K-STATE Research and Extension

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Single and Sequential Herbicide Treatments for Efficacy in Corn

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Summary

In this study, herbicides were tested to compare application of single and sequential treatments for weed control in corn. Quinoa and Russian thistle control was 95% or more regardless of herbicide treatment. Anthem Maxx, Resicore, and Corvus followed by Harness Max provided good control of Palmer amaranth. Acuron applied preemergence and Anthem Maxx plus Callisto and atrazine early postemergence were less effective on kochia than other herbicides, whereas Anthem Maxx plus Callisto and atrazine applied preemergence and Halex GT applied early postemergence were less effective on green foxtail. Grain yields from all herbicide-treated corn were substantially greater than for the nontreated control plots.

Introduction

As of 2019, 28 weed species have been reported to have herbicide resistance in Kansas. Use of herbicides with multiple modes of action and sequential applications of herbicides are two effective strategies to combat the development of herbicide-resistant weed species. The objective of this study was to compare single applications of herbicides with multiple modes of action to sequential applications 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 preemergence (PRE), early postemergence (EPOST), or PRE followed by postemergence (POST) herbicides for weed control in corn. All herbicides were applied using a tractor-mounted, compressed CO_2 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 weed control ratings were taken on June 27 and July 23, 2019. These dates were 1 and 27 days after the POST treatment (DA-C), respectively. Corn 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

Quinoa and Russian thistle control was essentially complete with all herbicides regardless of rating date (data not shown). All herbicide treatments containing Anthem Maxx (pyroxasulfone/fluthiacet) PRE controlled Palmer amaranth 95 to 100% at 1 and

27 DA-C, as did the treatment of Resicore (acetochlor/mesotrione/clopyralid) PRE (Table 2). Corvus (isoxaflutole/thiencarbazone) plus atrazine PRE followed by Harness Max (acetochlor/mesotrione) plus atrazine and glyphosate POST also controlled Palmer amaranth 95% at 27 DA-C. Kochia control at 1 and 27 DA-C was slightly less with Acuron (*S*-metolachlor/atrazine/mesotrione/bicyclopyrone) PRE or Anthem Maxx plus Callisto (mesotrione) and atrazine EPOST, compared to the most efficacious treatments. Green foxtail control was 95% or more with all herbicides except Anthem Maxx plus Callisto and atrazine PRE and Halex GT (*S*-metolachlor/glyphosate/mesotrione) plus atrazine EPOST at 27 DA-C. Yields of herbicide-treated corn plots ranged from 99.8 to 115.4 bu/a, which was 61 to 77 bu/a more than nontreated corn.

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Table 1. Application information

Application timing	Preemergence	Early postemergence	Postemergence
Application date	May 18, 2019	June 10, 2019	June 26, 2019
Air temperature (°F)	51	68	68
Relative humidity (%)	64	34	61
Soil temperature (°F)	60	69	71
Wind speed (mph)	0 to 2	3 to 6	3 to 5
Wind direction	North	South-southwest	South
Soil moisture	Good	Good	Good
Corn			
Height (inch)	0	6 to 9	15 to 20
Leaves (number)	---	2 to 3	6 to 7
Palmer amaranth			
Height (inch)	0	1 to 3	2 to 4
Density (plants/10 ft^2)	---	10	1
Kochia			
Height (inch)	0	1 to 3	2 to 3
Density (plants/10 ft^2)	---	10	1
Russian thistle			
Height (inch)	0	1 to 3	3 to 5
Density (plants/10 ft^2)	---	3	1
Quinoa			
Height (inch)	0	1 to 2	0
Density (plants/10 ft^2)	---	2	---
Green foxtail			
Height (inch)	0	1 to 2	2 to 3
Density (plants/10 ft^2)	---	10	1

Table 2. Single and sequential herbicide efficacy in corn

Treatment[1]	Rate	Timing[2]	Palmer amaranth		Kochia		Green foxtail		Corn yield
			1 DA-C[3]	27 DA-C	1 DA-C	27 DA-C	1 DA-C	27 DA-C	
	oz/a		% visual						bu/a
Untreated			---	---	---	---	---	---	38.3
Anthem Maxx	4.0	PRE	98	99	100	100	96	95	105.3
Balance Flexx	3.0	PRE							
Atrazine	48	PRE							
Anthem Maxx	4.0	PRE	100	100	100	100	95	93	110.1
Callisto	4.0	PRE							
Atrazine	32	PRE							
Corvus	5.6	PRE	85	86	100	100	96	95	99.8
Atrazine	48	PRE							
Acuron	80	PRE	91	89	91	90	100	96	107.6
Resicore	80	PRE	98	100	99	96	100	99	109.7
Anthem Maxx	3.0	EPOST	89	90	94	93	100	99	108.7
Callisto	3.0	EPOST							
Atrazine	32	EPOST							
Glyphosate	28	EPOST							
AMS	1.0%	EPOST							
Halex GT	58	EPOST	89	86	99	95	96	94	115.4
Atrazine	32	EPOST							
NIS	0.25%	EPOST							
AMS	1.0%	EPOST							
Anthem Maxx	4.0	PRE	95	100	100	100	98	100	104.0
Callisto	3.0	PRE							
Atrazine	48	PRE							
Status	4.0	POST							
Glyphosate	28	POST							
AMS	1.0%	POST							
Corvus	5.6	PRE	86	95	95	99	100	99	104.9
Atrazine	32	PRE							
Harness Max	40	POST							
Atrazine	16	POST							
Glyphosate	28	POST							
AMS	1.0%	POST							
LSD (0.05)			8	9	5	6	3	5	15.4

[1] NIS = nonionic surfactant. AMS = ammonium sulfate.
[2] PRE = preemergence. EPOST = early postemergence. POST = postemergence.
[3] DA-C = days after the postemergence treatments.

Figure 1. Untreated control.

Figure 2. Anthem Maxx 4 oz/a plus Balance Flexx 3 oz/a plus atrazine 48 oz/a applied preemergence. Photo taken 40 days after the preemergence application.

Figure 3. Resicore 80 oz/a applied preemergence. Photo taken 40 days after the preemergence application.

Figure 4. Halex GT 58 oz plus atrazine 32 oz/a applied early postemergence. Photo taken 17 days after early postemergence application.

Figure 5. Anthem Maxx 4 oz/a plus Callisto 3 oz plus atrazine 48 oz/a applied preemergence, followed by Status 4 oz/a plus glyphosate 28 oz/a applied postemergence. Photo taken 1 day after the postemergence application.