Science Societies

Pigweed pressure builds in the Pacific Northwest as resistant populations expand

By Vicky Boyd

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The 2022 discovery of Palmer amaranth in Idaho and its subsequent spread has prompted Pacific Northwest weed experts to recommend growers take an integrated management approach. It includes scouting fields after herbicide applications, layering or overlapping residual herbicides, rotating effective sites of action and rotating crops. Photo courtesy University of Idaho.



The spread of Palmer amaranth and waterhemp into the Pacific Northwest has posed a growing threat to crop yields and farm management. Researchers warn that without proactive, integrated control strategies, these invasive species could quickly dominate fields and become far harder to manage. This article explores where the weeds are appearing, why they're so difficult to control, and what growers and their advisers can do now to stay ahead of the problem.

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Palmer amaranth and waterhemp have long been the bane of Southern and Midwestern producers because of multiple herbicide resistance and prolific reproduction. Now that they've been confirmed in the Pacific Northwest (PNW), it's more important than ever for producers in the region to take an integrated management approach, says University of Idaho Assistant Professor and Extension Weed Science Specialist Albert Adjesiwor. This includes scouting fields after herbicide applications, layering or overlapping residual herbicides, rotating effective sites of

action, and rotating crops.

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“Just all of the practices we’ve been preaching to avoid resistance should be applied to Palmer amaranth and waterhemp,” he says. “We shouldn’t rely on the same chemistries, or else it will be just a matter of time.”

To complicate matters, Adjesiwor found that most Palmer amaranth plants tested in greenhouse trials were resistant to glyphosate (Group 9) and acetolactate cynthase inhibitors (ALS-inhibitors, Group 2) herbicides. Even though the newcomers remain scattered, Adjesiwor says producers and consultants should keep an eye out for the weeds.

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A dreaded duo

In July 2022, Adjesiwor confirmed waterhemp (*Amaranthus tuberculatus)* after an agronomist brought to his attention a suspicious weed from an Elmore County, Idaho, sugar beet field. Not long afterward, he received a call about suspicious pigweed near Homedale, Idaho, that was eventually confirmed as the state's first known Palmer amaranth (*Amaranthus palmeri).*

Both waterhemp and Palmer amaranth were subsequently identified in Malheur and Marion counties, Oregon, during summer 2023. Two Palmer populations have since been found in Walla Walla and Spokane counties, Washington, according to the Washington State Department of Agriculture.

Without effective management, a waterhemp or Palmer amaranth infestation can outcompete cultivated crops, reduce yields, and overtake a field in only a few years. That's because under ideal conditions, a single female Palmer amaranth can produce up to 500,000 seeds in a season, while a single waterhemp female may produce up to 1 million seeds.



Waterhemp was found in a number of Idaho sugar beet fields. Photo by

Albert Adjesiwor.

The PNW discoveries set off a collaborative scouting and mapping effort among Adjesiwor, Oregon State University Weed Science Professor Joel Felix, Washington State University Weed Science Assistant Professor Rui Liu, and Amalgamated Sugar Weed Scientist and CCA Clarke Alder. Although Alder has since changed jobs and is currently sales manager for Betaseed covering Idaho, Washington, and Oregon, he remains involved in the invasive weed effort.

According to a 2025 survey, Idaho had about 9,000 acres infested with Palmer amaranth and about 700 acres with waterhemp, but Alder says that may change. He recently found a previously unmapped 350-acre field in Idaho infested with waterhemp. Oregon had about 700 acres infested with Palmer, and Washington had only two Palmer infestations.

The discoveries also launched an intensive effort to educate producers and consultants about identifying and managing Palmer amaranth and waterhemp. That included developing color fact sheets complete with photos, descriptions, harvest tips, and rotational crop recommendations.

Even after three years, Alder said he still encounters growers who don't know about the two newcomers.

"They'll have it and not even know it until we show up and tell them what it is," he says. "It just goes to show you how many people we have to educate."

When promoting the use of preemergence herbicides and rotating effective sites of action, Adjesiwor said he's found it difficult, in today's economy, to reach some growers who may not yet have weeds.

“I was at a meeting, and a grower was in denial until he had (Palmer) last year and couldn’t control it. People just think it’s other people’s problems until it becomes their problem.”

A resistance wake-up call

As part of the collaborative effort, the researchers have collected seed for greenhouse testing. More than 85% of Palmer amaranth samples from the PNW were resistant to glyphosate, with some populations surviving 16 times the labeled rate, Adjesiwor says. In addition, they confirmed ALS resistance in about 90% of Palmer samples. He plans to conduct the same greenhouse assays on waterhemp collected from fields.



University of Idaho Assistant Professor and Extension Weed Science Specialist Albert Adjesiwor is screening waterhemp samples grown from seed to determine how effective various herbicides are. Photo by Albert Adjesiwor, University of Idaho.

Currently, Adjesiwor is also screening additional chemistries on Palmer grown from seeds that escaped treatment. The herbicides include metribuzin (Group 5), mesotrione (Group 27), and dicamba and 2,4-D (Group 4).

In states where Palmer and waterhemp are native or have been well established, resistance is much more pervasive than in the PNW. The University of Arkansas has identified one Palmer amaranth population with postemergence resistance to Groups 2, 4, 5, 9, 10, 14 and 27.

University of Illinois researchers have documented waterhemp populations resistant to seven herbicide groups in Illinois and neighboring states. They are Groups 2, 4, 5, 9, 14, 15 and 27.

Leaning on crop rotations

Both Adjesiwor and Alder say that PNW growers are fortunate to have up to two dozen different rotational cropping options for irrigated ground. This increases the number of effective herbicide sites of action available to manage invasive newcomers and weeds in general.

"One advantage is we have rotations in Idaho that include non-Roundup Ready crops," Alder says. "There are chemistries we use in other crops that will control Palmer and some of these other hard-to-control weeds."

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If a grower had a field heavily infested with Palmer amaranth, Adjesiwor said he probably would not recommend planting Roundup Ready sugar beets, alfalfa, or corn because most of the PNW Palmer populations are resistant to glyphosate. Potatoes also could be risky because of few postemergence options for Palmer.

A better choice would be a fall-planted small-grain crop since the grains are already established and can outcompete Palmer as it tries to emerge in late spring or early summer, Adjesiwor says. Before planting in the summer, he recommends shallow tillage to spur a Palmer flush, followed by a burndown such as paraquat or glufosinate. It may need to be repeated to reduce the seedbed.

While small grains are harvested before Palmer goes to seed, the weeds may resprout and produce seedheads. As a result, he says growers need to conduct late-summer tillage or apply a burndown to keep the weeds at bay.

Alfalfa, which may be in the ground for up to four years, is also a good rotational option, Adjesiwor said. If planted in the fall, the crop is well established and forms a dense canopy that competes with pigweed as it tries to emerge the following spring. A number of herbicides labeled for pigweed offer rotational options to glyphosate.

In addition, alfalfa is harvested multiple times during the season, reducing the potential for pigweed seed production. At the same time, growers frequently apply fall residual herbicides to minimize winter and spring weed germination.

Keep other weeds in mind

Adjesiwor, Alder, and Lui agree that the weed management mantra, “start clean, stay clean,” is paramount when addressing the two new invasive amaranth species.

As with any weed program, reviewing records of weeds from the previous season should be the basis for this year’s plans. Herbicide labels also should be followed to match the product to the appropriate crop and weed spectrum.

In addition to the newcomers, Alder says growers and consultants need to keep in mind other weeds, including herbicide-resistant kochia, when developing herbicide programs. After each herbicide application, Adjesiwor recommends scouting fields for possible escapes. If they see something suspicious, they should pull it to prevent it from going to seed and contact their crop consultant or a university weed specialist.

A residual-heavy approach

To effectively manage Palmer amaranth in potatoes, Adjesiwor recommends a preemergence, residual-heavy approach. That’s because postemergence options are limited and less effective due to resistance.

For example, apply Dual Magnum (S-metolachlor) or Prowl H2O (pendimethalin) after hilling/drag-off but before potatoes emerge to prevent early-season weed emergence and reduce overall weed pressure. For preemergence or early postemergence, use Zidua (pyroxasulfone) as a single or sequential treatment for long-lasting control of pigweed species.

If Palmer amaranth escapes preemerge treatments, he suggested applying metribuzin at 0.5 lb active ingredient per acre before weeds reach 8 inches tall.

While most of the preemerge herbicides used in Idaho potatoes provided good early season control of Palmer amaranth in University of Idaho efficacy trials, Adjesiwor says few provided complete control. Even some of the best performers, such as linuron (Linex 4 L) and Eptam (EPTC), allowed Palmer escapes. Under field conditions, he says they would need to be controlled with postemergence herbicides or hand rouging to prevent weed seed production and resistance development.

Sugar beets

Until the widespread adoption of Roundup Ready sugar beets beginning in 2008, producers typically relied on three to four post-emerge tank mix applications of several active ingredients at reduced rates—often referred to as micro-rates.

The goal was to keep the field as clean as possible since sugar beets compete poorly with weeds. Each Palmer plant per 10 feet of row, for example, can cause 3.8% yield loss, according to work by Adjesiwor, Felix, and Alder. Beets also are sensitive to several herbicides, hence the micro rates.



Although Palmer amaranth is still not widespread in Idaho, it proved troublesome for sugar beet growers whose fields were infested with it.

With Roundup Ready, beet producers almost overnight moved away from residual products and relied mostly on three over-the-top applications of glyphosate, Alder says.

“In 2008, not only was there an industry shift in genetics, but the industry shifted in chemistries applied,” he says. “They basically went away from everything else.”

Trying to get them to use a preemergent to bring in a different site of action has been a challenge, Alder says. Until 2025, only Nortron (ethofumesate) was labeled for application to sugar beets from the cotyledon to the two true-leaf stage. Yet during this period, which can extend for up to two months, Alder says a lot of Palmer can germinate and grow.

In 2025 and again in 2026, the Environmental Protection Agency granted a Section 18 for Goltix 700 SC (metamitron) to control glyphosate-resistant Palmer amaranth in Wyoming, Idaho, Oregon, Colorado, and Nebraska. It is labeled for use on beets between planting and two true leaves. The product’s registrant, Adama, recommends a single preemerge application of 64 fl oz of product per acre tank mixed with ethofumesate.

Alder recommends following with a Group 15—such as Dual Magnum, Outlook or Warrant—at the two- to four-leaf stage and again before row closure, which occurs about 9 to 10 weeks after planting. He says there was minimal use of Goltix in 2025, but he saw quite a bit more applied this season.

Sugar beet producers have a couple of products on the horizon that could help them manage the newcomers, Alder says. The industry is currently seeking an at-planting

and preemerge label for Dual Magnum in the West that would allow application to less-than-two-leaf beets.

A triple-stacked trait, branded as Truvera from KWS Seeds LLC in cooperation with Bayer, offers tolerance to glyphosate, glufosinate, and dicamba. Expected possibly as early as 2027, the trait is touted as providing improved management of several weeds, including kochia and amaranth species.

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1. Most Palmer amaranth plants tested in greenhouse trials were resistant to

a. Group 1 (ACCase inhibitors) and Group 3 (dinitroanilines).
b. Group 2 (ALS inhibitors) and Group 9 (glyphosate).
c. Group 4 (synthetic auxins) and Group 5 (photosystem II inhibitors).
d. Group 10 (glutamine synthetase inhibitors) and Group 27 (HPPD inhibitors).

2. Where have Palmer amaranth and waterhemp recently been confirmed in the Pacific Northwest?

a. Only in isolated greenhouse research facilities.

b. Across several counties in Idaho, Oregon, and Washington.

c. Primarily in coastal regions with high rainfall.

d. Exclusively in controlled university test plots.

3. Which of the following did the article recommend for managing Palmer amaranth in potatoes?

a. Apply Zidua postemergence after weeds have reached 8 inches tall.

b. Apply metribuzin at 2 lb active ingredient per acre after weeds have reached 8 inches tall.

c. Appy Prowl H2O before hilling/drag-off and after potatoes emerge.

d. Apply Dual Magnum after hilling/drag-off but before potatoes emerge.

4. Which change occurred in sugar beet weed management following the adoption of Roundup Ready varieties in 2008?

a. Growers increased their use of multiple post-emergence herbicide tank mixes at reduced rates.

b. Growers shifted primarily to repeated glyphosate applications and reduced use of residual herbicides.

c. Growers eliminated herbicide use in favor of mechanical weed control.

d. Growers focused exclusively on preemergence herbicides to prevent early weed growth.

5. Which of the following products is labeled for use in sugar beets between planting and two true leaves in Wyoming, Idaho, Oregon, Colorado, and Nebraska?

a. Dual Magnum.

b. Outlook.

c. Goltix.

d. Warrant.

This quiz was drafted with AI assistance and reviewed by the editorial team for accuracy and appropriateness.

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