

AGRONOMY TECHNICAL NOTE

Palmer Amaranth (*Amaranthus palmeri* S. Watson)

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Palmer amaranth Concerns

Palmer amaranth was recently found as a contaminant in conservation plantings in Illinois, Indiana, Iowa, Minnesota and Ohio. It was a contaminant in Conservation Reserve Program (CRP) seed mixes but honey bee pollinator, wildlife habitat and cover crop plantings may also be contaminated. Producers with recent conservation plantings should check their fields to ensure this invasive weed is not brought into Montana. Palmer amaranth is considered a noxious weed in Delaware, Minnesota and Ohio and mixes containing PA cannot be sold in those states.

Identification

Palmer amaranth (*Amaranthus palmeri* S. Watson) is an annual in the pigweed family (Amaranthaceae). Pigweeds are common weeds in agriculture fields in North and South America, Africa, Asia, Australia and Europe. Pigweeds are warm season annuals, grow quickly and aggressively, compete well with crops, reproduce by seed, are frost sensitive and have a high percent of hard seed. Pigweeds that are problem weeds in the U.S. include redroot pigweed (*A. retroflexus*), smooth pigweed (*A. hybridus*), Powell amaranth (*A. powellii*), spiny amaranth (*A. spinosus*), tumble pigweed (*A. albus*), prostrate pigweed (*A. blitoides*) and common waterhemp (*A. rudis*). Palmer amaranth has one central stem with many lateral branches and can grow 1 - 8 feet tall. The reddish central stem is smooth with relatively no hairs. In comparison, redroot and smooth pigweed seedlings are pubescent on the stems and leaves. Leaves are alternate and grow symmetrically around the stem, giving it a poinsettia appearance when viewed from above. Leaves are hairless, lance to diamond-shaped, 2 - 8 inches long, ½ - 2 ½ inches wide, and have a prominent whitish vein on the leaf underside. Some, not all, plants have a whitish V-shaped mark on the top surface and a single spine in the leaf-tip notch. The leaf petiole (attaches the leaf blade to the stem) is longer than the leaf itself. Palmer amaranth female plants have a long terminal seed head that can reach three feet long. The seed heads have stiff, sharp bracts that give it a prickly feel. It is a prolific seed producer, producing 100,000 – 500,000 seeds per plant which remain viable for 3 to 5 years. The small brown-black seeds thrive in no-till or minimum tillage fields.

Origin and Range

Palmer amaranth is native to the desert southwest and northern Mexico. It is spreading through the purchase of contaminated hay, feed and seed purchases, on equipment such as custom combining machinery and by ducks, geese and other wildlife. It is currently known to have spread to Eastern, Southern and Midwestern U.S. cropland acres, especially in cotton, corn, soybean and other row crop rotations. It has been documented in 28 states including Minnesota and South Dakota but has not been reported in Montana.

Impacts

Palmer amaranth is aggressive with a rapid growth rate, growing 2 to 3 inches per day. Given its aggressive nature and prolific seed production, it has the potential to become a major agronomic problem in the western states. In the Midwest, it has been documented to emerge from May through September, forcing producers to manage it throughout the year. It has been found to cause yield losses up to 91% in corn and 79% in soybeans. It can hybridize

with other pigweeds including redroot pigweed. Its dioecious reproduction (separate male and female plants) forces outcrossing and genetic diversity which allows it to readily adapt to new environmental conditions and quickly spread herbicide resistance genes when selection pressure is applied. It has evolved resistance to the following herbicides and modes of action: ALS inhibitors, triazines, HPPD inhibitors, dinitroanilines and glyphosate. In addition, Palmer amaranth can be toxic to livestock due to presence of oxalates and nitrates.

Anyone who has planted wildlife, pollinator, or other conservation plantings where seed may have originated from sources in the South or Midwest would be prudent to inspect and monitor plantings for the presence of Palmer amaranth. Palmer amaranth seed is thought to remain viable for 3 to 5 years depending on soil moisture and climate. As previously noted, this species produces large quantities of seed, thus every effort should be taken to ensure that any plants are found and destroyed before they set seed. This is especially true if the intent is to grow the planting to maturity for fall grazing, pollinator or wildlife habitat enhancement or similar conservation applications.

Montana Considerations

Federal Seed Act law requires that all agricultural and vegetable seed sold in the U.S. must have a label that includes: name and address of the seed labeler, lot number, germination rate (percent) and date, state or country of origin, percent of each kind or variety of seed component present, percent total weed seed and percent noxious weeds (according to state noxious weed list where seed originated or is sold), amount of inert material present, and warnings for treated seed. Seed labels list only weed species that are considered noxious weeds in the states where it is shipped from or the state where it is sold. Thus states (like Montana) that do not list Palmer amaranth as a noxious weed would only have the total percent of weed seed listed. Seed that contains species on the Montana noxious weed list or seed that contains more than 2% weed seed cannot be sold in Montana. The ‘Laboratory Report of Analysis’ from a seed lab lists other crop seeds, weed seeds and noxious weed seeds by species and number of seeds per pound for a seed lot. It should be available from vendors and gives information of all species in a mix. Since Palmer amaranth seed is visually indistinguishable from other species of *Amaranthus*, if any amaranth seed is found in a lot it will be listed as amaranth sp. A new DNA test developed by the California Department of Food and Agriculture and Eurofins BioDiagnostics with support from the Minnesota Department of Agriculture Plant Protection Division Seed Program differentiates Palmer amaranth from other amaranth and weed species. It is recognized by the Minnesota Department of Agriculture Seed Unit for labeling purposes but is only available on a limited basis. This may provide a method of determining if Palmer amaranth is present in seed mixes in the future.

Options for Preventing Spread of Palmer Amaranth

- Use seed from reliable and trusted sources; purchase certified seed if possible since it is field inspected for weeds and other contaminants.
- Ask for a copy of the label for the seed mixture mix prior to purchasing seed; check percent pure seed, inert matter, other crop, weed seed, test date, germination, hard or dormant seed, pure live seed (PLS) and origin of mix.
- Ask for the ‘Laboratory Report of Analysis’ for your mix or all individual species in the mix. Check species and amount (number of seeds/pound) of other crop seeds, weed seeds and noxious weed seeds (if any).
- If dealer won’t provide label or “Lab Report of Analysis” for your mix consider other vendors or obtain analysis for all individual species and mix yourself.
- Sample the purchased seed prior to planting and send in a sample and request a “Noxious Weed Only Seed Analysis” that includes amaranth species from the lab. Consult with the seed lab for the appropriate test for your mix as prices vary based on noxious weed species.
- If amaranth species are listed under weed seeds; consider different species or a different vendor.
- If a mix with amaranth species has already been or will be planted, be prepared to take steps in the field to ensure Palmer amaranth is not present or is eradicated prior to seed set.
- Walk fields after emergence to ensure Palmer amaranth or other noxious weeds are not in your plantings. Use seedling and mature plant keys to identify amaranth species.
- Since Palmer amaranth is resistant to many common herbicides, pulling the entire plant prior to seed set is an effective method of control. Place the plant in a plastic bag while in the field, and then ferment, burn, or dispose of properly.
- Scout fields for several years and use appropriate weed control to ensure Palmer amaranth or other noxious weeds are not introduced into Montana.



Figure 1. Young Palmer amaranth plant. Photo: Bruce Ackley, The Ohio State University, Bugwood.org



Figure 2. Spiny bracts such as these to positively identify Palmer amaranth. Photo: Bruce Potter, University of Minnesota



Figure 3. Palmer amaranth mature plant. Photo: Ross Recker, University of Wisconsin-Madison, Bugwood.org



Figure 4. Palmer amaranth seeds. Photo: D. Walters and C. Southwick, Table Grape Weed Disseminule ID, USDA APHIS ITP, Bugwood.org

Additional Resources

Palmer Amaranth, Biology, Identification, Management. Purdue Extension, 2013.
<https://www.extension.purdue.edu/extmedia/ws/ws-51-w.pdf>

Prohibited - Eradicate Noxious Weed Palmer Amaranth - *Amaranthus palmeri* S. Watson. Minnesota Department of Agriculture.
<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/palmeramaranth.aspx>

Scout and Identify Pigweed Now. Purdue Extension. 5/30/2013.
https://ag.purdue.edu/btny/weedscience/Documents/Palmer_ID.pdf

Palmer Amaranth *Amaranthus palmeri* S. Wats. Weed Images. Weed Science Society of America.
<https://www.weedimages.org/browse/subthumb.cfm?sub=5090>

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