

POTATO AND SUGAR BEET RESPONSE TO IMAZAMOX CARRYOVER

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Introduction

Imazamox is the active ingredient in commercial formulations of Raptor and Beyond. Raptor is used in alfalfa, dry bean, and soybean. More recently, wheat and canola varieties (Clearfield™) have been developed that are resistant to Beyond. Imazamox can persist in the soil and may cause injury to crops planted the following year. The amount of injury to rotational crops can vary depending upon the rotational crop and various environmental factors influencing the duration of herbicide soil persistence at or above injurious levels. In this study potato and sugar beet were evaluated for injury from imazamox applied at various rates the previous spring.

Methods

Two trials were established under furrow irrigation at the Malheur Experiment Station to evaluate Imazamox for rotational crop injury following postemergence application to Clearfield spring wheat the previous year. The soil type for the trial was an Owyhee silt loam with an organic matter content of 0.9 percent, a pH of 8.0, and a cation exchange capacity of 13 meq/100 g of soil. Experimental plots measured 10 ft by 27 ft or 12 ft by 30 ft and were arranged in a randomized complete block with three replicates. Herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi.

Clearfield (imidazolinone-resistant) winter wheat was seeded at a rate of 120 lb/acre on October 20, 2000. Imazamox was applied at 0.032, 0.048, 0.064, and 0.096 lb ai/acre on April 17, 2001. All imazamox treatments contained 32 percent urea ammonium nitrate (UAN) at 1.25 percent v/v and non-ionic surfactant (NIS) at 0.25 percent v/v. Bronate (2.0 pt/acre) was applied to all plots for broadleaf weed control on April 27, 2001. Wheat was not harvested and was flailed on July 18, 2001. Plots were irrigated and sprouting wheat was flailed. Ground was rototilled on October 1 and bedded for potatoes on October 22 and for sugar beet on October 23.

The rotational crops evaluated in 2002 were potato and sugar beet. 'Russet burbank' potatoes were planted using a 9-inch spacing within 36 inch rows on April 12. Potatoes were sidedressed with 90 lb N, 20 lb S, 4 lb Zn, 4 lb Mn, and 1 lb Bo per acre on April 18. Prowl at 1.0 lb ai/acre and Dual Magnum at 1.25 lb ai/acre were applied to all potato plots on April 25 and were incorporated with a Lilliston rotary cultivator. Sugar

beet (var. HM 'PM-21') were planted on April 9 using a 2-inch spacing on 22-inch rows. Counter 20 CR was applied at 6 oz/1,000 ft of row. Temik 15G was applied at 8 oz/1,000 ft of row on the water side of each row on May 13. Sugar beets were irrigated immediately after the Temik was applied. Due to uneven emergence, the initial sugar beet planting was rototilled under and replanted on May 28. Sugar beets were thinned to an 8-inch spacing on June 27. Injury evaluations were taken throughout the growing season. Yield data were collected for potato by harvesting the center two rows of each plot on September 12, and grading tubers by size on September 18-24. Sugar beet yield was determined by harvesting the center two rows of each plot on October 9. Sugar beet root yields were adjusted to allow for a 5 percent tare. A sample of 16 beets was collected from each plot to determine sucrose content and purity. Data were analyzed using ANOVA, and treatment means were separated using Fishers protected LSD (0.05).

Results

No injury was observed on sugar beet or potato regardless of the imazamox rate applied the previous spring. This was not expected since the current plantback restrictions for Raptor and Beyond requires that following an application of either herbicide producers must wait at least 18 months before potato can be planted and 26 months before sugar beet can be planted. Potato yields were not different among treatments (Table 1). Sugar beet stand (Table 2) was not reduced by imazamox carryover. Sugar beet yield, sucrose content, and sucrose extraction were not significantly different among treatments. Root yield and estimated recoverable sucrose were not different at the 5 percent probability level, but at the 15 percent probability level were reduced by imazamox at 0.064 and 0.096 lb ai/acre compared to the untreated check. We would have expected higher sugar beet injury considering the rates of imazamox that were applied. Even though no injury was observed in potato, the trends toward reduced yields from the sugar beet trial demonstrate that growers should continue to follow the rotational crop restrictions stated on the Beyond and Raptor labels.

Table 1. Potato yield in response to imazamox applied the previous year to Clearfield winter wheat, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment*	Rate	Potato yield							
		U.S. No. 1					Total No. 2	Total marketable	Total yield
		4-6 oz	6-12 oz	>12 oz	Total	%			
lb ai/acre	cwt/acre			%	cwt/acre				
Imazamox + 32% N + NIS	0.032 + 1.25% v/v + 0.25% v/v	106	142	77	325	55	181	506	593
Imazamox + 32% N + NIS	0.048 + 1.25% v/v + 0.25% v/v	111	177	69	357	59	178	535	610
Imazamox + 32% N + NIS	0.064 + 1.25% v/v + 0.25% v/v	110	173	68	351	57	184	535	617
Imazamox + 32% N + NIS	0.096 + 1.25% v/v + 0.25% v/v	102	140	63	304	50	229	533	616
Untreated control	--	109	167	92	369	57	196	565	646
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS

*Imazamox is the active ingredient in Raptor and Beyond herbicides. Treatments were applied to wheat on April 17, 2001.

†Potatoes were planted April 12, 2002 and harvested on September 18 to 24, 2002.

Table 2. Sugar beet injury and yield in response to imazamox applied the previous year to Clearfield winter wheat, Malheur Experiment Station, Oregon State University, Ontario, OR, 2002.

Treatment*	Rate	Sugar beet population		Sugar beet†				
		6-11-02	10-08-02	Root yield	Sucrose	Extraction	Estimated recoverable sucrose	
		no/acre	no/acre	ton/acre	%		lb/acre	lb/ton
lb ai/acre	no/acre		ton/acre	%		lb/acre	lb/ton	
Imazamox + 32% N + NIS	0.032 + 0.25% v/v + 0.25% v/v	91,080	34,898	23.8	17.7	93.4	7,857	330
Imazamox + 32% N + NIS	0.048 + 0.25% v/v + 0.25% v/v	90,956	35,640	25.3	17.3	93.5	8,170	324
Imazamox + 32% N + NIS	0.064 + 0.25% v/v + 0.25% v/v	88,357	34,774	23.8	17.1	93.3	7,630	320
Imazamox + 32% N + NIS	0.096 + 0.25% v/v + 0.25% v/v	88,729	32,918	23.2	17.3	93.5	7,501	323
Untreated control	--	85,387	33,165	25.4	17.3	93.3	8,212	323
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS
LSD (0.15)		NS	NS	1	NS	NS	455	NS

*Imazamox is the active ingredient in Raptor and Beyond herbicides. Treatments were applied to wheat on April 17, 2001.

†Sugar beets were planted May 28, 2002 and harvested on October 9, 2002.