

Should atrazine at reduced rates be applied PRE or POST in tank-mix combinations to improve giant ragweed control in corn?

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Introduction

Giant ragweed (*Ambrosia trifida* L.) is currently the only confirmed glyphosate-resistant weed in Wisconsin. Atrazine is an effective broadleaf herbicide to help provide control of giant ragweed in corn, and often it is used at reduced rates in Wisconsin to decrease its environmental impact.

Objective

To determine if reduced rates of atrazine should be applied preemergence (PRE) or postemergence (POST) to improve giant ragweed control and herbicide resistance management strategies in corn

Materials and Methods

A field experiment was conducted near Sauk City, WI. Rainfall was seasonably low, totaling only 4.4 cm from planting (May 11) until canopy closure (July 13).

Treatments

PRE	Rate*	POST (V4 Corn)	Rate*
	kg ha ⁻¹		kg ha ⁻¹
Atrazine	1.12	Glufosinate	0.45
Atrazine	1.12	Tembotrione	0.092
Atrazine	1.12	Glyphosate	0.87
Atrazine	0.56	Glufosinate	0.45
Atrazine	0.56	Tembotrione	0.092
Atrazine	0.56	Glyphosate	0.87
		Glufosinate + Atrazine	0.45 + 1.12
		Tembotrione + Atrazine	0.092 + 1.12
		Glyphosate + Atrazine	0.87 + 1.12
		Glufosinate + Atrazine	0.45 + 0.56
		Tembotrione + Atrazine	0.092 + 0.56
		Glyphosate + Atrazine	0.87 + 0.56
		Glufosinate	0.45
		Tembotrione	0.092
		Glyphosate	0.87
Weedy Control			
Weedy Control			
Weed Free Control			

* Rates are reported in acid equivalent for glyphosate and active ingredient for all other herbicides.

Data Collected

- Giant ragweed plants were counted (m⁻²) at the POST application timing.
- Giant ragweed control was estimated visually prior to harvest (scale ranging from 0 to 100, with 100 representing complete control)
- Giant ragweed biomass was collected (m⁻²) prior to corn harvest and dried at 54°C for one week.
- Corn yield was adjusted to 15.5% moisture.

Materials and Methods cont.

Experimental Design and Data Analysis

- RCBD with 3x5 factorial and 3 replications
 - 3 Post Herbicide Programs (Glyphosate, Glufosinate, Tembotrione)
 - 5 combinations of atrazine rates (kg ai ha⁻¹) and timings (0, 0.56 PRE, 1.12 PRE, 0.56 POST, 1.12 POST)
 - Weed free and weedy controls were not used in analysis
- Giant ragweed biomass data and counts were natural log transformed prior to analysis as suggested by the BoxCox method.
- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD ($\alpha = 0.1$). Preplanned contrasts were used to compare treatments with different atrazine rates and timings.
- Backtransformed data are presented for clarity.

Results

Atrazine applied PRE, regardless of rate, did not reduce giant ragweed densities present at the time of POST application ($P = 0.4797$).

Table 1. Influence of atrazine rate and timing on giant ragweed biomass, giant ragweed control, and corn yield from Sauk City, WI in 2012

Preplanned contrasts	Prior to Harvest					
	Giant ragweed biomass		Giant ragweed control		Corn yield	
	Mean	P > F	Mean	P > F	Mean	P > F
	g m ⁻²		% Control		kg ha ⁻¹	
Atrazine Timing						
PRE	4.9	0.0025	96	0.0438	11,220	NS
POST	1.6		98		11,050	
Atrazine Use						
Atrazine	2.9	0.1370	97	0.0646	11,130	0.0149
No Atrazine	5.1		95		10,360	
Atrazine Rate						
1.12 kg ai ha ⁻¹	2.5	NS	97	NS	11,080	NS
0.56 kg ai ha ⁻¹	3.3		97		11,190	

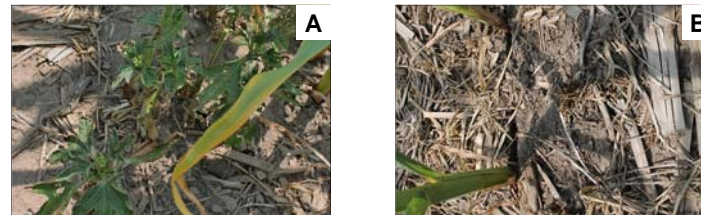


Figure 1. Giant ragweed 36 days after POST application of (A) glyphosate only at 0.45 kg ha⁻¹ and (B) glyphosate + atrazine at 0.87 kg ha⁻¹ + 1.12 kg ha⁻¹.

Results cont.

Table 2. Giant ragweed biomass prior to harvest as influenced by atrazine rate and timing combinations and different POST herbicide programs.

Atrazine Rate	Timing	POST Program ^a			
		Glufosinate Mean	Glufosinate Group ^b	Glyphosate Mean	Glyphosate Group ^b
None		12.91	C	7.29	B
0.56	PRE	6.60	C	3.63	B
1.12	PRE	5.69	BC	5.75	B
0.56	POST	1.34	AB	4.38	B
1.12	POST	1.05	A	0.02	A

^a Giant ragweed biomass was not different between POST atrazine (1.12 kg ai ha⁻¹) and no atrazine, with tembotrione as the POST herbicide program.

^b Similar letters are not significantly different ($\alpha = 0.1$).

Conclusions

We conclude from 2012 results that atrazine improved giant ragweed control and increased corn yield as part of a herbicide program, even at reduced rates. POST applied atrazine improved late season giant ragweed control and further reduced giant ragweed biomass compared to PRE applied atrazine. Furthermore, when glyphosate and glufosinate were used as the POST herbicide program, atrazine applied at 1.12 kg ai ha⁻¹ POST reduced late season giant ragweed biomass compared to no atrazine or atrazine applied PRE. Based on similar giant ragweed densities at the POST timing, regardless of PRE atrazine rates, applying atrazine at the POST timing may be a better herbicide resistance management strategy when reduced rates are used.