

VOLUNTEER POTATO CONTROL IN ONIONS

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Introduction

Many producers raise onions in rotation with potatoes. Volunteer potatoes are extremely competitive with onions and are not effectively controlled with herbicides currently registered for use on onions. Volunteer potatoes can serve as hosts for late blight, verticillium wilt, viruses, and nematodes. Starane, a new herbicide registered for volunteer potato control in corn, may control volunteer potatoes effectively in onions. Starane was evaluated in combination with Buctril and Goal for volunteer potato control and for onion tolerance.

Methods

A trial was established at the Malheur Experiment Station to evaluate Starane, Buctril, and Goal for volunteer potato control in onions. Potatoes were planted prior to onion seeding on April 3. 'Shepody' potato tubers were cut and planted 6 inches deep directly into the two center onion rows of each plot with a spacing of one seed piece every 3 ft. Onions (cv. 'Vision', Petoseed) were planted at a 3.7-inch spacing in double rows on 22-inch beds on April 4. Plots were four rows wide by 30 ft long. Lorsban was applied on a 6-inch band over each onion row at 3.7 oz per 1,000 ft of row. Onions were sidedressed with a split application of 200 lb N/acre as urea on May 23 and on June 13.

Annual weeds were controlled by applying Roundup (0.75 lb ai/acre) plus Prowl (1.5 lb ai/acre) prior to onion emergence on April 18. Herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 35 gal/acre at 30 psi. Herbicide combinations for volunteer potato control were applied on May 18, May 26, and June 13. At the first application, onions had two true leaves and potato plants were 4 inches tall. At the second application, onions had three true leaves and potatoes were 9 inches tall. The last application was to five-leaf onions and 16-inch tall potatoes. All plots were maintained free of weeds other than volunteer potatoes by hand weeding irrespective of herbicide effectiveness to allow the evaluation of the negative effects of volunteer potatoes on the onions.

Insecticides and fungicides were applied for thrips and downy mildew control as needed. Prior to onion harvest, potato tubers were dug, counted, and weighed from four plants in each plot on September 12 to determine the effect of the herbicide

treatments on tuber production. Tubers were placed in cold storage after harvest with a beginning temperature of 62°F and 80 to 85 percent humidity. Temperature was gradually decreasing to 45°F by October 19 and was maintained at 45°F until tubers were evaluated for sprouting January 18 and 19, 2001. Sprouting was evaluated by counting the number of tubers without sprouts, the number of tubers with sprouts <0.25 inches long, the number of tubers with sprouts >0.25 inches long, and the total number of sprouts. Decomposing tubers were not evaluated. Tuber and sprout numbers were used to calculate the percent of tubers sprouting and the average number of sprouts per tuber.

Onion yield and grade were determined by harvesting the two center rows from each plot on September 20 and grading the onions by size on October 5 and 6.

Results and Discussion

Onion injury was greatest immediately after Starane applications and lessened over time (Table 1). Treatments containing Starane at rates above 0.25 lb ai/acre applied once, or multiple applications of lower rates, resulted in significant onion injury. As the season progressed, injury symptoms decreased. Treatments containing Goal burned back the potato foliage, while Starane treatments caused potato stunting. On July 7, some of the highest volunteer potato control was achieved with one application of Buctril plus Goal followed by Buctril plus Starane (0.5 lb ai/acre) followed by Buctril, or three Starane (0.125 lb ai/acre) plus Buctril applications. Buctril plus Goal was among the least effective as were single applications of Starane at rates below 0.25 lb ai/acre.

Potato tuber production was high in all treatments compared to 1999. Only Buctril plus Goal followed by Starane (0.5 lb ai/acre) plus Buctril followed by Buctril reduced the number of tubers produced compared to the untreated plots. Treatments containing a single Starane application at 0.063 or 0.125 lb ai/acre produced significantly more tubers than plots treated with a single application of Starane at 0.25 or 0.5 lb ai/acre. Total tuber weight and average weight per tuber were reduced by all treatments compared to the untreated check. Treatments containing Starane at 0.5 lb ai/acre applied once or Starane at 0.125 lb ai/acre applied three times had among the greatest reduction in tuber biomass.

Evaluations of tuber sprouting (Table 2) showed that all treatments reduced the percentage of tubers producing sprouts greater than 0.25 inches long and the total percentage of tubers producing sprouts. Tuber sprouting was closely correlated with volunteer potato control ratings ($R^2 = 0.71$). For tubers producing sprouts, the number of sprouts per tuber did not differ among treatments.

Treatments containing Starane at 0.5 lb ai/acre had fewer small onions and more colossal onions compared to the untreated plots (Table 3). Single applications of Starane at 0.25 lb ai/acre or lower did not increase jumbo, colossal, or total onion yields compared to the untreated and there were no differences in jumbo, colossal, and total

yields among the three rates (0.063, 0.125, or 0.25 lb ai/acre). Because of the competitiveness of potatoes with onions, in general treatments that provided the highest volunteer potato control produced the highest yields (Fig. 1); however, they also caused some of the greatest onion injury early in the season (Table 1).

Conclusions

Onion injury was directly related to the application rate of Starane and the number of times it was applied. Injury seemed to be transient and may be tolerable where volunteer potatoes are prevalent. In addition to reducing volunteer potato competition with onions, Starane also reduced tuber biomass and reduced tuber sprouting.

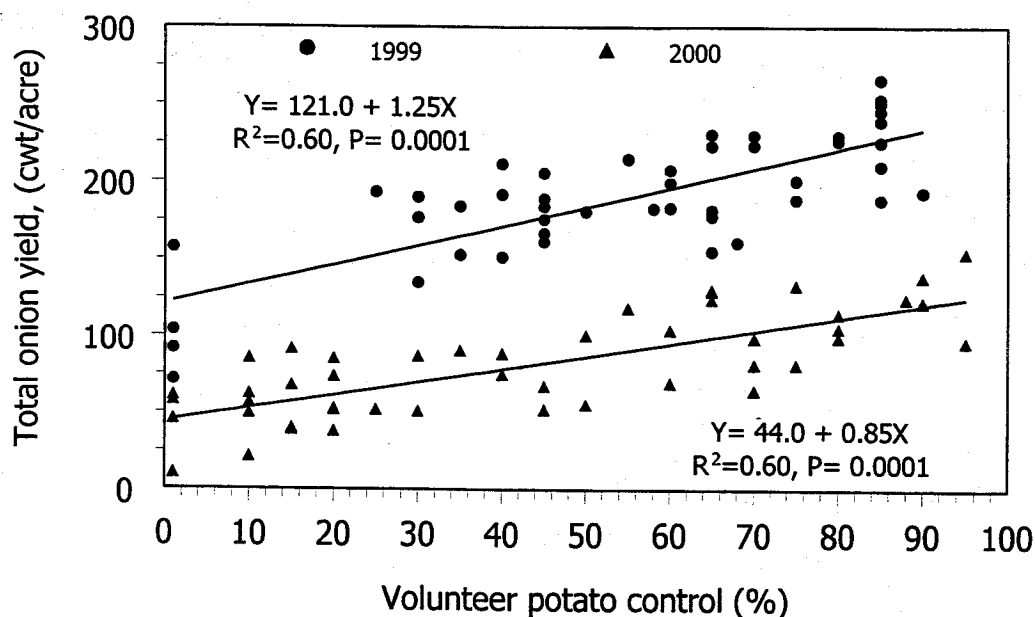


Figure 1. Relation between volunteer potato control and total onion yield in 1999 and 2000. The progressive suppression of volunteer potato growth was strongly associated with increased onion yields.

Table 1. Onion injury and volunteer potato control with postemergence herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Treatment	Rate	Timing*	Onion injury				Volunteer potato control				Tuber production per plant†		
			6-1	6-9	6-20	7-7	6-1	6-9	6-20	7-7	Weight	Number	Ave tuber weight
	lb ai/acre		-----%-----				-----%-----				grams		grams
Starane + Buctril	0.063 + 0.2	1	14	12	10	0	41	44	40	18	1,929	16	119
Buctril	0.2	2,3											
Starane + Buctril	0.063 + 0.2	1,2	24	21	19	0	50	61	60	25	1,393	12	132
Buctril	0.2	3											
Starane + Buctril	0.063 + 0.2	1,2,3	24	18	25	3	48	60	71	63	1,602	12	138
Starane + Buctril	0.125 + 0.2	1	18	15	11	0	43	49	46	14	1,906	18	114
Buctril	0.2	2,3											
Starane + Buctril	0.125 + 0.2	1,2	28	24	15	3	53	67	64	43	1,539	11	146
Buctril	0.2	3											
Starane + Buctril	0.125 + 0.2	1,2,3	40	25	40	14	51	65	82	81	1,040	12	90
Starane + Buctril	0.25 + 0.2	1	24	15	14	0	49	59	55	23	1,527	10	155
Buctril	0.2	2,3											
Starane + Buctril	0.5 + 0.2	1	39	34	28	9	61	73	79	70	1,008	9	112
Buctril	0.2	2,3											
Starane + Goal	0.063 + 0.12	1,2,3	33	28	29	3	59	63	81	68	1,273	11	120
Buctril + Goal	0.2 + 0.12	1,2,3	31	14	18	0	53	46	55	33	1,394	11	131
Buctril + Goal	0.2 + 0.12	1	50	36	25	8	56	68	82	93	699	7	100
Starane + Buctril	0.5 + 0.2	2											
Buctril	0.2	3											
Untreated			0	0	0	0	0	0	0	0	2,519	13	201
LSD (0.05)			10	9	11	7	5	7	5	15	453	5.7	33

*Treatments were applied on May 18 (1), May 26 (2), and June 13 (3).

†Tubers were harvested from four plants in each plot on September 12. The average tuber values per plant are presented.

Table 2. Volunteer potato tuber sprouting after storage in response to postemergence herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Treatment	Rate	Timing*	Tuber†			Total sprouting	Average sprouts per tuber
			Total evaluated	With sprouts <0.25 in long	With sprouts >0.25 in long		
	lb ai/acre		No.	%			No./tuber
Starane + Buctril	0.063 + 0.2	1	63	32	33	65	16
Buctril	0.2	2,3					
Starane + Buctril	0.063 + 0.2	1,2	46	25	18	43	12
Buctril	0.2	3					
Starane + Buctril	0.063 + 0.2	1,2,3	44	33	9	41	11
Starane + Buctril	0.125 + 0.2	1	64	18	25	43	16
Buctril	0.2	2,3					
Starane + Buctril	0.125 + 0.2	1,2	42	24	16	40	11
Buctril	0.2	3					
Starane + Buctril	0.125 + 0.2	1,2,3	47	10	2	12	12
Starane + Buctril	0.25 + 0.2	1	38	37	14	51	10
Buctril	0.2	2,3					
Starane + Buctril	0.5 + 0.2	1	33	20	2	22	8
Buctril	0.2	2,3					
Starane + Goal	0.063 + 0.12	1,2,3	41	16	1	17	10
Buctril + Goal	0.2 + 0.12	1,2,3	40	26	23	49	10
Buctril + Goal	0.2 + 0.12	1	29	2	0	2	7
Starane + Buctril	0.5 + 0.2	2					
Buctril	0.2	3					
Untreated			48	19	64	84	12
LSD (0.05)			NS	11	10	15	NS

*Treatments were applied on May 18 (1), May 26 (2), and June 13 (3).

†Tubers were evaluated for sprouting on January 18 and 19, 2001.

Table 3. Onion yield and grade in response to volunteer potato competition and postemergence herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Treatment	Rate	Timing*	Onion yield†				Total
			Small	Medium	Jumbo	Colossal	
	lb ai/acre		cwt/acre				
Starane + Buctril	0.063 + 0.2	1	14	48	98	22	189
Buctril	0.2	2,3					
Starane + Buctril	0.063 + 0.2	1,2	15	65	177	37	307
Buctril	0.2	3					
Starane + Buctril	0.063 + 0.2	1,2,3	12	62	272	65	427
Starane + Buctril	0.125 + 0.2	1	18	51	117	18	216
Buctril	0.2	2,3					
Starane + Buctril	0.125 + 0.2	1,2	18	68	206	34	338
Buctril	0.2	3					
Starane + Buctril	0.125 + 0.2	1,2,3	12	45	321	50	445
Starane + Buctril	0.25 + 0.2	1	20	72	171	3	276
Buctril	0.2	2,3					
Starane + Buctril	0.5 + 0.2	1	11	37	307	92	466
Buctril	0.2	2,3					
Starane + Goal	0.063 + 0.12	1,2,3	12	44	345	56	475
Buctril + Goal	0.2 + 0.12	1,2,3	20	47	261	54	394
Buctril + Goal	0.2 + 0.12	1	9	42	385	105	563
Starane + Buctril	0.5 + 0.2	2					
Buctril	0.2	3					
Untreated			18	38	109	20	192
LSD (0.05)			6	NS	79	46	110

*Treatments were applied on May 18 (1), May 26 (2), and June 13 (3).

†Onions were harvested on September 20.