WEED CONTROL IN ROUNDUP RESISTANT SUGAR BEETS

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Introduction

Weed control in Roundup resistant sugar beets was evaluated a second year to determine the proper application rates and timings of Roundup needed to achieve the greatest weed control. Research also was conducted to determine if soil-active herbicides can be used to improve weed control in Roundup resistant sugar beets.

Methods

Two studies were conducted with Roundup resistant sugar beets. One trial evaluated different Roundup application timings, and the second examined Roundup rates, timings, and tank mixtures with soil-active herbicides. Hilleshog HM Pillar RR sugar beets were planted on April 12 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 designed as randomized complete blocks with three replications. Plots were four rows wide and 30 ft long. Counter 20 CR was applied over the row at a rate of 6 oz/1,000 ft 1 day after planting. On June 15, plots were sidedressed with 210 lb N/acre as urea. Herbicide applications were made with a CO_2-pressurized backpack sprayer calibrated to deliver 20 gpa at 30 psi. Redroot pigweed, common lambsquarters, hairy nightshade, and barnyardgrass control was evaluated on July 19 and September 7 for the timing trial and on June 23 and September 7 for the rates and residual herbicide trial. Yield was determined by harvesting sugar beets from the center two rows of each plot on October 7.

Roundup Application Timing
To determine effective timings for Roundup applications, Roundup was applied at 0.75 lb ae/acre at different stages of sugar beet growth. The first applications were at either 2-leaf (2-lf), 4-leaf (4-lf), or 6-leaf (6-lf) sugar beets, and then sequential applications were applied 10, 20, 30, or 40 days after the initial application. Roundup treatments were compared to a standard sequential herbicide program of Progress (0.33 lb ai/acre) plus Poast (0.3 lb ai/acre) applied to cotyledon, 2-lf, and 4-lf sugar beets.

Roundup Rates, Timings, and Tank Mixtures
In this trial, Roundup applications were based on sugar beet growth stage. Applications were made to cotyledon, 4-leaf, and 6-leaf sugar beets. Treatments of Roundup at 0.37, 0.56, or 0.75 lb ae/acre were applied three times as sequential treatments. Roundup at 0.37 lb ae/acre with the addition of ammonium sulfate (AMS) also was

evaluated. Roundup (0.75 lb ae/acre) was applied one time alone and in combination with Nortron (1.0 lb ai/acre), BAS 656 07 H (0.64 lb ai/acre), or Dual II Magnum (1.59 lb ai/acre) to 4-leaf sugar beets. All treatments were compared to an untreated check and a standard herbicide program of Nortron (1.0 lb ai/acre) applied preplant incorporated (PPI) followed by Progress (0.25 lb ai/acre) applied to cotyledon sugar beets, Progress (0.33 lb ai/acre) plus Upbeet (0.0156 lb ai/acre) applied to 4-leaf sugar beets, and Progress plus Upbeet with Poast (0.3 lb ai/acre) applied to 6-leaf sugar beets.

Results

Roundup Application Timing

On July 26 and September 7, all Roundup treatments provided redroot pigweed, common lambsquarters, hairy nightshade, and barnyardgrass control (97 to 100 percent) greater than the standard program of Progress plus Poast (75 to 97 percent) (Table 1). All Roundup timings resulted in sugar beet yields (37 to 40 ton/acre) greater than the standard, except for Roundup applied initially to 6-leaf sugar beets with a sequential application 20 days later, which was equal to the standard (33 ton/acre). All herbicide treatments resulted in sugar beet yields greater than the untreated check (7 ton/acre).

Roundup Rates, Timings, and Tank Mixtures

On June 23, all Roundup treatments provided weed control (97 to 100 percent) equal to or greater than the standard herbicide program, except for a single application of Roundup at 0.75 lb ae/acre applied to 4-leaf sugar beets, which resulted in slightly less redroot pigweed control (94 percent) (Table 2). On September 7, similar results were observed, in that redroot pigweed control was lower than the standard with the single application of Roundup at 0.75 lb ae/acre alone and in combination with Nortron applied to 4-leaf sugar beets. There were no differences in sugar beet yield, which ranged from 35 to 40 ton/acre, with any of the herbicide treatments. All herbicide treatments resulted in greater sugar beet yields than the untreated check (13 ton/acre).

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

Treatment	Rate	Timing†	Weed control								Sugar beet yield‡					
			Redroot pigweed		Lambsquarters		Hairy nightshade		Barnyardgrass		Root yield	Sugar content	Gross sugar	Extraction	Estimated recoverable sugar	
			July 26	Sept. 7	July 26	Sept. 7	July 26	Sept. 7	July 26	Sept. 7						
	lb ae/acre	Leaf DAT	----------%----------								ton/acre	%	lb/acre	%	lb/acre	lb/ton
Roundup	0.75	2-lf + 10 + 20	98	91	100	100	100	100	98	98	37.4	17.54	13,123	92.55	12,145	324.7
Roundup	0.75	2-lf + 10 + 40	100	100	100	100	100	100	100	100	40.2	17.34	13,937	92.51	12,896	320.9
Roundup	0.75	2-lf + 20	97	99	100	100	100	100	100	100	38.2	17.73	13,542	92.93	12,584	329.5
Roundup	0.75	2-lf + 20 + 40	100	100	100	100	100	100	98	100	38.2	17.59	13,445	92.95	12,497	327.0
Roundup	0.75	2-lf + 30	97	97	100	100	100	100	100	100	39.2	17.19	13,452	92.43	12,433	317.8
Roundup	0.75	4-lf + 10 + 20	100	97	100	100	100	100	100	100	37.6	17.65	13,185	92.89	12,248	327.9
Roundup	0.75	4-lf + 10 + 40	100	98	100	100	100	100	100	100	37.8	17.93	13,561	92.92	12,601	333.3
Roundup	0.75	4-lf + 20	99	100	100	100	100	100	98	99	39.8	17.53	13,944	92.75	12,935	325.3
Roundup	0.75	4-lf + 20 + 40	100	100	100	100	100	100	100	100	38.1	18.04	13,734	92.97	12,768	335.6
Roundup	0.75	4-lf + 30	100	98	100	100	100	100	100	100	38.3	17.69	13,545	92.76	12,564	328.2
Roundup	0.75	6-lf + 20	100	100	100	100	100	100	100	100	36.9	17.90	13,196	93.11	12,286	333.3
Roundup	0.75	6-lf + 30	100	100	100	100	100	100	100	100	37.1	17.93	13,344	92.86	12,391	333.8
Progress	0.33	2-lf + 4-lf + 6-lf	77	73	97	95	77	85	90	86	33.1	17.77	11,770	92.97	10,942	330.4
Progress + Poast	0.33 + 0.3															
Untreated			0	0	0	0	0	0	0	0	7.1	17.46	3,546	92.98	3,298	324.8
LSD (0.05)			4	4	3	4	3	4	3	3	3.9	NS	1,098	NS	1,034	NS

†Treatments were initially applied at 2-, 4-, or 6-leaf (lf) sugar beets and followed by one or two subsequent Roundup applications 10, 20, 30, or 40 days after (DAT) the initial application.

‡Sugar beets were harvested on October 7.

Table 2. Weed control and sugar beet yield in response to Roundup rates, timings, and combinations with soil-active herbicides, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1999.

			Weed control								Sugar beet[§]					
			Redroot pigweed		Lambsquarters		Hairy nightshade		Barnyardgrass							
Treatment	Rate[†]	Timing[‡]	June 23	Sept. 7	June 23	Sept. 7	June 23	Sept. 7	June 23	Sept. 7	Root yield	Sugar content	Gross sugar	Extraction	Estimated recoverable sugar	
	lb ae/acre	Leaf	----------%----------								ton/acre	%	lb/acre	%	lb/acre	lb/ton
Roundup + AMS	0.37 + 2.5	cot + 4-lf + 6-lf	100	90	100	100	100	100	100	95	39.7	17.79	14,119	92.85	13,109	330.3
Roundup	0.37	cot + 4-lf + 6-lf	100	92	100	100	100	100	100	95	37.2	17.90	13,313	92.72	12,344	332.2
Roundup	0.56	cot + 4-lf + 6-lf	100	88	100	100	100	100	100	98	37.7	17.67	13,292	92.93	12,351	328.5
Roundup	0.75	cot + 4-lf + 6-lf	99	89	100	98	99	100	100	97	36.7	18.04	13,209	93.08	12,295	335.9
Roundup + Roundup + Nortron	0.75 + 0.75 + 1.0	cot + 4-lf + 6-lf	100	89	100	97	100	98	100	97	37.7	17.66	13,299	92.90	12,354	328.1
Roundup	0.75	4-lf	94	78	100	100	99	92	100	98	36.4	17.95	13,059	92.91	12,131	333.6
Roundup + Nortron	0.75 + 1.0	4-lf	97	82	100	93	97	100	100	95	35.1	17.87	12,536	93.04	11,664	332.5
Roundup + Dual II Magnum	0.75 + 1.59	4-lf	100	88	100	100	99	100	99	95	38.1	18.06	13,777	93.18	12,841	336.7
Roundup + BAS 656 07 H	0.75 + 0.64	4-lf	99	89	100	97	100	97	100	96	38.3	17.92	13,711	92.93	12,742	333.1
Nortron + Roundup	1.0 + 0.75	PPI + 4-lf + 6-lf	100	90	100	97	100	97	100	100	38.9	17.73	13,802	93.00	12,838	329.7
Nortron + Roundup	1.0 + 0.37	PPI + 4-lf + 6-lf	100	91	100	100	99	97	100	93	38.1	17.84	13,608	92.91	12,263	331.8
Nortron + Roundup + AMS	1.0 + 0.37 + 2.5	PPI + 4-lf + 6-lf	100	87	100	100	100	97	100	98	37.0	17.84	13,165	93.16	12,263	332.5
Nortron + Progress+ Progress+ Upbeet Progress+ Upbeet + Poast	1.0 + 0.25 + 0.33 + 0.0156 0.33 + 0.0156 + 0.3	PPI + cot + 4-lf + 6-lf	100	95	100	100	98	100	99	93	38.1	17.54	13,376	92.97	12,437	326.2
Untreated			0	0	0	0	0	0	0	0	12.8	18.22	4,647	93.47	4,341	340.6
LSD (0.05)			4	10	1	4	3	7	1	7	5.0	NS	1,680	NS	1,558	NS

[†]Roundup rates are in lb ae/acre, and all other herbicides are in lb ai/acre.
[‡]For timings, PPI = preplant incorporated, cot = cotyledon, 4-lf = 4-leaf, and 6-lf = 6-lleaf sugar beets.
[§]Sugar beets were harvested on October 7.