DEVELOPMENT OF NEW HERBICIDE OPTIONS FOR WEED CONTROL IN POTATO PRODUCTION

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Introduction

Weed control in potatoes is essential for production of high yielding marketable tubers. Herbicide options in potato production are limited. Chateau® (previously called Valor®) has demonstrated promise for use in potato in previous research. Chateau represents a mode of action that is not currently used in potatoes and offers excellent hairy nightshade control. A trial was conducted to evaluate two-way tank mixture with and without the addition of Chateau to determine if it can be added to increase weed control, especially hairy nightshade.

Materials and Methods

A trial was conducted at the Malheur Experiment Station to evaluate Chateau additions to two-way tank mixtures for enhanced weed control efficacy. The ground was ripped in the fall and because of fall rains hilling was done in the spring on March 18. Potatoes were planted April 22, 2005 in an Owyhee silt loam soil with pH 7.6, 2.7 percent organic matter content, and a cation exchange capacity of 19. 'Russet Burbank' seed pieces were planted every 9 inches in 36-inch-wide rows. Seed pieces were treated with Tops-MZ® plus Gaucho®. Experimental plots were 4 rows wide and 30 ft long. Plots were sidedressed with 174 lb nitrogen (N), 94 lb phosphorus (P), 45 lb potassium (K), 18 lb sulfate, 37 lb elemental sulfur (S), 5 lb zinc (Zn), 6 lb manganese (Mn), and 1 lb boron (B)/acre on April 29 and rehilled on May 12. Preemergence herbicides were applied with a CO_2-pressurized backpack sprayer delivering 20 gal/acre at 30 psi and incorporated with approximately 0.5 inch of sprinkler irrigation on May 13. On July 15, 20 lb N/acre was applied through the sprinkler. Aerial fungicide applications included Ridomil Gold® and Bravo® at 1.5 pt/acre on June 13, Endura® at 10 oz/acre plus Dithane at 2 lb/acre plus Folo Spray 20-20-20 on June 18, Dithane at 2 lb/acre plus liquid S at 6 lb/acre on June 28, Bravo at 1.5 pt/acre on July 20, Dithane at 2 lb/acre plus Tanos® at 8 oz/acre on July 28, and Bravo at 1.5 pt/acre on September 6. On August 20, 6 lb S/acre was applied to prevent two-spotted spider mite infestation.

Visual potato injury and weed control were evaluated throughout the growing season. Tubers were harvested from the center two rows of each plot on September 7. Potatoes were graded for yield and size on September 8 and 9.

Results and Discussion

Rainfall at the time of potato emergence resulted in significant injury from several of the herbicide combinations. In all cases, three-way tank mixtures containing Chateau had greater injury on May 23 than the corresponding two-way tank mixtures without Chateau (Table 1). Prowl plus Outlook also had higher injury compared to all the other standard two-way tank mixtures. For some reason the three-way combination of Prowl, Sencor®, and Chateau had less injury than all other treatments containing Chateau. Injury decreased with time, but on June 8, relative injury associated with Chateau treatments was similar to the earlier evaluation. The three-way combination of Prowl, Sencor, and Chateau did not differ in injury from the two-way combination of Prowl and Sencor. By July 11, no injury was visible with any herbicide treatment (data not shown).

All treatments controlled pigweed species (redroot pigweed and Powell amaranth) greater than 95 percent except for Dual Magnum plus Prowl (Table 1). Common lambsquarters control was lower with Dual Magnum plus Prowl compared to the other treatments. Outlook combined with Chateau provided less lambsquarters control than Prowl plus Sencor or the three-way tank mixture of Prowl, Outlook, and Chateau. Prowl plus Sencor provided the least hairy nightshade control of all the herbicide treatments. Adding Chateau to Prowl plus Sencor significantly improved hairy nightshade control, but control was still less than with the other combinations. Treatments providing greater than 90 percent control of hairy nightshade contained either Outlook or Chateau. All treatments controlled kochia and barnyardgrass 97-100 and 95-100 percent, respectively.

Potato yields were similar among all treatments with the exception that Dual Magnum plus Sencor had greater tuber yields in the 6- to 12-oz, greater than 12-oz, total, marketable, and total U.S. No. 1s categories than Prowl plus Sencor. Reduced yields with the Prowl plus Sencor tank mixture could be related to the poor hairy nightshade control. Yields did not appear to be related to the crop injury observed early in the season.

Table 1. Comparison of standard 2- and 3-way tank mixtures with Chateau® for potato crop injury and weed control, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Treatment*	Rate	Potato injury		Weed control†				
		5-23	6-8	Pigweed‡	Common lambsquarters	Hairy nightshade	Kochia	Barnyard grass
	lb ai/acre	----------			%----------			
Untreated check	--	-	-	-	-	-	-	-
Dual Magnum + Sencor	1.33 + 0.5	4	2	100 a	99 ab	84 bc	100 a	100 a
Prowl + Sencor	1.0 + 0.5	3	2	100 a	100 a	49 d	100 a	100 a
Dual Magnum + Prowl	1.33 + 1.0	8	3	88 b	82 c	80 c	100 a	99 a
Prowl + Outlook	1.0 + 0.84	22	3	99 a	97 ab	96 abc	97 a	99 a
Dual Magnum + Sencor + Chateau	1.33 + 0.5 + 0.048	27	15	96 ab	99 ab	93 abc	100 a	97 a
Sencor + Prowl + Chateau	0.5 + 1.0 + 0.048	15	5	100 a	99 ab	83 c	100 a	99 a
Dual Magnum + Prowl + Chateau	1.33 + 1.0 + 0.048	28	10	99 a	92 abc	91 abc	100 a	98 a
Prowl + Outlook + Chateau	1.0 + 0.84 + 0.048	31	16	100 a	100 a	99 a	99 a	98 a
Outlook + Chateau	0.84 + 0.048	33	15	98 a	92 bc	98 ab	100 a	95 a
LSD (P = 0.05)	--	7	6	-	-	-	-	-

*Herbicide treatments were applied preemergence on May 13, 2005.
†Weed control evaluations were taken September 2. Weed control data were arcsine transformed prior to analysis. Non-transformed means are presented. Means followed by the same letter are not significantly different at the P = 0.05 confidence level.
‡Pigweed species were a combination of Powell amaranth and redroot pigweed.

Table 2. Effect of standard 2- and 3-way tank mixtures with Chateau® on potato yield and quality, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

		Potato yield†							
		U.S. No. 1					Total	Total	Total
Treatment*	Rate	4-6 oz	6-12 oz	>12 oz	Total	Percent	No. 2	marketable	yield
	lb ai/acre	cwt/acre				%	cwt/acre		
Untreated check	--	61	27	1	89	35	1	243	243
Dual Magnum + Sencor	1.33 + 0.5	134	192	35	362	69	47	520	521
Prowl + Sencor	1.0 + 0.5	128	119	6	252	59	28	428	428
Dual Magnum + Prowl	1.33 + 1.0	129	150	17	297	64	45	462	462
Prowl + Outlook	1.0 + 0.84	135	150	20	305	64	37	475	475
Dual Magnum + Sencor + Chateau	1.33 + 0.5 + 0.048	130	148	12	290	64	33	450	451
Sencor + Prowl + Chateau	0.5 + 1.0 + 0.048	131	147	19	296	66	23	446	447
Dual Magnum + Prowl + Chateau	1.33 + 1.0 + 0.048	131	164	17	312	65	40	477	477
Prowl + Outlook + Chateau	1.0 + 0.84 + 0.048	137	143	22	302	64	39	468	470
Outlook + Chateau	0.84 + 0.048	120	154	17	291	64	39	450	452
LSD (0.05)		20	40	16	53	8	19	48	49

*Herbicide treatments were applied preemergence on May 13, 2005.
†Potatoes were harvested September 7. Total marketable yield = total U.S. No. 1s + total U.S. No. 2s.