Adjuvants Improve Micro-rate Herbicide Efficacy for Weed Control in Onion, Oakes, North Dakota

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An experiment was conducted at the Oakes Irrigation Research Site to compare early-season, broadleaf weed control of bromoxynil or oxyflourfen (water-based formulation) applied as micro-rates plus adjuvants to the same herbicides applied as micro-rates without adjuvants for weed control in onion (*Allium cepa* L.). The soil was an Embden sandy loam with 2.4% organic matter and 6.7 pH. Onion variety 'Teton' pelleted seed was planted at 285,000 seeds/A using a Monosem four-row, double-line planter on April 23. Plots were 6 ft. wide by 17 ft. long and arranged in a randomized complete block design with four replicates. At time of weed cotyledon stage (May 16) herbicides were applied as micro-rates at 1/8 of their lowest labeled rates every seven days, with four total applications. Herbicide micro-rates were applied with a CO_2-pressurized backpack sprayer. A standard application of bromoxynil and oxyfluorfen was applied on June 24 (4-leaf stage) to control broadleaf weeds. Another standard application of bromoxynil and oxyfluorfen was made on July 1 (5-6-leaf stage) as a final late-season broadleaf weed control measure. Standard applications were applied using a tractor-mounted sprayer. Best management practices were used for fertility, disease, insect, and grass weed control. Treatments were evaluated for overall control of redroot pigweed (*Amaranthus retroflexus* L.) and common lambsquarters (*Chenopodium album* L.) after all micro-rate treatments were completed using a visual evaluation on June 30. On September 24, 5 ft. 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 and diseased bulbs were graded as culls regardless of diameter.

Herbicide application dates, timings, and environmental conditions for Oakes, 2008.

Application Date:	5-16	5-26	6-3	6-9	6-24	7-1
Onion Stage:	loop	flag-1 lf	1-2 lf	2 lf	4 lf	5-6 lf
Air Temp., (F):	75	50	53	61	75	75
Wind speed, (MPH):	5	4	6.5	2.7	5	5
Operating Pressure:	40 psi	40 psi	40 psi	40 psi	40 psi	40 psi
Nozzle Type:	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan	Flat Fan
Nozzle Size:	8002	8002	8002	8002	8002	8002
Spray Volume, GPA:	20	20	20	20	20	20

Results: Micro-rate herbicide applications plus adjuvants provided excellent control of common lambsquarters at the highest application rates regardless of herbicide and regardless of adjuvant. These applications provided superior control to the herbicide treatments without adjuvant. Redroot pigweed control was excellent across all herbicides and all application timings, due to the late emergence and poor weed growth during the early season. Large grade yields were significantly greater with the high and medium application rates regardless of adjuvant, except where no adjuvant was included, where only the highest rate was significantly greater.

Table. Effect of adjuvant on herbicide efficacy and yield for weed control in onion at the Oakes Irrigation Research Site in 2008.

Treatment			Visual Evaluations		Yield		
Herbicide	Adjuvant	Rate (herbicide + adjuvant)	colq[1]	rrpw[2]	Medium[3]	Large[4]	Total
		--------(product/A)-----	-% control-		----------lb/A----------		
Oxyflourfen	MSO	2 oz + 0.5% v/v	95.0	100	15395.3	32771.4	51407.9
Oxyflourfen	MSO	1 oz + 0.5% v/v	85.0	100	22147.7	21427.5	46816.3
Oxyflourfen	MSO	0.5 oz + 0.5% v/v	62.5	100	20437.1	11343.9	38353.3
Oxyflourfen	POC	2 oz + 1 pt/A	95.0	100	13864.8	22867.9	39523.8
Oxyflourfen	POC	1 oz + 1 pt/A	87.5	100	18186.3	23588.2	44025.3
Oxyflourfen	POC	0.5 oz + 1 pt/A	53.8	100	14495.1	1530.5	24038.4
Oxyflourfen	None	2 oz	73.8	100	28539.9	9993.5	44025.3
Oxyflourfen	None	1 oz	48.8	100	9363.3	10173.5	25658.9
Oxyflourfen	None	0.5 oz	28.8	100	3511.2	0	8733.1
Bromoxynil	MSO	4 oz + 0.5% v/v	100	100	19896.9	29080.1	53118.5
Bromoxynil	MSO	2 oz + 0.5% v/v	93.5	100	19266.9	29530.3	52578.3
Bromoxynil	MSO	1 oz + 0.5% v/v	65.0	100	16565.8	15485.4	40334.0
Bromoxynil	POC	4 oz + 1 pt/A	100	100	22867.9	35202.2	62931.9
Bromoxynil	POC	2 oz + 1 pt/A	82.3	100	28810.0	30430.6	64462.4
Bromoxynil	POC	1 oz + 1 pt/A	62.5	87.5	17916.2	16205.7	39793.8
Bromoxynil	None	4 oz	87.5	100	22507.8	31511.0	58430.3
Bromoxynil	None	2 oz	40.0	100	6392.3	3331.2	14585.1
Bromoxynil	None	1 oz	27.5	100	2520.9	540.2	9543.3
Hand weeded check	--	--	100	100	20167.0	540.2	30160.5
Weedy check	--	--	0	0	0	0	1080.4
LSD	--	--	16.8	3.8	8884.9	15238.5	20658.6

[1]common lambsquarters, [2]redroot pigweed, [3]medium grade is 2.25-3 in, [4]large grade is 3 in and >, [5]oxyfluorfen water based formulation