tall waterhemp and a very similar species, common waterhemp, are members of the pigweed (Amaranth) family. These two species have identical vegetative characteristics and can be differentiated only during seed formation and plant maturation. There appears to be no difference in herbicide efficacy between the waterhemp species, so they will be discussed collectively as waterhemp.

Figure 1. Waterhemp leaf.

Waterhemp has become a predominant pigweed species throughout much of the Midwest over the past decade. Several factors probably contributed to the increase of waterhemp in the Midwest. Like other pigweeds, waterhemp is an annual plant that produces prolific amounts of very small seeds. The adoption of no-tillage and reduced-tillage production systems allows this seed to remain close to the soil surface for germination. Waterhemp can germinate much later in the growing season than other annual weeds, including other pigweed species. Peak emergence of waterhemp occurs during early July in Iowa; however, waterhemp emergence can span several months. Waterhemp's extended period of emergence proves to be a very important attribute of this weed because it allows it to avoid herbicide applications and tillage. Moreover, certain biotypes of waterhemp have been found to be resistant to ALS-inhibiting herbicides as well as triazine herbicides. A population of waterhemp in Kansas has displayed resistance to Ultra Blazer (acifluorfen) but not to the other diphenylethers. The decrease in soil-applied residual herbicides, the increase of total postemergence herbicide programs, and the presence of herbicide-resistant waterhemp have undoubtedly increased the population of waterhemp in the Midwest.

Waterhemp Identification

Twelve documented pigweed species exist in Michigan. Pigweed species commonly found in Michigan field crops are listed in Table 1. Waterhemp may have different emergence patterns than these other common pigweed species. Furthermore, the effectiveness of herbicides for waterhemp control may differ. Thus, proper identification of waterhemp is critical in establishing suitable weed control practices.

Table 1. **Pigweed species commonly found in Michigan.**

Common Name	Scientific Name
Tumble pigweed	*Amaranthus albus*
Prostrate pigweed	*Amaranthus blitoides*
Smooth pigweed	*Amaranthus hybridus*
Powell amaranth	*Amaranthus powellii*
Redroot pigweed	*Amaranthus retroflexus*
Tall waterhemp	*Amaranthus tuberculatus*

Waterhemp plants are dioecious, meaning that male and female flowers are produced on separate plants. Most other pigweeds are monoecious, having both male and female flowers on a single plant. Because waterhemp has male and female flowers on separate plants, waterhemp plants must cross with other plants to produce seed. The crossing of male and female plants results in a very diverse waterhemp species. Waterhemp plants may look slightly different from one another.

In spite of this diversity, waterhemp has a few common distinguishing characteristics. The stems and leaves of waterhemp typically have no hairs, giving the plant a bright, glossy appearance (Figure 1). In contrast, redroot and smooth pigweed have small hairs on the stem and leaves. These hairs make the leaves appear dull and feel rough (Figure 2). The stems and leaves of Powell amaranth typically lack or nearly lack hairs, but the leaf shape is different from that of waterhemp. The leaves of waterhemp are longer and more slender than the leaves of redroot pigweed, smooth pigweed, and Powell amaranth. Waterhemp leaves tend to be very glossy and often look puckered along the midvein of the newest leaves (Figure 1). Waterhemp stem color can vary greatly, ranging from light green to dark red. See Figure 3 for a comparison of pigweed stems.

Figure 2. Smooth pigweed leaf.

Figure 3. Comparison of stems (left to right): redroot pigweed, Powell amaranth, and waterhemp.

Figure 4. Female waterhemp seedhead.

Many pigweeds have very similar vegetative attributes, which can make the identification of the appropriate pigweed species difficult. Distinguishing characteristics become apparent as the plants near maturity, and pigweed species are most easily identified after the plants have produced mature seedheads. The seedheads appear different both in the size and the shape of the floral components.

Because waterhemp plants are dioecious, both male and female seedheads will be found in the field. Female waterhemp seedheads have many short, smooth, slender branches (Figure 4). Those of male waterhemp tend to be long, smooth, and slender (Figure 5). Female waterhemp plants were the predominant sex in Michigan's waterhemp populations. The seedhead branches of redroot pigweed are few, short, thick, and prickly in both appearance and feel (Figure 6). Smooth pigweed has longer, more numerous seedhead branches that are only slightly prickly (Figure 6). In contrast to both redroot and smooth pigweeds, Powell amaranth has few, very prickly, and very long and thick seedhead branches (Figure 7). Distinguishing characteristics of common pigweed species in Michigan are listed in Table 2.

Figure 5. Male waterhemp seedhead.

Figure 6. Seedheads of redroot pigweed (left) and smooth pigweed (right).

Waterhemp Management

Because waterhemp can have multiple emergence flushes throughout the growing year, a single application of any herbicide will probably not control all of the waterhemp for the season. Farmers should plan to control waterhemp with a preemergence application followed by one or two postemergence applications.

Waterhemp management was monitored in a Michigan soybean field in 2001. Herbicides that initially controlled waterhemp included Authority, Sencor, and Outlook preemergence and Cobra, Flexstar, Ultra Blazer, and glyphosate postemergence. However, each of these programs required a follow-up application

Table 2. **Comparison of pigweed species.**

Common Name	Stem and Leaf Hair	Leaf Shape	Leaf Appearance	Seedhead Branches
Smooth pigweed	Small, fine hairs	Oval to egg-shaped	Dull	Many, somewhat short, and slightly prickly
Powell amaranth	Few to no hairs	Diamond-shaped	Somewhat glossy	Few, very long, and very prickly
Redroot pigweed	Small, fine hairs	Egg to diamond-shaped	Dull	Few, short, thick, and prickly
Tall waterhemp	No hairs	Long and narrow	Very glossy	Female: numerous, short, and smooth Male: few, long, smooth, and slender

of a late postemergence herbicide application to control waterhemp that emerged later in the season. Other herbicides that have controlled waterhemp in other states are listed in Table 3. Waterhemp in the Michigan field was not controlled by Pursuit or any other ALS-inhibiting herbicide (the field had had repeated applications of Pursuit). Waterhemp management in corn in Michigan has not been evaluated as of yet. Herbicides that have controlled waterhemp in corn in other states are listed in Table 3.

Figure 7. Powell amaranth seedhead.

Waterhemp is a prolific, highly competitive weed. It has been found in a few fields in central lower Michigan. Proper management of waterhemp now may help to keep this prolific weed from becoming a dominant weed in Michigan. Identification of waterhemp is critical to managing this weed. If you suspect that you have waterhemp, please send samples to MSU Diagnostic Services. For questions on controlling waterhemp, contact your county extension agent or local agribusiness consultant.

Table 3. Herbicides that provide control of waterhemp*.

IN CORN		IN SOYBEANS	
Common Name	**Trade Name**	**Common Name**	**Trade Name**
Preemergence / Preplant Incorporated		*Preemergence / Preplant Incorporated*	
atrazine	many names	metribuzin	Sencor
metribuzin	Sencor	alachlor	Lasso, Micro-Tech
simazine	Princep	dimethenamid	Outlook
acetochlor	Harness, Surpass	metolachlor	Dual II Magnum
alachlor	Lasso, Mirco-Tech	pendimethalin	Prowl, Pendimax
dimethenamid	Outlook	trifluralin	Treflan
metolachlor	Dual II Magnum	sulfentrazone	Authority
pendimethalin	Prowl, Pendimax		
Postemergence / Burndown		*Postemergence / Burndown*	
glyphosate	many names	glyphosate	many names
glufosinate	Liberty	acifluorfen	Ultra Blazer
2,4-D	many names	fomesafen	Flexstar, Reflex
dicamba	Banvel, Clarity	lactofen	Cobra
		glufosinate	Liberty

* From the 2000 Illinois Agricultural Pest Management Handbook.

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