

Glyphosate-resistant Palmer amaranth in Michigan

Confirmation and management options

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Updated Feb. 2012



MICHIGAN STATE UNIVERSITY WEED SCIENCE

MSUWS02-2012



Palmer amaranth in Michigan soybean field

Palmer amaranth (*Amaranthus palmeri*), a pigweed not common to the northern U.S., was identified in some southwest Michigan fields in 2010. This Palmer amaranth population was not controlled by glyphosate (Roundup) in a Roundup Ready soybean field.

Glyphosate-resistant Palmer amaranth in Michigan:

Palmer amaranth seed samples collected from a St. Joseph County Roundup Ready soybean field were confirmed resistant to glyphosate through greenhouse testing at Michigan State University. The Palmer amaranth populations had a **20-fold level of resistance** to **glyphosate** compared with a susceptible Palmer amaranth population obtained from Tennessee. Some of these plants survived a 32X rate of glyphosate. This would be equivalent to 5.5 gallons of Roundup PowerMax. We have also identified this population as **resistant to ALS-inhibiting herbicides**.

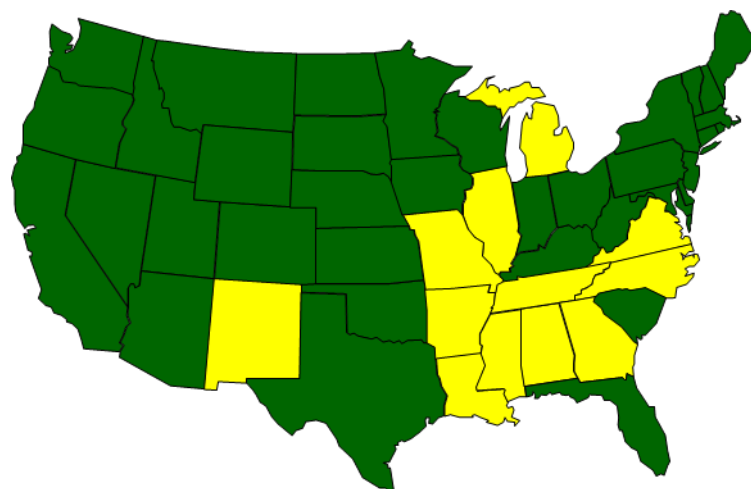
Herbicide resistance:

Glyphosate-resistance is one reason why Palmer amaranth has become an economically devastating weed. Currently there are 12 states in the U.S. that have reported glyphosate-resistant Palmer amaranth. Multiple resistance to glyphosate and the ALS-inhibiting herbicides has been reported in 4 of these states, including Michigan.



Palmer amaranth (AMAPA-04 & AMAPA-01) collected from a Southwest Michigan field survived up to a 32X rate of Roundup PowerMax (glyphosate).

States with confirmed glyphosate-resistant Palmer amaranth



Glyphosate-resistant Palmer amaranth in Michigan

Options for control:

This past growing season, with funding provided by the Michigan Soybean Promotion Committee we conducted some preliminary research that evaluated different herbicide products and strategies to help manage glyphosate-resistant Palmer amaranth in Michigan soybean. While none of the herbicides or strategies that we evaluated were 100% effective, we did learn which strategies will not work. These results and the information that we have on the biology of this weed are the basis for the recommendations below.

Keys to managing glyphosate-resistant Palmer amaranth:

- **Plant into a clean seedbed**, if Palmer amaranth has emerged it needs to be controlled with tillage or an effective burndown herbicide application (i.e., Gramoxone, 2,4-D, Liberty, etc.) prior to planting.
- **Two-pass herbicide programs are essential** (PRE followed by POST).
- **PRE** (soil-applied) residual herbicide must have **good control** of **Palmer amaranth**.
- **POST** herbicide needs to be applied **before Palmer amaranth is 3-inches tall**. These applications should be **tank-mixed** with a **residual** product (i.e., Dual II Magnum, Warrant, or Outlook).
- Additional herbicide applications or cultural control measures such as **hand-weeding** should be used to **eliminate** the remaining Palmer amaranth plants.

Corn:

- Several herbicide options are available. Including herbicides with different modes of action in the PRE and POST component of the weed control program will ensure effective management. Atrazine, chloroacetamide herbicides (Dual II Magnum, Harness, etc.), HPPD-inhibitors (Callisto based products, Laudis, Impact), and plant growth regulators (Status) are all options for management.

Consult the 2012 Weed Control Guide for Field Crops (E-434) and product labels for product rates, precautions, and rotation restrictions. Consult contracting seed companies for corn inbred sensitivities.

Soybean:

- Valor-based herbicides at higher use rates were the best PRE options from our research. However, there may be increased soybean injury.
- POST options are limited and application timing is extremely important. Residual herbicides should be tank-mixed for residual Palmer amaranth control.

Soybean soil-applied (PRE) options for initial control of multiple (glyphosate and ALS) resistant Palmer amaranth			
Active ingredient	Herbicide	Premixes	Effectiveness*
flumioxazin	Valor	Valor XLT Envive Gangster	Fair-Good
s-metolachlor	Dual Magnum	Boundary Prefix	Poor-Fair
dimethenamid-P	Outlook	--	Poor-Fair
* Due to the continued emergence of Palmer amaranth, control extended past 4 weeks after planting is reduced.			

Soybean POST options for control of multiple resistant Palmer amaranth			
Active ingredient	Herbicide	Premixes	Size
fomesafen	Flexstar Reflex	Flexstar GT	<3-inches
lactofen	Cobra (8 fl oz) Cobra (12.5 fl oz)	-- --	<3-inches <6-inches
glufosinate*	Liberty	(LibertyLink soybean)	
* Liberty should be an effective option for Palmer amaranth control. We will be examining control strategies in Liberty Link soybean in 2012.			

Contact information:

If you suspect that you have glyphosate-resistant Palmer amaranth, please contact Bruce MacKellar, Michigan State University Extension Educator, Van Buren County Office, mackella@anr.msu.edu, 269-657-8213 or Christy Sprague, Michigan State University Weed Extension Specialist, sprague1@msu.edu, 517-355-0271 x. 1224.