

WEED CONTROL IN LIBERTY RESISTANT SUGAR BEETS

Corey J. Guza, Corey V. Ransom, and Joey K. Ishida
Malheur Experiment Station
Oregon State University
Ontario, Oregon, 1999

Introduction

Weed control in Liberty resistant sugar beets was evaluated a second year to identify effective weed control strategies. Research was conducted to determine effective Liberty rates and application timings, and to determine if Nortron can be used effectively in Liberty resistant sugar beet weed control systems.

Materials and Methods

Two trials were established to evaluate Liberty for weed control in Liberty resistant sugar beets. One trial evaluated application timings for Liberty at different rates, with the addition of ammonium sulfate following or in combination with Nortron. The other trial evaluated Liberty rates and timings with Nortron applied preplant incorporated (PPI) or in combination with Liberty as a postemergence treatment. Sugar beets were planted using a tool bar planter with a 22-in row spacing. Seeds were planted to a 2-in spacing and subsequently thinned to an 8-in spacing. Trials were randomized complete block designs with three replications. A Liberty resistant sugar beet variety, Betaseed 8757 LL, was planted on April 7. Counter 20 CR was applied over the row at a rate of 6 oz/1,000 ft, 1 day after planting. On June 15, sugar beets were side dressed with 210 lb N/acre as urea. Herbicide applications were made with a CO₂-pressurized backpack sprayer delivering 20 gpa at 30 psi. Redroot pigweed, hairy nightshade, annual sowthistle, and barnyardgrass control was evaluated on July 13 and September 20. Sugar beet yields were determined by harvesting the two center rows of each plot on October 6. Herbicide applications were timed to weed growth stages.

Liberty Application Timing and Rates

The first trial evaluated sequential Liberty applications initiated at two different times. One application sequence began at 0.5-in weeds and the other at 2-in weeds. The initial applications of Liberty were followed with two additional applications approximately 10 and 20 days after the initial application. Three rates of Liberty, 0.26, 0.31, or 0.35 lb ai/acre, were evaluated with and without the addition of ammonium sulfate (AMS) at 3 lb/acre. Two applications of Liberty at 0.35 lb ai/acre following PPI Nortron or as a postemergence combination with Nortron (1.0 lb ai/acre) also were examined. Liberty treatments in this trial were compared to a standard herbicide program of Progress (0.33 lb ai/acre) applied to cotyledon sugar beets with a second application 10 days after the initial application, followed by Progress plus Poast (0.30 lb ai/acre) applied 20 days after the initial application.

Nortron Combinations with Liberty

The second trial evaluated Nortron applications at different timings for weed control in Liberty resistant sugar beets. Nortron was applied PPI (1.0, 1.5, or 2.0 lb ai/acre) and followed with one or two sequential applications of Liberty at 0.26 or 0.35 lb ai/acre. Liberty applications were begun at 0.5-in or 1-in weeds. Another treatment included one application of Liberty (0.26 or 0.35 lb ai/acre) to 0.5- or 1-in weeds followed by a treatment of Liberty tank-mixed with Nortron (1.0 lb ai/acre) as a layby treatment. Treatments with Nortron were compared to sequential applications of Liberty alone and to a standard herbicide program including Nortron (1.0 lb ai/acre) applied PPI, Progress (0.25 lb ai/acre) applied to cotyledon sugar beets, followed by Progress (0.33 lb ai/acre) plus Upbeet (0.0156 lb ai/acre), and Progress (0.33 lb ai/acre) plus Upbeet (0.0156 lb ai/acre) and Poast (0.3 lb ai/acre) applied 1 and 2 weeks after the initial postemergence application.

Results

Liberty Application Timing and Rates

All treatments containing Liberty provided weed control equal to or greater than the standard 28 days after the final treatment and at the end of the growing season for most weed species (Table 1). The greatest weed control resulted from Liberty (0.26 lb ai/acre) plus AMS and Liberty (0.35 lb ai/acre) with and without AMS applied initially to 0.5-in weeds, and all rates of Liberty with AMS applied initially at 2-in weeds. Sugar beet yields with most Liberty treatments (30 to 39 ton/acre) were all greater than the standard treatment (29.5 ton/acre) and the untreated check (11 ton/acre). Lower rates of Liberty applied three times without AMS and treatments with Nortron applied in combination with Liberty resulted in lower sugar beet yields than other Liberty treatments.

Nortron Combinations with Liberty

Weed control was variable for all weed species in this study. Twenty-eight days after the final herbicide application, Liberty applied three times alone or two times following Nortron applied PPI provided weed control equal to or greater than the standard for most weed species except barnyardgrass. The standard in this case resulted in greater barnyardgrass control. Weed control was highest with Liberty applied three times at 0.35 lb ai/acre, when Nortron (2.0 lb ai/acre) was applied PPI followed by Liberty (0.26 lb ai/acre), or when Nortron (1.0 lb ai/acre) PPI was followed by Liberty at 0.35 lb ai/acre. Weed control with all Liberty treatments was similar to the standard for all weed species at the end of the season. Weed control with Liberty treatments ranged from 70 to 90 percent for redroot pigweed, 98 to 100 percent for hairy nightshade, 80 to 100 percent for annual sowthistle, and 75 to 95 percent for barnyardgrass. Sugar beet yields ranged from 30 to 42 ton/acre. Most Liberty treatments resulted in sugar beet yields equal to the standard treatment (36 ton/acre). Multiple applications of Liberty alone or following Nortron PPI provided among the highest yields (37 to 42 ton/acre). Liberty (0.26 lb ai/acre) applied a single time following PPI Nortron or in combination with Nortron at layby resulted in the lowest sugar beet yields (30 to 32 ton/acre).

Table 1. Weed control and sugar beet yields in response to Liberty application timings and rates in Liberty resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

Treatment	Rate	Timing†	Weed control								Sugar beet					
			Redroot pigweed		Annual sowthistle		Hairy nightshade		Barnyardgrass		Root yield	Sugar content	Gross sugar	Extraction	Estimated recoverable sugar	
			July 13	Sept. 20	July 13	Sept. 20	July 13	Sept. 20	July 13	Sept. 20					ton/acre	%
Liberty	0.26		85	87	100	97	95	100	67	72	32.8	18.0	11,833	92.93	10,996	335.1
Liberty	0.35	EP + MP + LP	98	95	100	100	97	100	88	87	37.6	18.1	13,614	92.82	12,638	336.3
Liberty + AMS	0.26 + 3.0		97	92	100	100	100	100	93	92	37.5	17.8	13,338	92.82	12,379	330.6
Liberty + AMS	0.35 + 3.0		100	98	100	100	100	100	96	96	36.3	18.2	13,193	93.03	12,273	339.5
Liberty	0.26		80	80	82	87	93	100	78	82	29.8	18.0	10,745	92.72	9,967	334.5
Liberty	0.35	MP + LP + LLP	87	85	84	93	90	100	84	85	34.8	17.9	12,418	92.02	11,551	332.5
Liberty + AMS	0.26 + 3.0		87	85	92	93	100	100	87	87	37.4	17.8	13,297	92.81	12,341	330.5
Liberty + AMS	0.31 + 3.0		95	92	88	95	97	100	88	88	37.7	18.0	13,536	92.91	12,576	334.0
Liberty + AMS	0.35 + 3.0		98	100	100	100	98	100	93	90	35.8	18.3	13,090	92.89	12,159	340.0
Nortron + Liberty + AMS	1.0 + 0.35 + 3.0	PPI + MP + LP	98	92	93	97	95	100	93	89	38.6	17.9	13,800	92.74	12,797	331.6
Liberty + AMS + Liberty + AMS + Nortron	0.35 + 3.0 + 0.35 + 3.0 + 1.0	MP + LP	88	92	95	97	92	100	90	90	34.5	17.2	11,895	91.98	10,944	316.7
Liberty + Liberty + Nortron	0.35 + 0.35 + 1.0	MP + LP	77	85	97	100	82	100	65	92	33.4	17.8	11,875	92.80	11,020	329.6
Progress + Progress + Poast	0.33 + 0.33 + 0.2	COT + EP MP	70	65	80	80	93	93	78	67	29.5	18.5	10,941	93.12	10,188	345.3
Untreated			0	0	0	0	0	0	0	0	11.3	18.5	4,188	93.52	3,917	346.7
LSD(0.05)			9	9	10	9	14	5	12	13	3.2	NS	1,171	0.63	1,108	13.4

†EP= early postemergence applications were applied at 0.5 in weeds with MP and LP applications approximately 10 and 20 days after the initial application. MP= mid postemergence applications were applied to 2-in weeds and LP and LLP applications were made approximately 10 and 20 days after the initial application.

Table 2. Weed control and sugar beet yields with Liberty and Nortron applications in Liberty resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

Treatment	Rate	Timing	Weed control								Sugar beet					
			Redroot pigweed		Annual sowthistle		Hairy nightshade		Barnyardgrass		Root yield	Sugar content	Gross sugar	Extraction	Estimated recoverable sugar	
			July 13	Sept. 20	July 13	Sept. 20	July 13	Sept. 20	July 13	Sept. 20					ton/acre	%
	lb ai/acre		-----%-----													
Nortron + Liberty	1.0 + 0.26	PPI + MP	60	79	85	82	37	100	55	56	30.3	18.0	10,928	93.21	10,190	334.8
Nortron + Liberty	1.5 + 0.26	PPI + MP + LP	72	85	88	92	65	100	80	83	38.2	17.9	13,690	93.09	12,745	333.5
Nortron + Liberty	2.0 + 0.26	PPI + MP + LP	80	88	93	95	78	100	89	93	38.5	18.0	13,842	92.97	12,870	334.7
Nortron + Liberty	1.0 + 0.35	PPI + MP	62	78	87	83	53	100	81	84	35.8	17.9	12,781	93.18	11,910	333.0
Nortron + Liberty	1.0 + 0.26	PPI + MP + LP	70	80	100	93	88	100	77	83	37.0	18.3	13,502	93.25	12,588	340.9
Nortron + Liberty	1.0 + 0.35	PPI + MP + LP	88	90	100	97	78	97	80	90	40.2	17.9	14,359	93.00	13,354	332.5
Liberty	0.26	EP + MP + LP	74	83	100	100	93	100	75	87	38.4	18.3	14,056	93.22	13,103	341.9
Liberty	0.35	EP + MP + LP	83	85	100	100	95	100	90	87	41.6	18.2	15,148	93.23	14,123	339.8
Liberty	0.26	MP + LP + LLP	75	82	92	88	78	100	85	87	37.1	17.9	13,297	92.82	12,341	333.0
Liberty	0.35	MP + LP + LLP	78	80	97	97	83	100	87	88	37.8	18.0	13,611	92.78	12,631	333.7
Liberty + Liberty + Nortron	0.26 + 0.26 + 1.0	EP + MP	50	73	100	95	78	100	67	73	32.3	18.2	11,788	93.20	10,987	339.4
Liberty + Liberty + Nortron	0.35 + 0.35 + 1.0	EP + MP	75	83	100	90	78	100	72	83	37.4	18.2	13,651	93.33	12,741	340.5
Liberty + Liberty + Nortron	0.26 + 0.26 + 1.0	MP + LP	63	80	86	88	52	100	75	78	34.6	18.1	12,555	93.15	11,694	338.0
Liberty + Liberty + Nortron	0.35 + 0.35 + 1.0	MP + LP	73	80	97	100	70	97	73	78	35.1	18.0	12,644	93.27	11,793	336.2
Nortron + Progress + Progress+ Upbeet + Progress+ Upbeet + Poast	1.0 + 0.25 + 0.33 + 0.0156 + 0.33 + 0.0156 + 0.3	PPI + COT + EP + MP	68	79	84	83	73	100	92	93	36.3	18.1	13,146	93.19	12,251	337.8
Untreated			0	0	0	0	0	0	0	0	12.7	18.4	4,701	93.41	4,397	344.1
LSD(0.05)			11	8	12	9	20	3	16	21	4.5	NS	1,035	NS	1,613	NS