



Palmer amaranth can be found in corn and soybean fields in south central and southwestern [Nebraska](#). ([Photos](#) by Amit Jhala)

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Palmer Amaranth Resistant to Atrazine and HPPD inhibitors Confirmed in Nebraska

University of Nebraska-Lincoln greenhouse studies have confirmed a Palmer amaranth population [resistant](#) to postemergence [application](#) of atrazine and HPPD-inhibiting herbicides (Callisto, Laudis, Armezon/Impact). This is the second report (after Kansas) of a Palmer amaranth population resistant to atrazine and the HPPD group of herbicides.

Palmer amaranth, a member of the pigweed family, is a difficult-to-control [broadleaf weed](#) that infests corn and soybean fields in south central and southwestern Nebraska. In the last few years it has spread from southern states into Indiana, Illinois, Iowa, Michigan, Ohio, and Wisconsin, which raises concern about the spread of this species into areas not previously reported.

Research on Nebraska Palmer Amaranth

Because of its [rapid growth](#), ability for prolific seed production, and ability to evolve herbicide-resistance, Palmer amaranth can be of significant concern in corn and soybean fields in Nebraska. Glyphosate-resistant Palmer amaranth has been reported in several states in the southern U.S. and can disseminate through the movement of seed and pollen.

A Palmer amaranth population in a [corn seed production field](#) in Fillmore County had a control failure despite the application of atrazine and HPPD-inhibiting herbicides. The management history at this site was more than five years of continuous non-traited, white corn with heavy reliance on atrazine and HPPD inhibitors for weed control. Palmer amaranth seeds were collected from this field and dose response studies were conducted in the UNL greenhouse. Atrazine (Aatrex), mesotrione



Palmer amaranth.

(Callisto), tembotrione (Laudis), and topramezone (Armezon/Impact) were applied at 12 rates (0, 0.1x, 0.25x, 0.5x, 0.75x, 1x, 1.5x, 2x, 3x, 4x, 6x, and 12x; where x is the recommended rate of herbicide such as Aatrex at 1 lb ai/acre, Callisto at 3 oz/acre, Laudis at 3 oz/acre, and Impact at 1 oz/acre).

Based on visual injury ratings at the ED₉₀ level, the dose response curve showed a 4- to 23-fold level of resistance, depending upon the type of HPPD-inhibiting herbicide. At the recommended labeled use rates Callisto, Laudis, and Impact provided approximately 55%, 80% and 65% control, respectively. This population also has at least a 14-fold level of resistance to POST-applied atrazine. The level of atrazine resistance is likely much higher, but difficult to determine, since the highest rate only provided 20% visual injury.

Implications and Management

Palmer amaranth populations resistant to atrazine and HPPD [inhibitors](#) in this part of Nebraska are of particular concern due to the proximity to intense seed corn production, which is heavily reliant on POST atrazine and HPPD herbicides for weed control. Weed management in seed corn production will be complicated with the evolution of atrazine and HPPD-resistant Palmer amaranth biotypes. Integrated weed management strategies including crop rotation, tillage, and a systems approach using residual herbicides followed by POST herbicides with different modes of action will be required for control of atrazine and HPPD-inhibiting herbicide-resistant Palmer amaranth biotypes for sustainable seed corn production in Nebraska.

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Table 1: Values of ED₉₀^a and the level of resistance for Palmer amaranth populations based on visual control estimates at 21 days after treatment in a dose response study with Callisto, Laudis, Impact, and atrazine in greenhouse studies.^a

<i>Palmer amaranth population</i>	<i>ED₉₀ (±SE)</i>	<i>Resistance Level^b at ED₉₀</i>
Callisto (fl oz/acre)		
Susceptible	7(1)	—
Resistant	29 (7)	4x
Laudis (fl oz/acre)		
Susceptible	1 (0.1)	—
Resistant	6 (1)	6x
Armezon/Impact (fl oz/acre)		
Susceptible	0.2 (0.02)	—
Resistant	4.6 (0.9)	23x
Aatrex (fl oz/acre)		
Susceptible	1.6 (0.3)	—
Resistant	13.5 (60) ^c	14x

^aAbbreviations: ED₉₀, effective dose required to control 90% population; SE, standard error.

^bResistance level was calculated by dividing ED₉₀ value of resistant Palmer amaranth population by ED₉₀ value of susceptible population for each herbicide tested.

^cThese values have a limited biological meaning because 90% control was never achieved.

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