

Early Postemergence and Sequential Herbicides for Weed Control in Corn

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Summary

In this study, herbicides were tested to compare sequential and split rates for weed control in corn. Control of green foxtail, Russian thistle, and quinoa was excellent regardless of herbicide treatment, and most herbicides provided good kochia and Palmer amaranth control. Minor corn injury occurred with some herbicides applied early postemergence or postemergence, but did not persist. All herbicide treatments increased grain yield 56 to 78% compared to the weedy control, but yields did not differ between herbicide treatments.

Introduction

Historically, herbicides such as Acuron, Degree Xtra, Resicore, and Warrant were applied preemergence to corn to provide residual weed control until the crop became established and competitive with the weeds. As resistance issues to postemergence herbicides have increased, applying reduced rates of these residual herbicides preemergence and as part of a planned postemergence application has become increasingly popular. Applying these herbicides in a sequential program not only extends the residual weed control but also increases the modes of action used in the postemergence component. The objective of this study was to compare residual herbicides applied sequentially at split rates for efficacy in corn.

Experimental Procedures

An experiment was conducted at the Kansas State University Southwest Research-Extension Center near Garden City, KS, to compare various herbicides applied preemergence (PRE) followed by postemergence (POST) or early postemergence (EPOST) for weed control in corn. All herbicides were applied using a tractor-mounted, compressed CO₂ sprayer delivering 19.4 GPA at 4.1 mph and 30 psi. Application, environmental, and weed information are shown in Table 1. Plots were 10 by 35 feet and arranged in a randomized complete block design with four replications. Soil was a Beeler silt loam with 2.4% organic matter and pH of 7.6. Visual estimates of weed control were taken on June 17, July 8, and July 22, 2019. These dates were 7, 28, and 42 days after the POST applications (DA-C), respectively. Corn injury ratings were determined on June 7, June 17, and June 27, 2019, and these dates were 4 days after the EPOST applications (DA-B) and 7 or 17 DA-C. Yields were determined on September 19, 2019, by mechanically harvesting the center two rows of each plot and adjusting grain weights to 15.5% moisture.

Results and Discussion

All herbicides controlled Russian thistle, quinoa, and green foxtail 96% or more regardless of rating date, and did not differ between treatments (data not shown). Kochia control at 7 and 42 DA-C was slightly less with Capreno (thiencarbazone/tembotrione) plus Degree Xtra (acetochlor/atrazine), Clarity (dicamba), and glyphosate applied EPOST compared to the other herbicides and with Diflexx Duo (dicamba/tembotrione) plus Degree Xtra and glyphosate applied EPOST at 42 DA-C (Table 2). All herbicides except Acuron (atrazine/*S*-metolachlor/mesotrione/bicyclopyrone) PRE followed by Acuron plus glyphosate POST controlled Palmer amaranth 98% or more at 7 and 28 DA-C. By 42 DA-C, no differences occurred among herbicides for Palmer amaranth control. Corn chlorosis was 6 to 11% with the EPOST herbicides at 4 DA-B but did not persist (Table 3). All POST treatments containing mesotrione (Acuron, Harness Max, and Resicore) caused 11 to 19% corn chlorosis at 7 DA-C, but visible corn injury at 17 DA-C was 5% or less regardless of herbicide treatment. Grain yields were 38 to 52 bu/a more from herbicide-treated corn than from the nontreated controls. However, corn yields did not differ between herbicide treatments.

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Table 1. Application information

Application timing	Preemergence	Early postemergence	Postemergence
Application date	May 1, 2019	June 3, 2019	June 10, 2019
Air temperature (°F)	51	68	66
Relative humidity (%)	75	67	45
Soil temperature (°F)	53	67	63
Wind speed (mph)	3 to 6	5 to 8	4 to 6
Wind direction	South-southeast	South-southwest	South-southwest
Soil moisture	Good	Good	Good
Corn			
Height (inch)	PRE	5 to 8	8 to 12
Leaves (number)	---	2 to 3	4 to 5
Kochia			
Height (inch)	PRE	1 to 2	1 to 2
Density (plants/10 ft ²)	---	5	2
Palmer amaranth			
Height (inch)	PRE	0.5 to 2	1 to 2
Density (plants/10 ft)	---	5	1
Russian thistle			
Height (inch)	PRE	1 to 2	0
Density (plants/10 ft ²)	---	2	0
Quinoa			
Height (inch)	PRE	1 to 3	0
Density (plants/10 ft ²)	---	2	0
Green foxtail			
Height (inch)	PRE	0.5 to 1	1 to 2
Density (plants/10 ft ²)	---	5	1

Table 2. Sequential and early postemergence weed control in corn

Treatment ¹	Rate	Timing ²	Kochia			Palmer amaranth		
			7 DA-C ³	28 DA-C	42 DA-C	7 DA-C	28 DA-C	42 DA-C
			----- % visual -----					
Corvus	3.3	PRE	100	100	100	98	99	96
Atrazine	32	PRE						
Harness Max	40	POST						
Atrazine	16	POST						
Glyphosate	32	POST						
NIS	0.5%	POST						
AMS	1.0%	POST						
Balance Flexx	3.0	PRE	100	100	99	100	100	99
Harness Xtra 5.6	48	PRE						
Capreno	3.0	POST						
Atrazine	16	POST						
Glyphosate	32	POST						
Superb HC	0.5%	POST						
AMS	1.0%	POST						
Balance Flexx	3.0	PRE	100	100	100	100	99	98
Harness Xtra 5.6	48	PRE						
Laudis	3.0	POST						
Atrazine	16	POST						
Warrant	48	POST						
Glyphosate	32	POST						
Superb HC	0.5%	POST						
AMS	1.0%	POST						
Resicore	40	PRE	100	100	100	100	99	98
Atrazine	32	PRE						
Resicore	40	POST						
Atrazine	16	POST						
Glyphosate	32	POST						
NIS	0.5%	POST						
AMS	1.0%	POST						
Harness Xtra 5.6	41	PRE	100	100	100	100	100	100
Atrazine	32	PRE						
Harness Max	40	POST						
Atrazine	16	POST						
Glyphosate	32	POST						
NIS	0.5%	POST						
AMS	1.0%	POST						
Acuron	40	PRE	99	100	99	95	94	95
Acuron	40	POST						
Glyphosate	32	POST						
NIS	0.5%	POST						
AMS	1.0%	POST						

continued

Table 2. Sequential and early postemergence weed control in corn

Treatment ¹	Rate	Timing ²	Kochia			Palmer amaranth		
			7 DA-C ³	28 DA-C	42 DA-C	7 DA-C	28 DA-C	42 DA-C
			----- % visual -----					
Balance Flexx	3.0	PRE	100	100	100	100	99	100
Degree Xtra	48	PRE						
Laudis	3.0	POST						
Degree Xtra	48	POST						
Glyphosate	32	POST						
Superb HC	0.5%	POST						
AMS	1.0%	POST						
Diflexx Duo	32	EPOST	98	96	96	100	100	100
Degree Xtra	3.0	EPOST						
Glyphosate	32	EPOST						
Superb HC	0.5%	EPOST						
AMS	1.0%	EPOST						
Capreno	3.0	EPOST	93	95	94	100	100	100
Degree Xtra	96	EPOST						
Clarity	8.0	EPOST						
Glyphosate	32	EPOST						
Superb HC	0.5%	EPOST						
AMS	1.0%	EPOST						
LSD (0.05)			3	NS	3	3	4	NS

¹ NIS = nonionic surfactant. AMS = ammonium sulfate.

² PRE = preemergence. POST = postemergence. EPOST = early postemergence.

³ DA-C = days after postemergence treatment.

Table 3. Crop response to sequential and early postemergence herbicides applied in corn

Treatment ¹	Rate oz/a	Timing ²	Chlorosis		Stunting 4 DA-B	Necrosis 17 DA-C	Yield bu/a
			4 DA-B ³	7 DA-C ³			
Untreated		---	0	0	0	0	67.2
Corvus	3.3	PRE	0	19	0	5	104.8
Atrazine	32	PRE					
Harness Max	40	POST					
Atrazine	16	POST					
Glyphosate	32	POST					
NIS	0.5%	POST					
AMS	1.0%	POST					
Balance Flexx	3.0	PRE	0	5	0	3	117.7
Harness Xtra 5.6	48	PRE					
Capreno	3.0	POST					
Atrazine	16	POST					
Glyphosate	32	POST					
Superb HC	0.5%	POST					
AMS	1.0%	POST					
Balance Flexx	3.0	PRE	0	5	0	1	110.0
Harness Xtra 5.6	48	PRE					
Laudis	3.0	POST					
Atrazine	16	POST					
Warrant	48	POST					
Glyphosate	32	POST					
Superb HC	0.5%	POST					
AMS	1.0%	POST					
Resicore	40	PRE	0	16	0	5	108.0
Atrazine	32	PRE					
Resicore	40	POST					
Atrazine	16	POST					
Glyphosate	32	POST					
NIS	0.5%	POST					
AMS	1.0%	POST					
Harness Xtra 5.6	41	PRE	0	19	0	5	114.8
Atrazine	32	PRE					
Harness Max	40	POST					
Atrazine	16	POST					
Glyphosate	32	POST					
NIS	0.5%	POST					
AMS	1.0%	POST					
Acuron	40	PRE	0	11	0	1	113.7
Acuron	40	POST					
Glyphosate	32	POST					
NIS	0.5%	POST					
AMS	1.0%	POST					

continued

Table 3. Crop response to sequential and early postemergence herbicides applied in corn

Treatment ¹	Rate	Timing ²	Chlorosis		Stunting 4 DA-B	Necrosis 17 DA-C	Yield
			4 DA-B ³	7 DA-C ³			
			----- % visual -----				
Balance Flexx	3.0	PRE	0	1	0	0	111.2
Degree Xtra	48	PRE					
Laudis	3.0	POST					
Degree Xtra	48	POST					
Glyphosate	32	POST					
Superb HC	0.5%	POST					
AMS	1.0%	POST					
Diflexx Duo	32	EPOST	6	3	4	1	110.1
Degree Xtra	3.0	EPOST					
Glyphosate	32	EPOST					
Superb HC	0.5%	EPOST					
AMS	1.0%	EPOST					
Capreno	3.0	EPOST	11	3	10	0	119.8
Degree Xtra	96	EPOST					
Clarity	8.0	EPOST					
Glyphosate	32	EPOST					
Superb HC	0.5%	EPOST					
AMS	1.0%	EPOST					
LSD (0.05)			3	5	5	3	22.8

¹ NIS = nonionic surfactant. AMS = ammonium sulfate.

² PRE = preemergence. POST is postemergence. EPOST = early postemergence.

³ DA-B = days after early postemergence applications. DA-C = days after postemergence applications.



Figure 1. Untreated control.



Figure 2. Resicore 40 oz/a plus atrazine 32 oz/a applied preemergence followed by Resicore 40 oz/a plus atrazine 16 oz/a plus glyphosate 32 oz/a applied postemergence. Photo taken 17 days after the postemergence application.



Figure 3. Harness Xtra 5.6 at 40 oz/a plus atrazine 32 oz/a applied preemergence followed by Harness Max 40 oz/a plus atrazine 16 oz/a plus glyphosate 32 oz/a applied postemergence. Photo taken 17 days after the postemergence application.



Figure 4. Acuron 40 oz/a applied preemergence followed by Acuron 40 oz/a plus glyphosate 32 oz/a applied postemergence. Photo taken 17 days after the postemergence application.



Figure 5. Balance Flexx 3 oz/a plus Degree Xtra 48 oz/a applied preemergence followed by Laudis 3 oz/a plus Degree Xtra 48 oz/a plus glyphosate 32 oz/a postemergence. Photo taken 17 days after the postemergence application.