

Efficacy of Sequential Herbicide Applications in Glufosinate- and Glyphosate-Resistant Corn

R.S. Currie and P.W. Geier

Summary

To determine their efficacy in corn, this study compared two preemergence programs and sequential glufosinate (Interline) or glyphosate (Roundup PowerMax). Control of common sunflower and Russian thistle was excellent regardless of herbicide treatment. Preemergence herbicides alone provided no more than 78% johnsongrass control early in the season. By late season, only those plots receiving Roundup PowerMax had more than 85% johnsongrass control. However, corn yields did not differ among treatments, and all herbicides increased yield 70–97% relative to nontreated corn.

Introduction

With the recent increase in glyphosate-resistant weeds, management practices that minimize resistance development have become even more important. Use of premixtures (multiple modes of action), tank mixtures, and non-glyphosate herbicides are increasingly needed to manage changing weed spectrums. The use of a strong residual herbicide program as well as control of escaped weeds is important. The objective of this study was to compare two preemergence programs and sequential glufosinate (Interline) or glyphosate (Roundup PowerMax) 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 Coyote (*S*-metolachlor/mesotrione) as a preemergence (PRE) or postemergence (POST) treatment with Interline (glufosinate) or Roundup PowerMax (glyphosate) for efficacy in corn. All plots also received a late postemergence (LPOST) application of Interline or Roundup PowerMax. Herbicides were applied using a tractor-mounted, compressed CO₂ sprayer delivering 19.4 GPA at 4.2 mph and 30 psi. Application, environmental, crop, and weed information is shown in Table 1. Natural weed populations were supplemented by overseeding the experimental area with domesticated sunflower to simulate common sunflower. Plots were 10 × 32 feet and arranged in a randomized complete block with four replications. Soil was a Beeler silt loam with 2.4% organic matter and pH 7.6. Visual weed control was determined on May 30, June 26, and August 2, 2018. These dates were 14 days after the PRE treatments (14 DA-A), and 13 and 50 days after the LPOST treatments (13 and 50 DA-C). Corn yields were determined on October 5, 2018, by mechanically harvesting the center two rows of each plot and adjusting grain weights to 15.5% moisture.

Results and Discussion

All herbicides controlled common sunflower and Russian thistle by 95% or more regardless of rating date, and did not differ between treatments (data not shown). At 14 DA-A, Coyote plus Tricor (metribuzin) and Tricor plus Satellite HydroCap (pendimethalin) controlled johnsongrass similarly, 73–78%, when applied PRE (Table 2). Johnsongrass control was 95% or more with all herbicides except Tricor plus Satellite HydroCap PRE followed by Coyote plus Interline POST and Interline LPOST at 13 DA-C. By 50 DA-C, only those plots receiving Roundup PowerMax POST and LPOST had greater than 80% johnsongrass control. Grain yields were 50–69 bu/a greater with herbicide-treated corn compared to the nontreated controls, but yields did not differ between treatments (Table 2).

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Persons using such products assume responsibility for their use in accordance with current label directions of the manufacturer.

Table 1. Application information

Application timing	Preemergence	Postemergence	Late postemergence
Application date	May 16, 2018	May 31, 2018	June 13, 2018
Air temperature (°F)	88	71	86
Relative humidity (%)	31	57	39
Soil temperature (°F)	71	65	76
Wind speed (mph)	2 to 5	2 to 4	3 to 5
Wind direction	South-southeast	Southwest	East-southeast
Soil moisture	Good	Good	Good
Corn			
Height (inch)	---	2 to 4	9 to 12
Leaves (number)	0	1 to 2	4 to 5
Johnsongrass			
Height (inch)	---	1 to 4	1 to 4
Density (plants/10 feet ²)	0	5.0	2.5
Common sunflower			
Height (inch)	---	1 to 2	---
Density (plants/10 feet ²)	0	1	0
Russian thistle			
Height (inch)	---	---	---
Density (plants/10 feet ²)	0	0	0

Table 2. Coyote, Interline, and Roundup PowerMax applications in corn

Treatment	Rate	Timing ^a	Johnsongrass			Corn yield bu/a
			14 DA-A ^b	13 DA-C ^c	50 DA-C	
			----- % Visual -----			
Coyote	2.0 qt	PRE	78	95	79	131.1
Tricor	5.3 oz	PRE				
Interline	29 oz	POST				
Ammonium sulfate	2.0%	POST				
Interline	29 oz	LPOST				
Ammonium sulfate	2.0%	LPOST				
Coyote	2.0 qt	PRE	78	100	89	136.4
Tricor	5.3 oz	PRE				
Roundup PowerMax	24 oz	POST				
Ammonium sulfate	2.0%	POST				
Roundup PowerMax	24 oz	LPOST				
Ammonium sulfate	2.0%	LPOST				
Tricor	5.3 oz	PRE	78	89	76	122.2
Satellite HydroCap	3.0 pt	PRE				
Coyote	2.0 qt	POST				
Interline	29 oz	POST				
Nonionic surfactant	0.25%	POST				
Ammonium sulfate	2.0%	POST				
Interline	29 oz	LPOST				
Ammonium sulfate	2.0%	LPOST				
Tricor	5.3 oz	PRE	73	99	89	141.0
Satellite HydroCap	3.0 pt	PRE				
Coyote	2.0 qt	POST				
Roundup PowerMax	24 oz	POST				
Ammonium sulfate	2.0%	POST				
Roundup PowerMax	24 oz	LPOST				
Ammonium sulfate	2.0%	LPOST				
Untreated	---	---	---	---	---	71.8
LSD (0.05)			NS	5	10	29.2

^aPRE = preemergence. POST = early postemergence. LPOST = late postemergence.

^bDA-A = days after the preemergence treatments.

^cDA-C = days after the late postemergence treatments.



Figure 1. Untreated control.



Figure 2. Coyote 2.0 qt/a plus Tricor 5.3 oz/a applied preemergence followed by Interline 29 oz/a postemergence and Interline 29 oz/a late postemergence, picture taken at the time of late postemergence applications.



Figure 3. Coyote 2.0 qt/a plus Tricor 5.3 oz/a applied preemergence followed by Roundup PowerMax 24 oz/a postemergence and Roundup PowerMax 24 oz/a late postemergence, picture taken at the time of late postemergence applications.



Figure 4. Tricor 5.3 oz/a plus Satellite HydroCap 3.0 pt/a applied preemergence followed by Coyote 2.0 qt/a plus Interline 29 oz/a postemergence and Interline 29 oz/a late postemergence, picture taken at the time of late postemergence applications.



Figure 5. Tricor 5.3 oz/a plus Satellite HydroCap 3.0 pt/a applied preemergence followed by Coyote 2.0 qt/a plus Roundup PowerMax 24 oz/a postemergence and Roundup PowerMax 24 oz/a late postemergence, picture taken at the time of late postemergence applications.