EVALUATION OF V-10142 (IMAZOSULFURON) FOR YELLOW NUTSEDGE CONTROL IN POTATOES

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Ontario, OR, 2007

Introduction

Weeds are a major production problem for potato growers in eastern Oregon and other parts of the world. If not controlled in a timely manner, weeds can reduce tuber yields through direct competition with the crop for light, moisture, and nutrients, and may harbor insects and diseases that affect potatoes. Growers are always looking for newer and better herbicides to control weeds, especially in the earlier part of the growing season when newly emerged potato plants are vulnerable to competition. Products that control yellow nutsedge are especially sought by growers in eastern Oregon where the weed is widely distributed. Control of yellow nutsedge is extremely critical and a major emphasis is to use soil residual herbicides before the weeds emerge and establish to compete with the crop. If left uncontrolled, yellow nutsedge will reduce potato tuber yield and most importantly, it will produce more tubers that help to sustain its distribution in the field. There are reports that yellow nutsedge rhizomes can penetrate potato tubers and lower both yield and quality (Boldt 1976).

The varieties grown for processing in Malheur County, Oregon are mainly 'Ranger Russet', 'Shepody', and 'Russet Burbank'. Potatoes are generally planted in late March in beds formed during the previous fall. All soil-applied herbicides are sprayed and incorporated before potato emergence. The herbicide tested in this study, V-10142, is soil applied but does not require incorporation, and as such will reduce field activities.

Materials and Methods

A field study was established in a grower field planted to Russet Burbank near Adrian, Oregon. The objective was to determine the most efficient rates, timings, and phytotoxicity of V-10142 herbicide when applied to potatoes alone and in combinations with other herbicides. The study was laid out in a randomized complete block design with four replications; individual plots measured 9 ft wide by 30 ft long. The potatoes were planted in 30-inch beds on April 6 and emerged on May 7, 2007. Pre-emergence (PRE) treatments were applied on April 30 using a CO_2 sprayer with a boom fitted with four EVS 8002 flat-fan nozzles. There was no incorporation of the herbicides after applications were done. All postemergence (POST) treatments included methylated seed oil (MSO) at 1 percent V/V and were applied on May 24, 2007 when potato seedling height was about 6 inches and yellow nutsedge was about 4 inches high. Evaluations for phytotoxicity and yellow nutsedge control were done at 7, 14, and 46

days after treatment (DAT). Evaluations were based on visual estimates on a 0-100 percent (0 = no crop phytotoxicity or weed control and 100 = total crop injury or excellent weed control). The data were subjected to analysis of variance and means separated using the least significant difference (LSD) at P = 0.05 percent. Potatoes received overhead irrigation to keep the soil moist and were fertilized and sprayed for insect and disease prevention using recommended production practices for the area. Potatoes were harvested at maturity from the center row, graded following USDA standards, and specific gravity was determined.

Results and Discussion

There was no evident potato injury with any of the V-10142 treatments at any of the evaluation dates (Table 1). The best yellow nutsedge control was observed when a sequential application of PRE was followed by a POST application of V-10142. Yellow nutsedge control was low when V-10142 was applied PRE at 6.4 oz/acre. Yellow nutsedge control at the time of potato canopy closure tended to be greater with sequential applications of V-10142 applied PRE and POST than with single applications of V-10142 applied PRE. Control of yellow nutsedge by sequential applications at 21 DAT ranged from 88 to 94 percent and was similar to that provided by the standard herbicide application of Eptam® plus Prowl® H2O plus Dual Magnum® at 4.5 plus 1.58 plus 1.0 pt/acre, respectively. A similar trend was observed for the evaluations at potato row closure (July 9, 2007). With the exception of the lowest rate of V-10142 applied PRE, all herbicide treatments increased the marketable potato tuber yield compared to the untreated control (Table 2). Tuber yields tended to be greater with sequential application of V-10142 PRE followed by POST than PRE alone. The herbicide V-10142 has potential to become a valuable product for yellow nutsedge control in potato.

References

Boldt, P.F. 1976. Factors influencing the selectivity of U-compounds on yellow nutsedge. M. S. Thesis, Cornell University, Ithaca, NY.

Table 1. Potato response to V-10142 herbicide and yellow nutsedge control on June 1 and 7, 2007 at the Malheur Experiment Station, Oregon State University, Ontario, OR.

				Potato			Yellow nutsedge	Potato			Yellow nutsedge
				6/1/2007				6/7/2007			
	Treatment[a]	Rate	Timing[b]	Chlorosis	Necrosis	Growth reduction	Control	Chlorosis	Necrosis	Growth reduction	Control
				%				%			
1	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0
2	V10142	8.5 oz/acre	PRE	0.0	0.0	0.0	77.5	0.0	0.0	0.0	78.8
3	V10142	10.7 oz/acre	PRE	0.0	0.0	0.0	70.0	0.0	0.0	0.0	72.5
4	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	86.3	0.0	0.0	0.0	78.8
	V10142	6.4 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
5	V10142	8.5 oz/acre	PRE	0.0	0.0	0.0	90.0	0.0	0.0	0.0	87.5
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
6	V10142	10.7 oz/acre	PRE	0.0	0.0	0.0	95.0	0.0	0.0	0.0	90.0
	V10142	10.7 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
7	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	92.5	0.0	0.0	0.0	90.0
	D. Magnum	1.0 pt/acre	PRE								
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
8	Matrix	1.0 oz/acre	PRE	0.0	0.0	0.0	86.3	0.0	0.0	0.0	81.3
	D. Magnum	1.0 pt/acre	PRE								
	Matrix	1.0 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
9	D. Magnum	1.0 pt/acre	PRE	0.0	0.0	0.0	90.0	0.0	0.0	0.0	81.3
	Sencor 4	0.38 pt/acre	PRE								
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
10	D. Magnum	1.0 pt/acre	PRE	0.0	0.0	0.0	93.8	0.0	0.0	0.0	88.8
	Sencor 4	0.38 pt/acre	PRE								
	Matrix	1.0 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
11	Eptam 7E	4.5 pt/acre	PRE	0.0	0.0	0.0	78.8	0.0	0.0	0.0	63.8
	Prowl H2O	1.58 pt/acre	PRE								
	D. Magnum	1.0 pt/acre	PRE								
12	untreated			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSD ($P = 0.05$)				--	--	--	12.35	--	--	--	18.82
Standard Deviation				--	--	--	8.55	--	--	--	13.02
CV				--	--	--	11.28	--	--	--	18.13

[a]MSO = Methylated seed oil; D. Magnum = Dual Magnum.

[b]Timing PRE = Pre-emergence, POST = Post-emergence.

Table 1 continued. Potato response to V-10142 herbicide and yellow nutsedge control on June 14 and July 9, 2007 at the Malheur Experiment Station, Oregon State University, Ontario, OR.

				Potato			Yellow nutsedge	
				6/14/2007			6/14/2007	7/9/2007
	Treatment[a]	Rate	Timing[b]	Chlorosis	Necrosis	Growth reduction	Control	Control
				%			%	
1	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	55.0	65.0
2	V10142	8.5 oz/acre	PRE	0.0	0.0	0.0	75.0	78.8
3	V10142	10.7 oz/acre	PRE	0.0	0.0	0.0	82.5	86.3
4	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	88.8	92.5
	V10142	6.4 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
5	V10142	8.5 oz/acre	PRE	0.0	0.0	0.0	88.8	90.0
	V10142	8.5 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
6	V10142	10.7 oz/acre	PRE	0.0	0.0	0.0	95.0	95.0
	V10142	10.7 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
7	V10142	6.4 oz/acre	PRE	0.0	0.0	0.0	95.0	95.0
	D. Magnum	1.0 pt/acre	PRE					
	V10142	8.5 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
8	Matrix	1.0 oz/acre	PRE	0.0	0.0	0.0	87.5	88.8
	D. Magnum	1.0 pt/acre	PRE					
	Matrix	1.0 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
9	D. Magnum	1.0 pt/acre	PRE	0.0	0.0	0.0	93.8	95.0
	Sencor 4	0.38 pt/acre	PRE					
	V10142	8.5 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
10	D. Magnum	1.0 pt/acre	PRE	0.0	0.0	0.0	95.0	95.0
	Sencor 4	0.38 pt/acre	PRE					
	Matrix	1.0 oz/acre	POST					
	MSO	1.6 pt/acre	POST					
11	Eptam 7E	4.5 pt/acre	PRE	0.0	0.0	0.0	95.0	95.0
	Prowl H2O	1.58 pt/acre	PRE					
	D. Magnum	1.0 pt/acre	PRE					
12	untreated			0.0	0.0	0.0	0.0	0.0
LSD (*P* =.05)				--	--	--	10.57	8.81
CV				--	--	--	9.23	7.5

[a]MSO = Methylated seed oil; D. Magnum = Dual Magnum.

[b]Timing PRE = Pre-emergence, POST = Post-emergence.

Table 2. Potato tuber yield in response to V-10142 herbicide application to control yellow nutsedge at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2007.

				<4oz CWT/acre	4-6oz CWT/acre	6-12oz CWT/acre	>12oz CWT/acre	Marketable CWT/acre	twos CWT/acre	cull CWT/acre	Specific gravity g/cm^{-3}
				Potato Tuber Yield							
	Treatment[a]	Rate	Timing[b]								
1	V10142	6.4 oz/acre	PRE	56	54	204	152	411	50	3	1.0738
2	V10142	8.5 oz/acre	PRE	41	57	202	146	406	55	10	1.0698
3	V10142	10.7 oz/acre	PRE	76	65	198	133	396	83	28	1.0715
4	V10142	6.4 oz/acre	PRE	56	62	270	117	409	56	2	1.0785
	V10142	6.4 oz/acre	POST								
	MSO[a]	1.6 pt/acre	POST								
5	V10142	8.5 oz/acre	PRE	68	72	217	147	436	79	13	1.0748
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
6	V10142	10.7 oz/acre	PRE	52	75	256	153	483	80	20	1.0828
	V10142	10.7 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
7	V10142	6.4 oz/acre	PRE	65	82	261	127	470	48	4	1.0780
	Dual Magnum	1.0 pt/acre	PRE								
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
8	Matrix	1.0 oz/acre	PRE	69	69	255	191	515	82	29	1.0780
	Dual Magnum	1.0 pt/acre	PRE								
	Matrix	1.0 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
9	Dual Magnum	1.0 pt/acre	PRE	56	67	231	180	478	47	9	1.0770
	Sencor 4	0.38 pt/acre	PRE								
	V10142	8.5 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
10	Dual Magnum	1.0 pt/acre	PRE	66	71	270	180	522	45	18	1.0775
	Sencor 4	0.38 pt/acre	PRE								
	Matrix	1.0 oz/acre	POST								
	MSO	1.6 pt/acre	POST								
11	Eptam 7E	4.5 pt/acre	PRE	54	96	247	116	459	76	9	1.0813
	Prowl H2O	1.58 pt/acre	PRE								
	Dual Magnum	1.0 pt/acre	PRE								
12	untreated			55	87	206	106	400	28	2	1.0848
LSD ($P = 0.05$)				NS	24.4	57.2	45.4	79.7	41.3	21.5	NS
CV				34.43	23.61	16.87	21.57	12.3	46.96	120.79	0.77

[a]MSO = Methylated seed oil. [b]Timing PRE = Pre-emergence, POST = Post-emergence.