

# WEED CONTROL AND CROP TOLERANCE OF ONIONS TO HERBICIDES APPLIED POSTPLANT PREEMERGENCE AND AS MULTIPLE POSTEMERGENCE APPLICATIONS TO SEEDLING ONIONS

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## Purpose

Several different herbicides were applied singly and in tank-mix combinations at various rates and timing of applications to identify herbicide treatments which were most effective for weed control and crop safety.

## Procedures

Seed of Vision variety of yellow sweet Spanish onions was planted on April 16 in silt loam textured soil. The soil was mold-board plowed and bedded in October of 1994. Stephens wheat was the crop before planting onions. The soil pH was 7.3 and had 1.2 percent organic matter. On April 5 the beds were harrowed with a spike-tooth bed-harrow and the onions planted in double rows 2 1/4 inches apart on single beds spaced 22 inches apart. Individual plots for all treatments were four rows wide and 25 feet long. All treatments were replicated three times in blocks using a randomized complete block experimental design.

After planting, the trial area was watered by furrow irrigation to furnish soil moisture for seed germination and plant emergence. Prowl preemergence herbicide treatments were applied at rates of 1.0, 1.5, and 2.0 lb ai/ac on May 2, when the onion seedlings were about 0.5 inch below the soil surface. On May 2 the air temperature was 58°F when spraying, and the wind was blowing from the west at 2 to 3 mph. The skies were overcast, and the soil was moist on the surface.

On May 18 the early postemergence applications were applied to flag leaf onions in this trial to compare preemergence treatments with early postemergence treatments for weed control and crop tolerance. The early postemergence treatments consisted of Prowl, Dual, or Frontier herbicides tank-mixed with Buctril, Nortron, and Prism herbicides and applied to onions with a fully developed flag leaf.

Weed species in the plots treated with postemergence applied herbicides were redroot pigweed, lambsquarters, kochia, hairy nightshade, and barnyardgrass. Broadleaf weed species ranged in size from cotyledon leaf weeds to weeds with 4-true leaves. Barnyardgrass had one to three leaves. Buctril, Nortron, and Prism rates were 0.15, 0.25, and 0.05 lb ai/ac, respectively. Prowl rates were 1.5 and 2.0 lb; Dual rate was 2.0

lb; and Frontier was 1.17 and 2.34 lb ai/ac. Prowl, Dual, and Frontier herbicides were soil activated with 1.41 inches of rain water which fell on six different days from May 3 to May 16. The most rainfall occurring in a single 24-hour period was 0.48 inches which fell on May 2 and again on May 6. On June 1 the onions previously treated with preemergence and early postemergence were sprayed with a final postemergence treatment containing Buctril, Goal, Nortron, and Prism at rates of 0.15, 0.05, 0.25, and 0.05 lb ai/ac, respectively.

In a second trial, herbicide treatments were begun as repeat applications to seedling onions in the flag leaf and 1-true leaf stage of growth. The treatments applied to onions with flag leaves were applied on May 18. The flag leaves were fully developed on all plants, and about 20 percent of the onions had a true leaf about 1 inch long. On May 18, when these treatments were applied, the air temperature was 74°F; soil temperature at 4 inches was 68°F. Wind was blowing at 2 to 3 mph from the west, and the skies were mostly clear. The first herbicide treatments applied to onion plants with 1 true leaf were made on May 24. On May 24 the air temperature was 76°F; the soil temperature at 4 inches was 73°F. The skies were partly cloudy, and wind was 2 mph from the northwest.

The weed species in the postemergence trials included kochia, redroot pigweed, hairy nightshade, lambsquarters, annual sowthistle, and barnyardgrass. When the onions were flag leaf, the weeds were small, ranging in size from cotyledon to four true leaves. The plants with four true leaves had rosettes 1-inch across. When the onions had one true leaf, the weeds had grown to a height of 2 to 4-inches with pigweed, nightshade, and annual sowthistle measuring 2-inches across rosettes. The larger barnyardgrass was three leaves and one tiller. Each trial received a total of 3 applications. The second and third applications were applied 10 and 24 days after the initial application.

All herbicides were applied with a single bicycle wheel plot sprayer. The spray boom had four nozzles with a nozzle centered over each row of the plot. Spray nozzles were Teejet fan size 6502. Spray pressure was 42 psi, and water as the herbicide carrier was applied at 19.5 gal/ac. Each plot was 4 rows wide and 25 feet long. Treatments were replicated three times using a randomized strip-type experimental design.

### Results and Discussion

Postplant preemergence applications of Prowl gave good weed control without causing injury to the emerging onion plants. Weed control improved as the rate of Prowl was increased from 1.0 lb to 1.5 lb to 2.0 lb ai/ac. Prowl at 1.5 lb ai/ac controlled about 90 percent pigweed, lambsquarters, kochia, and barnyardgrass, 75 percent control of hairy nightshade, and 15 to 20 percent control of sow thistle. Prowl tank-mixed with Buctril/Nortron/Prism and applied postemergence to flag leaf onions controlled all weeds that emerged with the onions (Table 1). Two repeat applications of Buctril/Nortron/Prism applied 10 and 24 days after the initial application and the soil residual from Prowl kept the onions free of weeds until harvest. Seedling onions were tolerant of Frontier applied with Buctril/Nortron/Prism to flag leaf onions. Frontier did

give residual weed control similar to Prowl. Dual applied to flag leaf onions caused injury to the onion plants. Injury symptoms began to show three to four weeks after Dual was applied. Onions with three or more leaves are tolerant to Dual applied at 2 lb ai/ac.

The better treatments in the postemergence trials included tank-mixes containing Prowl/Buctril/Nortron and Poast applied to the flag leaf onions at the respective rates of 1.5, 0.15, 0.25, and 0.1 lb ai/ac. Herbicides applied at the flag leaf gave better weed control than did herbicide applications delayed until onions had one true leaf. Repeat applications of these herbicides without Prowl as new weeds emerged gave season long weed control. Goal tank-mixed with Buctril/Nortron and applied to onions with true leaves can improve control of pigweed too large for control with Buctril. Prism herbicide gave excellent control of barnyardgrass applied alone or in tank-mix combination with Buctril/Nortron. Upbeet caused severe onion injury and did not control weeds effectively. Onion tolerance was not adequate with the emulsifiable formulation of Tough. Onions were more tolerant to the wettable powder formulation of Tough, but Tough treatments were consistently inferior to the Buctril/Nortron tank mixes (Tables 2 and 3).

Table 1. Percent crop injury and weed control from herbicides applied as postplant preemergence and postemergence applications to onions with a flag leaf. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Herbicides	Rate	Applied	Percent weed control																				
			Crop injury			Pigweed			Lamquarters			H. Nightshade			Kochia			A. Sowthistle			Barnyardgrass		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
	lb a/ac		— % —			%																	
Prowl	1.0	Pre	0	0	0	85	90	85	90	85	85	65	70	70	85	85	85	0	0	0	85	95	90
Prowl	1.5	Pre	5	5	5	90	90	90	90	90	90	70	80	80	90	95	90	15	20	15	90	100	100
Prowl	2.0	Pre	10	10	5	90	95	95	85	90	90	70	85	85	90	95	95	20	20	15	95	100	95
Prowl <sup>1</sup>	1.5	Post	0	5	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Prowl <sup>1</sup>	2.0	Post	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Dual <sup>1</sup>	2.0	Post	40	60	30	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Frontier <sup>1</sup>	1.17	Post	5	10	5	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Frontier <sup>1</sup>	2.34	Post	10	15	5	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Untreated check	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

<sup>1</sup> Herbicide tank-mixed with Buctril, Nortron, and Prism.

Evaluated June 12.

Table 2. Crop tolerance and weed control ratings for herbicides applied as repeat applications beginning when onion plants were flag leaf. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Herbicides	Rate	Percent weed control																				
		Crop injury			Pigweed			Lamquarters			H. Nightshade			Kochia			Sowthistle			Barnyardgrass		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
	lb a/ac	— % —			%																	
Buctril + Prowl + Poast	0.1 + 1.5 + 0.1	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Buctril + Prowl + Poast	0.15 + 1.5 + 0.1	5	0	0	100	100	100	100	100	100	100	100	100	99	100	100	100	100	100	100	100	100
Buctril + Prowl + Nortron + Poast	0.1 + 1.5 + 0.25 + 0.1	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Buctril + Prowl + Nortron + Poast	0.15 + 1.5 + 0.25 + 0.1	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Buctril + Goal + Prowl + Poast	0.1 + 0.03 + 1.5 + 0.1	0	5	5	100	100	99	100	100	100	100	100	100	100	100	99	100	100	100	100	100	100
Buctril + Goal + Nortron + Prowl + Poast	0.1 + 0.03 + 0.25 + 1.5 + 0.1	10	0	5	100	100	100	100	100	100	99	100	100	99	100	100	100	100	100	100	100	100
Tough ec + Poast	0.5 + 0.1	20	40	65	100	100	100	100	100	100	96	95	95	85	85	85	100	100	100	100	100	100
Tough ec + Poast	1.0 + 0.1	80	80	80	99	90	90	99	100	99	99	100	99	99	95	95	99	99	99	99	99	99
Tough wp + Poast	0.5 + 0.1	10	10	10	100	100	100	100	100	100	100	90	90	98	85	85	100	100	100	100	100	100
Tough wp + Poast	1.0 + 0.1	10	15	35	99	95	95	99	95	99	85	90	90	90	85	85	99	95	90	99	95	90
Tough ec + Buctril + Poast	0.25 + 0.15 + 0.1	30	40	60	100	100	100	100	100	100	100	100	100	98	98	98	98	99	99	99	99	99
Tough wp + Buctril + Poast	0.25 + 0.15 + 0.1	5	0	5	100	95	95	100	100	100	80	95	95	90	85	85	95	98	95	95	98	98
Upbeet	0.0156	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upbeet + X-77	0.0156 + 0.25%	35	35	35	40	10	40	30	20	20	30	30	30	60	50	50	35	40	30	0	0	0
Upbeet + Buctril	0.0156 + 0.10	15	15	15	40	40	60	60	60	70	40	40	50	60	50	60	75	80	85	0	0	0
Upbeet + Buctril	0.0156 + 0.15	40	40	40	80	60	60	80	70	80	75	75	60	80	80	80	85	90	85	0	0	0
Prism + COC	0.045 + 1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
Prism + COC	0.094 + 1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
Buctril + Prism	0.15 + 0.045	0	0	0	85	85	90	100	100	100	100	100	100	90	95	100	98	98	100	100	100	100
Buctril + Prism	0.15 + 0.094	5	0	0	80	85	85	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Untreated check	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

COC = Crop oil concentrate = MorAct

X-77 = non-ionic surfactant

Evaluated June 12.

Table 3. Crop tolerance and weed control ratings for herbicides applied as repeat applications beginning when onion plants had 1-true leaf. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

Herbicides	Rate	Percent weed control																										
		Crop Injury			Pigweed			Lambsquarters			H. Nightshade			Kochia			Sowthistle			Barnyardgrass								
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
	lb ai/ec	— % —			%																							
Buctril + Prowl + Poast	0.1 + 1.5 + 0.1	0	0	0	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100			
Buctril + Prowl + Poast	0.15 + 1.5 + 0.1	5	0	0	98	98	99	99	99	99	99	100	99	99	100	98	100	100	100	100	100	100	100	100	100			
Buctril + Prowl + Nortron + Poast	0.1 + 1.5 + 0.25 + 0.1	0	0	0	98	100	98	99	100	100	99	100	100	98	98	100	100	100	100	100	100	100	100	100	100			
Buctril + Prowl + Nortron + Poast	0.15 + 1.5 + 0.25 + 0.1	5	5	5	98	98	99	99	99	99	99	99	99	99	99	98	100	100	100	100	100	100	100	100	100			
Buctril + Goal + Prowl + Poast	0.1 + 0.03 + 1.5 + 0.1	0	0	0	98	98	98	99	99	98	98	99	98	98	98	95	100	100	100	100	100	100	100	100	100			
Buctril + Goal + Nortron + Prowl + Poast	0.1 + 0.03 + 0.25 + 1.5 + 0.1	5	5	0	98	98	98	99	99	99	99	98	98	98	98	98	100	100	100	100	100	100	100	100	100			
Tough ec + Poast	0.5 + 0.1	30	15	15	99	99	96	99	99	99	99	99	96	90	95	95	100	100	100	100	100	100	100	100	100			
Tough ec + Poast	1.0 + 0.1	15	15	70	95	100	98	95	100	99	90	90	98	95	99	95	100	100	100	100	100	100	100	100	100			
Tough wp + Poast	0.5 + 0.1	0	0	0	90	90	95	90	95	98	90	90	95	80	85	85	95	98	98	100	100	100	100	100	100			
Tough wp + Poast	1.0 + 0.1	5	5	5	99	99	99	99	99	99	95	98	98	90	95	90	99	100	100	100	100	100	100	100	100			
Tough ec + Buctril + Poast	0.25 + 0.15 + 0.1	5	5	10	95	98	99	98	98	99	9	98	99	95	95	99	100	100	100	100	100	100	100	100	100			
Tough wp + Buctril + Poast	0.25 + 0.15 + 0.1	5	5	5	80	80	85	75	85	85	80	85	75	70	90	80	95	99	99	100	100	100	100	100	100			
Upbeet	0.0156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Upbeet + X-77	0.0156 + 0.25%	80	80	40	20	10	10	30	20	30	10	10	10	65	80	80	40	45	50	0	0	0	0	0	0			
Upbeet + Buctril	0.0156 + 0.10	30	30	30	20	20	25	30	20	25	10	10	15	35	25	30	95	95	95	0	0	0	0	0	0			
Upbeet + Buctril	0.0156 + 0.15	70	85	40	30	30	30	40	45	45	20	30	30	40	50	50	80	80	80	0	0	0	0	0	0			
Prism + COC	0.045 + 1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100			
Prism + COC	0.094 + 1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100			
Buctril + Prism	0.15 + 0.045	0	0	0	80	85	85	95	95	95	90	95	95	90	90	85	90	95	100	100	100	100	100	100	100			
Buctril + Prism	0.15 + 0.094	0	0	0	85	85	90	90	90	90	95	95	95	90	90	90	95	100	100	100	100	100	100	100	100			
Untreated check	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

COC = Crop oil concentrate = MorAct