

SOIL-ACTIVE HERBICIDE APPLICATIONS FOR WEED CONTROL IN ONION

Corey V. Ransom, Charles A. Rice, and Joey K. Ishida
Malheur Experiment Station
Oregon State University
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Introduction

Weed control is essential for the production of marketable onions. Only a few herbicides are registered for preemergence application in onion. Effective preemergence herbicides can control weeds as they germinate and reduce the size and number of weeds that are present when onions are large enough to tolerate postemergence herbicide applications. This research evaluated registered and experimental herbicides for preemergence weed control in onion.

Methods

General Procedures

A trial was conducted at the Malheur Experiment Station under furrow irrigation. On March 25, onions (cv. 'Vaquero', Nunhems, Parma, ID) were planted at 3.7-inch spacing in double rows on 22-inch beds. Plots were 4 rows wide and 27 ft long and arranged in a randomized complete block design with 4 replicates. Lorsban[®] was applied in a 6-inch band over each double row at 3.7 oz/1,000 ft of row. Onions were sidedressed with 175 lb nitrogen, 30 lb phosphorus, 35 lb sulfate, 38 lb elemental sulfur, 2 lb zinc, 3 lb manganese, and 1 lb boron/acre on June 3. Registered insecticides and fungicides were applied for thrips and downy mildew control.

Preemergence (PRE) applications of Prowl[®] (pendimethalin), Nortron[®] (ethofumesate), and Outlook[®] (dimethenamid-P) in combination with Roundup (glyphosate) were evaluated for weed control and onion tolerance. Each product was evaluated at two rates. Combinations of Prowl with Nortron or Outlook were also evaluated. Prowl and Prowl H₂O[®] (a new water-based formulation) were also applied to onions at the flag leaf stage following Roundup applied PRE. Prowl H₂O was also combined with Outlook applied at the flag leaf stage following a PRE application of Roundup. Preemergence treatments and other applications of soil-active herbicides were compared to plots where only Roundup was applied preemergence.

Herbicide treatments were applied with a CO₂-pressurized backpack sprayer. Preemergence applications were applied at 20 gal/acre at 30 psi. Postemergence applications were applied at 40 gal/acre at 30 psi. Preemergence treatments were applied on April 5, two-leaf on May 6, three-leaf on May 14, and five-leaf on June 2.

All plots received Poast[®] (sethoxydim) at 0.19 lbs ai/acre plus crop oil concentrate (COC) (1 qt/acre) on June 16 to control grasses. Weed control and onion injury were evaluated throughout the season. Onions were harvested September 16 and 17 and graded by size on October 1-4.

Data were analyzed using analysis of variance and means were separated using a protected least significant difference (LSD) at the 5 percent level (0.05).

Results and Discussion

Preemergence and postemergence treatments were effective because of rain and actively growing weeds at the time herbicides were applied. Injury was similar among treatments except for plots treated with a tank mixture of Buctril, Outlook, and Chateau, which had significantly more injury than all other treatments on May 24 and at the later evaluation on June 9 (Table 1). Pigweed (redroot pigweed and Powell amaranth) control was similar among herbicide treatments and ranged from 84 to 99 percent. Common lambsquarters control was improved with preemergence applications of Prowl compared to plots treated only with Roundup PRE. Outlook and Nortron did not significantly increase common lambsquarters control compared to Roundup alone. Hairy nightshade control was greater than 90 percent and barnyardgrass greater than 96 percent for all herbicides. Kochia control was significantly greater with PRE Prowl or Nortron compared to Outlook. However, the high rate of Outlook improved kochia control compared to Roundup alone PRE. This year, delaying Prowl or Prowl plus Outlook combinations until the flag leaf stage provided similar control to preemergence applications. If these treatments are as effective as the PRE applications, then applications to flag leaf onions provide an increased level of crop safety compared to PRE applications. Treatments with Prowl applied PRE or to flag leaf onions followed by applications of Outlook to two-leaf onions also effectively controlled all weeds. The Prowl label allows applications to flag leaf onions and the Outlook label allows applications to two-leaf onions.

Roundup alone PRE and Roundup plus Outlook (0.66 lb ai/acre) produced higher medium onion yields and lower colossal, total, and marketable onion yields compared to all the other treatments (Table 2). The combination of Prowl plus Outlook PRE had among the lowest number of onion bulbs per acre and was less than plots with Roundup alone PRE or applications of Prowl made to flag leaf onions. This result illustrates the potential to reduce onion stand with PRE applications of soil-active herbicides. Even with the reduced number of onion bulbs, this treatment produced yields similar to all other treatments. Only plots with reduced weed control had significantly lower yields. The increased weed control and subsequent increase in onion yields from plots receiving a PRE or flag leaf application of a soil-active herbicide demonstrates the importance of soil-active herbicides for reducing weed germination and growth prior to when postemergence herbicide applications can be made.

Table 1. Onion injury and weed control in response to applications of Outlook[®], Nortron[®], and Prowl[®], Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Treatment	Rate	Timing [†]	Injury			Weed control [‡]			
			5-24	6-9	Pigweed [†]	Common lambsquarters	Hairy nightshade	Kochia	Barnyardgrass
	lb ai/acre	Leaf	-----%						
Untreated	--	--	--	--	--	--	--	--	--
Roundup + Outlook	0.75 + 0.656	PRE	25	16	87	77	100	73	100
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Outlook	0.75 + 0.843	PRE	25	17	95	88	100	85	100
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Nortron	0.75 + 1.0	PRE	26	19	88	85	91	96	98
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Nortron	0.75 + 2.0	PRE	27	16	93	90	100	100	100
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl	0.75 + 1.0	PRE	25	16	98	96	100	95	98
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl	0.75 + 1.5	PRE	26	17	95	98	100	99	100
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup	0.75	PRE	25	16	84	77	98	69	99
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl + Nortron	0.75 + 1.0 + 1.0	PRE	26	16	99	100	100	99	97
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl + Outlook	0.75 + 1.0 + 0.843	PRE	26	18	97	100	95	98	100
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							

Table 1 (continued). Onion injury and weed control in response to applications of Outlook[®], Nortron[®], and Prowl[®], Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Treatment	Rate	Timing [*]	Injury		Weed control [†]				
			5-24	6-9	[‡] Pigweed	Common lambsquarters	Hairy nightshade	Kochia	Barnyardgrass
	lb ai/acre	Leaf	-----%						
Roudup	0.75	PRE	26	17	96	93	99	97	100
Prowl + Outlook	1.0 + 0.843	flag							
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup	0.75	PRE	26	18	95	92	100	88	100
Prowl H2O + Outlook	1.0 + 0.843	flag							
Buctril + Goal	0.125 + 0.125	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup	0.75	PRE	25	16	88	83	97	100	100
Prowl	1.0	flag							
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup	0.75	PRE	26	17	92	92	100	100	100
Prowl H2O	1.0	flag							
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl	0.75 + 1.0	PRE	24	17	97	98	100	100	99
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
Roundup + Prowl	0.75 + 1.0	PRE	39	27	98	100	100	100	96
Buctril + Chateau + Outlook	0.125 + 0.063 + 0.843	2-leaf							
Buctril + Goal	0.25 + 0.125	3-leaf							
Goal	0.25	5-leaf							
LSD (0.05)	--	--	2	3	12	12	6	10	3

*Preemergence (PRE) treatments were applied on April 5, two-leaf (2-leaf) on May 6, three-leaf (3-leaf) on May 14, and five-leaf (5-leaf) on June 2.

[†]Weed control was evaluated on September 2.

[‡]Pigweed is a combination of redroot pigweed and Powell amaranth.

Table 2. Onion yield in response to applications of Outlook[®], Nortron[®], and Prowl[®], Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Treatment	Rate	Timing ^a	Onion yield ^b					
			Small	Medium	Jumbo	Colossal	S. Colossal	Marketable
	lb ai/acre	Leaf	cwt/acre					
Untreated	--	--	--	--	--	--	--	--
Roundup + Outlook	0.75 + 0.656	PRE	8	59	650	151	25	884
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Outlook	0.75 + 0.843	PRE	9	23	726	340	22	1111
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Nortron	0.75 + 1.0	PRE	9	31	624	369	60	1085
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Nortron	0.75 + 2.0	PRE	5	32	633	379	61	1105
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl	0.75 + 1.0	PRE	9	22	695	412	70	1199
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl	0.75 + 1.5	PRE	7	23	640	357	73	1092
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup	0.75	PRE	11	59	678	128	10	874
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl + Nortron	0.75 + 1.0 + 1.0	PRE	11	23	555	498	101	1176
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl + Outlook	0.75 + 1.0 + 0.843	PRE	4	20	543	423	110	1095
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						

Table 2 (continued). Onion yield in response to applications of Outlook[®], Nortron[®], and Prowl[®], Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

Treatment	Rate	Timing [*]	Onion yield [†]					
			Small	Medium	Jumbo	Colossal	S. Colossal	Marketable
	lb ai/acre	Leaf	cwt/acre					
Untreated	--	--	--	--	--	--	--	--
Roundup	0.75	PRE	7	33	599	382	83	1097
Prowl + Outlook	1.0 + 0.843	flag						
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup	0.75	PRE	7	28	676	348	70	1122
Prowl H2O + Outlook	1.0 + 0.843	flag						
Buctril + Goal	0.125 + 0.125	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup	0.75	PRE	10	31	647	391	64	1132
Prowl	1.0	flag						
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup	0.75	PRE	6	30	683	370	61	1144
Prowl H2O	1.0	flag						
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl	0.75 + 1.0	PRE	6	23	582	491	126	1221
Buctril + Goal + Outlook	0.125 + 0.125 + 0.843	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
Roundup + Prowl	0.75 + 1.0	PRE	5	28	594	433	67	1122
Buctril + Chateau + Outlook	0.125 + 0.063 + 0.843	2-leaf						
Buctril + Goal	0.25 + 0.125	3-leaf						
Goal	0.25	5-leaf						
LSD (0.05)	--	--	6	20	111	181	57	188

*Preemergence (PRE) treatments were applied on April 5, two-leaf (2-leaf) on May 6, three-leaf (3-leaf) on May 14, and five-leaf (5-leaf) on June 2.

†Onions were harvested on September 16 and 17.