

# MICRO-RATE HERBICIDE PROGRAMS FOR WEED CONTROL IN SUGAR BEET

Corey V. Ransom, Charles A. Rice, and Joey K. Ishida  
Malheur Experiment Station  
Oregon State University  
Ontario, OR, 2002

## Introduction

Many growers are adapting to using herbicides at very low rates for weed control in sugar beet. Research has shown that sugar beet herbicides can be applied as a broadcast application using the amount of herbicide typically applied in a band if a methylated seed oil (MSO) surfactant is added (micro-rate). In order for these extremely low rates to be effective, herbicides must be applied while weeds are small and are applied four or more times on a 5- to 7-day interval. Trials were initiated to examine micro-rate herbicide treatments for weed control efficacy and sugar beet tolerance. This trial compared four applications of the micro-rate with three applications of the micro-rate alone or in combination with Dual Magnum, Nortron, or Outlook. All micro-rate treatments were compared to a standard herbicide program. The addition of Outlook to four applications of the micro-rate was also evaluated.

## Methods

This trial was established at the Malheur Experiment Station on sugar beets 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 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.

Micro-rate treatments were applied three or four times. In some of the treatments receiving only three applications, Dual Magnum, Nortron, or Outlook were applied in the last application to provide residual control of later germinating weeds. All treatments were compared to the micro-rate applied four times and to a standard herbicide treatment applied three times. Both micro-rate and standard rate treatments were applied broadcast. Micro-rate treatments contained Progress (1.3 oz ai/acre), UpBeet (0.063 oz ai/acre), Stinger (0.5 oz ai/acre), Select (0.5 oz ai/acre), and MSO (1.5

percent v/v). Micro-rate treatments were applied on April 22, April 29, May 4, and May 13. The standard treatments were applied on April 22, May 2, and May 13. At the first application, sugar beets were in the cotyledon growth stage.

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. Root yields were adjusted to account for a 5 percent tare. One sample of 16 beets was taken from each plot for quality analysis. The samples were coded and sent to Hillebrand 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. Differences among herbicide treatments were not as clear as would be desirable. There was no difference in control of pigweed species (i.e., Powell amaranth and redroot pigweed), common lambsquarters, hairy nightshade, kochia, and barnyardgrass between three or four applications of the micro-rate (Table 1). The standard treatment provided greater pigweed control than three applications of the micro-rate alone or with Outlook included in the third application. There was only a slight difference among treatments for common lambsquarters control. Hairy nightshade control was greater with four applications of the micro-rate with Outlook included in the third application, compared to three applications alone. Other treatments were not different. Kochia control was somewhat variable, but three applications of the micro-rate with Nortron combined with the third application provided among the greatest control. The standard herbicide treatment had the least barnyardgrass control. Sugar beet injury was greatest on May 20 with the standard treatment and four applications of the micro-rate with Outlook included in the third application (Table 2). Sugar beet yields were related to weed control. Four applications of the micro-rate with Outlook included in the third and fourth applications provided greater yields than three or four applications of the micro-rate alone or three applications of the micro-rate with Outlook included in the third application. Other treatments produced similar yields. There were no differences in sucrose content or sucrose extraction between treatments.

Table 1. Weed control with micro-rate herbicide treatments applied a different number of times and in various combinations in sugar beet, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment	Rate oz ai/acre % v/v	Timing*	Weed control				
			Pigweed species†	Common lambsquarters	Hairy nightshade	Kochia	Barnyard-grass
			-----%				
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2,4,5	85	90	85	82	87
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2,4	77	88	80	84	93
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	81	96	87	93	97
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 10.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	85	87	90	92	100
Progress + Upbeet + Stinger + Select + MSO + Dual Magnum	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 21.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	83	96	86	99	88
Progress + Upbeet + Stinger + Select + MSO + Nortron	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 16.0	4					
Progress + Upbeet + Stinger	4.0 + 0.25 + 1.5	1,3	93	96	84	94	76
Progress + Upbeet + Stinger + Select	4.0 + 0.25 + 1.5 + 2.0	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	88	96	98	88	93
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 10.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	84	95	89	89	94
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 13.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	92	94	87	93	98
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 7.8	4					
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 7.8	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	82	93	71	92	91
Progress + Upbeet + Stinger + Select + MSO	2.0 + 0.063 + 0.5 + 0.5 + 1.5%	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	79	99	77	84	96
Progress + Upbeet + Stinger + Select + MSO + Outlook	2.0 + 0.063 + 0.5 + 0.5 + 1.5% + 13.0	4					
Untreated			0	0	0	0	0
LSD (0.05)			10.2	11.6	16	11	8

\*Treatments were applied on April 22 (1), April 29 (2), May 2 (3), May 4 (4), and May 13 (5).

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

Table 2. Sugar beet injury and yield with micro-rate herbicide treatments applied a different number of times and in various combinations, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment	Rate oz ai/acre % v/v	Timing*	Sugar beet				ERS†
			Injury 5-20	Root yield	Sucrose	Extraction	
			---%---	ton/acre	---%---	---%---	
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2,4,5	14	34.8	16.91	92.6	10,918
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2,4	16	32.4	16.99	92.8	10,195
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	20	35.7	17.16	93.1	11,372
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 10.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	13	37.8	17.17	92.6	12,022
Progress + Upbeet + Stinger + Select + MSO + Dual Magnum	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 21.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	17	40.0	16.96	92.9	12,613
Progress + Upbeet + Stinger + Select + MSO + Nortron	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 16.0	4					
Progress + Upbeet + Stinger	4.0 + 0.25 + 1.5	1,3	26	37.1	16.75	92.5	11,477
Progress + Upbeet + Stinger + Select	4.0 + 0.25 + 1.5 + 2.0	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	22	39.1	17.14	92.8	12,399
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 10.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	15	39.9	16.85	92.7	12,483
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 13.0	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	24	41.6	17.37	92.9	13,441
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 7.8	4					
Progress + Upbeet + Stinger + Select + MSO + Outlook	1.3 + 0.063 + 0.5 + 0.5 + 1.5% + 7.8	5					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	11	36.2	17.13	92.9	11,504
Progress + Upbeet + Stinger + Select + MSO	2.0 + 0.063 + 0.5 + 0.5 + 1.5%	4					
Progress + Upbeet + Stinger + Select + MSO	1.3 + 0.063 + 0.5 + 0.5 + 1.5%	1,2	17	35.7	17.36	93.1	11,526
Progress + Upbeet + Stinger + Select + MSO + Outlook	2.0 + 0.063 + 0.5 + 0.5 + 1.5% + 13.0	4					
Untreated			0	9.5	16.98	93.0	2,963
LSD (0.05)			7	5.1	NS	NS	1,608

\*Treatments were applied on April 22 (1), April 29 (2), May 2 (3), May 4 (4), and May 13 (5).

†ERS, estimated recoverable sucrose.