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

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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, 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 needed by growers in eastern Oregon where the weed is widely distributed. Control of yellow nutsedge is extremely critical and a major method of control is the use of soil-residual herbicides before the weeds emerge and compete with the crop. If uncontrolled, yellow nutsedge reduces potato tuber yield and most importantly, it produces more tubers that increase its distribution in the field. Boldt (1976) found evidence that yellow nutsedge rhizomes can penetrate potato tubers and lower both the yield and quality. It is not uncommon for yellow nutsedge rhizomes to grow through or deposit their tubers in potatoes in fields in eastern Oregon (personal observation). The herbicide V-10142 is being tested by Valent for possible registration for use on several solanaceous crops including potato. When applied pre-emergence, V-10142 does not require incorporation and will therefore reduce field activities. The objective of this study was to determine the most efficacious rates, timings, and phytotoxicity of V-10142 herbicide when applied alone and in combination with other herbicides.

Materials and Methods

A field study was established in 2008 in a grower field near Adrian, Oregon. The grower planted potato variety ‘Ranger Russet’ on April 4 on 30-inch spaced beds. The study was a randomized complete block design with four replications. Individual plots measured 9 ft wide by 30 ft long. Pre-emergence (PRE) treatments were applied on May 15 using a CO_2-pressurized backpack sprayer with a boom equipped with six 8002EVS flat-fan nozzles and calibrated to deliver 20 gal/acre at 3 mph. The PRE herbicides were not mechanically incorporated, but instead the trial was sprinkler irrigated on May 18 to incorporate the herbicides in the soil. All postemergence (POST) treatments included methylated seed oil (MSO) at 1 percent V/V and were applied on June 7 when potato seedling height was about 6 inches and yellow nutsedge was about 4 inches in height. Evaluations for phytotoxicity and yellow nutsedge control were

conducted at 7, 14, 23, 34, and 100 days after treatment (DAT). Evaluations were based on visual estimates on a 0-100 percent scale (0 = no crop phytotoxicity or weed control and 100 = total crop injury or complete weed control). Potato plants were sprinkler irrigated on a calendar schedule to maintain soil moisture in the top 12 inches of the soil. Plants 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 using the weight-in-air, weight-in-water method (Dean and Thornton 1992). The data were subjected to analysis of variance and the means separated using the least significant difference (LSD) at P = 0.05 percent.

Results and Discussion

There was no detectable visual injury on potato plants from any of the V-10142 treatments tested. Visual evaluations at 7 and 14 DAT indicated weed control including yellow nutsedge at 99 percent (data not shown). Evaluations at 23 DAT indicated yellow nutsedge control ranged from 96 to 99 percent across herbicide treatments (Table 1). At 34 DAT, control for kochia, common lambsquarters, and pigweed remained high at 99 percent across herbicide treatments. Common mallow control was at 96 percent for V-10142 applied PRE at 4.27 and 6.4 oz/acre. Also, evaluations at 34 and 100 DAT indicated yellow nutsedge control ranged from 79 to 99 percent and 55 to 94 percent, respectively (Table 2). The best yellow nutsedge control at 100 DAT (94 percent) was observed with the PRE application of V-10142 plus Dual Magnum at 8.5 oz/acre plus 1 pt/acre, respectively, followed by POST application of V-10142 at 4.27 oz/acre. As expected, yellow nutsedge control was nonexistent in the untreated control. Control for kochia at 100 DAT ranged from 90 percent to 99 percent with stand-alone applications of V-10142 at 4.27 and 6.4 oz/acre PRE providing the least control. Common lambsquarters control at 100 DAT ranged from 96 to 99 percent, and once again V-10142 stand-alone treatments applied PRE provided the least control. Control for pigweed species remained consistently high at 99 percent while that of common mallow ranged from 95 to 99 percent.

Potato tuber yield was a direct reflection of weed control levels across treatments (Table 3). Small tuber yield (<4 oz) ranged from 2.6 to 4.1 ton/acre across herbicide treatments and was significantly greater (8 ton/acre) for the untreated control. There was no difference among treatments for potatoes in yield categories of 4-6 oz, 6-12 oz, and over 12 oz. The total U.S. No. 1 potato yield was lowest in the untreated control (17.3 ton/acre). The stand alone PRE application of V-10142 at 4.27 oz/acre produced the lowest U.S. No. 1 potato yield (22.6 ton/acre) among the herbicide treatments. Other V-10142 treatments produced similar U.S. No. 1 potato yield to the standard grower treatment of Eptam 7E plus Prowl H_2O plus Dual Magnum at 4.5 pt/acre plus 1.58 pt/acre plus 1 pt/acre, respectively, followed by POST application of Matrix 1 oz/acre. There was no difference for the U.S. No. 2 potato yield among treatments and it ranged from 1.6 to 3.5 ton/acre. Potatoes from different herbicide treatments had similar specific gravity ranging from 1.083 to 1.093.

The herbicide V-10142 provided season-long control of all broadleaf weeds at the site including common mallow, which is considered hard to control in most crops. Late season control for yellow nutsedge with V-10142 was as high as standard herbicides. The herbicide has the 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.

Dean, B.B., and R.E. Thornton. 1992. The potato specific gravity. Extension Bulletin EB1541, Washington State University.

Table 1. Weed control in potato at 23 days after herbicide application near Adrian, OR, 2008.

Treatment	Rate	Unit	Application timing	Potato Injury	Weed control [†]				
					Yellow nutsedge	Kochia	Common lambsquarters	Pigweed species	Common mallow
				%					
V-10142	4.27	oz/a	PRE	0 a	96 b	99 a	99 a	99 a	96 b
V-10142	6.4	oz/a	PRE	0 a	98 ab	99 a	99 a	99 a	96 b
V-10142	8.5	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	POST						
MSO	1	%V/V							
V-10142	6.4	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
V-10142	6.4	oz/a	POST						
MSO	1	%V/V							
V-10142	8.5	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	POST						
MSO	1	%V/V							
V-10142	8.5	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
Dual Magnum	1.0	pt/a	PRE						
V-10142	4.27	oz/a	POST						
MSO	1	%V/V							
Matrix	1	oz/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
Dual Magnum	1.0	pt/a	PRE						
Matrix	1	oz/a	POST						
NIS	0.4	pt/a							
Dual Magnum	1.0	pt/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
Sencor 4	0.5	pt/a	PRE						
V-10142	8.5	oz/a	POST						
MSO	1	%V/V							
Dual Magnum	1.0	pt/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
Sencor 4	0.5	pt/a	PRE						
Matrix	1	oz/a	POST						
NIS	0.4	pt/a							
Eptam 7E	4.5	pt/a	PRE	0 a	99 a	99 a	99 a	99 a	99 a
Prowl H_2O	1.58	pt/a	PRE						
Dual Magnum	1.0	pt/a	PRE						
Matrix	1	oz/a	POST						
NIS	0.4	pt/a							
untreated				0 a	0 c	0 b	0 b	0 b	0 c

[†]Means within a column followed by the same letter do not significantly differ (LSD, $P = 0.05$)

Table 2. Weed control at 34 DAT (and 100 DAT for yellow nutsedge) in potato study near Adrian, OR, 2008.

Treatment	Rate	Unit	Application timing	Potato Injury	Weed control [†] Yellow nutsedge 7/11/08	Yellow nutsedge 9/15/08	Kochia	Common lambsquarters	Pigweed species	Common mallow
				%						
V-10142	4.27	oz/a	PRE	0 a	79 e	55 cd	90 c	97 b	99 a	95 b
V-10142	6.4	oz/a	PRE	0 a	89 d	61 bcd	95 b	96 b	99 a	99 a
V-10142	8.5	oz/a	PRE	0 a	96 abc	61 bcd	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	PRE	0 a	96 bc	50 d	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
V-10142	6.4	oz/a	PRE	0 a	94 c	78 abc	99 a	99 a	99 a	99 a
V-10142	6.4	oz/a	POST							
MSO	1	%V/V								
V-10142	8.5	oz/a	PRE	0 a	99 a	80 abc	99 a	99 a	99 a	99 a
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
V-10142	8.5	oz/a	PRE	0 a	97 ab	94 a	99 a	99 a	99 a	99 a
Dual Magnum	1.0	pt/a	PRE							
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
Matrix	1	oz/a	PRE	0 a	99 a	79 abc	99 a	99 a	99 a	99 a
Dual Magnum	1.0	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
Dual Magnum	1.0	pt/a	PRE	0 a	99 a	74 a-d	99 a	99 a	99 a	99 a
Sencor 4	0.5	pt/a	PRE							
V-10142	8.5	oz/a	POST							
MSO	1	%V/V								
Dual Magnum	1.0	pt/a	PRE	0 a	98 ab	86 ab	99 a	99 a	99 a	99 a
Sencor 4	0.5	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
Eptam 7E	4.5	pt/a	PRE	0 a	99 a	64 bcd	99 a	99 a	99 a	99 a
Prowl H_2O	1.58	pt/a	PRE							
Dual Magnum	1.0	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
untreated				0 a	0 f	0 e	0 d	0 c	0 b	0 c

[†]Means within a column followed by the same letter do not significantly differ (LSD, $P = 0.05$)

Table 3. Potato yield in plots treated with V-10142 in a study near Adrian, OR, 2008.

Treatment	Rate	Unit	Application timing	Marketable tuber yield †						
				<4oz	4-6oz	6-12 oz	>12 oz	U.S. No. 1	U.S. No. 2	Specific gravity
				ton/acre						
V-10142	4.27	oz/a	PRE	3.1 b	5.2 a	12.4 a	5.0 a	22.6 b	3.5 a	1.087 a
V-10142	6.4	oz/a	PRE	2.6 b	5.7 a	15.5 a	3.9 a	25.0 ab	1.6 a	1.088 a
V-10142	8.5	oz/a	PRE	2.6 b	4.6 a	16.7 a	6.6 a	27.8 a	2.0 a	1.089 a
V-10142	4.27	oz/a	PRE	3.6 b	5.1 a	13.1 a	8.6 a	26.7 ab	3.0 a	1.083 a
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
V-10142	6.4	oz/a	PRE	3.8 b	5.8 a	14.0 a	6.6 a	26.3 ab	2.4 a	1.086 a
V-10142	6.4	oz/a	POST							
MSO	1	%V/V								
V-10142	8.5	oz/a	PRE	2.7 b	5.5 a	12.6 a	5.6 a	23.7 ab	2.0 a	1.099 a
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
V-10142	8.5	oz/a	PRE	4.1 b	6.3 a	13.8 a	5.2 a	25.3 ab	3.5 a	1.085 a
Dual Magnum	1.0	pt/a	PRE							
V-10142	4.27	oz/a	POST							
MSO	1	%V/V								
Matrix	1	oz/a	PRE	3.7 b	5.5 a	14.7 a	5.5 a	25.7 ab	2.9 a	1.086 a
Dual Magnum	1.0	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
Dual Magnum	1.0	pt/a	PRE	3.8 b	5.8 a	15.3 a	4.5 a	25.6 ab	1.8 a	1.093 a
Sencor 4	0.5	pt/a	PRE							
V-10142	8.5	oz/a	POST							
MSO	1	%V/V								
Dual Magnum	1.0	pt/a	PRE	2.9 b	4.8 a	12.4 a	7.4 a	24.6 ab	1.7 a	1.092 a
Sencor 4	0.5	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
Eptam 7E	4.5	pt/a	PRE	3.1 b	4.7 a	14.2 a	6.2 a	25.1 ab	1.7 a	1.089 a
Prowl H_2O	1.58	pt/a	PRE							
Dual Magnum	1.0	pt/a	PRE							
Matrix	1	oz/a	POST							
NIS	0.4	pt/a								
Untreated				8.0 a	6.1 a	8.1 a	3.1 a	17.3 c	2.3 a	1.090 a

†Means within a column followed by the same letter do not significantly differ (LSD, $P = 0.05$)