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Pigweeds of the Midwest- Distribution, Importance and Management

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Distribution

A number of pigweed species can be found throughout the Midwest, but we are most concerned about those species that are commonly found in cropping situations. The most common weedy pigweeds can be separated into three distinct groups according to their taxonomic characteristics and overall appearance. The first group includes some of the most common pigweeds in the Midwest: redroot pigweed \((\text{Amaranthus retroflexus})\), smooth pigweed \((\text{Amaranthus hybridus})\) and Powell amaranth \((\text{Amaranthus powellii})\).

Redroot pigweed can be found throughout the Midwest, but usually is not the dominant pigweed found in cropping situations, except in some areas of the western part of the Midwest. Smooth pigweed tends to dominate crop production fields in the eastern part of the Midwest, and also is very prevalent in the northern part of this area. Powell amaranth is usually found only in the northern parts of the Midwest, and often not in high populations. These three species of pigweeds have similar upright growth habits, are difficult to tell apart in seedling stages, compete very well with most crops, and have both male and female flowers on the same plants.

The second group of pigweeds includes common waterhemp \((\text{Amaranthus rudis})\), tall waterhemp \((\text{Amaranthus tuberculatus})\), and Palmer amaranth \((\text{Amaranthus palmeri})\). These three pigweed species have separate male and female plants, have an upright, but somewhat branched growth habit, and are competitive with crop plants. They are quite diverse and may differ widely as to branching and coloration within a species. Common and tall waterhemp are very difficult to distinguish from each other and are commonly found in the southern part of the Midwest, where they may be the dominant pigweed species from southern Illinois through Missouri and into Iowa and Nebraska. These waterhemp species seem to favor wet environments and poorly drained soils and can be found to some degree throughout much of the Midwest. Common waterhemp is probably the dominant of the two species in the western part of the Midwest, while tall waterhemp probably is found more often in the eastern part of the area. Palmer amaranth is closely related to the waterhemp species, and has long been the dominant pigweed type in Texas and Oklahoma, the Mississippi Delta and the Southeast. It is a rapidly growing species that is very competitive, and now can be found widely in Kansas and to some extent in Missouri and Illinois.

The third pigweed group includes spiny amaranth \((\text{Amaranthus spinosus})\), tumble pigweed \((\text{Amaranthus albus})\), and prostrate pigweed \((\text{Amaranthus blitoides})\). These pigweeds are similar in that they are either fairly short in height or somewhat prostrate, usually have substantial branching, and often do not provide much in the way of competition in corn and soybean
production systems. They can be troublesome in shorter, less competitive crops. Spiny amaranth is a dominant weed in the Southeastern part of the country, and seems to be advancing into the Midwest from that area. In the Midwest, this species is not usually a major problem except in pastures where it seems to thrive, presumably because it's spiny nature discourages livestock feeding. Prostrate and tumble pigweeds can be found throughout the Midwest, but seldom gain a foothold and cause major damage in corn and soybeans except in sparse stands and field edges later in the season. All of these weeds can on some occasions cause problems in cropping systems.

**Importance**

These groups of pigweeds can be very troublesome and have been shown to be competitive with crops and have the potential to cause harvesting problems. In the Midwest, pigweeds were prevalent in large numbers and were very competitive prior to widespread use of herbicides in cropping situations. More is known about growth and competitiveness of redroot and smooth pigweed than any other of these species in the Midwest. Because several of these species are difficult to tell apart, much of the research results with pigweeds have been lumped together in the literature and incorrectly referred to as redroot pigweed, and in some instances, smooth pigweed.

For a number of years, when broadcast applications of combinations of soil applied herbicides were widely used, and followed by one or more cultivations in row crops, pigweeds of any type only occasionally escaped control and developed into real problems for the grower. However, with the reduction in usage of soil applied and incorporated herbicides designed to control grasses and small seeded weeds, pigweeds escaped control more often in recent years. Often, the use of postemergence treatments were not as effective as preemergence or preplant incorporated treatments for pigweed control. Reduced cultivation began to eliminate backup procedures for controlling pigweeds, and the move toward conservation tillage created a more favorable environment for germination and growth of pigweed species in cropping systems.

A number of years ago, certain pigweed biotypes evolved resistance to the triazine herbicides, and although this is not widespread throughout the Midwest, certain areas have substantial acreage of triazine-resistant pigweeds. Recently, a number of sites have been identified as having biotypes of the waterhamps that appear to be resistant to one or more of the ALS enzyme inhibiting herbicides, which make up a substantial portion of the herbicides used in soybeans. Waterhamps seem to be widely diverse in morphology and in response to herbicides, with biotypes of the same species ranging from susceptible to moderately tolerant to resistant to some herbicides.

The net result of this evolution of weed management practices is a major concern of growers and dealers about the importance of pigweeds as species to be concerned with in the Midwest. Recent surveys indicate that the pigweeds as a group are among the most important and prevalent annual weeds in midwest corn and soybean production systems. Thus we, and other researchers, have concluded that the pigweeds as a group are one of our most important weeds to deal with, and have been putting a major effort in this area.
Management

Management or control of these pigweed species, while once relatively easy with most soil-applied herbicides plus cultivation, now presents a significant problem that requires intensive management for effective results in some cropping situations. The first step in managing pigweeds, among all the other species that growers encounter, is proper scouting and identification according to the correct species of weeds present. Separating out the types of pigweeds present in a field is especially difficult and important. The publication, "Pigweed Identification - A Pictorial Guide to the Common Pigweeds of the Great Plains", available from the Cooperative Extension Service at Kansas State University, is suggested for your use. This bulletin, featuring color photographs of seeds, seedlings and mature plants of the various pigweeds, is a very helpful guide to making correct identification of the various species.

It is very important to map fields and try to identify the species present both in early stages, when identification is possible but very difficult, and in the mature stage when identification can be positive. The fall-made maps can be very important in planning for control measures in following years. Pigweeds that have escaped control in recent years, mainly because of reduced use of effective soil-applied herbicides, conservation tillage, and reduced cultivation, and reliance on total postemergence systems, can quickly develop into significant problems, because of their diverse nature and tremendous ability to produce seed. Pigweeds typically germinate best in very warm conditions, and can continue to germinate well into the summer. Especially with the waterhemp, late germination following very wet conditions is rather common.

Once the pigweeds are identified correctly, then the information on herbicide labels and from guidelines from Cooperative Extension and private sector sources can be used to select the correct herbicide treatments for use in providing effective management of these weeds.

The appearance of biotypes of some of these species that are resistant to certain herbicide classes has complicated the issue, and made proper selection of herbicides more difficult. Biotypes of triazine-resistant pigweeds have become prevalent in some areas of the Midwest. This has primarily involved smooth pigweed and redroot pigweed, but there are a few examples of triazine resistant waterhemp as well. In essentially all instances, these biotypes have been selected for by continuous use of some form of triazines for many years, often with little or no backup management, such as cultivation.

A situation that is causing greater concern than the triazine resistance to the pigweeds in the Midwest is increasing difficulty in controlling waterhemp. There is some disagreement among weed scientists as to whether waterhemp are generally more tolerant of most herbicides than are the other pigweeds, or whether there is a wide range of susceptibilities involved, due to the diverse nature of these species, and the apparent evolution of resistant biotypes to several of the ALS enzyme inhibiting herbicides. Our research, and that of several others in the Midwest, would indicate that a majority of waterhemp in the Midwest can be controlled by the ALS inhibitors, but that a number of sites have biotypes that are resistant to these same herbicides. In these areas, probably due to the diverse nature of the species and resulting from cross-pollination,
we also can find biotypes that are somewhat tolerant of these same treatments. We are concerned because many of the herbicides now used in corn and soybean production control weeds by the same mode of action, inhibition of the ALS enzyme, and more of the same type of herbicides are coming into the marketplace.

Controlling these weeds, whether they are tolerant or resistant, need not be an impossible task, since there are available a number of classes of herbicides that are effective on both somewhat tolerant plants as well as resistant ones. It is a matter of correctly identifying the plants, then using sound weed management strategies to address the problem. Weed resistance management strategies, available from public and private sectors, seem to agree that scouting and identification are very important in determining where to start, then combining modes of action of herbicides that are both effective on the species in question. Some favor using tank-mixtures each year, while others promote the use of rotations of herbicide modes of action from year to year. I personally favor some combination of the two systems, with the goal of using several modes of action over a 2 to 3 year period. Wherever possible, following up with mechanical cultivation is an effective practice. And especially where small, unexplained patches of weeds appear uncontrolled, hand weeding or spot treatment, with an effective mode of action herbicide, may be a very important measure in keeping a potentially resistant biotype from producing seed and becoming a much bigger problem the next year. We have the herbicides available in our arsenal to manage all the potentially resistant and/or tolerant weeds mentioned above. It is just a matter of putting together the correct combinations of chemical and non-chemical methods of control and persistently attacking the problem year after year.