

Strategies for Managing Herbicide Tolerant Volunteer Corn in 2,4-D Tolerant Soybeans



Ryan P. Miller, Lisa M. Behnken, Debalin Sarangi

Introduction

- Soybean varieties tolerant to 2,4-D choline, glyphosate, and glufosinate have been widely adopted by MN soybean growers
- Growers and Ag-professionals report difficulties controlling volunteer corn in this system
- ACCase-inhibiting herbicides when tank mixed with auxinic herbicides show antagonism and result in reduced control of grassy weeds
- Growers relying on previously effective ACCase-inhibiting herbicide rates and application strategies see inadequate volunteer corn control
- Objective:** Evaluate the interaction between ACCase-inhibiting herbicides (clethodim and quizalofop-ethyl) and 2,4-D choline alone or 2,4-D choline with glyphosate in tank-mixes with and without S-metolachlor when controlling glyphosate-resistant volunteer corn 2,4-D tolerant soybeans

Methods

- Research was conducted at Rochester and Waseca, MN in 2022 and 2023 to evaluate the interaction between ACCase-inhibiting herbicides and tank-mix partners and the effect on glyphosate resistant volunteer corn control
- Experiments utilized a randomized complete block design with four replications
- Volunteer corn seeds were collected from grain harvested the previous year from a field that was planted to a glyphosate tolerant hybrid
- Volunteer corn seed was planted 3.8 cm deep at a density of 10,117 plants ha⁻¹, in 76 cm rows planted perpendicular to the soybean rows
- An initial application of 1.42 kg a.i. ha⁻¹ S-metolachlor (SMOCH) was sprayed PRE to minimize weed pressure without affecting volunteer corn growth
- Clethodim was applied at 50 g a.i. ha⁻¹ or 76 g a.i. ha⁻¹, and quizalofop-ethyl was applied at 30 g a.i. ha⁻¹ and 92 g a.i. ha⁻¹
- The 16 POST applied tank-mix treatments consisted of a core treatment with each graminicide at a low and high rate, both with and without SMOCH (Table 1)
- Sequential applications started with 2,4-D choline plus glyphosate core treatment followed by the low rate of each graminicide (Table 2)
- Appropriate adjuvants were added to each tank mix combination and all treatments were made at 6.4 KPH with a tractor-mounted sprayer delivering 56.8 LPA at 2.75 Bars using 110015 AIXR nozzles

Table 1. Core Treatment	Volunteer Corn Control	Residual
2,4-D choline @ 1,064 g a.e. ha ⁻¹	Quizalofop-ethyl (low rate) @ 30 g a.i. ha ⁻¹	S-metolachlor @ 1,067 g a.i. ha ⁻¹
	Quizalofop-ethyl (high rate) @ 92 g a.i. ha ⁻¹	
2,4-D choline @ 1,064 g a.e. ha ⁻¹ + Glyphosate @ 1,260 g a.e. ha ⁻¹	Clethodim (low rate) @ 50 g a.i. ha ⁻¹	
	Clethodim (high rate) @ 76 g a.i. ha ⁻¹	

Table 2. Sequential Treatments 7 Days After POST I	
POST I	POST II
2,4-D choline @ 1,064 g a.e. ha ⁻¹ + Glyphosate @ 1,260 g a.e. ha ⁻¹	Quizalofop-ethyl (low rate) @ 30 g a.i. ha ⁻¹
	Clethodim (low rate) @ 50 g a.i. ha ⁻¹



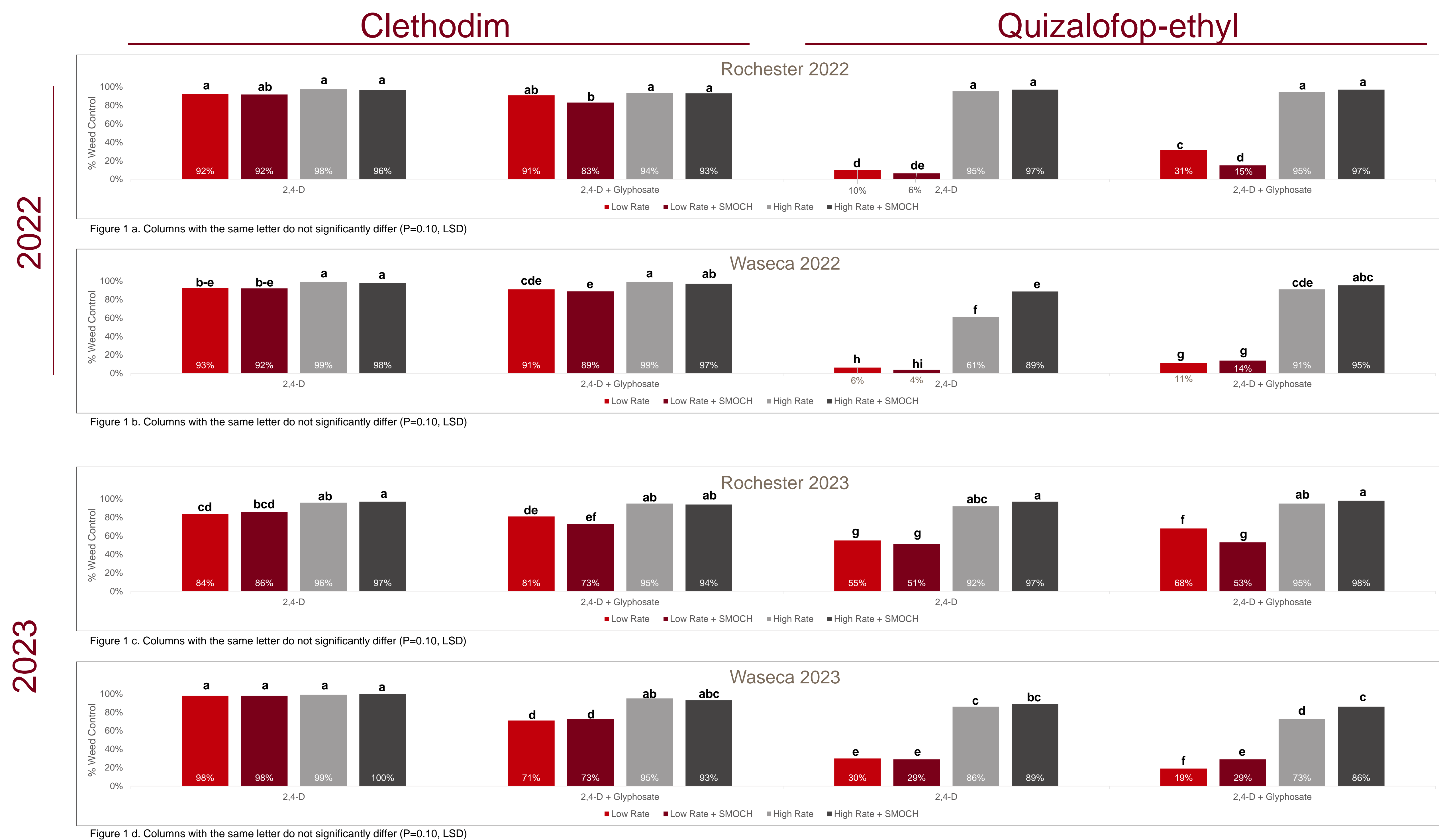
Complete Treatment List

More details!



Results

Volunteer Corn Control



Clethodim

- Tank-mixes with clethodim at the higher rates provided consistent and adequate ($\geq 90\%$) VC control
- Tank-mixes with clethodim at low rates provided better weed control than tank-mixes with quizalofop-ethyl at low rates.
- In 2022, tank-mixes with clethodim at low rates provided adequate or nearly adequate VC control (Figures 1 a,b)
- In 2023 at Rochester, tank-mixes with clethodim at low rates did not achieve adequate ($< 90\%$) VC control (Figure 1 c)
- In 2023 at Waseca, tank-mixes with low rates of clethodim and 2,4-D alone had adequate VC control, while tank-mixes with low rates of clethodim and 2,4-D plus glyphosate had inadequate VC control. (Figure 1 d)

S-metolachlor

- Regardless of tank-mix combination, when VC control was acceptable, addition of SMOCH did not have any negative impact on VC control

Sequentials

- Sequential treatments provided adequate control of VC and were often some of the best treatments (data not shown)

Quizalofop-ethyl

- In 2022 and 2023 at all sites, the low rates of quizalofop-ethyl in tank-mixes with or without glyphosate resulted in reduced volunteer corn (VC) control when compared to the higher rate tank mixes (Figures 1 a-d)
- In 2022 and 2023 at all sites, the low rates of quizalofop-ethyl in tank-mixes with or without glyphosate resulted in unacceptable ($< 90\%$) VC control
- High rates of quizalofop-ethyl in tank-mixes resulted in inconsistent VC control
- In 2022 and 2023 at Waseca, high rates of quizalofop-ethyl in tank-mixes resulted in unacceptable VC control (Figures 1 b,d)
- In 2022 and 2023 at Rochester, high rates of quizalofop-ethyl in tank-mixes resulted in acceptable VC control (Figures 1 a,c)
- In 2022 at Waseca high rates of quizalofop-ethyl in tank-mixes including glyphosate resulted in better VC control than tank mixes without glyphosate (Figure 1 b)

Summary

In general, lower rates of either graminicide resulted in reduced volunteer corn control, and reduced control was more pronounced with quizalofop-ethyl treatments. Higher graminicide rates helped overcome the antagonism between ACCase-inhibiting herbicides and 2,4-D choline and could be a useful strategy for managing volunteer corn. Sequential applications could also work as an alternative to tank mixes. With the possible exception of clethodim tank mixes at Waseca in 2023, glyphosate did not appear to cause any antagonism and might have even provided a slight benefit to VC control.