Broadleaf Weed Control in Onion

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INTRODUCTION

Onion production is relatively new in North Dakota. Slow onion growth along with a lack of herbicide options prior to the 2-leaf stage makes broadleaf weed control difficult.

MATERIALS AND METHODS

Herbicide combinations were tested in onion for crop tolerance and broadleaf weed control at three locations in North Dakota. Trials were conducted on a loam soil with 3.1% organic matter and 7.9 pH at the Carrington Research Extension Center, a clay loam soil with 3.5% organic matter and 7.5 pH at a site near Prosper, and on a sandy loam soil with 2% organic matter and 7.5 pH at the Oakes Irrigation Site. Onion seed 'Teton' was planted at Carrington on April 28, 2001, Prosper on May 17, 2001, and Oakes on May 1, 2001 into 3-inch paired rows on 16-inch centers at 200,000 seeds/A. Treatments were replicated four times in a randomized complete block design. Herbicides were applied with a CO^2-backpack sprayer. In Carrington, bromoxynil + oxyfluorfen was applied through XR 8005 nozzles delivering 50 gpa at 58 psi. All other treatments were applied with XR 8003 nozzles delivering 20 gpa at 20 psi. At Prosper, preemergence (PRE) treatments were applied through XR 8002 nozzles delivering 17 gpa at 40 psi. Postemergence (POST) herbicide treatments were applied with XR 8001 nozzles delivering 8.5 gpa at 40 psi. In Oakes, all herbicide treatments were applied through AI 11004 nozzles delivering 45 gpa at 55 psi. Application dates and timings are listed in Table 1. Herbicide rates are listed in Table 2. Rates for DCPA, ethofumesate, and flufenacet + metribuzin were adjusted for soil type at each location. DCPA was applied at 7.5 lb ai/A at Carrington and Prosper and at 6 lb/A at Oakes. The 1X and 2X rate of ethofumate was 1.5 and 3 lb/A at Carrington, 2 and 4 lb/A at Prosper, and 1 and 2 lb/A at Oakes. The 1X and 2X rate of flufenacet + metribuzin was 0.34 + 0.08 and 0.68 + 0.16 lb/A at Carrington, 0.46 + 0.12 and 0.92 + 0.24 lb/A at Prosper, and 0.23 + 0.06 and 0.46 + 0.12 lb/A at Oakes. At Carrington, individual plots were harvested on October 4, 2001. Further treatment separation using onion harvest data was unavailable at Prosper and Oakes due to widespread harvesting by unidentified individuals.

Pendimethalin at POST1 and POST4 and bromoxynil + oxyfluorfen at POST3 and POST5.

Flufenacet + metribuzin at PRE1 followed by bromoxynil + oxyfluorfen at POST3.

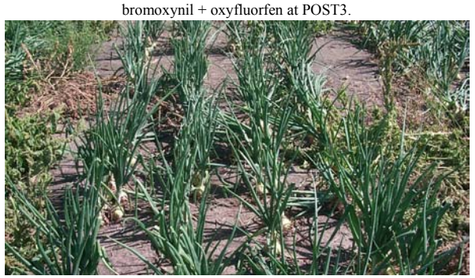

Table 1. Application Data.

	Carrington		Prosper		Oakes	
Application	Date	Onion growth stage	Date	Onion growth stage	Date	Onion growth stage
PPI	4/28					
PRE1	4/30		5/18		5/9	
PRE2	5/13		5/25		5/14	
POST1	5/24	flag-leaf	6/19	1-leaf	5/29	flag-leaf
POST2	6/8	1.5-leaf	6/19	1-leaf	6/4	1-leaf
POST3	6/21	3.5-leaf	7/2	2-leaf	6/12	2-leaf
POST4	6/26	4.5-leaf	7/2	2-leaf	6/19	3-leaf
POST5	7/5	5-leaf	7/24	5-leaf	6/29	4- to 5-leaf

RESULTS

At Carrington, flumioxazin applied PPI and flufenacet + metribuzin applied PRE caused significant early season (6/1) injury and a reduction in the number of harvested bulbs and yield (Table 2). While at Prosper and Oakes, injury from flumioxazin and flufenacet + metribuzin applied PRE was not as severe. Visual injury ratings for bromoxynil applied PRE2 and pendimethalin applied PRE1 or POST1 were ≤10% at all three locations. Pendimethalin, metolachlor, and dimethenamid applied POST4 did not injure the onion and provided residual late season weed control. Sulfentrazone applied POST4 also provided residual late season weed control but caused crop injury at Oakes (Tables 2 and 3). A POST2 application of 28% UAN at 20 gal/A did not increase broadleaf weed control (data not shown). Bromoxynil applied PRE2 followed by pendimethalin at POST1 and POST4 and bromoxynil + oxyfluorfen at POST3 and POST5 provided season long weed control at all three locations.

At Carrington, onion yield for the untreated check was 112 cwt/A with no bulbs greater than three inches in size (Table 3). Onion yield for pendimethalin at POST1 and POST4 and bromoxynil + oxyfluorfen at POST3 and POST5, and bromoxynil applied PRE2 followed by pendimethalin at POST1 and POST4 and bromoxynil + oxyfluorfen at POST3 and POST5 was 758 and 794 cwt/A, respectively.

SUMMARY

Bromoxynil applied delayed PRE, pendimethalin applied PRE or POST1, and pendimethalin, metolachlor, and dimethenamid applied POST4 appear to be safe options in a season-long onion weed control program. Bromoxynil applied delayed PRE followed by pendimethalin at POST1 and POST4 and bromoxynil + oxyfluorfen at POST3 and POST5 provided the highest yield at Carrington, and excellent season long weed control at all three locations.

Table 2. Onion injury and yield response to herbicides.

			Injury						Yield by grade and total yield						
			Carrington		Prosper		Oakes		2.25		4 to			# of	Single
Treatment[a]	Rate	Application timing	6/1	7/11	6/14	7/5	6/4	7/4	<2.25"	to 3"	3 to 4"	4.5"	Total	Bulbs	centers
	lb ai/A		%						cwt/A					1000s/A	%
DCPA/ bromoxynil + oxyfluorfen / pendimethalin /	X 0.375 + 0.15 0.619	PRE1 POST3 & 5 POST4	0	23	11	1	3	5	57	395	222	0	674	186	40
Flumioxazin	0.765	PPI/PRE1	48	0	6	1	15	0	43	50	9	0	101	60	63
Flumioxazin	1.53	PPI/PRE1	58	48	9	8	13	0	24	54	156	5	239	57	43
Flumioxazin / bromoxynil + oxyfluorfen	0.765 0.375 + 0.15	PPI/PRE1 POST3	60	0	14	6	10	0	20	117	331	6	473	98	28
Ethofumesate	1X	PRE1	0	0	18	5	3	0	70	20	0	0	90	105	60
Ethofumesate	2X	PRE1	0	0	9	3	0	10	70	26	0	0	96	79	50
Ethofumesate / bromoxynil + oxyfluorfen	1X 0.375 + 0.15	PRE1 POST3	0	0	16	8	5	8	97	413	103	0	613	192	50
Flufenacet + metribuzin	1X	PRE1	94	77	11	11	5	8	44	67	57	0	168	56	58
Flufenacet + metribuzin	2X	PRE1	98	85	24	23	28	3	8	14	44	0	66	16	60
Flufenacet + metribuzin / bromoxynil + oxyfluorfen	1X 0.375 + 0.15	PRE1 POST3	94	53	18	19	0	13	6	53	371	13	443	71	25
Bromoxynil/ pendimethalin / bromoxynil + oxyfluorfen	0.25 0.619 0.375 + 0.15	PRE2 POST1 & 4 POST3 & 5	0	20	10	4	8	5	33	446	315	0	794	191	53
Pendimethalin / bromoxynil + oxyfluorfen	0.619 0.375 + 0.15	POST1 & 4 POST3 & 5	0	20	9	4	0	8	41	549	168	0	758	196	43
Pendimethalin/ bromoxynil + oxyfluorfen	0.619 0.375 + 0.15	PRE1 & POST4 POST3 & 5	0	20	6	1	0	10	85	425	118	0	628	191	40
Pendimethalin/ bromoxynil + oxyfluorfen / metolachlor	0.619 0.375 + 0.15 0.595	POST1 POST3 & 5 POST4	0	20	8	4	3	10	50	466	235	0	751	188	48
Pendimethalin/ bromoxynil + oxyfluorfen / dimethenamid	0.619 0.375 + 0.15 0.469	POST1 POST3 & 5 POST4	0	23	8	4	5	8	67	501	162	0	730	200	45
Pendimethalin/ bromoxynil + oxyfluorfen / sulfentrazone	0.619 0.375 + 0.15 0.1875	POST1 POST3 & 5 POST4	0	23	6	0	0	58	63	395	268	0	726	191	55
Untreated			0	0	0	0	--	--	64	48	0	0	112	79	65
LSD (0.05)			12	12	12	10	12	14	49	118	131	ns	159	38	ns

[a]DCPA was applied at 7.5 lb/A at Carrington and Prosper and at 6 lb/A at Oakes. The 1X and 2X rate of ethofumate was 1.5 and 3 lb/A at Carrington, 2 and 4 lb/A at Prosper, and 1 and 2 lb/A at Oakes. The 1X and 2X rate of flufenacet + metribuzin was 0.34 + 0.08 and 0.68 + 0.16 lb/A at Carrington, 0.46 + 0.12 and 0.92 + 0.24 lb/A at Prosper, and 0.23 + 0.06 and 0.46 + 0.12 lb/A at Oakes.

Table 3. Weed control.

			Carrington						Prosper				Oakes			
			SINAR[b]		CHEAL[c]		AMARE[d]		CHEAL[c]		AMARE[d]		CHEAL[c]		AMARE[d]	
Treatment[a]	Rate	Application timing	6/1	7/11	6/1	7/11	6/1	7/11	6/14	8/2	6/14	8/2	6/4	7/4	6/4	7/4
	lb ai/A		% Control													
DCPA/ bromoxynil + oxyfluorfen / pendimethalin /	X 0.375 + 0.15 0.619	PRE1 POST3 & 5 POST4	0	95	0	95	0	95	94	100	96	94	95	100	93	93
Flumioxazin	0.765	PPI/PRE1	24	38	24	33	24	45	93	65	95	73	88	65	100	83
Flumioxazin	1.53	PPI/PRE1	66	70	74	78	74	80	98	85	99	85	93	85	100	95
Flumioxazin / bromoxynil + oxyfluorfen	0.765 0.375 + 0.15	PPI/PRE1 POST3	88	93	94	85	85	96	90	85	96	100	85	93	98	93
Ethofumesate	1X	PRE1	0	0	48	0	48	0	96	68	100	95	80	60	98	93
Ethofumesate	2X	PRE1	8	0	65	0	65	0	86	36	85	53	90	68	98	90
Ethofumesate / bromoxynil + oxyfluorfen	1X 0.375 + 0.15	PRE1 POST3	0	35	50	70	50	74	86	66	95	85	90	98	100	100
Flufenacet + metribuzin	1X	PRE1	95	98	95	96	96	100	88	45	91	60	85	68	100	85
Flufenacet + metribuzin	2X	PRE1	100	100	100	100	100	100	89	86	86	88	95	78	100	90
Flufenacet + metribuzin / bromoxynil + oxyfluorfen	1X 0.375 + 0.15	PRE1 POST3	100	99	100	98	100	98	91	88	96	100	85	80	95	88
Bromoxynil/ pendimethalin / bromoxynil + oxyfluorfen	0.25 0.619 0.375 + 0.15	PRE2 POST1 & 4 POST3 & 5	100	100	100	100	100	100	91	88	96	100	90	100	95	98
Pendimethalin / bromoxynil + oxyfluorfen	0.619 0.375 + 0.15	POST1 & 4 POST3 & 5	0	100	0	100	0	100	96	95	99	100	80	98	98	85
Pendimethalin/ bromoxynil + oxyfluorfen	0.619 0.375 + 0.15	PRE1 & POST4 POST3 & 5	0	100	0	99	0	100	85	90	91	100	100	100	83	88
Pendimethalin/ bromoxynil + oxyfluorfen / metolachlor	0.619 0.375 + 0.15 0.595	POST1 POST3 & 5 POST4	0	100	0	100	0	100	90	98	85	85	80	98	95	90
Pendimethalin/ bromoxynil + oxyfluorfen / dimethenamid	0.619 0.375 + 0.15 0.469	POST1 POST3 & 5 POST4	0	100	0	100	0	100	85	98	90	86	78	95	100	90
Pendimethalin/ bromoxynil + oxyfluorfen / sulfentrazone	0.619 0.375 + 0.15 0.1875	POST1 POST3 & 5 POST4	0	100	0	100	0	100	91	100	79	98	80	100	90	100
Untreated			0	0	0	0	0	0	0	0	0	0	--	--	--	--
LSD (0.05)			20	10	22	10	22	9	16	25	15	30	14	14	ns	10

[a]DCPA was applied at 7.5 lb/A at Carrington and Prosper and at 6 lb/A at Oakes. The 1X and 2X rate of ethofumate was 1.5 and 3 lb/A at Carrington, 2 and 4 lb/A at Prosper, and 1 and 2 lb/A at Oakes. The 1X and 2X rate of flufenacet + metribuzin was 0.34 + 0.08 and 0.68 + 0.16 lb/A at Carrington, 0.46 + 0.12 and 0.92 + 0.24 lb/A at Prosper, and 0.23 + 0.06 and 0.46 + 0.12 lb/A at Oakes. [b]SINAR=Wild mustard. [c]CHEAL=Common lamsquarters. [d]AMARE=Redroot pigweed.