

# **SUGAR BEET TOLERANCE AND WEED CONTROL WITH DIFFERENT HERBICIDE RATES AND TIMINGS**

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## **Introduction**

Weed control is often decreased if weeds are allowed to grow large prior to the initial herbicide application. Wind or rain often prevent herbicides from being applied at the optimal time. Increasing the herbicide rate when the initial application is delayed may provide increased control of larger weeds. This trial examined treatments applied at different rates and times.

## **Methods**

This trial was established at the Malheur Experiment Station on sugar beet grown under furrow irrigation. Sugar beets (Hilleshog 'PM-21') were planted in 22-inch rows at a 2-inch seed spacing on April 8, 2002. After planting, the trial was corrugated and Counter 20 CR was applied in a 7-inch band over the row at 6 oz/1,000 ft of row. Sugar beets were thinned to 8-inch spacings on May 6 and 7. Plots were sidedressed on May 22 with 150 lb N/acre as urea. All plots were treated with Roundup (0.75 lb ai/acre) prior to sugar beet emergence. On May 13, Temik 15G (10 lb/acre) was applied for sugar beet root maggot control. For powdery mildew control, Super-Six liquid sulfur was applied on June 20 and August 14, sulfur dust (30 lb/acre) was applied July 23, and Laredo fungicide was applied on July 11. All fungicide treatments were applied by air.

Herbicide treatments were applied broadcast with a CO<sub>2</sub>-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Plots were four rows wide and 27 ft long and treatments were arranged in a randomized complete block design with four replicates.

Herbicide treatments consisted of Progress, UpBeet, and Stinger applied at various rates and application timings. Initial herbicide applications were made 7 days before sugar beet emergence, to cotyledon sugar beets, 7 days after the cotyledon application, or 14 days after the cotyledon application. In later applications, herbicide rates were increased to determine if increased rates could compensate for the delay in the initial application.

Sugar beet injury and weed control were evaluated throughout the season. Sugar beet yields were determined by harvesting the center two rows of each plot on October 8 and 9. One sample of 16 beets was taken from each plot for quality analysis. The

samples were coded and sent to Hilleshog Mono-Hy Research Station in Nyssa, Oregon, to determine beet pulp sucrose content and purity. Sucrose content and recoverable sucrose were estimated using empirical equations. Data were analyzed using analysis of variance procedures and means were separated using protected LSD at the 95 percent confidence interval ( $P = 0.05$ ).

## Results and Discussion

Sugar beets grew slowly and exhibited higher than expected herbicide injury because of cool temperatures and late frost. Overnight low temperatures at the Malheur Experiment Station were 25°, 29°, and 27°F on April 24, 25, and May 8, respectively. The slow growth of sugar beet resulting from the combination of frost and herbicide injury delayed the formation of a competitive sugar beet canopy. On June 24, the treatment of three postemergence applications starting 7 days prior to sugar beet emergence had reduced pigweed populations (Powell amaranth and redroot pigweed), common lambsquarters, and hairy nightshade control less than treatments receiving three herbicide applications with the initial application at cotyledon, 7 days after cotyledon, or 14 days after cotyledon (Table 1). The final application when treatments were initiated 7 days prior to emergence was long before the sugar beet canopy closed. Ending herbicide treatment too early allowed additional weeds to emerge. Control of Powell amaranth and redroot pigweed with a single application of Progress (1.125 lb ai/acre) plus UpBeet (0.5 oz ai/acre) plus Stinger (0.25 lb ai/acre) applied 14 days after cotyledon was less than all other treatments. This treatment also had lower kochia control compared to some of the other treatments. In this case, Powell amaranth and redroot pigweed were probably too large to be controlled, in spite of the extremely high herbicide rates. On July 17, trends for weed control were similar to the June evaluation, but there were fewer significant ( $P = 0.05$ ) differences among treatments. Sugar beet injury was among the greatest with the treatment initiated 7 days prior to emergence with four herbicide applications (Table 2). Injury also increased with large increases in herbicide rate. Applications initiated 14 days after cotyledon had among the lowest injury, probably because the sugar beets were larger at the time of the applications compared to treatments initiated earlier. The treatment that received three herbicide applications beginning 7 days prior to emergence and the treatment receiving a single herbicide application 14 days after cotyledon had lower yields than treatments receiving three applications initiated at cotyledon, 7 days after cotyledon, or 14 days after cotyledon, or the treatment receiving two applications of high herbicide rates beginning at 14 days after cotyledon. On a different year weed control may have been increased with earlier herbicide applications. With the cold weather and slow sugar beet growth in 2002, sequential herbicide treatments applied 7 and 14 days after cotyledon performed as well as those applied earlier. However, in many instances these treatments had increased herbicide rates that increased herbicide costs compared to earlier applications. In situations where ideal application timings are missed, it appears that increased herbicide rates can help to control the larger weeds that are present.

Table 1. Weed control with different rates and application timings of postemergence herbicides, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment	Rate	Timing*	Weed control							
			Pigweed species†		Lambsquarters		H. nightshade		Kochia	
			6-24	7-17	6-24	7-17	6-24	7-17	6-24	7-17
	lb ai/acre		-----%							
Untreated	--	--	0	0	0	0	0	0	0	0
Progress + UpBeet	0.25 + 0.016	1	81	78	92	87	66	58	94	95
Progress + UpBeet	0.34 + 0.023	2								
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	3								
Progress + UpBeet	0.25 + 0.016	1	89	83	96	90	86	77	96	96
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	2								
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	3								
Progress	0.68	4								
Progress + UpBeet	0.25 + 0.016	2	91	80	99	96	85	79	99	99
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	3								
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	4								
Progress + UpBeet	0.25 + 0.016	3	94	96	99	98	95	94	91	89
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	4								
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	5								
Progress + UpBeet	0.34 + 0.016	3	91	84	99	96	93	93	98	98
Progress + UpBeet + Stinger	0.42 + 0.023 + 0.094	4								
Progress + UpBeet + Stinger	0.51 + 0.031 + 0.094	5								
Progress + UpBeet	0.42 + 0.016	3	89	80	96	88	92	87	99	98
Progress + UpBeet + Stinger	0.51 + 0.023 + 0.094	4								
Progress + UpBeet + Stinger	0.59 + 0.031 + 0.094	5								
Progress + UpBeet	0.34 + 0.016	4	92	85	99	97	81	78	95	91
Progress + UpBeet + Stinger	0.42 + 0.023 + 0.094	5								
Progress + UpBeet + Stinger	0.51 + 0.031 + 0.094	6								
Progress + UpBeet	0.42 + 0.016	4	93	85	100	100	89	84	95	93
Progress + UpBeet + Stinger	0.51 + 0.023 + 0.094	5								
Progress + UpBeet + Stinger	0.59 + 0.031 + 0.094	6								
Progress + UpBeet	0.51 + 0.016	4	92	87	100	98	85	81	99	98
Progress + UpBeet + Stinger	0.59 + 0.023 + 0.094	5								
Progress + UpBeet + Stinger	0.68 + 0.031 + 0.094	6								
Progress + UpBeet + Stinger	0.76 + 0.031 + 0.094	4	89	82	99	96	89	86	95	96
Progress + UpBeet + Stinger	1.05 + 0.031 + 0.094	5								
Progress + UpBeet + Stinger	1.125 + 0.031 + 0.25	4	68	61	100	91	78	82	90	90
LSD (0.05)			8	10	5	9	17	23	8	9

\*Applications were made April 17 (1), April 22 (2), April 29 (3), May 6 (4), May 13 (5), and May 22 (6). Sugar beet stages at each of the application timings were: 1 = few emerging, 2 = cotyledon, 3 = cotyledon to 2-leaf, 4 = 4-to 6-leaf, 5 = 4-to 8-leaf.

†Pigweed species were predominantly Powell amaranth mixed with some redroot pigweed.

Table 2. Sugar beet injury and yield in response to postemergence herbicide rates and application timings, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment	Rate lb ai/acre	Timing*	Sugar beet injury				Sugar beet yield				
			5-10	5-20	5-29	6-1	Root yield	Sucrose	Extraction	Estimated recoverable sucrose	
			-----%-----				ton/acre	---%---	---%---	lb/acre	lb/ton
Untreated	--	--	0	0	0	0	8.3	17.5	93.2	2,694	326
Progress + UpBeet	0.25 + 0.016	1	37	24	11	3	33.0	17.4	93.2	10,695	324
Progress + UpBeet	0.34 + 0.023	2									
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	3									
Progress + UpBeet	0.25 + 0.016	1	60	48	25	14	37.6	17.3	92.7	12,067	322
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	2									
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	3									
Progress	0.68	4									
Progress + UpBeet	0.25 + 0.016	2	40	38	18	6	39.2	17.0	92.9	12,403	316
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	3									
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	4									
Progress + UpBeet	0.25 + 0.016	3	33	42	21	10	40.1	17.1	92.8	12,736	318
Progress + UpBeet + Stinger	0.34 + 0.023 + 0.094	4									
Progress + UpBeet + Stinger	0.42 + 0.031 + 0.094	5									
Progress + UpBeet	0.34 + 0.016	3	35	43	25	13	41.9	17.5	92.6	13,547	323
Progress + UpBeet + Stinger	0.42 + 0.023 + 0.094	4									
Progress + UpBeet + Stinger	0.51 + 0.031 + 0.094	5									
Progress + UpBeet	0.42 + 0.016	3	39	46	27	16	38.9	17.5	92.8	12,618	324
Progress + UpBeet + Stinger	0.51 + 0.023 + 0.094	4									
Progress + UpBeet + Stinger	0.59 + 0.031 + 0.094	5									
Progress + UpBeet	0.34 + 0.016	4	15	28	24	16	39.8	16.7	92.3	12,296	309
Progress + UpBeet + Stinger	0.42 + 0.023 + 0.094	5									
Progress + UpBeet + Stinger	0.51 + 0.031 + 0.094	6									
Progress + UpBeet	0.42 + 0.016	4	16	31	27	19	39.9	17.0	92.6	12,543	315
Progress + UpBeet + Stinger	0.51 + 0.023 + 0.094	5									
Progress + UpBeet + Stinger	0.59 + 0.031 + 0.094	6									
Progress + UpBeet	0.51 + 0.016	4	23	37	33	28	39.8	16.9	92.6	12,457	313
Progress + UpBeet + Stinger	0.59 + 0.023 + 0.094	5									
Progress + UpBeet + Stinger	0.68 + 0.031 + 0.094	6									
Progress + UpBeet + Stinger	0.76 + 0.031 + 0.094	4	27	46	28	18	37.5	17.3	93.1	12,062	322
Progress + UpBeet + Stinger	1.05 + 0.031 + 0.094	5									
Progress + UpBeet + Stinger	1.125 + 0.031 + 0.25	4	49	47	24	14	30.3	17.2	93.0	9,705	321
LSD (0.05)			6	8	6	6	5.1	NS	NS	1,530	NS

\*Applications were made April 17 (1), April 22 (2), April 29 (3), May 6 (4), May 13 (5), and May 22 (6). Sugar beet stages at each of the application timings were: 1 = few emerging, 2 = cotyledon, 3 = cotyledon to 2-leaf, 4 = 4-to 6-leaf, 5 = 4-to 8-leaf.