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Wild oat control with triallate and pyroxasulfone. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Prosper on May 3. Treatments were applied as follows:

Treatment date	May 3	May 3	May 30
Temperature (°F)	65	61	63
Relative humidity (%)	63	47	45
Cloud cover (%)	0	0	90
Wind velocity (mph)	9	9	3
direction (°)	360	360	315
Soil moisture	Good	Good	Damp
Soil temperature (°F)	45	47	56
Wheat	Preplant incorporated	Preemergence	2 to 3 leaf
Wioa	-	-	2 to 3 leaf
Yeft	-	-	2 to 3 leaf
Rrpw	-	-	2 leaf
Cocb	-	-	2 to 4 leaf
Colq	-	-	2 to 4 leaf

All treatments were applied with a backpack sprayer delivering 8.5 (treatment 1) or 17 gpa at 35 psi through TT11001 TT11002 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		Application	June 6						
Treatment	Rate	type	Wht	Wioa	Yeft	Rrpw	Colq	Cocb	Hans
	oz ai/A		%	%	%	%	%	%	%
Fenx&brox&pyst	3.9	2 L	0	75	75	91	90	93	94
Flucarbazone+NIS	0.21+0.25%	PRE	0	73	58	91	75	43	40
Triallate	16	PPI	0	81	53	40	40	5	33
Triallate+pyroxasulfone	16+0.85	PPI	0	88	83	85	79	5	69
Triallate+pyroxasulfone	16+1.3	PPI	0	83	79	80	58	5	60
Triallate/pyroxasulfone	16/0.85	PPI/PRE	0	81	86	84	70	10	74
Triallate/pyroxasulfone	16/1.3	PPI/PRE	0	88	80	86	76	13	66
Untreated check	0		0	0	0	0	0	0	0
CV			0	5	12	11	16	39	15
LSD (P=0.05)			0	5	11	11	14	12	12

Herbicides did not cause noticeable wheat response. Early season differences could be determined but lack of soil moisture and subsequent herbicidal activity precluded treatment separation by the end of June. Treatments with triallate gave better control of wild oat than flucarbazone PRE or fenoxaprop at 2 leaf. Pyroxasulfone PRE or PPI, 80 to 85%, provided better control of foxtail than triallate PPI or flucarbazone PRE and essentially similar control to fenoxaprop at 2 leaf. Bromoxynil and pyrasulfotole provided 90% or better control of broadleaf weeds. Neither triallate nor pyroxasulfone affected common cocklebur by more than 12% control. Pyroxasulfone, regardless of whether PRE or PPI, gave about 84% control of redroot pigweed, 71% control of common lambsquarters, and 67% control of hairy nightshade.

Wild oat control with F9312. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo April 20 in silty clay soil with 5% OM and 7.5 pH. Preemergence treatments were applied April 25 with 76°F, 47% relative humidity, mostly cloudy sky, 6 mph wind at 180°, and dry soil surface at 50°F. Postemergence treatments were applied to 3-leaf wheat, 2- to 3-leaf wild oat, 1- to 2-leaf yellow foxtail, 4- to 6-leaf bolting wild mustard, and 1- to 3-leaf annual smartweed on May 23 with 71°F , 34% relative humidity, mostly cloudy sky, 5 mph wind at 180°, and moist soil. Preemergence treatments were applied with a backpack sprayer delivering 17 gpa at 38 psi through 11001 nozzles and 2-leaf treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzle to a 7-ft wide area the length of 10- by 30-ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Timing	Spray Volume	5/23 Wioa	5/23 Yeft	6/6 Wht	6/6 Wioa	6/6 Yeft	6/6 Wimu	6/6 Answ	6/22 Wioa
F9312	1.37	pre	17G	0	0	0	23	25	0	0	5
F9312	1.83	pre	17G	35	35	0	45	45	23	15	23
F9312	3.66	pre	17G	40	38	0	58	60	38	28	23
F9310	1.32	pre	17G	0	0	0	2	30	23	10	13
F9312/Brox&Pyst+NIS+AMS	0.91/3.7+0.25%+24	Pre/2lf	17G8.5G	0	0	0	20	30	95	95	10
F9312/Brox&Pyst+NIS+AMS	1.4/3.7+0.25%+24	Pre/2lf	17G8.5G	0	0	0	20	33	95	95	18
F9312/Brox&Pyst+NIS+AMS	1.82/3.7+0.25%+24	Pre/2lf	17G8.5G	38	38	0	35	43	95	95	15
F9312/Brox&Pyst+NIS+AMS	0.91/1.9+0.25%+24	Pre/2lf	17G8.5G	0	0	0	20	25	95	95	13
F9312/Brox&Pyst+NIS+AMS	1.4/1.9+0.25%+24	Pre/2lf	17G8.5G	0	0	0	28	33	95	95	10
F9312/Brox&Pyst+NIS+AMS	1.82/1.9+0.25%+24	Pre/2lf	17G8.5G	33	35	0	38	43	95	95	13
F9310+NIS+AMS	1.75+0.25%+24	2lf	8.5G	0	0	9	0	0	25	23	15
F9310+Brox&PystNIS+AMS	1.32+3.7+0.25%+24	2lf	8.5G	0	0	9	0	0	95	95	10
F6180	1.29	pre	17G	0	0	0	20	23	10	5	5
Pxlm&Flas&Flox+NIS+AMS	1.68+0.25%+24	2lf	8.5G	0	0	0	75	71	95	95	97
Brox&Pyst+NIS+AMS	3.7+0.25%+24	2lf	8.5G	0	0	0	0	0	95	95	0
Untreated Check	0			0	0	0	0	0	0	0	0
CV				48	51	34	14	15	4	9	30
LSD (P=.05)				7	8	1	5	6	4	7	7

Rainfall events April – July
2 miles from site
4/13/2012—0.27
4/15/2012—0.46
4/17/2012—0.01
4/18/2012—0.19
4/21/2012—0.10
4/27/2012—0.09
4/28/2012—0.01
5/02/2012—0.02
5/03/2012—0.01
5/04/2012—0.03
5/07/2012—0.02
5/08/2012—0.04
5/22/2012—0.37
5/27/2012—1.00
5/28/2012—0.03
6/07/2012—0.01
6/10/2012—0.21
6/14/2012—0.87
6/16/2012—0.05
6/19/2012—0.30
6/20/2012—0.78
6/23/2012—0.02
7/15/2012—0.02
7/17/2012—0.07
7/23/2012—0.01
7/24/2012—0.59
7/25/2012—0.18

The top 2 to 5 cm of soil was generally dry through the season. Once plants were established with roots into subsoil moisture, growth seemed normal. However, meaningful precipitation did not occur for about 1 month after preemergence treatment application. Establishment of weeds had occurred by this time. Suppression of wild oat and yellow foxtail growth and fewer plants were noted May 23 with higher rates of F9310 and F9312 applied PRE. Growth differences were noted midseason for all PRE treatments but maximum rating was 60% control. F9310 caused notable wheat injury when applied POST. This injury was not severe and not expressed on new tissue. Broadleaf weeds were partially controlled by PRE treatments and F9310 gave less than 30% control of broadleaf weeds when applied POST. Bromoxynil and pyrasulfotole provided 95% control of broadleaf weeds at either rate and pyroxsulam and florasulam and fluroxypyr also provided 97% control of wild oat.

Foxtail control with F9312. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 25 in silty clay soil with 5% OM and 7.5 pH. Preemergence treatments were applied on April 30 with 52°F, 75% relative humidity, and mostly cloudy sky, 2 mph wind at 180° and dry soil surface at 38°F. Postemergence treatments were applied to 2- to 3-leaf wheat, 2-leaf yellow foxtail, and cotyledon Venice mallow on June 1 with 58°F, 63% relative humidity, 40% cloud cover, 5 mph wind at 180° and dry soil at 55°F. PRE and POST treatments were applied with a backpack sprayer delivering 17 gpa through TT11002 and 8.5 gpa through TT11001, respectively, at 35 psi to a 7-foot-wide area the length of 10- by 30-foot plots. The experiment was a randomized complete block design with 4 replicates.

Treatment	Rate	timing	Spray Volume	Mix Size	6/5 Wht	6/5 Yeft	6/15 Yeft	6/15 Vema	7/20 Yeft
F9312	1.37	pre	17G	1.7L	0	74	73	85	75
F9312	1.83	pre	17G	1.7L	0	81	88	90	73
F9312	3.66	pre	17G	1.7L	0	75	89	86	84
F9310	1.32	pre	17G	1.7L	0	73	75	89	61
F9312/brox&pyst+NIS+AMS	0.91/3.7+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	3	78	85	93	84
F9312/brox&pyst+NIS+AMS	1.4/3.7+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	5	78	80	91	81
F9312/brox&pyst+NIS+AMS	1.82/3.7+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	3	75	85	91	90
F9312/brox&pyst+NIS+AMS	0.91/1.9+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	5	76	86	90	83
F9312/brox&pyst+NIS+AMS	1.4/1.9+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	1	79	78	91	80
F9312/brox&pyst+NIS+AMS	1.82/1.9+0.25%+24	pre/2 lf	17G/8.5G	1.7/0.85L	0	76	84	87	81
F9310+NIS+AMS	1.75+0.25%+24	2 lf	8.5G	0.85L	11	70	66	90	53
F9310+brox&pyst+NIS+AMS	1.32+3.7+0.25%+24	2 lf	8.5G	0.85L	12	75	80	84	80
F6180	1.29	pre	17G	1.7L	0	55	64	76	55
Pxlm&flas&flox+NIS+AMS	1.68+0.25%+24	2 lf	8.5G	0.85L	7	70	76	9	91
Brox&pyst+NIS+AMS	3.7+0.25%+24	2 lf	8.5G	0.85L	3	70	75	9	60
Untreated check	0		8.5G		0	21	0	0	0
CV					82	20	16	8	11
LSD (P=0.05)					4	20	17	10	11

Rainfall events April – July		
2 miles from site	5/03/2012—0.01	6/16/2012—0.05
4/13/2012—0.27	5/04/2012—0.03	6/19/2012—0.30
4/15/2012—0.46	5/07/2012—0.02	6/20/2012—0.78
4/17/2012—0.01	5/08/2012—0.04	6/23/2012—0.02
4/18/2012—0.19	5/22/2012—0.37	7/15/2012—0.02
4/21/2012—0.10	5/27/2012—1.00	7/17/2012—0.07
4/27/2012—0.09	5/28/2012—0.03	7/23/2012—0.01
4/28/2012—0.01	6/07/2012—0.01	7/24/2012—0.59
5/02/2012—0.02	6/10/2012—0.21	7/25/2012—0.18
	6/14/2012—0.87	

The top 2 to 5 cm of soil was generally dry through the season. Once plants were established with roots into subsoil moisture, wheat growth seemed normal. However, meaningful precipitation did not occur for about 1 month after preemergence treatment application, which stimulated a second flush of wheat and the majority of foxtail present. Establishment of weeds was sporadic with low population and precluded early season control ratings. Herbicide remained in the soil and activity on Venice mallow emerging midseason was pronounced for all treatments that included a soil active herbicide. Venice mallow control with bromoxynil and pyrasulfotole or pyroxsulam and florasulam and fluroxypyr was very poor because emergence was primarily after POST application. Foxtail control was fairly independent of rate of the PRE treatments, generally giving 75 to 90% control. Pyroxsulam gave 91% control of foxtail. Foxtail control with bromoxynil and pyrasulfotole was surprisingly high but not a new observation.

Grass control in spring wheat with Pre-Pare and Everest 2.0. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate grass control with Pre-Pare and Olympus applied PRE followed by either Everest 2.0 or Huskie Complete applied POST. The PRE treatments were applied May 14 and the POST treatments were applied June 8 to 4- to 4.5-leaf wheat. Pre-Pare alone provided about 60% control of wild oat and foxtail. Olympus provided similar wild oat control, but provided only 40% foxtail control. Pre-Pare or Olympus followed by Everest 2.0 or Huskie Complete provided more than 90% wild oat and foxtail control. Very little crop injury was observed with the herbicide treatments.

Table. Grass control in spring wheat with Pre-Pare and Everest 2.0. (1203)

			HRSW			Weed Control					HRSW	
			Injury			Wild Oat			Foxtail		Yield	TW
Treatment[a]	Rate[b]	Stage	31-May	15-Jun	22-Jun	31-May	15-Jun	11-Jul	15-Jun	11-Jul	7-Aug	
	g/ha		%			%					bu/A	lb/bu
Untreated			0	0	0	0	0	0	0	0	32.8	51.9
Glyphosate	450	PRE	0	0	0	0	0	0	0	0	38.4	51.6
Gly + Pre-Pare	450 + 9.8	PRE	4	2	0	27	79	60	77	63	41.2	50.8
Gly + Pre-Pare	450 + 12.3	PRE	4	2	0	30	82	63	81	64	41.1	53.8
Gly + Pre-Pare	450 + 14.7	PRE	3	2	0	30	86	68	84	68	45.4	53.8
Gly + Olympus	450 + 9.8	PRE	3	2	0	20	78	62	63	40	42.2	53.6
Gly + Pre-Pare + Olympus	450 + 9.8 + 9.8	PRE	5	2	0	25	83	62	76	53	46.7	53.8
Gly + Pre-Pare / Everest 2.0[c]	450 + 9.8 / 20	PRE/POST	3	5	2	27	92	99	91	95	50.9	52.8
Gly + Olympus / Everest 2.0[c]	450 + 9.8 / 23	PRE/POST	2	2	0	20	94	99	92	97	44.4	53.7
Gly + Olympus / Everest 2.0[c]	450 + 9.8 / 30.6	PRE/POST	2	3	0	21	93	98	92	96	48.1	54.0
Everest 2.0[c]	23	POST	0	2	0	0	86	98	85	95	48.3	52.6
Gly + Olympus / Huskie Complete	450 + 9.8 / 211	PRE/POST	2	5	1	17	85	98	83	91	44.1	53.1
LSD (0.05)			1.3	2.1	1.1	4.2	5.0	5.0	5.0	9.1	7.5	NS
CV			31	55	290	14	4	4	4	8	11	3.0

[a] *Gly=Glyphosate*

[b] *Glyphosate applied with AMS (2.94%)*

[c] *Everest 2.0 applied with Basic Blend (1%)*

Barley tolerance to preemergence herbicides. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate barley tolerance to non-labeled preemergence herbicides. If resistance to Group 1 herbicides (Puma, Axial, etc.) continues to increase, we will need alternative herbicides to control grassy weeds in barley. All treatments were applied May 15, four days after planting. Dual II Magnum, Pre-Pare, and Valor caused slight to moderate crop injury at the June 5 and June 25 ratings. However, by July 11 very little barley injury was visible. Despite the early injury from some herbicides, there were no yield differences between treatments. Several treatments yielded slightly lower than the untreated; however, statistically there were no yield differences between treatments. This study will be conducted again in 2013 to confirm these results.

Table. Barley tolerance to preemergence herbicides. (1208)

		Barley					
		Injury				Yield	TW
Treatment[a]	Rate	5-Jun	25-Jun	11-Jul	21-Jul	6-Aug	
		----------%----------				bu/A	lb/bu
Untreated		0	0	0	0	84.8	42.4
Zidua	3 oz	0	0	0	0	78.6	43.3
Warrant	1.5 qt	2	1	1	0	86.2	43.3
Dual II Magnum	1.67 pt	15	13	6	5	82.5	43.1
Pre-Pare	0.3 oz	25	17	5	3	81.0	42.6
Prowl H2O	3 pt	2	1	0	0	80.5	43.5
Valor	3 oz	30	20	5	2	82.0	42.9
LSD (0.05)		6	5	NS	NS	NS	NS
CV		29	40	139	257	10	3

[a] *All treatments applied PRE*

Barley response to NAI-1333. Howatt, Roach, Ciernia, and Harrington. 'Pinnacle' barley was seeded near Fargo on April 26. Treatments were applied to one-tiller barley on June 4 with 82°F, 30% relative humidity, 0% cloud cover, 7 mph wind at 0°, and dry soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		Injury			
Treatment	Rate	June 8	June 11	June 18	June 29
	oz prod/A	%	%	%	%
NAI-1333+NIS	0.5+0.25%	4	4	3	0
NAI-1333+NIS	1+0.25%	5	5	3	0
NAI-1333+NIS	2+0.25%	10	7	3	0
NAI-1333+NAI-1335+NIS	1+0.8+0.25%	5	5	3	0
Widematch+HarmonyGT-sg	16+0.2	0	0	0	0
Untreated Check	0	0	0	0	0
CV		17	24	0	0
LSD (P=0.05)		1	1	0	0

Weed pressure was sparse and crop competition from barley was vigorous. Weeds were not present in the untreated at evaluation.

Injury manifested as necrotic lesions sparsely distributed on leaf tissue present at herbicide application. Newly emerging tissue did not have damage. NAI-1333 at half to 2x field rate caused 10% injury or less. Injury June 18 was 3% for any treatment containing NAI-1333. NAI-1335 did not alter the response of wheat to NAI-1333. Injury was not detected June 29 after leaves with damage naturally senesced.

Wheat response to low-dose glyphosate exposure during four-leaf stage. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to four-leaf wheat on June 12 with 60°F, 66% relative humidity, 5% cloud cover, 2 mph wind at 300°, and damp soil at 56°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 14.

Treatment	Rate	June 27 Wheat	July 10 Wheat	Aug 14 Yield
	oz ae/A	%	%	bu/A
Glyt+ NIS+AMS	1.5+0.25%+12	85	96	0
Glyt+ NIS+AMS	1+0.25%+12	71	85	0
Glyt+ NIS+AMS	0.5+0.25%+12	36	21	15
Glyt+ NIS+AMS	0.25+0.25%+12	3	5	34
Glyt+ NIS+AMS	0.1+0.25%+12	0	1	42
Glyt+ NIS+AMS	0.05+0.25%+12	0	0	44
Glyt+ NIS+AMS	0.01+0.25%+12	0	0	44
Untreated Check	0	0	0	46
CV		16	11	14
LSD (P=.05)		6	4	8

Wheat treated with 1 oz ae/A glyphosate ($1/12^{th}$ field rate) was nearly dead 14 days after application. This rate or more prevented seed production. Glyphosate at 0.1 oz/A ($1/120^{th}$ field rate) did not produce a notable response or statistically affect grain yield although yield tended to be less than the untreated for each glyphosate exposure.

Injury on plants that was observed but non-lethal manifested as randomly occurring bleached stems and heads or portions of heads. The heads remained secured to the plant through the culm but did not produce grain in some or all of the florets. Reproductive damage was more severe than vegetative observation. Wheat expressing 5% visible injury on July 10 produced 26% less grain, and plants with 21% visible injury produced 67% less grain than the untreated.

Drift is not the only possible source of glyphosate exposure that could cause injury. While misapplication of glyphosate for an adjuvant, fungicide, or insecticide likely would kill the entire treated area, mistakenly loading in a portion of the desired product could result in the intermediate responses observed in this study. Less than 2 quarts of product in a 1000 gal tank could reduce yield by 26%. Fifteen gallons of glyphosate spray solution left in the tank before spraying wheat could cost you 1400 bu of wheat profit. Diligence with sprayer and loading system sanitation between crops or products can return major dividends.

Wheat response to low-dose glyphosate exposure during flag/boot stage. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to wheat in late boot stage on June 19 with 59°F, 88% relative humidity, 100% cloud cover, 5 mph wind at 45°, and damp soil at 63°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 14.

Treatment	Rate	June 27 Wheat	July 3 Wheat	July 16 Wheat	Aug 14 Yield
	oz ae/A	%	%	%	bu/A
Glyt+ NIS+AMS	1.5+0.25%+12	26	76	83	3[a]
Glyt+ NIS+AMS	1+0.25%+12	21	56	68	3[a]
Glyt+ NIS+AMS	0.5+0.25%+12	13	20	25	33
Glyt+ NIS+AMS	0.25+0.25%+12	4	6	7	36
Glyt+ NIS+AMS	0.1+0.25%+12	1	1	1	39
Glyt+ NIS+AMS	0.05+0.25%+12	0	0	0	46
Glyt+ NIS+AMS	0.01+0.25%+12	0	0	0	43
Untreated Check	0	0	0	0	47
CV		25	23	18	10
LSD (P=0.05)		3	7	6	5

[a] Yield is average based on one plot, remaining replicates did not produce grain.

Injury to wheat with higher rates of glyphosate developed rapidly between June 27 and July 3. Glyphosate at 0.1 oz/A (1/120th field rate) did not produce a notable response but grain yield was reduced by 17% compared with the untreated. Less glyphosate than this did not cause visible injury or reduce grain yield.

Injury on plants that was observed but non-lethal manifested as randomly occurring bleached stems and heads or portions of heads. The heads remained secured to the plant through the culm but did not produce grain in some or all of the florets. Wheat expressing 7% visible injury on July 16 produced 23% less grain, and plants with 25% visible injury produced 30% less grain than the untreated. Wheat rated greater than 50% injury essentially did not produce grain.

Drift is not the only possible source of glyphosate exposure that could cause injury. While misapplication of glyphosate for an adjuvant, fungicide, or insecticide likely would kill the entire treated area, mistakenly loading in a portion of the desired product could result in the intermediate responses observed in this study. Less than 2 quarts of product in a 1000 gal tank could reduce yield by 23%. Fifteen gallons of glyphosate spray solution left in the tank before spraying wheat could cost you 1250 bu of wheat profit. Diligence with sprayer and loading system sanitation between crops or products can return major dividends.

Durum response to fenoxaprop&pinoxaden. Howatt, Roach, Ciernia, and Harrington. 'Mountrail' durum wheat was seeded near Fargo on May 7. Treatments were applied to 1 to 4 leaf durum on June 12 with 59°F, 66% relative humidity, 5% cloud cover, 2 mph wind at 300° and damp soil at 56°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	June 19 Durum	June 27 Durum	July 3 Durum	July 16 Durum
	oz ai/A	%	%	%	%
Fenoxaprop&Pinoxaden	0.86	0	0	0	0
Fenoxaprop&Pinoxaden	1.72	0	0	0	0
Clodinfop NG	0.8	0	0	0	0
Clodinfop NG	1.6	0	0	0	0
Pinoxaden	0.86	0	0	0	0
Pinoxaden	1.72	0	0	0	0
Fenoxaprop	0.66	0	0	0	0
Fenoxaprop	0.33	0	0	0	0
Fenx&Pxdn+Thif+Trib+MCPA	0.86+0.24+0.06+5.6	0	0	0	0
Fenx&Pxdn+Brox&Pyst+AMS	0.86+2.9+16	0	0	0	0
Fenx&Pxdn+Trib+Clpy&Flox	0.86+0.125+3	0	0	0	0
Fenx&Pxdn+2,4-D	0.86+12	0	0	0	0
Fenx&Pxdn+Flox&Dica+MCPA	0.86+2.6+4	0	0	0	0
CV		0	0	0	0
LSD (P=0.05)		0	0	0	0

Seedbed moisture resulted in two main flushes of durum emergence and the subsequent large range of plant stages at application. Durum response to herbicide treatments could not be discerned at any of the evaluation dates. Anthesis and grain development also were not affected (data not shown).

ACCase-resistant wild oat and foxtail control with Rimfire Max and Huskie Complete. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate Group 1-resistant wild oat and foxtail control with the Group 2 herbicides, Rimfire Max and Huskie Complete. Treatments were applied June 1 to 3- to 4-leaf wheat. Most treatments caused slight temporary crop injury. Rimfire Max and Wolverine provided poor foxtail control (32-59%) regardless of tank mix partner or adjuvant used (Aug 7 evaluation). Huskie Complete provided good foxtail control (82%). All Rimfire Max and Huskie Complete treatments provided excellent wild oat control (≥97%), whereas Wolverine provided only 47% wild oat control due to ACCase resistance.

Table. ACCase-resistant wild oat control with Rimfire Max and Huskie Complete. (1233)

		HRSW			Weed Control[b]					
		Injury			Wild oat			Foxtail		
Treatment[a]	Rate	8-Jun	22-Jun	7-Aug	8-Jun	22-Jun	7-Aug	8-Jun	22-Jun	7-Aug
		%			%					
Untreated		0	0	0	0	0	0	0	0	0
Rimfire Max + Huskie + MSO	3 oz + 11 fl oz + 1.5 pt	16	2	0	82	95	99	78	62	55
Rimfire Max + Huskie + Quad 7	3 oz + 11 fl oz + 1%	13	0	0	81	95	99	74	57	52
Rimfire Max + Huskie + HSOC	3 oz + 11 fl oz + 0.75 pt	13	0	0	81	95	99	76	60	48
Rimfire Max + Affinity TM + Starane U + Quad 7	3 oz + 0.6 oz + 0.18 pt + 1%	9	0	0	80	95	97	83	65	59
Huskie Complete	13.7 fl oz	14	2	0	84	95	97	84	84	82
Huskie Complete + AMS	13.7 fl oz + 1.47%	14	2	0	83	95	98	85	84	82
Wolverine	27.4 fl oz	5	0	0	67	67	47	45	37	32
LSD (0.05)		1	1	NS	5	5	13	16	10	12
CV		5	101	0	4	3	9	14	10	14

[a] *All treatments applied to 3-4 leaf HRSW*

[b] *Foxtail=majority was green foxtail*

Wild oat control with thiencarbazone, location 1. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Ada, MN, on April 9. Treatments were applied to 2 leaf wheat and 1 to 2 leaf wild oat on May 9 with 70°F, 39% relative humidity, 10% cloud cover, 6 mph wind at 180°, and damp soil at 52°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 feet. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 1.

		June 5		June 23	July 11	Aug 13
Treatment	Rate	Wioa	Wioa	Wioa	Wioa	Yield
	oz ai/A	%	%	%	%	bu/A
Prcz&mess+brox&pyst+MSO	0.2+2.9+24	0	61	35	35	31
Prcz&mess+brox&pyst+BB	0.2+2.9+1%	0	63	38	38	30
Prcz&mess+brox&pyst+HSOC	0.2+2.9+12	0	61	43	43	30
Prcz&mess+thif+trib+flox+BB	0.2+0.24+0.06+1+1%	0	66	45	45	36
Brox&pyst&thcz	3.5	0	76	64	64	34
Brox&pyst&thcz+AMS	3.5+8	0	76	59	59	33
Fenoxaprop&brox&pyst	3.9	0	86	84	84	31
Untreated check	0	0	0	0	0	21
CV		0	8	12	12	13
LSD (P=0.05)		0	7	8	8	6

Injury to wheat was not observed. Wild oat control was better with thiencarbazone than propoxycarbazone and mesosulfuron, but fenoxaprop gave the best wild oat control of 86% on June 5. Additives did not alter control obtained with propoxycarbazone and mesosulfuron or thiencarbazone. Control with fenoxaprop remained fairly consistent through evaluations, but other herbicides provided a maximum of 64% control of wild oat.

Wild oat control with thiencarbazone, location 2. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat, 1 to 2 leaf yellow foxtail, 4 to 6 leaf wild mustard, and 2 to 4 leaf wild buckwheat on May 23 with 75°F, 43% relative humidity, mostly cloudy sky, 5 mph wind at 180°, and moist soil. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 13.

		June 6				June 22	
Treatment	Rate	Wioa	Yeft	Wimu	Wibw	Wioa	Yield
	oz ai/A	%	%	%	%	%	bu/A
Prcz&mess+brox&pyst+MSO	0.2+2.9+24	74	61	95	94	89	43
Prcz&mess+brox&pyst+BB	0.2+2.9+1%	73	61	93	93	90	44
Prcz&mess+brox&pyst+HSOC	0.2+2.9+12	75	63	95	93	91	40
Prcz&mess+thif+trib+flox+BB	0.2+0.24+0.06+1+1%	81	74	93	93	95	44
Brox&pyst&thcz	3.5	73	69	95	94	90	35
Brox&pyst&thcz+AMS	3.5+8	75	70	94	95	88	35
Fenoxaprop&brox&pyst	3.9	79	70	94	94	85	46
Untreated check	0	0	0	0	0	0	24
CV		4	3	2	3	3	14
LSD (P=0.05)		4	3	4	4	3	8

Treatments did not cause injury to wheat (data not shown). Control of wild oat with propoxycarbazone and mesosulfuron was improved when thifensulfuron and tribenuron was included compared with other prcz and mess tank-mixes. Adjuvant did not affect control achieved with prcz and mess. AMS did not affect the activity of thiencarbazone for wild oat or yellow foxtail control. All treatments with prcz and mess or thiencarbazone provided better control of wild oat than fenoxaprop premix on June 22. Yellow foxtail was not present in plots and broadleaf weeds were completely controlled by all herbicide treatments on June 22.

ACCase-resistant foxtail control with Rimfire Max and Huskie Complete. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate Group 1-resistant foxtail control with the Group 2 herbicides, Rimfire Max and Huskie Complete. Treatments were applied May 31 to 3- to 4-leaf wheat. Most treatments caused slight temporary crop injury. Rimfire Max and Wolverine provided poor foxtail control (33-47%) regardless of tank mix partner or adjuvant used. Huskie Complete provided fair to good foxtail control (77-81%).

Table. ACCase-resistant foxtail control with Rimfire Max and Huskie Complete. (1226)

		HRSW			Weed Control		
		Injury			Foxtail		
Treatment[ab]	Rate	8-Jun	21-Jun	13-Aug	8-Jun	21-Jun	13-Aug
		----------%----------			----------%----------		
Untreated		0	0	0	0	0	0
Rimfire + Huskie + MSO	3 oz + 11 fl oz + 1.5 pt	10	4	0	58	47	40
Rimefire + Huskie + Quad 7	3 oz + 11 fl oz + 1%	7	2	0	48	42	33
Rimfire + Huskie + HSOC	3 oz + 11 fl oz + 0.75 pt	7	4	0	48	43	35
Rimfire + Aff TM + Starane + Q7	3 oz + 0.6 oz + 0.18 pt + 1%	6	3	0	70	52	47
Huskie Complete	13.7 fl oz	7	4	0	78	78	77
Huskie Complete + AMS	13.7 fl oz + 1.47%	7	4	0	78	80	81
Wolverine	27.4 fl oz	1	1	0	50	45	42
LSD (0.05)		1	2	NS	8	12	10
CV		9	33	0	8	14	13

[a] *All treatments applied at 3-4 leaf HRSW*

[b] *Rimfire=Rimfire Max; Aff TM=Affinity TankMix; Starane=Starane Ultra; Q7=Quad 7*

Green and Yellow Foxtail Control in Wheat

Mike Ostlie

In 2012 a study was conducted in collaboration with Bayer to compare the effects of herbicide adjuvants and products for controlling green and yellow foxtail in wheat. This study was planted on Apr 23rd and harvested Aug 8th. Herbicide treatments were applied at the 3 leaf stage with weed injury evaluations occurring 7 and 21 days after application and 1 week prior to harvest. The treatments were applied with a CO_2 backpack sprayer using 8002 nozzles and 28 PSI at a target rate of 20 GPA.

Huskie Complete and Wolverine provided greater control of the foxtail species 21 DAT than the other herbicide/adjuvant combinations. Both Huskie Complete options were better than all RimfireMax combinations except the one using a basic blend adjuvant. Most of these differences were not noted in the yield results for the trial. Only the Wolverine treatment exhibited a yield advantage over any other treatments.

Table 1. Control of green and yellow foxtail in wheat

Product	Adjuvant	Product Rate	Adjuvant Rate	--Green and Yellow Foxtail Control-- 21 DAT	Pre-harvest	Yield
		oz/a	% v/v	%	%	bu/a
non treated		-	-	0	0	35.6
RimfireMax + Huskie	MSO	3 + 11	1.5*	42	33	39.0
RimfireMax + Huskie	Basic Blend	3 + 11	1	43	43	39.2
RimfireMax + Huskie	HSOC	3 + 11	0.75*	33	37	37.2
RimfireMax + Affinity Tankmix + Starane	Basic Blend	3 + 0.6 + 0.75*	1	22	17	35.5
Huskie Complete		13.7		63	55	38.9
Huskie Complete	AMS	13.7	0.5**	80	58	40.6
Wolverine		27.4		80	48	42.0
LSD (0.05)				20	16	5.2

*Pints/A
**lbs/A

Fungicide interaction with thiencarbazone, Fargo location. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on May 24. Treatments were applied to 5 leaf to boot stage wheat on July 3 with 78°F, 75% relative humidity, 0% cloud cover, 4 mph wind at 45°, and dry soil at 73°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	July 4 Wheat	July 6 Wheat	July 10 Wheat	July 13 Wheat	July17 Wheat
	oz ai/A	%	%	%	%	%
Brox&pyst&thcz	3.5	0	0	3	3	3
Brox&pyst&thcz+propiconazal	3.5+0.9	0	0	3	3	3
Brox&pyst&thcz+pyraclostrobin	3.5+0.78	0	0	3	3	3
Brox&pyst&thcz+pyraclostrobin	3.5+0.78	0	0	3	3	3
Brox&pyst&thcz+pyraclostrobin	3.5+1.56	0	0	3	3	3
Brox&pyst&thcz+fluxapyroxad&pyraclostrobin	3.5+1.04	0	0	3	3	3
Brox&pyst&thcz+fluxapyroxad&pyraclostrobin	3.5+2.08	0	0	3	3	3
Brox&pyst&thcz+pyraclostrobin&metconazole	3.5+1.1	0	0	3	3	3
CV		0	0	0	0	0
LSD (P=0.05)		0	0	0	0	0

There was not any evidence that fungicides interact with thiencarbazone to result in synergistic crop injury. Injury to wheat was not observed until July 7, one week after application of treatments. Slight chlorosis and possible stunting was observed across all treatments. This injury was consistent with other observations of ALS-inhibitor grass herbicide damage to wheat.

Fungicide interaction with thiencarbazone, Prosper location. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded at Prosper on May 3. Treatments were applied to wheat on June 6 with 71°F 70% relative humidity, 50% cloud clover, 10 mph wind at 180°, and dry soil at 67°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was randomized complete block design with four replicates. Wheat was harvested for grain yield on August 6.

		June 9	June 12		June 15	June 22	Aug 6
Treatment	Rate	Wht	Wht lf	Stunting	Wht lf	Wht	Yield
	oz ai/A	%	%	%	%	%	bu/A
Brox&pyst&thcz	3.5	0	0	0	0	0	54
Brox&pyst&thcz+propiconazole	3.5+0.9	0	6	0	3	0	54
Brox&pyst&thcz+pyraclostrobin(a)	3.5+0.78	0	6	0	3	0	53
Brox&pyst&thcz+pyraclostrobin(b)	3.5+0.78	0	9	0	6	0	54
Brox&pyst&thcz+pyraclostrobin(a)	3.5+1.56	0	4	5	3	0	57
Brox&pyst&thcz +fluxapyroxad&pyraclostrobin	3.5 +1.04	0	5	5	3	0	54
Brox&pyst&thcz +fluxapyroxad&pyraclostrobin	3.5 +2.08	0	5	5	3	0	53
Brox&pyst&thcz +pyraclostrobin&metconazole	3.5 +1.1	0	10	5	7	0	47
CV		0	23	0	37	0	13
LSD (P=0.05)		0	2	0	2	0	10

None of the treatments initially demonstrated injury. However, necrotic lesions on older leaves were evident for all treatments that included fungicide. Fungicide checks were not included so determination of whether the response would have occurred in the absence of herbicide could not be performed. Treatments with 2x rate of pyraclostrobin or pyraclostrobin with another fungicide also caused minor stunting of wheat. Necrotic lesions persisted but height differences were not noted on June 15.

As early leaves senesced, injury could not be detected on June 22 and 29 or July 3 and 11 (data not shown). Anthesis was not delayed or inhibited and head development appeared normal (data not shown). Grain yield was not affected by fungicide addition, although grain yield after treatment that included pyraclostobin and metconazole tended to be less than other treatments.

Fungicide interaction with pyroxsulam. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to 5 to 6 leaf wheat in the boot stage on June 12 with 60°F, 66% relative humidity, 10% cloud cover, 2 mph wind at 300°, and damp soil at 56°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 14.

Treatment	Rate	June 15 Wht	June 20 Wht	June 27 Wht	July 10 Wht	Aug 14 Yield
	oz ai/A	%	%	%	%	bu/A
Pxlm&flas&flox+NIS+AMS	1.68+0.5%+48	0	0	2	4	43
Pxlm&flas&flox+2,4-De+AMS	1.68+6+48	0	0	5	4	39
2,4-De	6	0	0	0	0	36
GF 242	1.82	0	0	0	0	37
Pxlm&flas&flox+GF 242+AMS	1.68+1.82+48	0	6	4	3	42
Pxlm&flas&flox+2,4-De+GF 242+AMS	1.68+6+1.82+48	0	8	9	8	34
2,4-De+GF 242+AMS	6+1.82+48	0	0	0	0	45
Pyraclostrobin	2.37	0	0	0	1	44
Pxlm&flas&flox+pyracl+AMS	1.68+2.37+48	0	0	0	2	43
Pxlm&flas&flox+2,4-De+pyracl+AMS	1.68+6+2.37+48	0	0	3	4	39
2,4-De+pyraclostrobin+AMS	6+2.37+48	0	0	0	2	39
Propicon&trifloxy	2.61	0	0	0	0	37
Pxlm&flas&flox+propicon&trifloxy+AMS	1.68+2.61+48	0	9	8	8	41
Pxlm&flas&flox+2,4-De+propicon&trifloxy +AMS	1.68+6+2.61 +48	0	9	8	7	46
2,4-De+propicon&trifloxy+AMS	6+2.61+48	0	0	8	0	36
Untreated Check	0	0	0	0	0	39
CV		0	35	59	47	20
LSD (P=0.05)		0	1	2	2	12

Wheat response of stunting and slight chlorosis was not apparent until June 20. Only pyroxsulam and florazulam and fluroxypyr (Goldsky) plus GF 242 or plus propiconazole and trifloxystrobin caused injury to wheat visible on this date. Treatments with GF 242 or propiconazole and trifloxystrobin did not cause injury in the absence of Goldsky. By June 27 almost all treatments with Goldsky were exhibiting stunting. At any evaluation, the maximum injury of any treatment was less than 10%. Anthesis and grain development were not delayed by this injury (data not shown). And grain yield was similar across the experiment with more variation due to environmental conditions than herbicide treatment.

Propoxycarbazone&mesosulfuron control of wild oat with adjuvants. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat and wild oat on May 30 with 58°F, 59% relative humidity, 20% cloud cover, 2 mph wind at 270°, and damp soil at 51°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 6	June 13		June 22
Treatment	Rate	Wheat	Wheat	Wioa	Wioa
	oz ai/A	%	%	%	%
Prcz&mess	0.2	3	0	70	69
Prcz&mess+NPak AMS	0.2+2.5%	3	0	70	75
Prcz&mess+NPak AMS	0.2+5%	4	0	70	74
Prcz&mess+ClassActNG	0.2+1.25%	5	0	70	80
Prcz&mess+ClassActNG	0.2+2.5%	5	0	70	80
Prcz&mess+AG08034	0.2+2%	5	0	70	80
Prcz&mess+AG08034	0.2+1%	5	0	70	80
Prcz&mess+AG08047	0.2+1%	5	0	70	82
Prcz&mess+AG11011	0.2+1%	6	0	70	90
Prcz&mess+AG11013	0.2+1%	3	0	70	73
Prcz&mess+AG12030	0.2+0.5%	4	0	70	70
Prcz&mess+AG12031	0.2+1%	5	0	70	71
Prcz&mess+MSO	0.2+0.19g	8	0	70	83
Prcz&mess+Basic Blend	0.2+1%	7	0	70	84
CV		20	0	0	8
LSD (P=0.05)		1	0	0	9

Initial wheat injury of chlorosis was 8% or less and not apparent by June 13. Symptoms of wild oat control were evident on June 13 but not different for any treatment. By June 22 several adjuvants enhanced control of wild oat with propoxycarbazone and mesosulfuron. Greatest enhancement was provided by AG11011, although control was not better than with MSO or basic blend adjuvants. NPak AMS, AG11013, AG12030, and AG12031 did not improve control with propoxycarbazone and mesosulfuron.

Resistant wild oat control with flucarbazone. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seed near Nielsville, MN, on April 8 in a field with wild oat resistant to fenoxaprop. Treatments were applied to 2 to 3 leaf wheat and 1 to 2 leaf wild oat on May 9 with 95% cloud cover 5 mph wind at 225°. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 5		June 23
Treatment	Rate	Wioa	Wheat	Wioa
	oz ai/A	%	%	%
Flcz&flox+BB	1.8+1%	89	0	75
Flcz&flox+BB	2+1%	86	0	76
Flcz&flox+BB	2.3+1%	91	0	83
Flcz&flox+BB	2.7+1%	89	0	81
Flcz&flox+ARY546+ARY547+BB	1.8+0.22+0.07+1%	94	0	76
Flcz&flox+ARY546+ARY547+BB	2+0.22+0.07+1%	88	0	77
Flcz&flox+ARY546+ARY547+BB	2.3+0.22+0.07+1%	94	0	81
Flcz&flox+MCPA ester+BB	1.8+5+1%	91	0	78
Flcz&flox+MCPA ester+BB	2.3+6.3+1%	88	0	79
Flcz&flox+2,4-D Ester+BB	2.3+5.7+1%	88	0	79
Flcz&flox+brox&MCPA+BB	2.3+8+1%	90	0	78
Flcz+clpy&flox+MCPA ester+BB	0.35+3+5+1%	88	0	76
Pinoxaden+MCPA ester	0.86+5	90	0	68
Pxlm&flas&flox+BB	1.68+1%	93	0	59
Brox&pyrasulfotole&Thcz	3.5	89	0	45
Untreated check	0	0	0	0
CV		5	0	8
LSD (P=.05)		6	0	8

Herbicides did not cause observable injury to wheat. Treatments with flucarbazone gave an average of 90% control of wild oat on June 5. Dramatic differences were not observed with various flucarbazone rates or herbicide partners. Although the field had fenoxaprop-resistant wild oats, pinoxaden gave 90% control. Pyroxsulam and thiencarbazone gave similar control to flucarbazone or pinoxaden at this date. On June 23, flucarbazone maintained better control of wild oat, 75 to 81%, than other herbicides. Pinoxaden gave 68% control, pyroxsulam was rated at 59% control, and thiencarbazone only scored 45% control. While flucarbazone left several wild oat plants to compete with wheat and produce seed, it was the most effective herbicide included. Wild oat control on July 16 did not differ from evaluation on June 23.

Flucarbazone control of wild oat. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat, 1 to 2 leaf yellow foxtail, 4 to 6 leaf wild mustard, 2 to 4 leaf wild buckwheat, and 1 to 3 leaf annual smartweed. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 13.

		June 6					June 22	Aug 13
Treatment	Rate	Wht	Wioa	Yeft	Wimu	Wibw	Wioa	Yield
	oz ai/A	%	%	%	%	%	%	bu/A
Flcz+pxdn+flox&thif&trib+BB	0.35+0.86+1.6+1%	0	78	73	94	86	90	34
Flcz+clopyralid&flox+MCPA+BB	0.35+3+4+0.5%	0	74	70	94	85	86	26
Flcz+clopyralid&flox+MCPA+BB	0.43+3+4+0.5%	0	73	70	90	79	88	34
Flcz+flox&thif&trib+BB	0.35+1.6+1%	0	76	70	93	88	88	33
Flcz+flox&florasulam+BB	0.35+1.5+1%	0	79	75	93	85	89	31
Flcz&flox+ARY546+ARY547+BB	1.8+0.23+0.07+1%	0	75	71	93	86	87	34
Flcz&flox+ARY546+ARY547+BB	2.3+0.23+0.07+1%	0	79	74	90	86	88	35
Flcz&flox+MCPA+BB	1.8+5+1%	0	74	71	91	79	86	33
Flcz&flox+MCPA+BB	2.3+6.3+1%	0	73	70	94	78	86	31
Pxdn+flox&thif&trib	0.86+1.6	0	90	84	91	89	92	42
Pyroxsulam&flas&flox+BB	1.68+1%	0	83	79	95	93	89	35
Broxl&pyst&thiencarbazone	3.5	0	76	74	94	90	85	32
Untreated check	0	0	0	0	0	0	0	20
CV		0	5	4	4	6	2	14
LSD (P=0.05)		0	5	4	4	7	3	6

Herbicides did not cause visible injury. The greatest wheat yield was obtained from wheat treated with pinoxaden plus fluroxypyr and thifensulfuron and tribenuron. This treatment provided rapid control of wild oat, 90%, and yellow foxtail, 84%, compared to other herbicide treatments. Various treatments with flucarbazone gave 73 to 79% wild oat control and 70 to 75% control of yellow foxtail. By June 22, herbicides generally gave 85 to 90% control of wild oat. Control of broadleaf weeds did not provide major separation among herbicide treatments.

Grass herbicide standards. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat, and 1 to 2 leaf yellow foxtail on May 23 with 72°F, 34% relative humidity, mostly cloudy sky, 5 mph wind at 180°, and moist soil. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 14.

		June 6			June 22	Aug 14
Treatment	Rate	Wheat	Wioa	Yeft	Wioa	Yield
	oz ai/A	%	%	%	%	bu/A
Flcz-2.0+brox&MCPA5+BB	0.32+8+1%	0	75	73	84	25
Prcz+brox&MCPA5+BB	0.42+8+1%	0	71	68	73	28
Prcz&mess+brox&MCPA5+BB	0.2+8+1%	0	76	65	87	31
Pxlm+brox&MCPA5+BB	0.26+8+1%	0	79	70	91	30
Pxlm&flas&flox+BB	1.68+1%	0	79	70	85	25
Brox&pyst&thcz	3.5	0	75	69	84	30
Fenx+brox&MCPA5	1.32+8	0	83	78	88	34
Clodinfop NG+brox&MCPA5	0.8+8	0	83	76	90	26
Pxdn+brox&MCPA5	0.86+8	0	88	84	95	38
Fenx&Pxdn+brox&MCPA5	0.86+8	0	86	79	96	35
Untreated check	0	0	0	0	0	0
CV		0	4	8	7	18
LSD (P=0.05)		0	4	7	8	8

Herbicide injury to wheat was not observed. Control of wild oat was better with ACCase-inhibiting herbicides such as fenoxaprop and pinoxaden, 83 to 88% control, than with ALS inhibitors such as flucarbazone or pyroxsulam, 71 to 79% control, June 6. Thiencarbazone, sold in premix as Huskie Complete, gave 75% control. By June 22, pinoxaden control of wild oat was 95% while thiencarbazone gave 84% control. Thiencarbazone gave 69% control of yellow foxtail in this study, less than any of the ACCase herbicides but similar to other ALS herbicides. Foxtail was not observed in plots June 22. Grass control with fenoxaprop and pinoxaden, sold in premix as Foxfire, gave similar control to pinoxaden in this study.

Investigate SU herbicide antagonism of grass control with pinoxaden. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat, and 1 to 2 leaf yellow foxtail on May 23 with 72°F, 34% relative humidity, partly cloudy sky, 5 mph wind and 180°, and moist soil. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 6			June 22
Treatment	Rate	Wheat	Wioa	Yeft	Wioa
	oz ai/A	%	%	%	%
Pinoxaden	0.86	0	90	80	96
Pinoxaden&fluoxypyr	2.35	0	90	80	96
Pinoxaden+thif-sg+trib-sg	0.86+0.125+0.125	0	90	80	97
Pxdn&flox+thif-sg+trib-sg	2.35+0.125+0.125	0	90	80	97
Pxdn+brox&MCPA+thif-sg	0.86+8+0.125	0	90	80	97
Untreated check	0	0	0	0	0
CV		0	0	0	1
LSD (P=.05)		0	0	0	1

Wheat did not express injury from any of the herbicide treatments. Development of initial symptoms was relatively slow considering previous pinoxaden activity. Control was very consistent for wild oat or yellow foxtail among all herbicide treatments. On June 22, slight separation was determined but the difference did not have practical importance as each herbicide treatment gave 96 or 97% control of wild oat.

Wild oat control with broadleaf tank mix. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat, and 1 to 2 leaf yellow foxtail on May 23 with 75°F, 34% relative humidity, mostly cloudy sky, 5 mph wind at 180°, and moist soil. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 6			June 22
Treatment	Rate	Wheat	Wioa	Yeft	Wioa
	oz ai/A	%	%	%	%
Fenoxaprop+AGH09035	1.32+7.7	0	83	75	86
Fenoxaprop+AGH09035+AG02013	1.32+7.7+4	0	79	71	88
Fenoxaprop+AGH08032	1.32+10.6	0	76	68	83
Fenoxaprop+AGH08032+AG02013	1.32+10.6+4	0	78	69	83
Prcz&meso+AGH09035+ClassActNG	0.2+7.7+2.5%	0	79	74	92
Prcz&meso+AGH09035+ClassActNG+AG02013	0.2+7.7+2.5%+4	0	76	71	91
Prcz&meso+AGH08032+ClassActNG	0.2+10.6+2.5%	0	75	66	92
Prcz&meso+AGH08032+ClassActNG+AG02013	0.2+10.6+2.5%+4	0	75	68	92
AGH120020+ClassActNG	1.8+2.5%	0	75	69	94
AGH120020+ClassActNG+AG02013	1.8+2.5%+4	0	78	69	91
AGH120020+Thif+Trib+ClassActNG	1.8+0.15+0.15+2.5%	0	80	74	93
Untreated Check	0	0	0	0	0
CV		0	4	6	3
LSD (P=0.05)		0	4	6	3

Injury to wheat was not observed in this study. AG02013 did not improve control of wild oat or yellow foxtail with herbicides. Yellow foxtail control tended to be better when AGH09035 was the broadleaf herbicide rather than AGH08032, but there was no separation among fenoxaprop, propoxycarbazone and mesosulfuron, and AGH120020 for yellow foxtail control. On June 22, prcz and mess or AGH120020 gave better control of wild oat than fenoxaprop, and fenoxaprop control was slightly better when AGH09035 was the broadleaf herbicide compared with AGH08032, which was consistent with control of yellow foxtail with fenoxaprop.

Effect of application timing on grass control in HRSW with Everest 2.0, GoldSky, and Huskie Complete. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate the impact of application timing on grass control in spring wheat. Everest 2.0, GoldSky, and Huskie Complete were applied at 2-leaf, 3-leaf, or 4-leaf wheat. Wild oat, green foxtail, and yellow foxtail were present in the study, with the majority being green foxtail. All treatments provided 91% or more wild oat control. GoldSky and Huskie Complete were slightly more effective applied at the later stage, while Everest 2.0 was generally consistent across timings. Everest provided good to excellent foxtail control at all stages, but was slightly more effective when applied at the two later stages. GoldSky provided poor foxtail control at the 2-leaf wheat stage, but good to excellent control at the later stages.

Table. Effect of application timing on grass control in HRSW with Everest 2.0, GoldSky, and Huskie Complete. (1204)

			HRSW			Weed Control					
			Injury			Wild oat				Foxtail	
Treatment[ab]	Rate	Timing	5-Jun	15-Jun	25-Jun	5-Jun	15-Jun	25-Jun	3-Jul	25-Jun	3-Jul
	g/ha	(wheat)	----------%----------			----------%----------					
Untreated			0	0	0	0	0	0	0	0	0
Everest 2.0	23	2-leaf	7	0	0	90	95	91	95	93	93
Everest 2.0	30.6	2-leaf	8	0	0	93	95	91	96	87	87
Everest 2.0 + Audit	23 + 21	2-leaf	8	2	0	90	95	90	93	88	86
Goldsky	117	2-leaf	8	0	0	87	87	83	91	65	62
Huskie Complete	211	2-leaf	8	0	0	91	93	91	95	86	91
Everest 2.0	23	3-leaf	8	0	0	70	94	95	98	93	88
Everest 2.0	30.6	3-leaf	7	0	0	70	95	96	98	99	99
Everest 2.0 + Audit	23 + 21	3-leaf	8	0	0	70	94	96	96	98	98
Goldsky	117	3-leaf	8	0	0	75	93	88	93	82	80
Huskie Complete	211	3-leaf	7	0	0	70	94	93	96	84	83
Everest 2.0	23	4-leaf	0	0	0	0	73	95	98	96	94
Everest 2.0	30.6	4-leaf	0	0	0	0	72	95	98	96	93
Everest 2.0 + Audit	23 + 21	4-leaf	0	2	0	0	72	96	98	97	95
Goldsky	117	4-leaf	0	6	0	0	72	96	97	95	93
Huskie Complete	211	4-leaf	0	0	0	0	73	94	98	92	90
LSD (0.05)			1	2	NS	4	3	4	5	7	9
CV			12	129	0	5	2	3	3	5	7

[a] *All treatments applied POST at wheat 2-leaf (May 21), 3-leaf (May 31), or 4-leaf (Jun 8)*

[b] *Everest 2.0 and Goldsky applied with Basic Blend (1%)*

Tribenuron influence on yellow foxtail control with ALS-inhibiting herbicides. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on May 24. Treatments were applied to 5 leaf wheat, 1 leaf Venice mallow, and 1 to 3 leaf yellow foxtail on June 28 with 70°F, 66% relative humidity, 10% cloud cover, 3 mph wind at 270°, and dry soil at 65°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	July 13 Yeft	Aug 7 Yeft
	oz ai/A	%	%
Flcz-2.0+NIS	0.35+0.25%	62	77
Pxlm&flas&flox+NIS	1.67+0.25%	56	53
Prcz&mess+MSO	0.2+24	58	61
Flcz-2.0+trib-sg+NIS	0.35+0.2+0.25%	58	86
Pxlm&flas&flox+trib-sg+NIS	1.67+0.2+0.25%	57	60
Prcz&mess+trib-sg+MSO	0.2+0.2+24	55	67
Flcz-2.0+thif-sg+trib-sg+NIS	0.35+0.15+0.15+0.25%	60	78
Pxlm&flas&flox+thif-sg+trib-sg+NIS	1.67+0.15+0.15+0.25%	51	70
Prcz&mess+thif-sg+trib-sg+MSO	0.2+0.15+0.15+24	57	55
Trib-sg+NIS	0.2+0.25%	38	29
Thif-sg+trib-sg+NIS	0.15+0.15+0.25%	54	51
Thif-sg+trib-sg+NIS	0.05+0.2+0.25%	40	38
Flcz-2.0+thif-sg+trib-sg+NIS	0.35+0.05+0.2+0.25%	51	65
Untreated check	0	0	0
CV		26	11
LSD (P=0.05)		19	9

Tribenuron or thifensulfuron and tribenuron again suppressed yellow foxtail growth, 30 to 50% control. Enhancement of grass herbicide control of yellow foxtail was not as consistent in this study as in previous years. Even in this study there was not a consistent effect. Propoxycarbazone and mesosulfuron control was not affected by addition of tribenuron or thifensulfuron, but control when tribenuron was added was better than when tribenuron and thifensulfuron was added. Tribenuron also improved the control of yellow foxtail with flucarbazone, but tribenuron and thifensulfuron did not affect activity of flucarbazone. The combination of tribenuron and thifensulfuron improved control of yellow foxtail with pyroxsulam, but tribenuron alone did not increase control of foxtail with pyroxsulam.

Foxtail control with Express and Affinity. (Jenks, Walter, and Willoughby). The objective of the study was to determine if foxtail control with Everest 2.0, GoldSky, and Rimfire Max will increase when tank mixed with Express or Affinity. Everest 2.0, GoldSky, and Rimfire Max were applied alone or tank mixed with Express or Affinity. Tank mixing Express or Harmony increased foxtail control only 5-9% with Everest, 2-4% with GoldSky, and 9-12% with Rimfire Max. In 2011, green foxtail control was increased 6-14% with the same treatments. In 2010, yellow foxtail control with Everest was increased 14-16%, but control with GoldSky and Rimfire was not increased.

Table. Foxtail control with Express and Affinity. (1213)

		HRSW		Foxtail[c]		
		Injury		Control		
Treatment[ab]	Rate	16-Jun	28-Jun	16-Jun	28-Jun	13-Jul
		%		%		
Untreated		0	0	0	0	0
Everest 2.0	0.5 fl oz	0	0	62	55	58
Everest 2.0 + Express	0.5 fl oz + 0.4 oz	0	0	70	63	63
Everest 2.0 + Express + Harmony	0.5 fl oz + 0.3 oz + 0.3 oz	0	0	74	67	67
Everest 2.0 + Express + Harmony	0.5 fl oz + 0.4 oz + 0.1 oz	0	0	72	63	65
GoldSky	1 pt	0	0	77	70	73
GoldSky + Express	1 pt + 0.4 oz	0	0	79	72	77
GoldSky + Express + Harmony	1 pt + 0.3 oz + 0.3 oz	0	0	79	72	75
Rimfire Max	3 oz	0	0	50	42	38
Rimfire Max + Express	3 oz + 0.4 oz	0	0	65	52	50
Rimfire Max + Express + Harmony	3 oz + 0.3 oz + 0.3 oz	0	0	66	52	47
Express	0.4 oz	0	0	22	15	12
Express + Harmony	0.3 oz + 0.3 oz	0	0	22	17	15
Express + Harmony	0.4 oz + 0.1 oz	0	0	18	15	13
LSD (0.05)		NS	NS	8	6	9
CV		0	0	8	7	11

[a] *All treatments applied at HRSW 4-leaf; Express=Express SG; Harmony=Harmony SG*

[b] *Rimfire Max applied with MSO (1.5 pt); Express and Everest 2.0 applied with NIS (0.25%)*

[c] *Foxtail was approximately 75% yellow and 25% green foxtail*

Investigate SU herbicide antagonism of foxtail control with pinoxaden. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on May 24. Treatments were applied to 5 leaf wheat, 1 leaf Venice mallow, and 1 to 3 leaf yellow foxtail on June 28 with 70°F, 66% relative humidity, 10% cloud cover, 3 mph wind at 270° and dry soil at 65°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates evaluated on July 13 and one replicate on August 7.

Treatment	Rate	July 13 Yeft	Aug 7 Yeft
	oz ai/A	%	%
Pinoxaden	0.86	76	97
Pinoxaden&fluoxypyr	2.35	71	95
Pinoxaden+thif-sg+trib-sg	0.86+0.125+0.125	62	85
Pxdn&flox+thif-sg+trib-sg	2.35+0.125+0.125	72	75
Pxdn+brox&MCPA+thif-sg	0.86+8+0.125	80	85
Untreated Check	0	0	0
CV		7	.
LSD (P=0.05)		10	.

Lack of moisture affected the crop and yellow foxtail, which prevented the full season evaluation of this study. The treatment that included bromoxynil provided 80% control of yellow foxtail on July 13, perhaps due to desiccant activity of bromoxynil on foxtail, especially young foxtail. This treatment was observed at 85% control on August 7, while pinoxaden alone or in premix with fluroxypyr provided 95% control or better in single observation. Broadleaf SU herbicide tended to result in less yellow foxtail control with pinoxaden. The effect of fluroxypyr was mixed in this study but has not been determined antagonistic of grass control in other studies.

Foxtail control with thiencarbazone. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Prosper on May 3. Treatments were applied to 3 leaf wheat, 2 to 3 leaf wild oat and green and yellow foxtail, 2 leaf redroot pigweed and hairy nightshade, and 2 to 4 leaf common lambsquarters on May 30 with 65°, 45% relative humidity, 100% cloud cover, 3 mph wind at 315°, and damp soil at 56°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 6.

		June 6					
Treatment	Rate	Wht	Wioa	Fxtl	Rrpw	Colq	Hans
	oz ai/A	%	%	%	%	%	%
Prcz&mess+brox&pyst+MSO	0.2+2.9+24	5	73	71	94	90	95
Prcz&mess+brox&pyst+BB	0.2+2.9+1%	5	75	75	95	95	95
Prcz&mess+brox&pyst+HSOC	0.2+2.9+12	5	76	76	94	93	95
Prcz&mess+thif+trib+flox+BB	0.2+0.24+0.06+1+1%	5	76	75	88	85	94
Brox&pyst&thcz	3.5	5	76	78	94	90	95
Brox&pyst&thcz+AMS	3.5+8	5	83	85	95	94	95
Fenoxaprop&brox&pyst	3.9	0	74	74	89	84	94
Untreated check	0	0	0	0	0	0	0
CV		0	6	5	3	7	2
LSD (P=0.05)		0	6	5	4	8	2

Table continued

		June 22			July 13		Aug 14
Treatment	Rate	Wht	Fxtl	Wioa	Fxtl	Wioa	Yield
	oz ai/A	%	%	%	%	%	bu/A
Prcz&mess+brox&pyst+MSO	0.2+2.9+24	5	74	95	43	99	36
Prcz&mess+brox&pyst+BB	0.2+2.9+1%	5	79	95	30	99	35
Prcz&mess+brox&pyst+HSOC	0.2+2.9+12	6	84	95	35	99	40
Prcz&mess+thif+trib+flox+BB	0.2+0.24+0.06+1+1%	9	89	95	89	99	41
Brox&pyst&thcz	3.5	5	91	95	93	99	38
Brox&pyst&thcz+AMS	3.5+8	6	94	95	94	99	36
Fenoxaprop&brox&pyst	3.9	5	86	95	70	90	37
Untreated check	0	0	0	0	0	0	27
CV		29	5	0	9	1	13
LSD (P=0.05)		2	5	0	7	1	7

Each treatment containing propoxycarbazone and mesosulfuron or thiencarbazone induced mild chlorosis of wheat on June 16. Injury recorded June 22 was primarily stubting. Wheat treated with fenoxaprop also displayed this response, but addition of thifensulfuron and tribenuron to propoxycarbazone and mesosulfuron resulted in increased injury complared with other herbicide treatments. Injury to wheat was not observed on July 13.

Thif and trib also enhanced control of foxtails by June 22 but provided slower activity on redroot pigweed and common lambsquarters than other herbicides except fenoxaprop and bromoxynil and pyrasulfotole. Addition of AMS improved early wild oat control with thiencarbazone, but control was similar across herbicides for wild oat by June 22. Each herbicide treatment provided complete control of broadleaf weeds by June 22.

Pyroxsulam control of yellow foxtail with adjuvants. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to 2 to 3 tiller wheat and 2 to 4 leaf yellow foxtail on June 6 with 69°F, 56% relative humidity, 100% cloud cover, 6 mph wind at 100°, and dry soil at 65°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	June 22 Yeft	July 5 Yeft
	oz ai/A	%	%
Pyroxsulam	0.21	70	30
Pxlm+NPak AMS	0.21+2.5%	70	48
Pxlm+NPak AMS	0.21+5%	70	63
Pxlm+ClassActNG	0.21+1.25%	70	65
Pxlm+ClassActNG	0.21+2.5%	70	76
Pxlm+AG08034	0.21+2%	70	64
Pxlm+AG08034	0.21+1%	70	68
Pxlm+AG07043	0.21+1%	70	84
Pxlm+AG11011	0.21+1%	70	76
Pxlm+AG12030	0.21+1%	70	65
Pxlm+AG12030	0.21+0.5%	70	28
Pxlm+AG12030+AG02013	0.21+1%+4	70	55
CV		0	10
LSD (P=0.05)		0	9

Treatments could not be separated June 22. Symptoms of chlorosis were evident across all treatments with very little stunting at the time of evaluation. Adjuvants are important for activity of pyroxsulam. Since this is a dry formulation, adjuvant component has to be added separately. All adjuvants improved control of yellow foxtail with pyroxsulam by July 5 except AG12030 at 0.5%. Greatest control of yellow foxtail on July 5 with pyroxsulam was obtained with AG07034 as the adjuvant, 84%. AG11011 or Class Act at 2.5% were distantly similar at 76% control with pyroxsulam. Several other adjuvants improved control of foxtail with pyroxsulam from 30% to mid 60s. AG02013 slightly antagonized foxtail control.

Flucarbazone control of yellow foxtail with adjuvants. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to 2 to 3 tiller wheat and 2 to 4 leaf yellow foxtail on June 6 with 69°F, 56% relative humidity, 100% cloud cover, 4 mph wind at 100°, and dry soil at 65°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	June 22 Yeft	July 5 Yeft
	oz ai/A	%	%
Flcz&Flox	2	75	45
Flcz&Flox+NPak AMS	2+2.5%	75	56
Flcz&Flox+NPak AMS	2+5%	75	64
Flcz&Flox+ClassActNG	2+1.25%	75	78
Flcz&Flox+ClassActNG	2+2.5%	75	81
Flcz&Flox+AG08034	2+2%	75	85
Flcz&Flox+AG08034	2+1%	75	70
Flcz&Flox+AG07043	2+1%	75	76
Flcz&Flox+AG11011	2+1%	75	80
Flcz&Flox+AG12030	2+1%	75	71
Flcz&Flox+AG12030	2+0.5%	75	61
Flcz&Flox+AG12031	2+1%	75	81
CV		0	9
LSD (P=0.05)		0	10

Treatments could not be separated June 22. Symptoms of chlorosis were evident across all treatments with very little stunting at the time of evaluation. All adjuvants improved control of yellow foxtail with flucarbazone by July 5. AG08034 at 2% helped produce the greatest foxtail control at 85%, while 1% only resulted in 70% control. Class Act resulted in about 80% control with 1.25 or 2.5% additive rate. AG11011 and 12031 also enhanced activity to about 80%.

Barnyard grass control in cereals. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments were applied to 2 to 4 leaf wheat and 2 to 3 leaf barnyardgrass and yellow foxtail on May 25 with 60°F, 33% relative humidity, 0% cloud cover, 7 mph wind at 330°, and dry soil at 58°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 36 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 8			July 13
Treatment	Rate	Wheat	Barnyardgrass	Foxtail	Foxtail
	oz ai/A	%	%	%	%
Flcz+brox&MCPA5+BB	0.32+8+1%	0	76	75	71
Prcz+brox&MCPA5+BB	0.42+8+1%	0	74	65	28
Prcz&mess+brox&MCPA5+BB	0.2+8+1%	0	70	63	40
Pxlm+brox&MCPA5+BB	0.26+8+1%	0	76	74	73
Pxlm&flas&flox+BB	1.68+1%	0	75	74	80
Brox&pyst&thcz	3.5	0	71	71	73
Fenx+brox&MCPA5	1.32+8	0	92	92	91
Clodinfop NG+brox&MCPA5	0.8+8	0	86	86	86
Pxdn+brox&MCPA5	0.86+8	0	90	90	93
Fenx&pxdn+brox&MCPA5	0.86+8	0	85	89	83
Untreated check	0	0	0	0	0
CV		0	5	5	8
LSD (P=.05)		0	5	5	8

Treatments did not cause injury to wheat. Barnyardgrass was controlled more effectively by ACCase-inhibiting herbicides, such as fenoxaprop and pinoxaden, than ALS-inhibiting herbicides, such as flucarbazone and pyroxsulam. The study area became very dry midseason and barnyardyrass was not longer present in untreated plots for comparison.

Control of foxtail largely mirrored activity on barnyardgrass. One exception was much less control of foxtail species with propoxycarbazone or propoxycarbazone and mesosulfuron than other ALS-inhibiting herbicides. Pyroxulam premix with florasulam and fluroxypyr gave 80% control of foxtails, but pinoxaden provided 93% foxtail control.

2012 Grassy Weed Control with Spring Herbicide Applications in Winter Wheat

Eric Eriksmoen, Hettinger, ND

'Jerry' HRWW was seeded no-till into dry soil on October 10, 2011. Persistent dry fall conditions resulted in less than 1% winter wheat emergence prior to freeze up and a very poor crop stand during the growing season. Spring post-emergence treatments were applied on April 14, 2012 to 2 ½ leaf wheat and to tillering downy brome (dobr), 2 leaf Japanese brome (jabr), 1 leaf wild oat (wiot) and 1 leaf Persian darnel (peda) with 55° F, 45% RH, cloudy sky, moist soil conditions and a south wind at 7 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The soil is classified as a silt-loam with a pH of 6.2, OM of 3.2% and had 85% fall hrsw residue ground cover (4300 lbs/A). The trial was a randomized complete block design with four replications. The trial had an application of 21 oz/A WideMatch herbicide on June 2 to control broadleaf weeds. Weed populations for downy brome, Japanese brome, wild oat and Persian darnel were 3, 6, 0.5 and 0.25 plants /ft^2 respectively. Plots were evaluated for crop injury on April 23, May 18, June 2 and July 7, and for weed control on June 2 and July 7. The trial was not harvested.

			4/23	5/18	- June 2 -		---------- July 7 ----------				
	Treatment	Product rate	inj	inj	inj	dobr	inj	dobr	jabr	wiot	peda
		oz/A	---------- Percent control ----------								
1	PowerFlex HL+Act. 90+AMS	2 + 0.5% +1.5 lb	0	0	0	85	0	95	96	32	99
2	Olympus Flex+Act. 90+AMS	3.5 + 0.5% + 1.5 lb	0	0	0	75	0	90	97	65	0
3	Olympus + Act. 90	0.9 + 0.5%	0	0	0	90	0	97	99	62	3
4	Maverick + Act. 90	0.67 + 0.5%	0	0	0	45	0	91	94	9	33
5	Untreated		0	0	0	0	0	0	0	0	0
6	Axial XL	16.4	0	0	0	10	0	1	2	84	99
7	Osprey + Act. 90 + AMS	3.25+0.5%+64	0	0	0	67	0	21	46	1	3
	C.V. %		0	0	0	26	0	27	31	39	66
	LSD .05		NS	NS	NS	20	NS	23	29	21	28

NS = no statistical difference between treatments

Summary

Crop injury (leaf speckling) was minor when observed (less than 1%) and diminished quickly. PowerFlex HL, Olympus Flex, Olympus and Maverick treatments provided very good season long control of downy brome and Japanese brome. None of the treatments were very effective on wild oat, however, Olympus Flex, Olympus and Axial XL treatments provided significantly better control than the other treatments. PowerFlex HL and Axial XL treatments provided excellent season long control of Persian darnel.

2012 Control of Tough Grassy Weeds with Huskie Complete and Olympus in Spring Wheat - Eric Eriksmoen, Hettinger, ND

Pre-plant treatments (PP) were applied on April 14 to 3 leaf downy brome (dobr) with 54° F, 47% RH, cloudy sky and east wind at 7 mph. 'Mott' HRSW was seeded no-till on April 17. Post emergence treatments (POST) were applied on May 18 to 4 ½ leaf wheat, late boot stage downy brome, jointing Japanese brome (jabr), 3 leaf wild oat (wiot), jointing foxtail barley (fxba) and 8" smooth bromegrass (smbr) with 71° F, 54% RH, mostly cloudy sky and northeast wind at 5 mph. Treatments were applied with a tractor mounted CO_2 propelled plot sprayer delivering 10 gpa at 30 psi through PK-01E80 nozzles to a 5 foot wide area the length of 10 by 28 foot plots. The soil is classified as a silt-loam with a pH of 6.2 and OM of 3.2%. The trial was a randomized complete block design with four replications. HRSW plant population was tabulated on May 22. Weed populations for downy brome, Japanese brome, wild oat and foxtail barley were 20, 6, 0.25 and 0.25 plants per square foot, respectively. Wild oat and Smooth bromegrass populations were inconsistent and limited to one replication. Plots were evaluated for crop injury on April 30, June 2 and June 16, and for weed control on June 2, June 16 and July 9. The trial was harvested on August 3.

	Treatment	Product Rate	App. Timing	HRSW Pop.	6/2	June 16					July 9				Grain Yield
					dobr	dobr	jabr	wiot	fxba	smbr	dobr	jabr	fxba	smbr	
		oz/A		#/ft^2	% Control										bu/A
1	Roundup WeatherMax + AMS / Huskie + AMS	16 + 17lb / 11 + 0.5lb	PP POST	35	58	55	25	0	50	50	40	38	18	30	12.6
2	R'up W.Max + AMS / Huskie Complete	16 + 17lb / 13.7	PP POST	27	89	76	90	99	80	50	68	98	53	90	17.3
3	R'up W.Max + AMS / Huskie Complete + AMS	16 + 17lb / 13.7 + 0.5lb	PP POST	32	80	72	79	99	65	0	68	99	50	0	14.4
4	R'up W.Max+Olympus+ AMS / Huskie Complete	16+0.2+17lb / 13.7	PP POST	28	86	88	92	99	40	10	84	99	96	50	18.2
5	R'up W.Max+Olympus+ AMS / Huskie Complete + AMS	16+0.2+17lb / 13.7 + 0.5lb	PP POST	26	84	82	84	99	90	95	70	99	97	90	18.3
6	R'up W.Max+Olympus+ AMS / Huskie Complete+Olympus+AMS	16+0.2+17lb / 13.7+0.2+0.5lb	PP POST	32	94	92	92	99	92	90	90	99	93	90	19.8
7	R'up W.Max + AMS / Rimfire Max + Huskie + MSO	16 + 17lb / 3 + 11 + 21	PP POST	31	88	81	90	99	88	90	85	99	98	90	15.8
8	R'up W.Max+Olympus+ AMS / Rimfire Max + Huskie + MSO	16+0.2+17lb / 3 + 11 + 21	PP POST	32	91	92	95	99	73	30	94	99	98	80	17.6
9	Everest 2.0 + Huskie + NIS	1.0+11+0.25%	POST	25	2	0	75	0	30	0	0	99	5	10	5.2
10	R'up W.Max + PrePare +AMS / Everest 2.0 + Huskie + NIS	16 +0.3+17lb / 0.5+11+0.25%	PP POST	24	78	75	92	0	60	0	54	97	37	0	13.4
11	Untreated			30	0	0	0	0	0	0	0	0	0	0	1.9
	C.V. %			26	12	17	17	--	31	--	27	9	39	--	14.4
	LSD .05			NS	12	16	18	--	31	--	23	11	32	--	7.1

NS = no statistical difference between treatments.

Summary

Crop injury was not observed on any treatment (data not shown). Treatments containing preplant Olympus tended to provide better season long control of downy brome. All treatments, except for preplant Roundup followed by POST Huskie (trt 1), provided excellent season long control of Japanese brome. Treatments containing Olympus and/or Rimfire Max provided excellent season long control of foxtail barley. Several treatments appear to have very good efficacy on smooth bromegrass.

Foxtail barley control with Huskie Complete and Olympus. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate foxtail barley control with a glyphosate burndown compared to glyphosate tank mixed with Olympus or Pre-Pare and then followed by Huskie Complete, Rimfire Max, or Everest 2.0. The preplant burndown application was applied May 3 and spring wheat was planted on May 17. Only slight temporary injury was observed in a few treatments. The glyphosate burndown alone provided about 68% foxtail barley control at the final evaluation on July 12. Foxtail barley control with Huskie Complete applied POST was about 14-18% higher than the glyphosate burndown alone. Applying Olympus preplant or postemergence with Huskie Complete resulted in about 21-25% higher foxtail barley control compared to the glyphosate burndown alone. Everest applied POST or following Pre-Pare improved foxtail barley control about 11-17% above the glyphosate burndown alone.

Table. Foxtail barley control with Huskie Complete and Olympus. (1232)

			HRSW				Weed Control		
			Injury			Density	Foxtail barley		
Treatment[a]	Rate	Timing	2-Jun	26-Jun	12-Jul	18-Jun	13-Jun	26-Jun	12-Jul
			----------%----------			plnt/m	----------%----------		
Gly / Huskie	22 oz / 11 fl oz	PP / POST	0	0	0	25.2	82	72	68
Gly / Huskie Complete	22 oz / 13.7 fl oz	PP / POST	0	0	0	29.0	83	83	82
Gly / Huskie Complete[b]	22 oz / 13.7 fl oz	PP / POST	0	0	0	23.3	82	86	86
Gly + Olympus / Huskie Complete	22 oz + 0.2 oz / 13.7 fl oz	PP / POST	2	6	0	25.5	86	89	90
Gly + Olympus / Huskie Complete[b]	22 oz + 0.2 oz / 13.7 fl oz	PP / POST	1	3	0	26.9	88	91	89
Gly + Olympus / Huskie C + Olympus[b]	22 oz + 0.2 oz / 13.7 fl oz + 0.2 oz	PP / POST	1	6	0	23.4	85	89	93
Gly / Rimfire Max + Huskie[c]	22 oz / 3 oz + 11 fl oz	PP / POST	0	0	0	24.4	83	84	91
Gly + Olymp / Rimfire Max + Huskie[c]	22 oz + 0.2 oz / 3 oz + 11 fl oz	PP / POST	1	8	0	25.3	85	89	92
Gly / Everest 2.0 + Huskie[d]	22 oz / 1 fl oz + 11 fl oz	PP / POST	0	0	0	26.3	85	85	85
Gly + Pre-Pare / Everest 2.0 + Huskie[d]	22 oz + 0.3 oz / 0.5 fl oz + 11 fl oz	PP / POST	4	5	0	22.3	85	85	81
LSD (0.05)			1	3	NS	NS	NS	6.6	5.3
CV			91	85	0	16	4	5	4

[a] *Gly = Roundup Powermax (22 fl oz) applied Preplant with AMS (5%);*

[b] *Applied with AMS (1.47%)*

[c] *Applied with MSO (1.3 pt)*

[d] *Applied with NIS (0.25%)*

Wheat tolerance to Dicamba formulation. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 24. Treatments (3L) were applied to 3 leaf wheat on May 30 with 51°F, 50% relative humidity, 5% cloud cover, 1 mph wind at 270°, and soil at 51°F. Treatments (5.5L) were applied to 5 to 6 leaf wheat on June 12 with 60°F, 60% relative humidity, 10% cloud cover, 2 mph wind at 300°, and damp soil at 56°F. All treatments were applied with a backpack sprayer delivering 15 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 24.

Treatment	Rate	Growth stage	6/4 Wheat	6/13 Wheat	6/20 Wheat	7/10 Wheat	8/24 Yield
	oz ae/A		%	%	%	%	bu/A
Dicamba+NIS+UAN	4+0.25%+1%	3L	13	19	25	10	40
BAS18322+NIS+UAN	4+0.25%+1%	3L	14	20	25	10	43
BAS18323+NIS+UAN	4+0.25%+1%	3L	18	26	25	9	40
Dicamba+NIS+UAN	2+0.25%+1%	5.5L	-	0	10	10	30
BAS18322+NIS+UAN	2+0.25%+1%	5.5L	-	0	10	10	33
BAS18323+NIS+UAN	2+0.25%+1%	5.5L	-	0	10	10	29
Dicamba+NIS+UAN	4+0.25%+1%	5.5L	-	0	10	10	32
BAS18322+NIS+UAN	4+0.25%+1%	5.5L	-	0	10	11	33
BAS18323+NIS+UAN	4+0.25%+1%	5.5L	-	0	10	9	33
Untreated check			0	0	0	0	45
CV			28	26	0	31	16
LSD (P=0.05)			2	2	0	4	9

Dicamba injury symptoms were evident 5 days after application to three-leaf wheat. This manifested as splayed and decumbent growth characteristic with minor stunting. BAS18323 caused slightly more injury than other dicamba formulations, although injury was similar across formulation later in the season. Injury obtained from dicamba applied at three-leaf stage did not reduce yield, although numerical yield values tended to be slightly less than the untreated.

Dicamba injury was not apparent 1 day after application to five-leaf wheat but by June 20 a consistent 10% injury was observed regardless of formulation or rate. Injury was primarily stunting. Splayed and decumbent appearance was not as pronounced perhaps because lignification of stem tissue would have already occurred. Heads were more likely to demonstrate twisted awns than application to three-leaf wheat; however head sterility and awn deformity was not a regular observation. Although much less visible injury was recorded for application to five-leaf compared with three-leaf wheat, grain yield of wheat treated with dicamba at the five-leaf stage suffered reproductive damage resulting in 25 to 35% less grain yield than the untreated.

Please note that application of dicamba to five-leaf wheat is past the window of labeled application. Formulation modifications did not result in more safety to advanced wheat stages.

Broadleaf herbicide standards. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 4 leaf wheat, 2 to 3 leaf annual smartweed, and 2 to 5 leaf wild buckwheat on May 25 with 58°F, 44% relative humidity, 0% cloud cover, 3 mph wind at 330°, and dry soil at 52°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield on August 14.

Treatment	Rate	6/22 Wimu	6/22 Wibw	6/22 Answ	8/14 Yield
	oz ai/A	%	%	%	bu/A
Flox&MCPA	8	93	92	94	38
Flox&dicamba	1.85	80	86	90	39
Clpy&flox	3	81	87	91	45
Clpy&MCPA	9.4	94	84	93	42
Clpy&flox+thif-sg+trib-sg	2+0.1+0.1	97	94	96	41
Thif-sg+trib-sg+MCPA+NIS	0.24+0.06+4+0.25%	96	93	95	48
Thif-sg+trib-sg+2,4-D+NIS	0.15+0.15+4+0.25%	97	94	95	43
Flas&MCPA+NIS	5.07+0.25%	97	93	96	44
Carf&2,4-D+NIS	4.1+0.25%	91	70	90	45
Pyraflufen+2,4-D+NIS	0.013+4+0.25%	96	74	90	42
Brox&MCPA	8	95	87	95	42
Brox&flox	5	86	90	95	37
Brox&pyst	2.9	97	92	95	43
Brox&pyst&thcz	3.5	96	96	96	41
Flox&thif-sg&trib-sg	1.86	95	93	96	38
Untreated check	0	0	0	0	42
CV		4	7	3	14
LSD (P=0.05)		5	8	4	8

With weeds under low-moisture stress and wheat rooted to moisture, even the untreated wheat did not suffer yield loss from weed competition. Control of wild mustard or annual smartweed generally exceeded 90% for each herbicide. Control of wild mustard was markedly lower when the treatment did not include a phenoxy or SU herbicide. The premix bromoxynil and pyrasulfotole and thiencarbazone (Huskie Complete) provided 96% control of wild buckwheat while also effectively controlling mustard and smartweed. Many other treatments that included SU or phenoxy components maintained buckwheat control near 90%, but carfentrazone or pyraflufen plus 2,4-D gave only 70 and 74% control of wild buckwheat, respectively.

Broadleaf weed control with thiencarbazone. Howatt, Roach, Ciernia, and Harrington. 'Argent' hard red spring wheat was seeded near Valley City on April 1. Treatments were applied to 4 to 4.5 leaf wheat, 2 to 5 inch tall kochia, 2 to 7 inch tall marshelder, and 2 to 6 leaf volunteer sunflower on May 21 with 73°F, 40% relative humidity, 10% cloud cover, 3.5 mph wind at 180°, and dry soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested for grain yield July 26.

		June 7				June 21			July 26
Treatment	Rate	Wht	Kocz	Vosu	Mael	Kocz	Vosu	Mael	Yield
	oz ai/A	%	%	%	%	%	%	%	bu/A
Brox&pyst+AMS	2.9+8	0	83	83	92	90	92	96	38
Brox&pyst&thcz	3.5	0	90	85	93	89	91	96	33
Brox&pyst&thcz+AMS	3.5+8	0	88	83	93	84	96	94	36
Fenx&brox&pyst	4.7	0	88	83	90	88	93	96	34
Clpy&flox+MCPA	2.3+4	0	83	90	92	88	95	97	32
Thif-sg+trib-sg+flox+NIS	0.24+0.06+1+0.25%	0	87	83	92	88	92	95	34
Untreated check	0	0	0	0	0	0	0	0	35
CV		0	4	3	4	5	4	2	10
LSD (P=0.05)		0	6	4	6	7	5	3	5

Herbicide treatments did not cause visible injury to wheat. Weed pressure was sparse except in the first replicate and moisture appeared to be very limiting for plant growth. Herbicide treatments essentially provided similar levels of control for the three species evaluated.

Broadleaf weed control with Huskie and Huskie Complete in spring wheat, Carrington, 2012. Greg Endres and Mike Ostlie. The experiment was conducted at the NDSU Carrington Research Extension Center in cooperation with Bayer CropScience. Experimental design was a randomized complete block with three replicates. 'Glenn' HRS wheat was seeded on April 25. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 10 gal/A at 35 psi through 8001 flat fan nozzles to the center 6.7 ft of 10- by 25-ft plots. Treatments were applied on May 31 with 72 F, 23% RH and 7 mph wind to 4-leaf wheat, 1- to 4-inch tall wild buckwheat, 1- to 3-inch tall common lambsquarters, and 1- to 4-inch tall volunteer canola. Puma at 0.66 pt/A was sequentially applied on May 31 to plots previously not receiving a grass herbicide except the untreated check. The trial was harvested for seed yield on July 30.

Huskie, Huskie Complete, and Wolverine provided excellent control (98-99%) of common lambsquarters and volunteer canola, and generally good to excellent control (78-98%) of wild buckwheat (Table). Weed control generally was excellent 3 and 7 wk after treatment (WAT) with WideMatch + MCPA and Affinity TankMix + Starane. Wheat injury was not observed 1 WAT (June 8). Wheat seed yield was similar among treatments.

Table.

		Weed control[1]									Wheat
Herbicide		8-Jun			22-Jun			19-Jul			Seed
Treatment[2]	Rate	wibw	colq	voca	wibw	colq	voca	wibw	colq	voca	yield
	fl oz product/A	%									bu/A
Untreated check	x	0	0	0	0	0	0	0	0	0	44.2
Huskie + AMS	11 + 18.8	98	99	99	86	99	98	98	99	99	49.0
Huskie Complete	13.7	96	99	98	89	99	98	98	99	99	46.2
Huskie Complete + AMS	13.7 +18.8	98	99	99	87	99	99	87	99	99	47.6
Wolverine	27.4	93	99	99	78	99	99	95	99	99	47.8
WideMatch + MCPA	12 + 8	78	82	78	91	97	99	99	99	99	47.4
Affinity TankMix + Starane + NIS	0.6 (oz wt) + 5.3 + 0.25%	80	77	78	72	96	99	97	99	99	43.1
C.V. (%)		4.6	2.0	2.6	9.1	2.7	1.1	3.2	0.0	0.0	9.7
LSD (0.05)		6	3	4	12	4	2	5	NS	NS	NS

[1]Wibw=wild buckwheat; colq=common lambsquarters; voca=volunteer canola.

[2]AMS=AMS-Xtra (Drexel); NIS=Preference (Winfield Solutions).

Effect of adjuvants on weed control in spring wheat with Everest 2.0 and Huskie Complete. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate the impact of adjuvants on weed control with Everest 2.0 + Supremacy and Huskie Complete. All treatments were applied June 4 at the 4-leaf wheat stage. Weeds were very small and the crop was very competitive. All treatments provided excellent control of all weeds. Only slight temporary injury was observed. Tank mixes with Stratego tended to cause more crop injury, mostly in the form of slight stunting; however most injury symptoms were gone by 2 WAT.

Table. Effect of adjuvants on weed control in spring wheat with Everest 2.0 and Huskie Complete. (1222)

		HRSW		Weed Control[b]							
		Injury		Wibw		Colq		Rrpw		Foxtail	
Treatment[a]	Rate	11-Jun	18-Jun	18-Jun	16-Jul	18-Jun	16-Jul	18-Jun	16-Jul	18-Jun	16-Jul
		%		%							
Ev2.0 + Supremacy	0.75 fl oz + 5 oz	1	0	94	99	94	99	94	99	94	97
Ev2.0 + Supremacy + Axon	0.75 fl oz + 5 oz + 0.5%	2	0	95	99	95	99	96	99	95	97
Ev2.0 + Supremacy + WC112	0.75 fl oz + 5 oz + 0.5%	3	0	96	99	96	99	96	99	95	98
Ev2.0 + Suprm + Axon + Stratego	1 fl oz + 5 oz + 0.5% + 5 fl oz	12	3	95	99	95	99	95	99	95	98
Ev2.0 + Suprm + WC112 + Stratego	1 fl oz + 5 oz + 0.5% + 5 fl oz	12	2	95	99	95	99	96	99	95	98
Huskie Complete	13.7 fl oz	9	0	99	99	99	99	99	99	95	97
Huskie Complete + Axon	13.7 fl oz + 0.5%	10	0	99	99	99	99	99	99	95	96
Huskie Complete	10 fl oz	9	0	99	99	99	99	99	99	95	96
Huskie Complete + Axon	10 fl oz + 0.5%	9	0	99	99	99	99	99	99	94	95
Huskie Complete + Stratego	13.7 fl oz + 5 fl oz	12	1	99	99	99	99	99	99	95	95
Huskie Complete + Axon + Stratego	13.7 fl oz + 0.5% + 5 fl oz	9	0	99	99	99	99	99	99	95	96
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		2	2	1	0	1	0	2	0	2	3
CV		16	194	1	0	1	0	1	0	1	2

[a] *All treatments applied at 4-lf wheat; Suprm=Supremacy; WC112 applied with AMS (1 lb)*

[b] *Wibw=Wild buckwheat; Colq=Common lambsquarters; Rrpw=Redroot pigweed*

Broadleaf weed control with Huskie and Huskie Complete. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate broadleaf weed control with Huskie, Huskie Complete, Wolverine, WideMatch + MCPA, and Affinity + Starane. All treatments were applied June 8 to 4- to 5-leaf wheat. Weeds were 2- to 5-inches tall at application. Huskie Complete and Affinity + Starane caused slight crop stunting. There was no statistical difference in crop yield or test weight between treatments. Huskie, Huskie Complete, Wolverine, and Affinity + Starane provided excellent control of all weeds. WideMatch + MCPA ester provided excellent control of lambsquarters and wild buckwheat, but was weaker on pigweed.

Table. Broadleaf weed control with Huskie and Huskie Complete. (1225)

		HRSW			Weed Control						Yield	
		Injury			Rrpw		Colq		Wibw		bu/A	lb/bu
Treatment	Rate	16-Jun	29-Jun	9-Aug	16-Jun	9-Aug	16-Jun	9-Aug	16-Jun	9-Aug	20-Aug	
		%			%						bu/A	lb/bu
Untreated		0	0	0	0	0	0	0	0	0	39.2	59.5
Huskie + AMS	11 fl oz + 1.47%	0	0	0	100	100	100	100	100	100	41.8	59.3
Huskie Complete	13.7 fl oz	14	4	0	100	100	100	100	100	100	38.8	58.5
Huskie Complete + AMS	13.7 fl oz + 1.47%	18	5	0	100	100	100	100	100	100	38.9	59.3
Wolverine	27.4 fl oz	0	0	0	100	100	100	100	100	100	43.5	59.7
WideMatch + MCPA	0.75 pt + 0.5 pt	2	1	0	53	77	92	100	88	100	39.4	59.1
Affinity TM + Starane U + NIS	0.6 oz + 0.18 pt + 0.25%	9	11	3	93	100	93	100	93	100	39.6	59.1
LSD (0.05)		1	4	0	4	10	2	0	3	0	NS	NS
CV		9	67	57	3	7	1	0	2	0	6.4	0.8

[a] *Treatments applied to 2- to 5-inch broadleaf weeds and 4- to 5-leaf wheat*

[b] *Rrpw=Redroot pigweed; Colq=Common lambsquarters; Wibw=Wild buckwheat*

Broadleaf control with Flucarbzone. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Prosper on May 3. Treatments were applied to 2 to 3 leaf wheat, wild oat, and green and yellow foxtail; 2 leaf redroot pigweed, 2 to 4 leaf common cocklebur, and 2 to 4 leaf common lambsquarters, and 2 leaf hairy nightshade on May 30 with 65°F, 45% relative humidity, 100% cloud cover, 3 mph wind at 315° and damp soil at 56°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 12						June 22
Treatment	Rate	Wht	Fxtl	Rrpw	Colq	Cocb	Hans	Wht
	oz ai/A	%	%	%	%	%	%	%
Flcz 2.0+flox&thif&trib+BB	0.36+1.6+1%	0	70	84	76	88	91	3
Flcz&flox+ARY546+ARY547+BB	2.3+0.22+0.07+1%	0	75	89	83	93	91	4
ARY454+BB	1.6+1%	0	76	92	85	91	94	4
ARY454+BB	2+1%	0	76	91	86	94	95	3
Flcz&flox+MCPA-ester+BB	1.8+5+1%	0	71	86	81	86	90	3
Flcz&flox+MCPA+BB	2.3+6.3+1%	0	71	90	85	91	94	5
ARY934+BB	8.5+1%	0	0	0	0	0	0	0
Flcz&flox+ARY461+BB	2.3+0.07+1%	0	73	85	68	86	90	3
Flcz&flox+brox+BB	2.3+4+1%	0	76	95	89	95	95	3
Flcz+clopyralid&flox+BB	0.36+3+1%	0	68	85	75	89	91	3
Pxlm&flas&flox+BB	1.68+1%	9	78	90	85	93	94	8
Brox&pyst&thcz	3.5	7	79	93	92	93	95	2
Fenx&brox&pyst	4.7	0	78	94	91	95	95	3
Pinoxaden&flox+MCPA	2.36+6.3	8	81	91	86	92	95	3
Untreated check	0	0	0	0	0	0	0	0
CV		52	5	3	5	3	2	49
LSD (P=0.05)		1	5	4	5	4	3	2

		June 22				July 16		
Treatment	Rate	Fxtl	Wioa	Colq	Cocb	Grft	Yeft	Wioa
	oz ai/A	%	%	%	%	%	%	%
Flcz 2.0+flox&thif&trib+BB	0.36+1.6+1%	89	94	99	99	97	91	99
Flcz&flox+ARY546+ARY547+BB	2.3+0.22+0.07+1%	89	85	97	96	80	76	58
ARY454+BB	1.6+1%	92	96	99	99	98	95	99
ARY454+BB	2+1%	93	96	99	98	99	97	99
Flcz&flox+MCPA-ester+BB	1.8+5+1%	94	97	99	99	96	91	99
Flcz&flox+MCPA+BB	2.3+6.3+1%	94	97	99	99	98	95	99
ARY934+BB	8.5+1%	0	20	0	0	0	0	30
Flcz&flox+ARY461+BB	2.3+0.07+1%	91	96	53	97	98	96	99
Flcz&flox+brox+BB	2.3+4+1%	90	96	99	99	99	84	99
Flcz+clopyralid&flox+BB	0.36+3+1%	91	96	96	99	99	97	99
Pxlm&flas&flox+BB	1.68+1%	93	95	98	99	98	94	99
Brox&pyst&thcz	3.5	91	97	99	99	99	97	99
Fenx&brox&pyst	4.7	90	93	99	99	97	94	99
Pinoxaden&flox+MCPA	2.36+6.3	96	97	99	99	98	96	98
Untreated check	0	0	0	0	0	0	0	0
CV		4	4	5	3	2.99	4.99	3.55
LSD (P=0.05)		5	5	4	3	2.5	4.37	2.92

All effective treatments caused minor wheat injury of less than 10%, but injury diminished and was not observed on July 16. All herbicide treatments except ARY934 provided 99% control of hairy nightshade on June 22 (data not shown). Redroot pigweed could not be found in the untreated plots on June 22.

Broadleaf weed control with Starane Flex. (Jenks, Walter, and Willoughby). The objective of the study was to evaluate broadleaf weed control with Starane Flex tank mixes. Starane Flex contains fluroxypyr (Starane) and florasulam. Florasulam is a Group 2 ALS-inhibitor used primarily for broadleaf weeds. All treatments were applied to 4-leaf durum on June 8. Very minimal crop chlorosis was observed with any treatment, but temporary slight stunting was observed. Starane Flex alone did not control lambsquarters, while Starane Flex tank mixed with MCPA ester or 2,4-D ester effectively controlled lambsquarters. All treatments provided excellent control of pigweed and wild buckwheat.

Table. Broadleaf weed control in durum with Starane Flex. (1214)

		Durum					Weed Control[b]					
		Chlorosis		Growth Reduction			Colq		Rrpw		Wibw	
Treatment[a]	Rate	13-Jun	16-Jun	16-Jun	23-Jun	5-Jul	5-Jul	21-Jul	5-Jul	21-Jul	5-Jul	21-Jul
		----%----		----%----			----%----					
Untreated		0	0	0	0	0	0	0	0	0	0	0
Starane Flex	13.5 fl oz	1	0	1	6	0	47	40	99	99	99	99
Starane Flex + MCPe	13.5 fl oz + 8.63 fl oz	1	0	3	8	2	99	99	99	99	99	99
Starane Flex + 2,4-De	13.5 fl oz + 8.55 fl oz	1	0	1	7	0	99	99	99	99	99	99
Affinity TM + MCPe	0.6 oz + 12.95 fl oz	1	0	5	15	5	99	99	99	99	99	99
Huskie + AMS	11 fl oz + 1.47%	2	0	0	1	0	99	99	99	99	97	99
LSD (0.05)		NS	NS	1	3	2	4	NS	NS	NS	2	NS
CV		0	0	25	28	93	3	0	0	0	1	0

[a] *All treatments applied at 4-leaf durum; Affinity TM=Affinity TankMix applied with Activator 90 (0.25%)*

[b] *Colq=Common lambsquarters; Rrpw=Redroot pigweed; Wibw=Wild buckwheat*

Broadleaf weed control in wheat . Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Valley City on April 1. Treatments were applied to 4 leaf wheat, 3 to 4 inch kochia, 2 to 4 leaf volunteer sunflower, and 2 to 7 inch tall marshelder on May 25 with 54°F, 64% relative humidity, 0% cloud cover, 8 mph wind at 30°, and damp soil at 49°F. Treatments were applied with a backpack plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates evaluated on June 7 and 3 replicates evaluated June 21.

		June 7				June 21			
Treatment	Rate	Wht	Kocz	Vosu	Mael	Wht	Kocz	Vosu	Mael
	fl oz/A	%	%	%	%	%	%	%	%
Craze	12	11	75	77	78	0	83	96	96
Weedone LV4	12	0	41	66	68	0	78	95	97
Widematch	16	0	85	85	90	0	87	92	95
Huskie	13	0	86	84	90	0	91	96	97
Untreated Check	0	0	0	0	0	0	0	0	0
CV		55	11	10	10	0	8	4	2
LSD (P=0.05)		2	13	12	13	0	11	6	3

Widematch or Huskie gave about 85% control of kochia on June 7 and was 87 and 91%, respectively, on June 21. Craze gave 83% kochia control but also caused necrotic lesions similar to what has been observed with Aim. This injury was not noticed on June 21 as affected leaves had senesced. Volunteer sunflower and marshelder were controlled by all herbicide treatments, although control was greater on June 7 with Widematch or Huskie than Craze or Weedone.

Fluthiacet use in Wheat. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 20. Treatments were applied to 4 leaf wheat, 2 to 5 leaf wild buckwheat, 4 to 8 leaf wild mustard, and 1 to 3 leaf annual smartweed on May 25 with 57°F, 42% relative humidity, 10% cloud cover, 5 mph wind at 330° and dry soil at 54°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 38 psi through 11001 TT nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with 4 replicates.

		June 8				June 15		
Treatment	Rate	Wht	Wimu	Wibw	Answ	Wimu	Wibw	Answ
	oz ai/A	%	%	%	%	%	%	%
Fluthiacet+MCPA+NIS	0.085+10+0.25%	0	89	63	65	96	45	54
Fluthiacet+2,4-D ester+NIS	0.085+8+0.25%	0	90	70	70	97	48	53
Fluthiacet+thif-sg+trib-sg+NIS	0.085+0.2+0.2+0.25%	0	96	92	94	99	96	97
Carf&mets+MCPA+NIS	0.14+8+0.25%	0	96	95	95	99	94	97
Bromoxynil&MCPA5	8	0	92	89	88	95	89	91
Clopyralid&flox+thif-sg+trib-sg	2+0.1+0.1	0	95	91	94	98	94	96
CV		0	3	4	6	2	7	8
LSD (P=0.05)		0	4	6	7	2	8	9

Treatments that included a SU herbicide provided at least 94% control of all broadleaf weeds on June 15. Bromoxynil and MCPA provided near 90% control of these weeds, but fluthiacet plus MCPA or 2,4-D gave only 45 to 55% control of wild buckwheat or annual smartweed. Observations on June 22 were not markedly different from ratings on June 15.

Broadleaf control with PGR. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring was seed near Fargo on April 24. Treatments were applied to 4 leaf wheat, 3 to 6 leaf wild oat, flowering wild mustard, and 2 to 6 leaf wild buckwheat on May 30 with 51°F, 50% relative humidity, 10% cloud cover, 10 mph wind at 270°, and damp soil at 49°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Pinoxaden at 0.86 oz ai/A was added to each treatment for control of wild oat.

		June 13				June 22			
Treatment	Rate	Wht	Wimu	Wibw	Wioa	Wht	Wimu	Wibw	Wioa
	oz ai/A	%	%	%	%	%	%	%	%
Thifensulfuron+AGH02007	0.15+8	0	89	85	90	0	95	94	96
Thifensulfuron+2,4-DeLV	0.15+7.5	0	92	85	90	0	95	95	97
Thifensulfuron+2,4-D	0.15+7.6	0	92	88	90	0	95	93	95
Thifensulfuron+AGH09008	0.15+7	0	93	89	90	0	95	95	96
Thif+AGH09008+NIS +AG02013	0.15+7+0.25% +4	8	94	90	90	0	95	95	95
AGH11021	8	29	86	89	74	33	95	95	73
AGH11021+NIS+AG02013	8+0.25%+4	26	92	94	75	31	95	95	70
AGH11021	12	33	90	94	70	34	95	95	71
AGH09035	5.8	0	88	83	90	0	93	93	97
AGH09035+AG02013	5.8+4	0	88	86	90	0	94	95	97
AGH08032	8	0	93	94	90	0	95	95	94
AGH08032+AG02013	8+4	0	95	92	90	0	93	93	92
Untreated check	0	0	0	0	90	0	0	0	97
CV		45	3	4	3	16	1	1	2
LSD (P=0.05)		5	3	5	4	2	2	2	3

Wild oat control with pinoxaden was slightly antagonized by AGH08032, but AGH11021 reduced control of wild oat with pinoxaden to 70% from 97% with pinoxaden alone. AGH08032 gave better control of wild mustard and wild buckwheat than AGH09035 and similar control to tank-mixes of thifensulfuron plus 2,4-D on June 13. AG02013 did not appear to improve weed control with herbicides. Control of mustard and buckwheat did improve with AGH11021 when AG02013 was included; however, NIS also was present. The effects of each adjuvant could not be separated. All herbicide combinations provided 93 to 95% control of mustard and buckwheat by June 22.

Volunteer canola management, run 1. Howatt, Roach, Ciernia, and Harrington. Experiment was established in a fallow area near Fargo with expected volunteer canola emergence. Treatments were applied to 2 to 6 leaf volunteer canola (Voca) and wild mustard and 1 to 4 leaf wild buckwheat on May 25 with 58°F, 41% relative humidity, 0% cloud cover, and dry soil at 55°F. Emerging volunteer canola (Ecan), Venice mallow, redroot pigweed, and common lambsquarters were not present at application. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 38 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		June 8						June 22			
Treatment[a]	Rate	Voca	Ecan	Wibw	Wimu	Vema	Rrpw	Ecan	Vema	Rrpw	Colq
	oz ai/A	%	%	%	%	%	%	%	%	%	%
Thif+trib+AMS+NIS	0.04+0.16+12+0.25%	78	0	59	95	0	99	0	0	0	0
Thif+trib+glyt+AMS	0.04+0.16+12+12	84	0	73	95	0	99	0	0	0	0
Thif+trib+AMS+NIS	0.05+0.2+12+0.25%	84	0	78	95	0	99	0	0	0	0
Thif+trib+glyt+AMS	0.05+0.2+12+12	83	0	89	90	0	99	0	0	0	0
Trib+AMS+NIS	0.15+12+0.25%	85	0	76	95	0	99	0	0	0	0
Trib+mets+AMS+NIS	0.15+0.02+12+0.25%	88	45	81	95	70	99	76	80	84	86
Trib+mets+glyt+AMS	0.15+0.02+12+12	88	53	89	95	70	99	85	86	90	93
Glyt+AMS	12+12	0	0	69	95	0	0	0	0	0	0
Saff+glyt+AMS+MSO	0.36+12+12+16	48	0	50	65	48	0	0	8	8	10
Safl+glyt+AMS+MSO	0.72+12+12+16	94	60	74	89	78	63	89	94	69	89
Safl+glyt+AMS+MSO	1.08+12+12+16	95	70	76	94	99	99	83	91	59	79
Untreated check	0	0	0	0	0	0	0	0	0	0	0
CV		4	29	7	3	15	4	21	18	31	22
LSD (P=0.05)		4	8	7	3	7	4	8	8	12	9

[a] Abbreviation glyt=4.5 lb ae/gal glyphosate as PowerMax from Monsanto Corp.

Canola was resistant to glyphosate. All SU herbicides and saflufenacil at 0.72 oz/A or more controlled emerged canola. Metsulfuron or saflufenacil at 0.72 oz/A or more provided residual control for emerging canola through June 22. These treatments also provided activity through soil residual to control Venice mallow, redroot pigweed, and common lambsquarters. Saflufenacil gave better control of Venice mallow while metsulfuron provided better control of redroot pigweed.

Volunteer canola management, run 2. Howatt, Roach, Ciernia, and Harrington. Experiment was established in a fallow area near Fargo with expected volunteer canola emergence. Treatments were applied to 2 leaf Venice mallow, bolting wild mustard, 4 to 6 leaf redroot pigweed, and 3 to 5 leaf yellow foxtail on June 25 with 72°F, 59% relative humidity, 0% cloud cover, 7 mph wind at 180°, and dry soil at 66°F. Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		July 10				Aug 7		
Treatment	Rate	Yeft	Wimu	Vema	Rrrpw	Yeft	Vema	Rrpw
	oz ai/A	%	%	%	%	%	%	%
Thif-sg+trib-sg+AMS+NIS	0.04+0.16+12+0.25%	61	90	89	88	43	81	80
Thif-sg+trib-sg+glyt-4.5[a]+AMS	0.04+0.16+12+12	99	98	94	99	94	91	97
Thif-sg+trib-sg+AMS+NIS	0.05+0.2+12+0.25%	65	91	89	89	50	84	89
Thif-sg+trib-sg+glyt-4.5+AMS	0.05+0.2+12+12	98	99	94	99	86	91	98
Trib-sg+AMS+NIS	0.15+12+0.25%	69	94	92	83	43	74	40
Trib-sg+mets+AMS+NIS	0.15+0.02+12+0.25%	59	96	88	88	35	76	75
Trib-sg+mets+glyt-4.5+AMS	0.15+0.02+12+12	99	99	96	99	95	96	97
Glyt-4.5+AMS	12+12	99	99	96	97	88	93	96
Saff+glyt-4.5+AMS+MSO	0.36+12+12+16	95	99	93	93	88	80	66
Safl+glyt-4.5+AMS+MSO	0.72+12+12+16	92	99	93	93	73	78	79
Safl+glyt-4.5+AMS+MSO	1.08+12+12+16	95	99	96	95	86	81	92
Untreated Check	0	0	0	0	0	0	0	0
CV		5	2	3	4	10	7	7
LSD (P=.05)		6	3	4	4	9	8	8

[a] Abbreviation glyt4.5=4.5 lb ae/gal glyphosate as PowerMax from Monsanto Corp.

Treatments with glyphosate or glyphosate plus SU herbicides provided 98 to 99% control of yellow foxtail on July 10. Addition of saflufenacil to glyphosate gave 92 to 95% control of foxtail. New emergence of foxtail led to 85 to 95% control of foxtails with these treatments on August 7. Treatments with SU herbicides alone suppressed foxtail growth resulting in ratings of 35 to 50% control.

Wild mustard was easily controlled by all herbicide mixtures. Treatments that included glyphosate gave slightly better control on July 10 than SU herbicides alone. All wild mustard was removed by August 7.

SU herbicides gave 75 to 80% control of Venice mallow on August 7. Glyphosate or glyphosate plus SU provided better control between 90 and 96%, but addition of saflufenacil to glyphosate antagonized control and resulted in ratings of 78 to 81%.

Emerged redroot pigweed was adequately controlled, near 90% or better, by most treatments on July 10 with the exception of tribenuron alone at 83% control. Emergence of new pigweed as well as recovery of surviving plants helped separate treatments on August 7. Increasing saflufenacil rate improved soil residual control of emerging pigweed. For other treatments, the complete control of pigweed provided by glyphosate resulted in ratings greater than 96%, except for combination with low saflufenacil rates where antagonism occurred. The high rate was sufficient to overcome antagonism and kill existing plants as well as provide residual.

Canada thistle control with GoldSky in spring wheat, Carrington, 2012. Greg Endres. The experiment was conducted at the NDSU Carrington Research Extension Center in cooperation with Dow AgroSciences. Experimental design was a randomized complete block with three replicates. The conventional-till trial was seeded to 'Glenn' HRS wheat on April 25. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 19 gal/A at 35 psi through 8001 flat fan nozzles to the center 5 ft of 8- by 15-ft plots on May 31 with 66 F, 31% RH and 7 mph wind to 4-leaf wheat and 3- to 8-inch tall Canada thistle. Canada thistle stand density was low and variable.

Crop response, visually evaluated as chlorosis, was noted 3 and 7 days after application of herbicide treatments (table). However, ≥ 2 weeks after treatment (WAT), chlorosis or other injury to wheat was not observed. Canada thistle control was good (80-87%) at 2 and 4 WAT with Goldsky plus Stinger and WideMatch treatments. On July 19, Goldsky plus Stinger provided 98% control of Canada thistle, and control continued to be good with WideMatch.

Table.

Herbicide		Canada thistle control			Wheat chlorosis	
Treatment[1]	Rate	13-Jun	29-Jun	19-Jul	2-Jun	7-Jun
	fl oz/A		%		0-9[2]	
untreated	x	0	0	0	0	0
Goldsky	16	72	77	72	3	3
NIS	0.5 % v/v					
AMS	57.2					
Goldsky	16	83	83	98	4	3
NIS	0.5 % v/v					
AMS	57.2					
Stinger	4					
WideMatch	16	80	87	89	2	1
Simplicity	6.84					
AMS	57.2					
Axial XL	16.4	85	80	84	2	2
WideMatch	16					
Axial Star	16.4	73	78	74	2	2
Affinity Broadspec	0.4					
CV (%)		3.0	5.1	14.8	27.1	52.6
LSD (0.05)		4	7	20	1	NS

[1]NIS=Preference (WinField Solutions); AMS=AMSXtra (Drexel).

[2]0=green; 9=yellow.

Control of difficult profile kochia. Howatt, Roach, Ciernia, and Harrington. 'Pinnacle' barley was seeded near Courtenay on April 24. Treatments were applied to barley and 3 to 4 inch kochia on May 23 with 65°F, 60% relative humidity, 40% cloud cover, 11 mph wind at 225°, and damp soil at 60°F. Treatments were applied with a backpack type sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with three replicates.

Treatment	Rate	6/7 Barley	6/7 Kocz	6/20 Barley	6/20 Kocz
	oz ai/A	%	%	%	%
Fluroxypyr	1	2	78	0	90
Fluroxypyr	1.5	4	91	0	93
Fluroxypyr	2	6	93	0	94
Fluroxypyr	3	8	88	0	92
Clopyralid&fluroxypyr	3	3	83	0	90
Fluroxypyr&dicamba	1.75	9	91	0	93
Fluroxypyr&dicamba	2.6	13	92	3	96
Bromoxynil&MCPA	8	0	96	0	92
Bromoxynil&2,4-D	9.4	1	96	0	96
Bromoxynil&fluroxypyr	5	3	92	0	94
Bromoxynil&fluroxypyr	7.5	2	96	0	94
Bromoxynil&pyrasulfotole+AMS	2.9+8	1	96	0	96
Carfentrazone&2,4-D+NIS	6.15+0.25%	5	96	2	95
Florasulam&MCPA+NIS	5+0.25%	4	38	0	37
Thif+trib+MCPA+NIS	0.2+0.2+4+0.25%	0	60	0	0
CV		79	15	485	14
LSD (P=0.05)		5	21	3	20

Seed collected from this field tested positive for resistance to glyphosate in a greenhouse experiment. Kochia also demonstrated a high proportion of ALS-resistant plants in this field study. Kochia response was highly variable across the study. Initially, more kochia was present in Rep 1 than the other two; however, Reps 2 and 3 were closer to the salt soil of a pothole and barley growth suffered which allowed kochia to emerge mid-season. Damage to lower kochia leaves and stems was used to determine whether plants had been present during herbicide application.

Most treatments eventually provided 90% or better control of kochia. Some plants in nearly all treatments had produced relatively normal shoots from leaf axil meristem. Seed was obtained from several of the plots treated with fluroxypyr for additional evaluation in the greenhouse.

Post harvest kochia control in wheat. Howatt, Roach, Ciernia, and Harrington. Faller hard red spring wheat was seeded near Valley City on April 1. Treatments were applied as follows:

Treatment date	5/21	5/25	8/7
Temperature (°F)	73	54	83
Relative humidity (%)		64	35
Cloud cover (%)	10	0	0
Wind velocity (mph)	3.5	8	5
direction (°)	180	300	90
Soil	Dry	Damp	Dry
Soil temperature (°F)	58	49	72
Wheat stage	4 leaf	4 to 5 leaf	Post harvest
Kochia	3 to 4 inch	3 to 6 inch	8 inch stubble
Volunteer sunflower	2 to 4 leaf	2 to 6 leaf	-
Marshelder	2 to 5 inch	3 to 7 inch	

Treatments were applied with a backpack type plot sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates on June 7, otherwise three reps.

		Growth	June 7				June 21
Treatment	Rate	Stage	Wht	Koch	Vosu	Mael	Wht
Dica+2,4-D/dica+NIS+AMS	2+6/8+0.13%+40	3"/P-H	7	88	87	90	0
Dica+2,4-D+Prxf/dica+NIS+AMS	2+6+1.7/8+0.13%+40	3"/P-H	7	88	88	92	0
Dica+brox&pyst+NIS+AMS/dica+NIS+AMS	2+2.9+0.25%+16/8+0.13%+40	3"/P-H	7	88	88	88	0
Triasulfuron&dica+NIS/dica+NIS+AMS	2.4+0.5%/8+0.13%+40	3"/P-H	0	90	92	93	0
Clpy&flox/dica+NIS+AMS	4/8+0.13%+40	6"/P-H	0	92	90	95	0
Brox&pyst/dica&difl+dica+NIS+AMS	2.9/4.2+8+0.13%+40	6"/P-H	0	82	77	85	0
Brox&pyst/dica+atra+COC	2.9/8+6+0.5%	6"/P-H	0	80	78	78	0
Brox&pyst/dica+atra+Saff+COC	2.9/8+6+1.44+0.5%	6"/P-H	0	83	77	82	0
Brox&pyst/tpmz+dica+atra+MSO+UAN	2.9/0.34+8+6+1%+2.5g	6"/P-H	0	80	80	82	0
Brox&pyst/tpmz+atra+MSO+UAN	2.9/0.34+6+1%+2.5g	6"/P-H	0	80	78	83	0
Brox&pyst/para+atra+COC	2.9/12+4+1%	6"/P-H	0	83	83	83	0
Brox&pyst/para+linuron+NIS	2.9/12+12+0.5%	6"/P-H	0	83	82	85	0
Brox&pyst/dica+2,4-D+NIS+AMS	2.9/4+8+0.13%+40	6"/P-H	0	80	80	82	0
Untreated check	0		0	0	0	0	0
CV			68	5	6	6	0
LSD (P=0.05)			1	7	8	8	0

		Growth	June 21			Aug 21	Sept 21
Treatment	Rate	Stage	Koch	Vosu	Mael	Koch	Koch
Dica+2,4-D/dica+NIS+AMS	2+6/8+0.13%+40	3"/P-H	94	97	96	94	95
Dica+2,4-D+Prxf/dica+NIS+AMS	2+6+1.7/8+0.13%+40	3"/P-H	96	97	97	98	99
Dica+brox&pyst+NIS+AMS/dica+NIS+AMS	2+2.9+0.25%+16/8+0.13%+40	3"/P-H	92	93	96	99	99
Triasulfuron&dica+NIS/dica+NIS+AMS	2.4+0.5%/8+0.13%+40	3"/P-H	91	96	96	80	83
Clpy&flox/dica+NIS+AMS	4/8+0.13%+40	6"/P-H	85	93	96	86	91
Brox&pyst/dica&difl+dica+NIS+AMS	2.9/4.2+8+0.13%+40	6"/P-H	82	93	91	68	75
Brox&pyst/dica+atra+COC	2.9/8+6+0.5%	6"/P-H	85	93	94	59	64
Brox&pyst/dica+atra+Saff+COC	2.9/8+6+1.44+0.5%	6"/P-H	83	92	93	74	76
Brox&pyst/tpmz+dica+atra+MSO+UAN	2.9/0.34+8+6+1%+2.5g	6"/P-H	83	92	94	78	79
Brox&pyst/tpmz+atra+MSO+UAN	2.9/0.34+6+1%+2.5g	6"/P-H	83	93	94	55	61
Brox&pyst/para+atra+COC	2.9/12+4+1%	6"/P-H	83	92	93	81	84
Brox&pyst/para+linuron+NIS	2.9/12+12+0.5%	6"/P-H	82	93	95	86	90
Brox&pyst/dica+2,4-D+NIS+AMS	2.9/4+8+0.13%+40	6"/P-H	85	94	96	71	76
Untreated check	0		0	0	0	0	0
CV			3	2	1	6	7
LSD (P=0.05)			4	3	2	6	8

Preharvest desiccation in wheat. Howatt, Roach, Ciernia, and Harrington. 'Faller' hard red spring wheat was seeded August 24. Treatments were applied preharvest to a biologically mature crop at approximately 30% grain moisture and mature weeds present were redroot pigweed, common lambsquarters, Venice mallow, and wild buckwheat on August 20 with 68°F, 41% relative humidity, 0% cloud cover, 2 mph wind at 10°, and dry soil at 64°F. Treatments were applied with a sprayer mounted on a 4X4 all terrain vehicle delivering 8.5 gpa at 50 psi through 8001 flat fan nozzles to a 7-foot-wide area the length of 15 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		Aug 27				Aug 30				Sept 4			
Treatment	Rate	Stem	Rrpw	Colq	Vema	Wibw	Rrpw	Colq	Vema	Rrpw	Colq	Vema	Wibw
	oz ai/A	%	%	%	%	%	%	%	%	%	%	%	%
Saff+MSO+AMS	0.36+1%+22	90	33	10	15	38	65	28	18	70	40	20	77
Saff+MSO+AMS	0.72+1%+22	98	43	18	23	38	70	35	25	77	51	28	72
Saff+MSO+AMS	1.44+1%+22	99	45	15	43	53	73	40	28	80	55	33	75
Glyt4.5[a] +MSO+AMS	12+1%+22	99	40	20	20	36	73	55	38	88	85	40	73
Saff+Glyt4.5+MSO+AMS	0.36+12+1%+22	99	50	28	69	50	79	68	54	89	86	55	80
Carf+MSO+AMS	0.5+1%+22	97	33	18	10	35	38	30	25	45	33	35	40
2,4-D amine+NIS+AMS	16+0.25%+22	97	43	28	70	55	65	58	88	74	66	95	87
Untreated	0	97	20	0	0	13	19	5	3	30	13	10	21
CV		1	18	28	25	23	10	18	16	10	16	39	17
LSD 0.5		1	10	7	12	14	9	10	8	10	13	23	17

[a] Abbreviation glyt4.5=4.5 lb ae/gal glyphosate as PowerMax from Monsanto Corp.

Treatment effect was not evident 3 days after application. At this evaluation on August 23 stems were 85% desiccated and leaf tissue was 93% desiccated. Wild buckwheat and redroot pigweed were showing early stages of senescence, 10 and 20% control, respectively. Common lambsquarters and Venice mallow had full green coloration with no evidence of damage.

Only the stems of wheat plants retained any green color by August 27; leaves were completely desiccated in all treatments. The low rate of saflufenacil delayed stem desiccation compared with the untreated. In general, weed control did not reach the desired level. Saflufenacil or 2,4-D worked better for wild buckwheat than other herbicides. All herbicides except carfentrazone gave good control of redroot pigweed. Glyphosate had better than average activity on common lambsquarters. And 2,4-D eventually provided 95% control of Venice mallow, while the next best treatment (glyphosate and saflufenacil) gave only 55% control.

Preharvest desiccation in barley. Howatt, Roach, Ciernia, and Harrington. 'Pinnacle' barley was seeded near Fargo on April 26. Treatments were applied to barley in the hard dough stage; 4 to 6 inch tall Venice mallow; and 6 to 12 inch tall yellow foxtail, redroot pigweed, common lambsquarters, and wild buckwheat on July 23 with 69°F, 77% relative humidity, 50% cloud cover, 1 mph wind at 20°, and dry soil at 71°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		June 26						July 30				
Treatment	Rate	Bar	Vema	Rrpw	Colq	Wibw	Yeft	Stem	Leaf	Head	Vema	Rrpw
	oz ai/A	%	%	%	%	%	%	%	%	%	%	%
Saff+MSO+AMS	0.36+1%+22	90	0	0	0	0	0	91	95	96	29	28
Saff+MSO+AMS	0.72+1%+22	90	0	0	0	0	0	94	97	97	48	54
Saff+MSO+AMS	1.44+1%+22	90	0	0	0	0	0	96	97	99	56	73
Glyt4.5[a] +MSO+AMS	12+1%+22	90	0	0	0	0	0	99	99	99	59	75
Saff+glyt4.5+MSO+AMS	0.36+12+1%+22	90	0	0	0	0	0	99	99	99	80	96
Carf+MSO+AMS	0.5+1%+22	90	0	0	0	0	0	95	96	97	20	23
2,4-D amine+NIS+AMS	16+0.25%+22	90	0	0	0	0	0	94	98	98	35	43
Untreated	0	90	0	0	0	0	0	91	95	96	0	0
CV		0	0	0	0	0	0	2	1	1	22	29
LSD (P=0.05)		0	0	0	0	0	0	2	2	2	14	21

Table continued

		July 30			Aug 7							
Treatment	Rate	Colq	Wibw	Yeft	Stem	Leaf	Head	Vema	Rrpw	Colq	Wibw	Yeft
	oz ai/A	%	%	%	%	%	%	%	%	%	%	%
Saff+MSO+AMS	0.36+1%+22	25	63	25	95	99	99	35	43	25	67	33
Saff+MSO+AMS	0.72+1%+22	31	63	43	97	99	99	58	59	27	58	31
Saff+MSO+AMS	1.44+1%+22	40	71	54	97	99	99	70	69	54	81	43
Glyt4.5+MSO+AMS	12+1%+22	90	64	85	99	99	99	88	97	100	92	97
Saff+glyt4.5+MSO+AMS	0.36+12+1%+22	91	79	90	99	99	99	91	99	100	93	90
Carf+MSO+AMS	0.5+1%+22	18	25	18	97	99	99	28	35	31	25	8
2,4-D amine+NIS+AMS	16+0.25%+22	32	42	0	96	99	99	40	50	49	35	0
Untreated	0	0	0	0	96	99	99	0	0	0	0	0
CV		23	23	25	1	0	0	15	12	15	12	12
LSD (P=0.05)		14	18	14	1	0	0	11	10	11	10	7

[a] Abbreviation glyt4.5=4.5 lb ae/gal glyphosate as PowerMax from Monsanto Corp.

With rather mature barley at application and warm, dry weather after application, there were very minor differences among treatments. This includes the barley for which differences were not of practical implication.

Saflufenacil plus glyphosate caused the most rapid desiccation of weeds with essentially 80% or better control of weeds July 30. Treatments with glyphosate provided much better weed desiccation than other treatments, 88 to 100% depending on the species.