Response of Palmer amaranth (*Amaranthus palmeri*) to glyphosate and PPO-inhibiting herbicide tank-mixtures

Jesaelen G. Moraes, Thomas R. Butts, and Greg R. Kruger

Department of Agronomy & Horticulture, University of Nebraska-Lincoln

Introduction

Palmer amaranth (*Amaranthus palmeri S. Wats.*) is one of the most invasive, competitive, and aggressive pigweed species. It has become a major agricultural challenge due to its rapid growth, aggressive competition, germination throughout the season, high fecundity, and the evolution of resistance to different herbicide modes-of-action. One of the approaches to delay the evolution of resistance is the use of tank-mixtures containing herbicides for postemergence applications.

Objective

Evaluate the response of Palmer amaranth to glyphosate and PPO-inhibiting herbicide tank-mixtures as influenced by nozzle selection.

Materials & Methods

- Two different fallow fields located in Beaver City, NE
- **Experimental design**

  Randomized Complete Block Design (RCBD) with four replications
- **Treatments structure**

	SOLUTIONS	NOZZLES (11004)		
		XR	AIXR	TTI
1	Glyphosate + AMS			
2	Glyphosate + Lactofen + AMS + COC			
3	Glyphosate + Fomesafen + AMS + COC			
4	Lactofen + AMS + COC			
5	Fomesafen + AMS + COC			

RATES	
Glyphosate	1.2 kg ae ha^{-1}
Fomesafen	0.13 kg ai ha^{-1}
Lactofen	0.22 kg ai ha^{-1}
AMS	20.4 g l^{-1}
COC	1% v v^{-1}

- Treatments were sprayed at 187 l ha^{-1} in 9.6 kph, and 275 kPa
- **Application**

  Co_2 pressure boom mounted to a Bobcat 3400 UTV with a four nozzle spaced 50 cm apart and at 50 cm above the plants

	Field	
Application	1st	2nd
Date	6/30/2016	7/6/2016
Applic. timing	3:30 PM	2:10 PM
Wind speed (kph)	13	5
Cloud cover (%)	30	10
Air temperature (°C)	27	32
Humidity (%)	50	45
Weed size (cm)	58	30

- Visual estimations of injury at 7, 14, 21 and 28 DAT
- **Droplet size spectra**

  Low- speed wind tunnel at the Pesticide Application Technology (PAT) with a Sympatec HELOS-VARIO/KR laser diffraction system.
- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test with the Tukey adjustment

Results

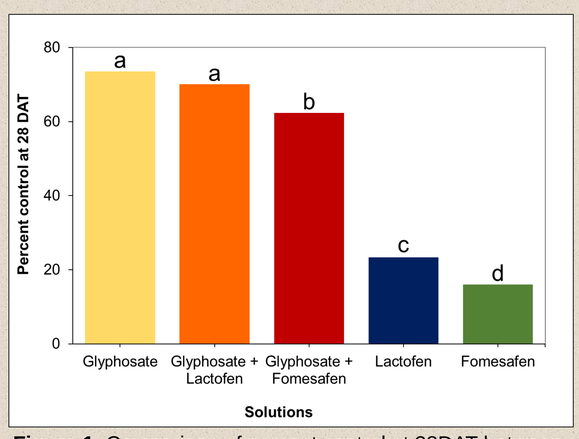

Figure 1. Comparison of percent control at 28DAT between five different solutions.

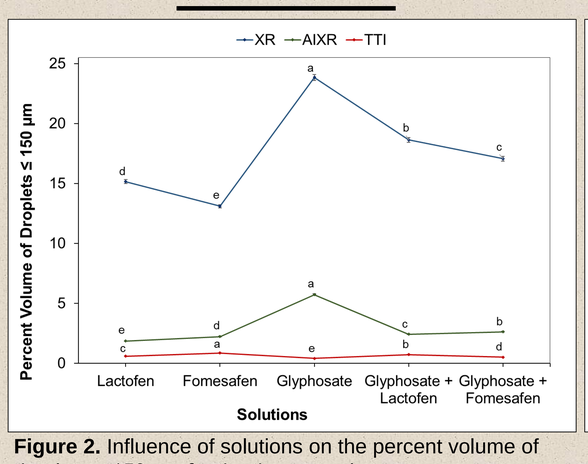

Figure 2. Influence of solutions on the percent volume of droplets ≤ 150 µm for the three nozzle types.

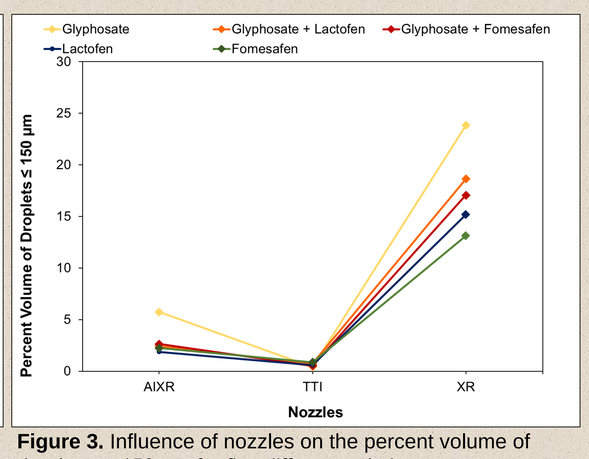

Figure 3. Influence of nozzles on the percent volume of droplets ≤ 150 µm for five different solutions.

Figure 4. Images of injury at 14 DAT using the XR nozzle. [0] Untreated , [1] Glyphosate , [5] Glyphosate + Lactofen , [4] Glyphosate + Fomesafen , [3] Lactofen , [2] Fomesafen.

Figure 5. Images of injury at 14 DAT using the TTI nozzle. [0] Untreated , [1] Glyphosate , [5] Glyphosate + Lactofen , [4] Glyphosate + Fomesafen , [3] Lactofen , [2] Fomesafen.

Conclusions

- The interaction between nozzle and solution were all significant (p<0.0001) for droplet size spectra. Nozzle selection did not influence control of Palmer amaranth;
- Both solutions glyphosate and glyphosate + lactofen provided the best control by increasing injury by 8, 47, and 54% compared to solutions lactofen, glyphosate + fomesafen, and fomesafen, respectively;
- The interaction between nozzle and solution had an impact on the percent volume of fine droplets (<150 µm) produced;
- The percent volume of fine droplets were increased when glyphosate was used alone in combination with the XR nozzle, followed by the AIXR nozzle. The droplet size for the TTI nozzle remained unchanged across solutions.

Discussion

- Since nozzle (and thereby, droplet size) did not influence control of Palmer amaranth, it would be recommended to use TTI nozzles as the larger droplets would minimize the drift potential of the spray application.

Further Information

- Access the PAT LAB website page using the QR Code
- Poster in pdf version will be available on the tab: Research and Innovation.

Jesaelen G. Moraes
(402) 219-1674
jesaelenmoraes@huskers.unl.edu