

Effect of Spray Volume and Herbicide Rate on Early Postemergence Weed Control in Onion, 2005

Carrie Schumacher, Harlene Hatterman-Valenti and Paul Hendrickson

Field research was conducted in 2005 to determine the effect of bromoxynil and oxyfluorfen rate and spray volume on early postemergence weed control in onion (*Allium cepa* L.). Bromoxynil and oxyfluorfen are two postemergence herbicides commonly used in onion, but both may cause onion leaf injury, so a high application volume (50 gal/A) is necessary to increase crop safety. In addition, onion must be in the two-leaf stage before herbicide application, but at this stage, many broadleaf weeds are already too large for control by either herbicide.

The study was conducted at the Carrington Research Extension Center, Carrington, ND. The soil was a Heimdal-Emerick/Fram-Wyard loam with 2.9% organic matter and a pH of 7.9, with soybean as the previous crop. Onion variety 'Teton' pelleted seed was planted on May 3 using a Stanhay four double-row planter unit, with 4-inch paired rows and 14 inches between main rows. Bromoxynil was applied at 0.075 and 0.3 lb. ai/A and oxyfluorfen at 0.025 and 0.1 lb. ai/A. High and low herbicide rates were sprayed with 10, 25 and 50 gal/A of water. Treatments were applied at the first-true-leaf stage (June 9) with a CO₂-pressurized backpack sprayer delivering the necessary volume to 6 foot wide and 20 foot long plots arranged in a randomized complete block design with four replications. Treatments were evaluated for weed coverage and control and onion height and injury one and three weeks after application. At the fifth-leaf stage, a standard application of 0.375 lb. ai/A bromoxynil and 0.125 lb. ai/A oxyfluorfen was made to all treatments, except checks, at a volume of 50 gal/A. An application of 0.62 lb. ai/A pendimethalin at a volume of 20 gal/A was made after the fifth-leaf stage as a final late-season weed control measure. A final weed control evaluation was taken one week before harvest. On September 22, 10 feet of the middle two rows of each plot were harvested for grade and yield analysis. After harvest, onions were allowed to cure and then were graded. Split, diseased and double bulbs were graded as culls, regardless of diameter.

Onion height early in the growing season was affected by treatment. However, one week before harvest, height was similar for all treatments except the weedy check. Plant stand was not affected by treatment. Treatments at the low rate and 50gal/A spray volume had the greatest weed density for both herbicides. Grades of cull, small and medium onions were not significantly different among treatments. Treatment differences were observed for large grade onions and total yield. No treatment yielded as well as the hand-weeded check. Treatments with oxyfluorfen resulted in the same yield, regardless of rate and volume. With bromoxynil, the low rate at all spray volumes and high rate at 10 gal/A were similar in yield and tended to yield better than the high rate at the medium and high volume.

Table 1. Effect of herbicide rate and volume on onion injury and weed control.

Treatment	Herbicide	Rate	Volume	% Onion Injury	-----% Weed Control ² -----		
		lb. ai/A	gal/A	1WAT ¹	1WAT	3WAT	1WBH
1	Weedy check	-	-	0 ^{c*}	0 ^f	0 ^g	0 ^g
2	Hand-weeded check	-	-	0 ^c	100 ^a	100 ^a	100 ^a
3	Bromoxynil	0.075	10	1.3 ^{cb}	81.3 ^{bc}	60 ^{bcd}	73.8 ^{bcd}
4	Bromoxynil	0.075	25	0 ^c	75 ^{cd}	50 ^{de}	52.5 ^{def}
5	Bromoxynil	0.075	50	0 ^c	52.5 ^e	17.5 ^{fg}	40 ^f
6	Bromoxynil	0.3	10	2.5 ^{abc}	87.5 ^{abc}	78.8 ^b	78.8 ^{abc}
7	Bromoxynil	0.3	25	5 ^a	81.3 ^{bc}	76.3 ^{bc}	81.3 ^{abc}
8	Bromoxynil	0.3	50	3.8 ^{ab}	78.8 ^{bc}	70 ^{bcd}	70 ^{bcd}
9	Oxyfluorfen	0.025	10	3.8 ^{ab}	75 ^{cd}	61.3 ^{bcd}	60 ^{cd}
10	Oxyfluorfen	0.025	25	2.5 ^{abc}	81.3 ^{bc}	50 ^{de}	70 ^{bcd}
11	Oxyfluorfen	0.025	50	3.75 ^{ab}	60 ^{de}	32.5 ^{ef}	47.5 ^{ef}
12	Oxyfluorfen	0.1	10	3.6 ^{ab}	77.5 ^{bcd}	57.5 ^{cd}	82.5 ^{abc}
13	Oxyfluorfen	0.1	25	5 ^a	93.8 ^{ab}	77.5 ^{bc}	88.8 ^{ab}
14	Oxyfluorfen	0.1	50	5 ^a	80 ^{bc}	65 ^{bcd}	75 ^{bcd}

*Means followed by the same letters within each column are not significantly different using Fisher's protected LSD test at P ≤ 0.05.

¹Abbreviations: WAT, weeks after treatment; WBH, week before harvest.

²Average control of common lambsquarters and redroot pigweed.

Table 2. Effect of herbicide rate and volume on onion yield and grade.

Treatment	Herbicide	Rate lb. ai/A	Volume gal/A	Yield (cwt/A)				
				1-2 ¼ in	2 ¼-3 in	3 in or >	Total	Culls
1	Weedy check	-	-	57.8 ^{ab*}	1.8 ^a	0 ^e	60.8 ^d	1.2 ^a
2	Hand-weeded check	-	-	11.4 ^a	278.6 ^a	527.5 ^a	849.4 ^a	32 ^a
3	Bromoxynil	0.075	10	43.8 ^a	148.4 ^a	430.4 ^{abc}	643 ^{bc}	43.8 ^a
4	Bromoxynil	0.075	25	21.3 ^a	207.6 ^a	285.9 ^{bcd}	533 ^{bc}	21.3 ^a
5	Bromoxynil	0.075	50	9.3 ^a	258.9 ^a	193.3 ^{de}	491.4 ^c	9.3 ^a
6	Bromoxynil	0.3	10	12.9 ^a	145.7 ^a	409.3 ^{abc}	593.7 ^{bc}	25.9 ^a
7	Bromoxynil	0.3	25	34.9 ^a	245.9 ^a	370.3 ^{abcd}	677.9 ^b	26.8 ^a
8	Bromoxynil	0.3	50	16.6 ^a	202.1 ^a	418.1 ^{abc}	684 ^b	47.2 ^a
9	Oxyfluorfen	0.025	10	12 ^a	167.7 ^a	371.9 ^{abcd}	586.7 ^{bc}	12 ^a
10	Oxyfluorfen	0.025	25	34.5 ^a	208 ^a	385.7 ^{abcd}	648.2 ^{bc}	34.5 ^a
11	Oxyfluorfen	0.025	50	29 ^a	243.2 ^a	248 ^{cd}	540.7 ^{bc}	29 ^a
12	Oxyfluorfen	0.1	10	22.7 ^a	186 ^a	367.1 ^{abcd}	587.8 ^{bc}	22.7 ^a
13	Oxyfluorfen	0.1	25	48.1 ^a	161.5 ^a	390 ^{abcd}	609.2 ^{bc}	48.1 ^a
14	Oxyfluorfen	0.1	50	30.6 ^a	136.8 ^a	449.7 ^{ab}	628.9 ^{bc}	30.6 ^a

*Means followed by the same letters within each column are not significantly different using Fisher's protected LSD test at P ≤ 0.05.