

# TIMING OF OUTLOOK® AND DUAL MAGNUM® APPLICATIONS FOR WEED CONTROL IN SUGAR BEET

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Ontario, OR, 2003

## Introduction

Outlook (dimethenamid-P) and Dual Magnum (s-metolachlor) are soil-active herbicides that are labeled for postemergence application in sugar beet. Outlook can be applied to two-leaf or larger beets and Dual Magnum may be applied to one-leaf or larger beets. Outlook or Dual Magnum were applied as part of a standard rate program in the second or third postemergence application or as a lay-by application. The objectives of this trial were 1) to determine if weed control can be improved with Outlook or Dual Magnum in the standard rate program, and 2) to determine if the application timing of these herbicides influences weed control or crop response.

## Methods

This trial was established at the Malheur Experiment Station under furrow irrigation on April 4, 2003. Sugar beets (Hilleshog 'PM-21') were planted in 22-inch rows at a 2-inch seed spacing. On April 3, kochia, pigweed, and common lambsquarters seed was spread over the entire experimental area to promote an even weed distribution. 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 spacing on May 13 and 14. Plots were sidedressed on June 3 with 176 lb nitrogen (urea), 96 lb phosphate, 100 lb potash, 38 lb sulfates, 62 lb elemental sulfur, 2 lb zinc, and 1 lb/acre boron. All plots were treated with Roundup (0.75 lb ai/acre) prior to sugar beet emergence on April 11. On May 16, Temik 15G (14 lb/acre) was applied for sugar beet root maggot control. For powdery mildew control, Headline (12 fl oz/acre) was applied on June 17 and again on July 2 with Super Six liquid sulfur (16 pt/acre), Topsin M (0.5 lb/acre) was applied on August 4. All fungicide treatments were applied by air. Herbicide treatments were broadcast-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.

Soil-active herbicides were applied at various timings as part of a standard rate herbicide program to evaluate the effect of application timing on weed control and crop response with the selected herbicides. The standard rate program consisted of Progress (ethofumesate + desmedipham + phenmedipham) applied at 4.0, 5.4, and 6.7 oz ai/acre in applications one, two, and three, respectively. UpBeet (triflurosulfuron) was applied at 0.25 oz ai/acre in all three applications and Stinger (clopyralid) at 1.5 oz

ai/acre in the last two applications. Soil-active herbicides included Outlook, Dual Magnum, and Treflan (trifluralin). Outlook was applied at 12.0 oz ai/acre when applied in the second or third application or as a lay-by following the last cultivation. When split across the first and second applications, Outlook was applied at 10.5 and 5.2 oz ai/acre, respectively. Treflan at 6 oz ai/acre was applied with Outlook as a lay-by. Dual Magnum was applied at 20.8 oz ai/acre in the second or third application or as a lay-by. The first, second, third, and lay-by applications were made on April 23, April 30, May 16, and May 21, to cotyledon, 2-leaf, 10-leaf, and 12-leaf beets, respectively.

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 6 and 7. 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 ( $P = 0.05$ ). The untreated control was not included in the analysis of variance for weed control or crop response.

## Results and Discussion

Outlook or Dual Magnum, when added to the standard rate program whether applied in the second or third application or as a lay-by application, did not improve broadleaf weed control compared to the standard rate treatment without any soil-active herbicides (Table 1). All treatments resulted in 97 percent or greater control of broadleaf weed species. Treatments including Outlook or Dual Magnum, regardless of when they were applied, controlled barnyardgrass significantly better than the standard rate treatment without a soil-active herbicide application. Barnyardgrass control was greater with Outlook compared to Dual Magnum when applied in the third standard rate application. Control of barnyardgrass with Outlook was similar whether applied in the second, third, or lay-by applications. Control of barnyardgrass with Dual Magnum was greater when applied in the second application than when applied in the third or lay-by applications.

Sugar beet injury on May 5 was greater with treatments where Outlook or Dual Magnum were applied in the second application compared to the standard treatment alone (Table 2). Injury on May 5, which was only 4 days after the third standard rate application, was similar between treatments with Outlook or Dual Magnum in the third application and the standard treatment without Outlook or Dual Magnum. There were no differences in sugar beet injury among treatments on June 2 (17 days after treatment). Sugar beet root yields associated with herbicide treatments ranged from 47.7 to 49.5 tons/acre and were significantly greater than the untreated control (Table 2). Estimated recoverable sucrose yields were similar among herbicide treatments and were greater than the untreated control.

Table 1. Weed control in sugar beet with standard rate herbicide treatments including postemergence applications of Outlook and Dual Magnum, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

Treatment	Rate oz ai/acre	Timing*	Weed control†				
			Kochia	Pigweed spp.‡	Lambs- quarters	Hairy nightshade	Barnyard- grass
			8-5	8-5	8-5	8-5	6-16
			----- % -----				
Untreated control	--	--	--	--	--	--	--
Progress + UpBeet	4.0 + 0.25	1	97	98	100	100	81
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3					
Progress + UpBeet	4.0 + 0.25	1	100	100	100	100	100
Progress + UpBeet + Stinger + Outlook	5.4 + 0.25 + 1.5 12.0	2					
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3					
Progress + UpBeet	4.0 + 0.25	1	98	92	100	100	99
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger + Outlook	6.7 + 0.25 + 1.5 + 12.0	3					
Progress + UpBeet	4.0 + 0.25	1	100	100	100	100	100
Progress + UpBeet + Stinger + Outlook	5.4 + 0.25 + 1.5 + 10.5	2					
Progress + UpBeet + Stinger + Outlook	6.7 + 0.5 + 1.5 + 5.2	3					
Progress + UpBeet	4.0 + 0.25	1	98	98	100	100	96
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger	6.7 + 0.5 + 1.5	3					
Outlook	12.0	4					
Progress + UpBeet	4.0 + 0.25	1	98	99	100	100	99
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3					
Outlook + Treflan	12.0 + 6.0	4					
Progress + UpBeet	4.0 + 0.25	1	100	100	100	100	100
Progress + UpBeet + Stinger + Dual Magnum	5.4 + 0.25 + 1.5 + 20.8	2					
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3					
Progress + UpBeet	4.0 + 0.25	1	99	96	100	100	90
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger + Dual Magnum	6.7 + 0.25 + 1.5 + 20.8	3					
Progress + UpBeet	4.0 + 0.25	1	100	96	100	100	93
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2					
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3					
Dual Magnum	20.8	4					
LSD (0.05)	--	--	NS	NS	NS	NS	5

\*Application timings were (1) April 23 to cotyledon beets, (2) April 30 to 2-leaf beets, (3) May 16 to 10-leaf beets, (4) May 21 lay-by to 12-leaf beets.

†The untreated control was not included in the weed control analysis.

‡Pigweed species included Powell amaranth and redroot pigweed.

Table 2. Sugar beet injury and yield with standard rate herbicide treatments including postemergence applications of Outlook and Dual Magnum, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

Treatment	Rate oz ai/acre	Timing*	Sugar beet					
			Injury†		Yield‡			
			5-5 ----- % -----	6-2 ----- % -----	Root yield ton/acre	Sucrose ----- % -----	Extraction ----- % -----	ERS lbs/acre
Untreated control	--	--	--	--	26.2	16.7	92.7	8,095
Progress + UpBeet	4.0 + 0.25	1	17	14	48.2	15.6	92.6	13,896
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3						
Progress + UpBeet	4.0 + 0.25	1	22	19	49.5	15.7	92.9	14,407
Progress + UpBeet + Stinger + Outlook	5.4 + 0.25 + 1.5 + 12.0	2						
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3						
Progress + UpBeet	4.0 + 0.25	1	18	25	47.7	15.6	92.7	13,773
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger + Outlook	6.7 + 0.25 + 1.5 + 12.0	3						
Progress + UpBeet	4.0 + 0.25	1	20	22	49.8	15.9	92.5	14,601
Progress + UpBeet + Stinger + Outlook	5.4 + 0.25 + 1.5 + 10.5	2						
Progress + UpBeet + Stinger + Outlook	6.7 + 0.5 + 1.5 + 5.2	3						
Progress + UpBeet	4.0 + 0.25	1	20	21	48.2	16.1	92.6	14,350
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger	6.7 + 0.5 + 1.5	3						
Outlook	12.0	4						
Progress + UpBeet	4.0 + 0.25	1	15	21	48.4	16.4	92.7	14,699
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3						
Outlook + Treflan	12.0 + 6.0	4						
Progress + UpBeet	4.0 + 0.25	1	22	22	49.1	15.9	92.3	14,424
Progress + UpBeet + Stinger + Dual Magnum	5.4 + 0.25 + 1.5 + 20.8	2						
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3						
Progress + UpBeet	4.0 + 0.25	1	17	21	48.3	15.8	92.2	14,070
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger + Dual Magnum	6.7 + 0.25 + 1.5 + 20.8	3						
Progress + UpBeet	4.0 + 0.25	1	15	17	49.0	16.4	92.7	14,934
Progress + UpBeet + Stinger	5.4 + 0.25 + 1.5	2						
Progress + UpBeet + Stinger	6.7 + 0.25 + 1.5	3						
Dual Magnum	20.8	4						
LSD (0.05)			5	NS	4.1	NS	NS	1,491

\*Application timings were (1) April 23 to cotyledon beets, (2) April 30 to 2-leaf beets, (3) May 16 to 10-leaf beets, (4) May 21 lay-by to 12-leaf beets.

†The untreated control was not included in the sugar beet injury analysis.

‡Sugar beets were harvested on October 6-7, 2003.