

Liberty Rates and Tank Mixes with Balance Flexx, Capreno, Diflexx, Halex GT, and Laudis for Weed Control in Irrigated Liberty-Resistant Corn

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Summary

Control of common sunflower, quinoa, green foxtail, and kochia was excellent regardless of herbicide treatment or evaluation date. Palmer amaranth and crabgrass control was 95% or more regardless of herbicide treatment at 7 days after postemergence application (DAPT). Postemergence applications of Liberty (glufosinate) at any rate alone controlled Palmer amaranth greater than 85% 72 DAPT, whereas tank mixing any herbicide with Liberty increased control 7 to 15%. Crabgrass control was greater than 89% at 72 DAPT with all treatments except when Liberty at 22 oz/a was applied with Diflexx (dicamba). Corn yields did not differ among herbicide-treated plots, but all herbicide treatments increased yield 118 to 149 bu/a relative to the untreated controls.

Introduction

The active ingredient in Liberty, glufosinate, was first reported to have herbicidal activity in 1981. Although it has very broad spectrum capacity to burn most weed species, it does not translocate well in plants so it only kills very small weeds. Further, it could also cause severe damage to crops. With the advent of Liberty Link soybean and corn with excellent resistance to glufosinate, this compound has had renewed interest for weed control. Further as more weeds have developed resistance to glyphosate, Liberty—when used on small weeds—has been shown to provide a suitable substitute. However, like glyphosate it lacks any preemergence weed control. Unlike glyphosate it also needs some assistance when applied to weeds above certain sizes. Therefore, it was the objective of this study to explore tank mixes of atrazine, Capreno (tembotrione + thien carbazon), Laudis (tembotrione), and Halex GT (*S*-metolachlor + glyphosate + mesotrione) to enhance weed control provided with Liberty.

Experimental Procedures

An experiment at the Kansas State University Southwest Research-Extension Center near Garden City, KS, evaluated Liberty rates and tank mix partners for postemergence weed control in corn. The experimental area was overseeded with a mixture of kochia, Palmer amaranth, crabgrass, quinoa, and domesticated sunflower seed prior to corn planting. Quinoa and domesticated sunflower were used as surrogates for common lambsquarters and common sunflower, respectively. All postemergence treatments were

preceded by a preemergence application of Balance Flexx at 3.0 oz/a + atrazine at 32 oz/a. Herbicides were applied using a tractor-mounted, compressed-CO₂ sprayer delivering 20 GPA at 30 psi. Application, environmental, crop, and weed details are shown in Table 1. Plot size was 10 × 35 feet and arranged in a randomized complete block with four replicates. Soil for the experiment was a Beeler silt loam with pH 7.6 and 2.4% organic matter. Weed control was visually rated on June 12 and August 16, 2017, which was 7 and 72 DAPT, respectively. Corn yields were determined on October 18, 2017, by mechanically harvesting the center two rows of each plot and adjusting grain weights to 15.5% moisture.

Results and Discussion

Control of quinoa, green foxtail, and kochia was 98% or more regardless of herbicide treatment or evaluation date (data not shown) as was common sunflower control (Table 2). Palmer amaranth and crabgrass control was 95% or more regardless of herbicide treatment at 7 DAPT. Postemergence applications of Liberty at any rate alone controlled Palmer amaranth 85 to 88% at 72 DAPT, whereas tank mixing any herbicide with Liberty increased control 7 to 15%. Crabgrass control was 89 to 96% at 72 DAPT with all treatments except when Liberty at 22 oz/a was applied with Diflexx at 10 oz/a (84%). Corn yields did not differ among herbicide-treated plots, but each herbicide treatment increased yield 118 to 149 bu/a relative to the untreated controls.

Table 1. Application information

Application timing	Preemergence	Postemergence
Application date	April 20, 2017	June 5, 2017
Air temperature (°F)	54	90
Relative humidity (%)	56	29
Soil temperature (°F)	60	90
Wind speed (mph)	8	5
Wind direction	North-northwest	Southeast
Soil moisture	Good	Good
Corn		
Height (inch)	---	8 to 10
Leaves (no.)	0	3 to 4
Common sunflower		
Height (inch)	---	4 to 6
Density (plants/10 ft ²)	0	3
Palmer amaranth		
Height (inch)	---	3 to 7
Density (plants/10 ft ²)	0	3
Green foxtail		
Height (inch)	---	2 to 3
Density (plants/10 ft ²)	0	2
Kochia		
Height (inch)	---	3 to 7
Density (plants/10 ft ²)	0	15
Russian thistle		
Height (inch)	---	3 to 6
Density (plants/m ²)	0	2
Crabgrass		
Height (inch)	---	2 to 4
Density (plants/10 ft ²)	0	10

Table 2. Liberty rates and tank mixtures in corn

Treatment	Rate	Timing ^a	Palmer amaranth		Common sunflower		Crabgrass		Corn yield
			7 DAPT ^b	72 DAPT	7 DAPT	72 DAPT	7 DAPT	72 DAPT	
			----- % Visual -----						
			-----						bu/a
Untreated	---		0	0	0	0	0	0	52.1
Balance Flexx	3.0	PRE	99	88	100	100	97	95	176.9
Atrazine	32	PRE							
Liberty	32	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	99	86	100	100	95	93	183.1
Atrazine	32	PRE							
Liberty	36	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	98	85	100	100	97	89	186.7
Atrazine	32	PRE							
Liberty	43	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	98	100	100	98	91	173.5
Atrazine	32	PRE							
Liberty	32	POST							
Atrazine	16	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	96	99	100	97	93	188.8
Atrazine	32	PRE							
Liberty	36	POST							
Atrazine	16	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	95	100	100	98	94	201.5
Atrazine	32	PRE							
Liberty	43	POST							
Atrazine	16	POST							
Ammonium sulfate	3.0 lb	POST							
Balance Flexx	3.0	PRE	100	100	100	100	97	90	170.4
Atrazine	32	PRE							
Liberty	22	POST							
Laudis	3.0	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	99	100	100	97	94	185.4
Atrazine	32	PRE							
Liberty	32	POST							
Laudis	3.0	POST							
AMS	3 lb	POST							

continued

Table 2. Liberty rates and tank mixtures in corn

Treatment	Rate	Timing ^a	Palmer amaranth		Common sunflower		Crabgrass		Corn yield bu/a
			7 DAPT ^b	72 DAPT	7 DAPT	72 DAPT	7 DAPT	72 DAPT	
			----- % Visual -----						
Balance Flexx	3.0	PRE	98	95	100	100	96	84	184.7
Atrazine	32	PRE							
Liberty	22	POST							
Diflexx	10	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	99	97	100	96	89	179.6
Atrazine	32	PRE							
Liberty	32	POST							
Diflexx	10	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	100	100	98	99	90	181.8
Atrazine	32	PRE							
Liberty	22	POST							
Capreno	3.0	POST							
Atrazine	16	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	98	99	100	99	94	188.8
Atrazine	32	PRE							
Liberty	22	POST							
Halex GT	3.6 pt	POST							
Ammonium sulfate	3 lb	POST							
Balance Flexx	3.0	PRE	100	100	100	100	99	96	198.3
Atrazine	32	PRE							
Halex GT	3.6 pt	POST							
Status	5.0	POST							
Nonionic surfactant	0.25%	POST							
Ammonium sulfate	1.7 lb	POST							
LSD (0.05)			2	6	3	2	3	7	32.9

^a PRE = preemergence, POST = postemergence.

^b DAPT = days after postemergence treatments. Weed control ratings determined on June 12 and August 16, 2017. Corn yields determined on October 18, 2017.



Figure 1. Untreated control.



Figure 2. Balance Flexx 3 oz/a + atrazine 32 oz/a applied preemergence followed by Liberty 32 oz/a + ammonium sulfate 3 lb/a postemergence, 18 days after postemergence treatment.



Figure 3. Balance Flexx 3 oz/a + atrazine 32 oz/a applied preemergence followed by Liberty 43 oz/a + ammonium sulfate 3 lb/a postemergence, 18 days after postemergence treatment.



Figure 4. Balance Flexx 3 oz/a + atrazine 32 oz/a applied preemergence followed by Liberty 43 oz/a + atrazine 16 oz/a and ammonium sulfate 3 lb/a postemergence, 18 days after postemergence treatment.



Figure 5. Balance Flexx 3 oz/a + atrazine 32 oz/a applied preemergence followed by Liberty 32 oz/a + Diflexx 10 oz/a and ammonium sulfate 3 lb/a postemergence, 18 days after postemergence treatment.



Figure 6. Balance Flexx 3 oz/a + atrazine 32 oz/a applied preemergence followed by Liberty 22 oz/a + Halex GT 3.6 pt/a and ammonium sulfate 3 lb/a postemergence, 18 days after postemergence treatment.