

Oakes Irrigation Research Site

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Early-season Weed Control in Onion Using Micro-rates

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This study was conducted at the Oakes Irrigation Research Site near Oakes, North Dakota, to compare early-season weed control of bromoxynil (Buctril and Broclean) and oxyfluorfen (GoalTender) applied at micro rates to standard pre-emergence treatment of DCPA (Dacthal) and ethofumesate (Nortron) in onion. 'Crockett', 'Patterson', 'Sedona', and 'Talon' were planted April 25 with 16" centers and a planting population of 250,000 seeds/acre. PRE treatments included 1 and 2 lb/acre ethofumesate and 13.33 lb/acre DCPA and were applied 11 days after planting (DAP). Micro rate applications began between the flag-leaf and one-leaf stage, 27 DAP. Bromoxynil and oxyfluorfen were applied at the 0.25 and 0.13 times the lowest labeled rate and applied in four of five sequential applications when weeds and onions were in seedling growth stages. Petroleum oil-surfactant (Herbimax) (1 pt/acre) was tank mixed with the micro rate application. All treatments received bromoxynil at 0.25 lb/acre and oxyfluorfen at 0.50 lb/acre when onions were around the 5 and 9-leaf stages.

Table 1. Treatment Application Information.

Date:		5/6/14	5/22/14	5/29/14	6/4/14	6/13/14	6/20/14	6/30/14	7/23/14
Time:		A	B	C	D	E	F	G	H
Sprayer:	GPA:	20	20	20	20	20	20	20	20
	PSI:	40	40	40	40	40	40	40	40
	Nozzle:	8002	8002	8002	8002	8002	8002	8002	8002
Air Temperature (F):		48	72	87	81	59	69	75	79
Relative Humidity (%):		76	37	24	37	63	83	45	43
Wind (MPH):		4.6	7	10	9	7	7.5	11.1	7
Cloud Cover (%):		100	0	0	10	5	5	50	60
Onion Leaf Stage:		PRE	Flag	1-2	2	3	4	5	9



Early-season weed control in onions using micro-rates.

Table 2. Treatment details.

Trt No.	Trt Name	Rate	Unit	App Code	Trt No.	Trt Name	Rate	Unit	App Code
1	Bucril	4	fl oz/ac	B	10	Bucril	4	fl oz/ac	B
	Bucril	4	fl oz/ac	C		Bucril	4	fl oz/ac	C
	Goal Tender	2	fl oz/ac	D		Bucril	4	fl oz/ac	D
	Goal Tender	2	fl oz/ac	E		Goal Tender	2	fl oz/ac	D
2	Bucril	2	fl oz/ac	B		Bucril	4	fl oz/ac	E
	Bucril	2	fl oz/ac	C		Goal Tender	2	fl oz/ac	E
	Bucril	4	fl oz/ac	D	11	Bucril	4	fl oz/ac	B
	Bucril	2	fl oz/ac	E		Bucril	4	fl oz/ac	C
	Goal Tender	2	fl oz/ac	E		Bucril	4	fl oz/ac	D
	Bucril	2	fl oz/ac	F		Bucril	4	fl oz/ac	E
	Goal Tender	2	fl oz/ac	F		Goal Tender	2	fl oz/ac	E
Bucril	2	fl oz/ac	F	Bucril		4	fl oz/ac	F	
3	Bucril	2	fl oz/ac	B	Goal Tender	2	fl oz/ac	F	
	Goal Tender	1	fl oz/ac	B	12	Check			
	Bucril	2	fl oz/ac	C		13	Broclean	2	fl oz/ac
	Goal Tender	1	fl oz/ac	C	Broclean		2	fl oz/ac	C
	Bucril	2	fl oz/ac	D	Broclean		2	fl oz/ac	D
	Goal Tender	1	fl oz/ac	D	Broclean		2	fl oz/ac	E
	Bucril	2	fl oz/ac	E	Goal Tender		2	fl oz/ac	E
	Goal Tender	1	fl oz/ac	E	Broclean		2	fl oz/ac	F
	Bucril	2	fl oz/ac	F					
Goal Tender	1	fl oz/ac	F	Goal Tender	2	fl oz/ac	F		
4	Bucril	4	fl oz/ac	B	14	Broclean	4	fl oz/ac	B
	Bucril	4	fl oz/ac	C		Broclean	4	fl oz/ac	C
	Bucril	4	fl oz/ac	D		Broclean	4	fl oz/ac	D
	Bucril	4	fl oz/ac	E		Broclean	4	fl oz/ac	E
	Bucril	4	fl oz/ac	F		Broclean	4	fl oz/ac	F
5	Goal Tender	2	fl oz/ac	B	15	Nortron	32	fl oz/ac	A
	Goal Tender	2	fl oz/ac	C	16	Broclean	4	fl oz/ac	B
	Goal Tender	2	fl oz/ac	D		Broclean	4	fl oz/ac	C
	Goal Tender	2	fl oz/ac	E		Broclean	4	fl oz/ac	D
	Goal Tender	2	fl oz/ac	F		Goal Tender	2	fl oz/ac	D
				Broclean		4	fl oz/ac	E	
6	Dacthal	10	lb/ac	A	Goal Tender	2	fl oz/ac	E	
7	Nortron	32	fl oz/ac	A					
8	Nortron	64	fl oz/ac	A					
9	Bucril	2	fl oz/ac	B					
	Bucril	2	fl oz/ac	C					
	Bucril	2	fl oz/ac	D					
	Goal Tender	2	fl oz/ac	D					

Table 3. Stand counts, weed control and injury ratings.

Trt No.	Stand Counts				Weed Control and Injury 38 DAA-A.		
	29 DAA ¹ -A ² , 13 DAA-B ² , 6 DAA-C ² in 3 row feet.				----% Control----		%
	-----Variety-----				Colq ³	Pigw ⁴	Injury
	Crockett	Sedona	Patterson	Talon			
1	12.8a ⁵	12.8a	9.3a	7.8a	93.3a	100.0a	7.5ab
2	12.3a	10.5a	12.0a	11.0a	70.0a	81.3ab	1.3c
3	11.5a	12.5a	9.8a	9.0a	86.7a	100.0a	8.8a
4	10.3a	10.3a	10.8a	8.0a	85.0a	98.8a	3.8abc
5	12.0a	9.5a	8.8a	9.8a	81.7a	100.0a	6.3ab
6	12.8a	8.3a	10.8a	8.3a	80.0a	62.5b	0.0c
7	10.5a	13.3a	10.8a	9.5a	11.7b	100.0a	0.0c
8	12.0a	12.3a	12.0a	11.0a	38.3b	98.8a	0.0c
9	11.5a	10.8a	11.0a	9.3a	80.0a	100.0a	7.5ab
10	10.5a	7.8a	9.5a	9.0a	95.0a	100.0a	6.3ab
11	8.0a	8.5a	10.8a	9.3a	90.0a	98.8a	2.5bc
12	7.8a	10.3a	10.8a	7.5a	0.0c	0.0c	0.0c
13	13.8a	10.8a	11.8a	9.5a	86.7a	100.0a	6.3ab
14	9.8a	10.3a	9.8a	7.3a	86.7a	100.0a	5.0abc
15	12.3a	13.8a	11.8a	9.3a	15.0c	100.0a	0.0c
16	9.3a	11.5a	10.5a	9.5a	95.0a	100.0a	6.3ab
LSD (<i>P</i> = 0.05)	4.0	4.0	3.3	3.7	17.0	20.9	3.1

¹DAA = Days after application.

²Time from table 1.

³Colq = Common lambsquarters.

⁴Pigw = Redroot pigweed.

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Table 4. Crockett onion yield results.

Trt No.	-----Onion Bulb Counts in 6 row feet-----						-----CWT/A-----					
	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.7b ¹	4.7c	12.5abc	10.0ab	0a	0.0a	3.63a	34bcd	211abc	312a	0a	565abc
2	0.3b	15.3ab	16.5ab	1.0d	0a	33.5a	2.42a	95abc	264ab	29bc	0a	388bcd
3	0.1b	9.5abc	15.3abc	7.5abc	0a	32.8a	1.21a	62a-d	270ab	219a	0a	568abc
4	0.1b	6.8bc	14.3abc	6.8abc	0a	28.3ab	1.21a	46a-d	247abc	200a	0a	501abc
5	0.1b	20.0a	7.5cd	0.5d	0a	28.8ab	1.21a	125a	120cd	5c	0a	260de
6	0.0b	5.9bc	19.8a	8.3ab	0a	34.0a	0.0a	44a-d	340a	244a	0a	634a
7	0.1b	12.0abc	13.0abc	2.0cd	0a	27.8ab	1.21a	78a-d	207abc	42bc	0a	346cde
8	0.6b	3.5c	14.3abc	8.8ab	0a	27.5ab	3.63a	22cd	258ab	276a	0a	566abc
9	0.3b	19.2b	4.5de	0.0d	0a	24.3ab	2.42a	118ab	65de	0c	0a	184ef
10	0.1b	7.3bc	11.0bcd	6.8abc	0a	25.8ab	1.21a	56a-d	186bc	201a	0a	451abc
11	0.2b	6.7bc	10.3bcd	10.5ab	0a	28.5ab	1.21a	41a-d	184bc	322a	0a	558abc
12	3.6a	12.5abc	1.3e	0.3d	0a	18.8b	6.05a	52a-d	22e	3c	0a	88f
13	0.7b	10.5abc	13.5abc	5.0a-d	0a	30.8a	3.63a	69a-d	247abc	114ab	0a	471abc
14	0.4b	8.5abc	11.0bcd	7.5abc	0a	28.3ab	2.42a	59a-d	192bc	223a	0a	486abc
15	0.1b	11.7abc	12.0bc	4.3bcd	0a	28.5ab	1.21a	107ab	213abc	123ab	0a	473abc
16	0.1b	3.5c	12.8abc	10.8a	0a	27.5ab	1.21a	19d	225abc	346a	0a	594ab
LSD (<i>P</i> = 0.05)	0.5	1.0	4.7	3.8	0	6.2	3.32	3	81	5	0	138

¹Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 5. Patterson onion yield results.

Trt No.	-----Onion Bulb Counts in 6 row feet-----						-----CWT/A-----					
	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.4a ¹	14.0ab	9.5ab	0.0a	0a	24.3a	2.42a	97ab	133abc	0a	0a	232abc
2	0.3a	18.3ab	2.0c	0.0a	0a	20.8ab	2.42a	94ab	27d	0a	0a	123de
3	0.1a	17.5ab	9.0ab	0.3a	0a	27.0a	1.21a	115a	145ab	7a	0a	269ab
4	2.8a	19.8ab	2.0c	0.3a	0a	25.0a	4.84a	98ab	28d	8a	0a	139cde
5	0.1a	19.8ab	5.8abc	0.0a	0a	25.8a	1.21a	122a	85a-d	0a	0a	208a-d
6	0.0a	17.8ab	10.5ab	0.8a	0a	29.0a	0.0a	117a	156ab	19a	0a	293a
7	0.4a	16.8ab	5.3abc	0.5a	0a	23.3a	2.42a	81ab	76a-d	15a	0a	174bcd
8	0.3a	19.8ab	7.8abc	0.3a	0a	28.3a	2.42a	122a	121abc	8a	0a	254ab
9	0.0a	21.3a	4.8bc	0.0a	0a	26.0a	0.0a	120a	65bcd	0a	0a	185a-d
10	0.4a	12.5ab	8.5ab	1.3a	0a	23.0a	2.42a	85ab	136abc	35a	0a	258ab
11	0.1a	16.3ab	11.0a	0.3a	0a	27.8a	1.21a	107a	173a	8a	0a	289a
12	0.6a	9.3b	2.8c	0.0a	0a	13.3b	2.42a	35b	46cd	0a	0a	83e
13	0.3a	14.5ab	10.5ab	0.8a	0a	26.3a	2.42a	90ab	165ab	18a	0a	275ab
14	0.1a	16.5ab	4.5bc	0.5a	0a	21.8ab	1.21a	91ab	76a-d	13a	0a	182a-d
15	0.1a	14.3ab	6.5abc	0.8a	0a	21.8ab	1.21a	79ab	100a-d	21a	0a	201a-d
16	0.1a	12.0ab	9.3ab	0.8a	0a	22.3ab	1.21a	74ab	146ab	22a	0a	243ab
LSD (<i>P</i> = 0.05)	0.5	6.4	3.6	0.9	0	6.5	3.38	41	58	24	0	66

¹Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 6. Sedona onion yield results.

Trt No.	-----Onion Bulb Counts in 6 row feet-----						-----CWT/A-----					
	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.2a ¹	6.8cd	12.0a	7.4ab	0.0a	27.0a	1.21a	44bc	215a	258ab	0a	524a-d
2	0.3a	15.8ab	13.5a	1.0c	0.0a	31.0a	2.42a	107a	208a	21c	0a	353cde
3	0.1a	7.0cd	12.3a	10.1a	0.1a	30.0a	1.21a	41bc	229a	317a	15a	609ab
4	0.7a	14.3abc	9.8a	2.4bc	0.0a	27.8a	3.63a	82abc	172a	69bc	0a	341cde
5	0.1a	7.8cd	13.5a	2.6bc	0.0a	25.0a	1.21a	57abc	217a	69bc	0a	378b-e
6	0.0a	4.0d	13.0a	9.7a	0.0a	26.8a	0.00a	33c	246a	332a	0a	611ab
7	0.1a	10.8a-d	17.3a	2.8bc	0.0a	31.5a	1.21a	84abc	306a	74bc	0a	488a-d
8	0.0a	4.5d	13.8a	9.7a	0.1a	28.5a	0.00a	35bc	243a	323a	13a	623a
9	0.4a	17.5a	11.5a	0.4c	0.0a	30.3a	2.42a	113a	180a	5c	0a	310de
10	0.1a	3.3d	12.0a	7.6ab	0.0a	23.3a	1.21a	39bc	223a	235ab	0a	515a-d
11	0.1a	6.3d	11.8a	8.1ab	0.1a	27.0a	1.21a	50bc	225a	272ab	17a	570abc
12	0.7a	16.3ab	5.8a	0.4c	0.0a	23.5a	3.63a	97ab	86a	9c	0a	201e
13	0.3a	9.8bcd	12.3a	6.1ab	0.1a	29.0a	2.42a	71abc	218a	193ab	13a	508a-d
14	0.4a	8.8cd	9.8a	5.4ab	0.1a	25.3a	2.42a	58abc	177a	169ab	15a	434a-d
15	0.1a	6.3d	14.5a	5.8ab	0.0a	27.0a	1.21a	46bc	267a	181ab	0a	502a-d
16	0.1a	4.0d	10.3a	12.2a	0.1a	27.0a	1.21a	36bc	199a	416a	15a	667a
LSD (<i>P</i> = 0.05)	0.5	4.9	5.0	7.9	0.2	6.2	3.45	36	92	90	25	143

¹Values in the same column followed by the same letter are not significantly different at the 0.05 level.

Table 7. Talon onion yield results.

Trt No.	-----Onion Bulb Counts in 6 row feet-----						-----CWT/A-----					
	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total	<1"	1-2.25"	2.25-3"	3-4"	>4"	Total
1	0.0a ¹	5.0a	9.0a	5.8a-d	0.1a	20.0ab	0.00a	36a	153a	186a-d	17a	392abc
2	0.0a	10.5a	5.7a	2.5bcd	0.0a	18.8ab	0.00a	62a	88a	81bcd	0a	231cd
3	0.0a	5.8a	10.1a	5.8a-d	0.1a	22.3ab	0.00a	34a	173a	172a-d	18a	397abc
4	0.0a	10.5a	6.7a	2.8a-d	0.0a	20.8ab	0.00a	61a	113a	82bcd	0a	255bcd
5	0.0a	7.0a	8.2a	4.8a-d	0.0a	20.0ab	0.00a	50a	130a	137a-d	0a	316a-d
6	0.0a	7.8a	7.7a	6.5abc	0.1a	22.3ab	0.00a	47a	125a	221abc	15a	408abc
7	0.0a	12.0a	6.8a	3.8a-d	0.0a	23.3ab	0.00a	64a	130a	115a-d	0a	309a-d
8	0.0a	6.8a	10.5a	5.3a-d	0.1a	23.3ab	0.00a	42a	176a	185a-d	16a	419abc
9	0.0a	9.5a	13.4a	3.0a-d	0.0a	26.0a	0.00a	59a	215a	88bcd	0a	363abc
10	0.3a	7.0a	9.1a	7.3ab	0.1a	24.0a	1.21a	51a	146a	237ab	15a	450ab
11	0.0a	8.8a	9.4a	7.8a	0.0a	26.0a	0.00a	54a	166a	263a	0a	483a
12	0.3a	6.8a	4.1a	1.3d	0.0a	12.5b	1.21a	36a	68a	42d	0a	148d
13	0.0a	7.8a	8.7a	6.3a-d	0.0a	23.0ab	0.00a	52a	151a	209a-d	0a	413abc
14	0.0a	7.8a	7.9a	5.5a-d	0.1a	21.5ab	0.00a	48a	131a	197a-d	15a	391abc
15	0.5a	8.5a	6.3a	2.0cd	0.0a	17.5ab	2.42a	53a	108a	59cd	0a	223cd
16	0.3a	5.0a	7.0a	7.3ab	0.1a	20.0ab	1.21a	35a	121a	236ab	12a	405abc
LSD (<i>P</i> = 0.05)	0.4	4.4	7.8	3.0	0.3	6.5	1.77	28	77	98	30	126

¹Values in the same column followed by the same letter are not significantly different at the 0.05 level.

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RESULTS

The pre-applications of DCPA and ethofumesate didn't injure onion (37 DAA), while the post-applications all had some injury after the third application. Micro-rate treatments without oxyfluorfen at third application had less injury and bromoxynil at 0.031 lb/acre had less injury than 0.062 lb/acre. The Buctril treatments had less injury than the Broclean treatments. When comparing treatment 2 (Buctril) versus treatment 13 (Broclean), treatment 4 (Buctril) vs. treatment 14 (Broclean), treatment 7 (Buctril) vs. treatment 15 (Broclean) and treatment 10 (Buctril) vs. treatment 16 (Broclean); the biggest difference in injury was shown between treatments 2 and 13. Both received 0.031 lb/ acre bromoxynil for two applications, followed by (fb) 0.0625 lb/acre with 6.3% onion injury for Broclean and only 1.3% onion injury for Buctril. DCPA controlled COLQ better than ethofumesate, while ethofumesate had better control of RRPW than DCPA 37 DAA. Stand counts were taken 40 DAP, just prior to the third application. No differences were observed.

Sedona onions had the highest yield among the four cultivars fb Crockett, Talon, and Patterson. Even though there was more onion injury in the Broclean treatments, these treatments had a higher yield overall than the Buctril treatments. The highest yielding treatment over all four cultivars was treatment 16 with Sedona onions at 666 cwt/acre. This treatment consisted of bromoxynil (Broclean) at 0.0625 lb/acre applied twice fb bromoxynil (Broclean) at 0.0625 lb/acre and oxyfluorfen at 0.0625 lb/acre applied twice. This treatment resulted in a top seven yield among the four cultivars of onion. In comparison, the Buctril treatment 10 ranked in the middle among all treatments for total onion yield averaged over all cultivars. The most consistent treatment was treatment 6; pre-application of DCPA and two additional applications of the grower standard use rate of bromoxynil and oxyfluorfen at the 5- and 9-leaf stages. The untreated consistently yielded at the bottom even though it received the two standard bromoxynil and oxyfluorfen applications at the 5- and 9-leaf stages, because the weeds were too big to fully control.

Having oxyfluorfen mixed with bromoxynil in the first three applications compared to only bromoxynil increased yields with all four cultivars (treatments 3 vs. 2). Comparing treatments 10 and 11, where an application of bromoxynil at 0.0625 lb/acre was added for treatment 11, showed a yield increase with all four cultivars. Treatment 10 had two applications of bromoxynil at 0.0625 lb/ acre and 2 applications of bromoxynil at 0.0625 lb/acre plus oxyfluorfen at 0.0625 lb/acre. Treatment 11 added a third application of bromoxynil at 0.0625 lb/acre in the middle fb two applications of bromoxynil at 0.0625 lb/acre plus oxyfluorfen at 0.0625 lb/acre.

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