Green section: **Weed Control in Small Grains** Page

Pyroxasulfone pre-emergence in wheat, Exp 1. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Fargo North Dakota on April 23. Preemergence treatments were applied April 29 with 53°F, 86% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and moist soil at 50°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. The experiment was harvested August 10.

Treatment	Rate	5/17 Wht	5/17 Weeds	6/1 Wht	6/1 Wimu	6/1 Rrpw	6/1 Yeft	8/10 Yield
	oz ai/A	%	%	%	%	%	%	bu/A
Flucarbazone	0.21	0	0	0	89	85	81	70
Pyroxasulfone	0.9	0	0	0	62	76	74	71
Pyroxasulfone	1.5	0	0	0	84	91	87	77
Pyroxasulfone	1.8	0	0	0	91	96	86	76
Pyroxasulfone	2.8	0	0	0	92	95	91	75
Pyroxasulfone	3.6	0	0	0	96	96	92	80
Pyroxasulfone	6	0	0	0	96	99	96	73
Flumioxazin	1	0	0	0	79	57	37	67
Flumioxazin	1.5	0	0	0	76	75	32	70
Sulfentrazone	2	0	0	0	62	91	45	67
Sulfentrazone	4	0	0	16	89	95	70	65
Quinclorac	4	0	0	0	0	0	0	60
Untreated	0	0	0	0	0.	0	0	60
CV		0	0	106	7	6	8	10
LSD 5%		0	0	1	6	6	7	10

Sulfentrazone at 4 oz ai/A caused 16% injury as leaf necrosis and plant stunting on June 1. This injury was not observed at earlier or later evaluations. On June 1, none of the other herbicides or the lower rate of sulfentrazone resulted in injury expression. None of the herbicides produced symptoms on any of the weed species on May 17, but substantial weed control was evident 2 weeks later. Pyroxasulfone at 1.8 oz ai/A provided greater than 90% control of wild mustard and redroot pigweed and 86% control of yellow foxtail. Flucarbazone gave 81 to 89% control of these weeds, but flumioxazin activity did not reach 80%. Quinclorac did not produce observable weed response, as a result, grain yield was identical to the control. In general, pyroxasulfone weed control resulted in more wheat yield than other treatments.

Pyroxasulfone pre-emergence in wheat, Exp 2. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Prosper on May 20. Preemergence treatments were applied May 20 with 87°F, 23% relative humidity, 40% cloud cover, 7 to 9 mph wind at 180°, and dry soil at 70°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/9 Wht
	oz ai/A	%
Flucarbazone	0.21	0
Pyroxasulfone	0.9	0
Pyroxasulfone	1.5	0
Pyroxasulfone	1.8	0
Pyroxasulfone	2.8	0
Pyroxasulfone	3.6	0
Pyroxasulfone	6	0
Flumioxazin	1	0
Flumioxazin	1.5	0
Sulfentrazone	2	0
Sulfentrazone	4	0
Quinclorac	4	0
Untreated	0	0
CV		0
LSD 5%		0

None of the treatments caused visible wheat injury during the season. Weed pressure was not consistent throughout the experiment area. However, the weeds that were present did not appear to be affected by the treatments. Precipitation was less than other locations and years, so perhaps adequate soil moisture for herbicide activation did not accumulate until after weeds were well established.

Saflufenacil pre-emergence in wheat, Exp 1. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded in Fargo on April 23. Preemergence treatments were applied April 29 with 53°F, 85% relative humidity, 100% cloud cover, 3 to 4.5 mph wind at 135° and moist soil at 50°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Crop was harvested for yield on August 10.

Treatment	Rate	5/17 Wht	5/17 Weeds	6/01 Wht	6/01 Wimu	6/01 Rrpw	6/1 Coma	6/1 Vema	8/10 Yield
	oz ai/A	%	%	%	%	%	%	%	bu/A
Saflufenacil	0.26	0	0	0	70	74	37	42	72
Saflufenacil	0.36	0	0	0	80	80	55	57	75
Saflufenacil	0.72	0	0	0	94	95	71	72	77
Saflufenacil	1.1	0	0	0	98	96	76	82	74
Saflufenacil	1.4	0	0	0	98	99	85	94	74
Saflufenacil	2.2	0	0	0	98	99	94	96	79
Saflufenacil	2.8	0	0	0	99	99	97	99	75
Untreated	0	0	0	0	0	0	0	0	59
CV		0	0	0	2	2	5	4	7
LSD 5%		0	0	0	2	2	5	4	8

Saflufenacil, as much as 2.8 oz ai/A (6 fl oz/A Sharpen), did not cause wheat injury visible during the season or detectable in grain yield. Weeds did not demonstrate symptoms of saflufenacil activity on May 17, but by June substantial control was recorded. Labeled use rates of 0.72 or less for wheat did not provide maximum control of any weed species, but weed suppression and control in combination with crop competition resulted in wheat yield similar across all saflufenacil rates.

Saflufenacil pre-emergence in wheat, Exp 2. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Fargo on May 20. Treatments were applied preemergence May 20 with 87°F, 23% relative humidity, 40% cloud cover, 7 to 9 mph wind at 180°, and dry soil at 70°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest was on August 19.

Treatment	Rate	6/9 Wht	6/9 Rrpw	6/23 Rrpw	6/23 Yeft	7/8 Rrpw	7/8 Yeft	8/19 Yield
	oz ai/A	%	%	%	%	%	%	bu/A
Saflufenacil	0.26	0	62	75	72	70	5	41
Saflufenacil	0.36	0	77	77	70	67	10	38
Saflufenacil	0.72	0	85	84	77	79	32	40
Saflufenacil	1.1	0	88	87	81	86	65	43
Saflufenacil	1.4	0	91	91	81	95	69	43
Saflufenacil	2.2	0	93	94	88	94	79	46
Saflufenacil	2.8	0	94	94	89	96	87	49
Untreated	0	0	0	0	0	0	0	32
CV		0	4	5	7	9	15	12
LSD 5%		0	4	6	7	10	9	7

Saflufenacil, as much as 2.8 oz ai/A (6 fl oz/A Sharpen), did not cause wheat injury visible during the season or detectable in grain yield. Optimum control of redroot pigweed was achieved with 1.4 oz/A saflufenacil, twice the amount allowed by the label. POST herbicide application is expected for maximum weed control, but residual activity from even 0.26 oz/A saflufenacil greatly improved grain yield. Yellow foxtail emerged after the first evaluation date. Suppression and control of at least 70% was provided by all saflufenacil rates, but control did not reach 90%. By July 8, yellow foxtail had established in many plots. Saflufenacil at 2.2 oz/A was needed to get approximately 80% yellow foxtail control, but redroot pigweed was controlled nearly 80% with 0.72 oz/A saflufenacil (2 fl oz/A Sharpen applied May 20).

Cereal response to saflufenacil. Howatt, Roach, and Harrington. 'Rymin' rye and 'AC Ultima' triticale were seeded bioassay in 12-ft wide strips perpendicular to direction of plots near Fargo on April 27. Preemergence treatments were applied on April 29 with 55°F, 74% relative humidity, 100% cloud cover, 6 mph wind at 135°, and moist soil at 50°F. Applications were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to a 20-ft wide area the length of 20- by 24-ft plots. The experiment was a randomized complete block design with four replicates.

		5/17		5/26						6/9		7/6		8/2			8/23
Treatment	Rate	Rye	Triticale	Rye	Triticale	Wild mustard	Redroot pigweed	Common lambsquarters	Wild buckwheat	Rye	Triticale	Rye	Triticale	Rye	Triticale	Triticale vegetation	Triticale grain
	oz ai/A	% injury or control														g/m^2	bu/A
Saflufenacil	0.71	0	0	0	0	94	96	94	91	0	0	0	0	0	0	369	38
Saflufenacil	1.43	0	0	0	0	97	97	96	95	0	0	0	0	0	0	506	42
Saflufenacil	2.86	0	0	0	0	98	98	98	98	0	0	0	0	0	0	260	35
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	515	34
CV		0	0	0	0	2	2	2	3	0	0	0	0	0	0	299	13
LSD 5%		0	0	0	0	2	2	2	3	0	0	0	0	0	0	45	8

Visible response of rye and triticale was not present throughout the duration of the study. Prior to herbicide maintenance treatment over the entire study, weed control rating was recorded. All saflufenacil rates provided excellent control of pigweed, lambsquarters, and buckwheat. This was better than expected given previous experience at this location, especially with the low rate corresponding to 1 oz/A of formulated product. Rye was a winter type and did not vernalize to provide reasonable vegetation mass. Triticale biomass production was variable and influenced by non-study effects, possibly accounting for the unusual rate response. Triticale grain yield was not hindered by saflufenacil.

Effect of Sharpen and Aim on weed control with Glyphosate. Jenks, Willoughby, and Hoefing.The objective of this study was to determine if glyphosate activity is reduced when tank mixed with Sharpen or Aim. Glyphosate is a slow acting, systemic herbicide while Sharpen and Aim are fast acting, contact herbicides. In this study, Sharpen, Aim, and glyphosate were applied alone or in a tank mix when weeds were approximately 2 and 6 inches tall. Sharpen, Aim, and glyphosate were applied at 1, 0.5, and 11 fl oz, respectively.

Glyphosate activity on annual weeds (flixweed, greenflowerpepperweed, prickly lettuce, and volunteer wheat) generally was not reduced by tank mixing with Sharpen or Aim. The only exception was prickly lettuce control where Aim + Glyphosate tended to be about 11% lower than glyphosate alone. Control of annual weeds with Sharpen + glyphosate was similar to or better than glyphosate alone. However, Canada thistle control with glyphosate was reduced significantly when tank mixed with Sharpen at both timings.

Table. Effect of Sharpen and Aim on weed control with Glyphosate. (1021)

		Flix[b]			Gfpw[b]			Prle[b]			Vowh[b]		Cath[b]			
		Days after treatment														
Treatment[a]	Timing	7	16	30	7	16	30	7	16	30	7	16	7	16	30	60
		% control														
Sharpen	2-inch	68	96	85	78	66	59	91	84	80	45	30	88	53	43	23
Aim	2-inch	55	70	62	37	33	30	28	23	22	10	8	8	0	0	3
Glyphosate	2-inch	63	95	99	23	93	99	25	96	97	55	99	15	87	85	74
Sharpen + Gly	2-inch	82	99	98	79	96	96	95	99	99	72	99	88	78	65	38
Aim + Gly	2-inch	68	97	97	35	90	97	63	98	86	63	98	23	84	79	75
Sharpen	6-inch	77	96	87	75	80	80	95	91	91	42	37	85	65	43	17
Aim	6-inch	48	63	55	20	37	32	30	37	33	13	13	8	0	0	3
Glyphosate	6-inch	47	91	79	47	93	95	43	91	78	72	94	30	82	87	85
Sharpen + Gly	6-inch	82	97	88	77	94	98	95	93	93	73	97	75	85	84	62
Aim + Gly	6-inch	67	95	87	62	91	94	75	85	67	67	98	35	79	76	75
LSD (0.05)		12.5	5.9	14.2	12.4	10.5	10.9	11.3	11.0	16.8	7.5	7.5	6.1	7.3	13.9	22.3

[a]*Sharpen, Aim, and Glyphosate were applied at 1, 0.5, and 11 fl oz, respectively.*

[b]*Flix=Flixweed; Gfpw=Greenflowerpepperweed ; Prle=Prickly lettuce; Vowh=Volunteer wheat; Cath=Canada thistle*

Pre-emergence herbicides in wheat. Howatt, Roach, and Harrington. Preplant treatments were applied April 29 with 54° F, 85% relative humidity, 100% cloud cover, 4 to 8 mph wind at 135°, and moist soil at 50° F. 'Faller' hard red spring wheat was seeded near Fargo May 21. The experiment was oversprayed post emergence with fenoxaprop+bromoxynil&MCPA at 1.32+8 oz ai/A. Treatments were applied with a backpack sprayer delivering 17 gpa at 35 psi through 11002 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 three replicates. Harvest was on August 23.

Treatment	Rate	6/9 Wht	6/19 Wht	7/8 Yeft	7/8 Brdlf	8/23 Yield
	oz ai/A	%	%	%	%	bu/A
Glyphosate+Flumioxazin+AMS	12+1+16	0	0	80	77	15
Glyphosate+Flcz+AMS	12+0.21+16	0	0	83	78	12
Glyphosate+Saflufenacil+AMS	12+0.72+16	0	0	82	88	21
Glyphosate+Florasulam+AMS	12+0.072+16	0	0	73	88	17
Glyphosate+Sulfentrazone+AMS	12+3+16	0	9	82	78	9
Glyphosate+Quinclorac+AMS	12+0.25+16	0	0	13	80	10
Glyphosate+AMS	12+16	0	0	0	0	9
CV		0	184	12	8	49
LSD 5%		0	4	12	10	12

Late seeding and water-saturated soil conditions greatly limited grain yield. Treatments did not cause visible injury on June 9, but by June 19, sulfentrazone caused 9% injury as leaf necrosis. This injury was not detected during later evaluation. Weed control of all products except quinclorac or glyphosate alone was quite similar. Numerically saflufenacil provided the best control of yellow foxtail and broadleaf weeds. Florasulam gave 88% control of broadleaf weeds and 73% control of yellow foxtail. This herbicide, available in co-pack with glyphosate-DMA, resulted in insoluble precipitate when mixed with glyphosate-K. Therefore, the treatment was remixed using glyphosate-DMA.

2010 Prepare Herbicide + Glyphosate on Winter Wheat

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Pre-plant treatments (PP) were applied on October 8 with 41° F, 36% RH, clear sky and NW wind at 6 mph. Downy brome (dobr) and Japanese brome (jabr) were not emerged. 'Jerry' HRWW was seeded on October 17, 2009 into cool dry soil. Fall post-emergence treatments (FPOST) were applied on November 5 to winter wheat that was about 25% emerged (spike) and to 2 leaf downy brome with 46° F, 24% RH, partly cloudy sky and south wind at 7 mph. Winter wheat survival was excellent. Early spring post-emergence treatments (SPOST) were applied on April 10 to 2 leaf winter wheat and to tillering downy brome and 2 leaf Japanese brome with 46° F, 24% RH, clear sky and north 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 trial was a randomized complete block design with four replications. The soil is classified as a silt-loam with a pH of 6.2 and OM of 3.2%. Downy brome populations averaged 3 / ft^2 at FPOST and 5 /ft^2 at SPOST. Japanese brome populations averaged 3 / ft^2 at SPOST. Plots were evaluated for crop injury and weed control on May 3, June 8 and July 27. Plant height was measured on June 24, shortly after heading. The trial was harvested on August 2.

Summary

Crop injury was relatively minor except for treatments with PowerFlex (trts 10-12) which caused crop thinning and delayed maturity. The addition of ARY-0454-110 pre-plant (trt 3) significantly improved season long control of Japanese brome and downy brome compared to pre-plant glyphosate alone (trt 2). Glyphosate + PrePare (trt 4) applied pre-plant provided very good season long control of Japanese brome but only marginal season long control of downy brome. The lower rate of ARY-0454-104 applied as a fall split application (trt 5) provided very good season long control of both Japanese and downy brome. All fall / spring split applications with PrePare applied in the fall (trts 7–11) provided excellent season long control of both Japanese and downy brome. There were no statistical differences between treatments for plant height. Herbicide treatment test weights tended to be significantly higher than the untreated check. All herbicide treatments had higher grain yields than the untreated check although none were statistically different.

	Treatment	Product rate	App. timing	- May 3 - inj	dobr	- June 8 - inj	dobr	----- July 27 ----- inj	jabr	dobr	Plant height	Test weight	Grain Yield
		oz/A		---------- % Control ----------							cm	lbs/bu	bu/A
1	Untreated			0	0	0	0	0	0	0	74	55.7	37.4
2	Glyphosate + AMS	11 + 1lb	PP	0	25	0	0	0	67	0	79	56.5	50.3
3	Glyphosate + AMS + ARY-0454-110	11 + 1lb + 0.52	PP	4	97	15	91	5	99	97	72	57.5	47.3
4	Glyphosate + AMS + PrePare	11 + 1 lb + 0.306	PP	0	80	1	42	0	92	82	72	56.6	48.7
5	Glyphosate + AMS + PrePare / ARY-0454-104 + Basic Blend (BB)	11 + 1 lb + 0.306 / 0.61 + 1%	PP / FPOST	0	92	1	80	0	94	91	78	57.1	57.0
6	Glyphosate + AMS / ARY-0454-104 + BB	11 + 1 lb / 1.22 + 1%	PP / FPOST	0	94	0	65	0	96	60	79	56.8	51.0
7	Glyphosate + AMS + PrePare / ARY-0454-104 + Basic Blend	11 + 1 lb + 0.306 / 0.61 + 1%	PP / SPOST	0	97	2	94	2	99	97	74	56.5	50.6
8	Glyphosate + AMS + PrePare / ARY-0454-104 + Metsulfuron 60 + BB	11 + 1 lb + 0.306 / 0.61 + 0.05 + 1%	PP / SPOST	1	97	2	96	6	99	94	73	57.1	47.5
9	Glyphosate + AMS + PrePare / ARY-0454-104 + ARY-0546-001 + ARY-0547-001 + BB	11 + 1 lb + 0.306 / 0.61 + 0.225 + 0.075 + 1%	PP / SPOST	2	99	1	88	0	97	94	77	57.1	50.6
10	Glyphosate + AMS + PrePare / PowerFlex + BB	11 + 1 lb + 0.306 / 1.75 + 1%	PP/ SPOST	10	99	4	94	1	98	96	76	56.8	48.9
11	Glyphosate + AMS + PrePare / PowerFlex + BB	11 + 1 lb + 0.306 / 3.52 + 1%	PP / SPOST	39	99	12	99	11	99	98	72	57.1	48.0
12	Glyphosate + AMS / PowerFlex + BB	11 + 1 lb / 3.52 + 1%	PP / SPOST	8	99	0	82	0	99	81	70	57.4	52.1
	C.V. %			152	15	130	20	166	11	13	9	1.1	13.1
	LSD 5%			12	17	6	20	5	14	14	NS	0.9	NS

NS = no statistical difference between treatments.

Control of foxtail barley. Howatt, Roach, and Harrington. Treatments were applied near Fargo on fallow ground to post seed set foxtail barley at 10 to 50 plants per square meter on August 31, 2009, with 35% relative humidity, 17% cloud cover, 3 mph wind at 180° and dry soil. A backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7-ft wide the length of 10- by 30-ft plots was used for all treatments. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Foba Jun-04-10
	oz/A	% control
Glyt (3.0)+NIS+AMS	12+0.25%+11	40
Propoxycarbazone+NIS	0.42+0.25%	64
Sulfosulfuron+NIS	0.5+0.25%	22
Flumioxazin+NIS	1+0.25%	0
Pyroxasulfone+NIS	1.8+0.25%	10
Imazapic+MSO+UAN	2+0.25G+0.25G	70
Glyt (3.0)+Prcz+NIS+AMS	12+0.42+0.25%+11	85
Glyt (3.0)+Sulf+NIS+AMS	12+0.5+0.25%+11	84
Glyt (3.0)+Flumioxazin+NIS+AMS	12+1+0.25%+11	50
Glyt (3.0)+Pyroxasulfone+NIS+AMS	12+1.8+0.25%+11	84
CV		16
LSD 5%		12

Best control was achieved when glyphosate, which effectively killed the existing foxtail barley plants, was tank-mixed with an herbicide having soil residual activity, such as propoxycarbazone, sulfosuluron, or pyroxasulfone. Glyphosate alone killed existing plants but the plants were quickly replaced by new cohorts. Propoxycarbazone or imazapic gave good suppression of foxtail barley. These treatments did not kill all existing plants but did reduce the amount of new emergence. Flumioxazin did not injure existing plants and provided poor control of new emergence.

Control of foxtail barley. Howatt, Roach, and Harrington. Treatments were applied at West Fargo on fallow ground to post seed set foxtail barley and green foxtail on September 3, 2009 with 77°F, 57% relative humidity, 50% cloud cover, 2 to 3 mph wind at 225°, and dry soil at 65°F. Application was with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles 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	6/3/10 Foba
	oz/A	% control
Glyt (3.0)+NIS+AMS	12+0.25%+11	23
Propoxycarbazone+NIS	0.42+0.25%	60
Sulfosulfuron+NIS	0.5+0.25%	68
Flumioxazin+NIS	1+0.25%	17
Pyroxasulfone+NIS	1.8+0.25%	40
Imazapic+MSO+UAN	2+0.25G+0.25G	47
Glyt (3.0)+Prcz+NIS+AMS	12+0.42+0.25%+11	63
Glyt (3.0)+Sulf+NIS+AMS	12+0.5+0.25%+11	87
Glyt (3.0)+Flumioxazin+NIS+AMS	12+1+0.25%+11	57
Glyt (3.0)+Pyroxasulfone+NIS+AMS	12+1.8+0.25%+11	83
CV		12
LSD 5%		11

Best control was achieved when glyphosate, which effectively killed the existing foxtail barley plants, was tank-mixed with sulfosuluron or pyroxasulfone, which provided soil residual activity. Glyphosate alone killed existing plants but the plants were quickly replaced by new cohorts. Propoxycarbazone or sulfosulfuron gave good suppression of foxtail barley. These treatments did not kill all existing plants but did reduce the amount of new emergence. Flumioxazin did not substantially injure existing plants and provided poor control of new emergence.

Control of foxtail barley. Howatt, Roach, and Harrington. Treatments were applied at Casselton to fallow ground on post seed set foxtail barley on August 31, 2009, with 84° F, 30% RH, 10% cloud cover, 9.8 mph wind at 135°, and dry soil at 70°F. Applications were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7-ft wide the length of 10- by 30-ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Jun-09-10 Foxtail barley
	oz/A	% control
Glyt (3.0)+NIS+AMS	12+0.25%+11	62
Propoxycarbazone+NIS	0.42+0.25%	45
Sulfosulfuron+NIS	0.5+0.25%	2
Flumioxazin+NIS	1+0.25%	0
Pyroxasulfone+NIS	1.8+0.25%	0
Imazapic+MSO+UAN	2+0.25G+0.25G	30
Glyt (3.0)+Prcz+NIS+AMS	12+0.42+0.25%+11	81
Glyt (3.0)+Sulf+NIS+AMS	12+0.5+0.25%+11	93
Glyt (3.0)+Flumioxazin+NIS+AMS	12+1+0.25%+11	80
Glyt (3.0)+Pyroxasulfone+NIS+AMS	12+1.8+0.25%+11	91
CV		10
LSD 5%		7

Best control was achieved when glyphosate, which effectively killed the existing foxtail barley plants, was tank-mixed with sulfosulfuron or pyroxasulfone, which provided soil residual activity. However, glyposate plus propoxycarbazone or flumioxazin gave 80% control without the concern for crop rotation as sulfosulfuron. Glyphosate alone killed existing plants but the plants were quickly replaced by new cohorts. Propoxycarbazone or imazapic gave some suppression of foxtail barley, but at less than 50% control, the usefulness is marginal. These treatments did not kill all existing plants but did reduce the amount of new emergence. Sulfosulfuron, flumioxazin, and pyroxasulfone did not injure existing plants at this location.

Evaluating resistance management herbicide programs. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat and 'HyClass 40 RR' Canola were seeded at Fargo on April 23. Treatments were applied to 2 to 3 leaf wheat and canola, flowering dandelion, cotyledon to 4 leaf common mallow and redroot pigweed, 2 to 4 leaf wild mustard, 2 to 3 leaf yellow foxtail, and 4 inch tall thistle on June 3 with 64°F, 56% relative humidity, 30% cloud cover, 3 mph wind at 180°, and dry soil at 60°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to a 20-ft wide area the length of 20- by 25-ft plots. The experiment was a randomized complete block design with four replicates.

Crop	Treatment	Rate	7/1 Wioa
		oz ai/A	%
Canola4	Fenoxaprop+Clopyralid	1.32+2	72
Canola4	Clethodim+Clopyralid+PO	1+2+24	96
Canola4	Glyphosate	6	97
Canola4	Clethodim+Clopyralid+PO	1+2+24	98
Canola4	Glyphosate	6	98
Wheat1	Fenoxaprop+Brox&MCPA	1.32+8	80
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	92
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	94
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	99
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	99
Canola2	Fenoxaprop+Clopyralid	1.32+2	83
Canola2	Clethodim+Clopyralid+PO	1+2+4	97
Canola2	Glyphosate	6	98
Canola2	Glyphosate	6	97
Canola2	Glyphosate	6	98
Wheat3	Fenoxaprop+Brox&MCPA	1.32+8	85
Wheat3	Pinoxaden+Brox&MCPA5	0.86+8	98
Wheat3	Pinoxaden+Brox&MCPA5	0.86+8	98
Wheat3	Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	99
Wheat3	Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	99
CV			9
LSD 5%			12

Plots that have received yearly application of fenoxaprop again demonstrate lower control of wild oat by fenoxaprop. Pinoxaden control in Wheat1 tended to be lower than other pinoxaden plots and was a plot treated with clethodim the year before where wild oat survival was greater than expected. Sed from several plots was collected and conditioned for dose response screening this winter in the greenhouse.

Herbicide antagonism to wild oat control. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 2 leaf wheat and 2 to 3 wild oat on May 21 with 69°F, 60% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 three replicates. Harvest was on August 17.

Treatment	Rate	6/4 Wheat	6/4 Wioa	6/21 Wioa	8/17 Yield
	oz ai/A	%	%	%	bu/A
Fenx	1.2	0	82	93	19
Fenx+Brox&MCPA5	1.2+8	0	80	91	20
Fenx+Brox&Pyst	1.2+2.83	0	83	96	20
Fenx+Dica&Flox	1.2+1.75	0	82	93	13
Clfp-ng	0.72	0	82	96	19
Clfp-ng+Brox&MCPA5	0.72+8	0	82	94	19
Clfp-ng+Brox&Pyst	0.72+2.83	0	83	95	20
Clfp-ng+Dica&Flox	0.72+1.75	0	80	96	19
Pxdn	0.77	0	85	95	22
Pxdn+Brox&MCPA5	0.77+8	0	82	95	19
Pxdn+Brox&Pyst	0.77+2.83	0	85	96	24
Pxdn+Dica&Flox	0.77+1.75	0	80	96	21
Untreated	0	0	0	0	12
CV		0	2	2	24
LSD 5%		0	3	3	8

Herbicides did not cause injury to wheat. Broadleaf herbicides did not antagonize the activity of fenoxaprop or clodinafop towards wild oat. Slight antagonism of pinoxaden with bromoxynil and MCPA or dicamba and fluroxypyr was recorded on June 4, but by June 21, all treatments with pinoxaden provided at least 95% control of wild oat.

Gibberellic acid (GA3) effect on grass control. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 2 leaf wheat, 2 to 3 leaf wild oat, and coleoptile yellow foxtail on May 21 with 60°F, 60% relative humidity, 100% cloud cover, 1 to 2 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	5/28 Wheat	5/28 Wioa	5/28 Yeft	6/4 Wioa	6/4 Yeft	6/21 Wioa
	oz ai/A	%	%	%	%	%	%
Fenx+Brox&MCPA5	1+8	0	69	51	85	77	90
GA3+Fenx+Brox&MCPA5	0.4+1+8	0	57	40	82	69	87
Clfp-ng+Brox&MCPA5	0.6+8	0	71	60	84	74	95
GA3+Clfp-ng+Brox&MCPA5	0.4+0.6+8	0	77	57	85	77	96
Prcz&Mess+Brox&MCPA5 +MSO	0.2+8 +16	0	71	42	77	42	82
GA3+Prcz&Mess +Brox&MCPA5+MSO	0.4+0.2 +8+16	0	56	37	70	37	82
Pxlm&Flas&Flox+MSO	1.69+16	0	70	45	80	60	90
GA3+Pxlm&Flas&Flox+MSO	0.2+1.69+16	0	71	42	77	45	90
Untreated	0	0	0	0	0	0	0
CV		0	7	25	7	14	4
LSD 5%		0	6	15	6	10	5

Treatments did not cause wheat injury. Overall, gibberellic acid did not affect grass control. If anything, the addition of gibberellic acid tended to reduce control especially for yellow foxtail.

Station Grass Control, Fargo. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded April 21. Treatments were applied to 2 leaf wheat and 2 to 3 leaf wild oat on May 21 with 70°F, 60% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to a 7-ft wide area the length of 10- by 30-foot plots. The experiment was a randomized complete block design with three replicates. Harvest was on August 17.

Treatment	Rate	6/4 Wheat	6/4 Wioa	6/21 Wioa	8/17 Yield
	oz/A	%	%	%	bu/A
Mesosulfuron+Brox&MCPA5+MSO	0.036+8+24	0	67	53	9
Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	0	78	75	15
Prcz+Brox&MCPA5+Basic Blend	0.42+8+1%	0	73	70	17
Prcz&Mess+Brox&MCPA5+Basic Blend	0.2+8+1%	0	72	82	15
Pxlm+Brox&MCPA5+Basic Blend	0.26+8+1%	0	73	77	22
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	72	75	21
Tral+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	0	77	78	20
Fenoxaprop+Brox&MCPA5	0.8+8	0	77	65	15
Fenoxaprop+Brox&MCPA5	1.32+8	0	78	93	21
Clodinafop-ng+Brox&MCPA5	0.8+8	0	80	95	24
Pinoxaden+Brox&MCPA5	0.86+8	0	83	96	24
Difenzoquat+Brox&MCPA5	16+8	13	75	80	17
Untreated	0	0	0	0	6
CV		78	4	6	21
LSD 5%		1	4	8	6

Only difenzoquat caused injury to wheat, and the injury persisted through the entire season. The injury was less than observed in other studies but still severe enough to inhibit wheat development. ALS inhibitors generally gave 70 to 80% control of wild oat. ACCase inhibitors generally provided 80 to 95% wild oat control when applied at wild oat rates. Pinoxaden, clodinafop, and fenoxaprop at 1.32 oz ai/A provided 93 to 96% control of wild oat. ACCase inhibitors or pyroxsulam resulted in the greatest wheat yield.

Wild oat control in wheat, Langdon. Lukach, Howatt, and Harrington. Hard red spring wheat was seeded at Langdon. Treatments were applied to 3 leaf wheat and wild oat. Treatments were applied with a tractor sprayer delivering 10 gpa at 35 psi 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	6/30 Wheat	6/30 Wild Oat	7/22 Wheat	7/22 Wild Oat
	oz ai/A	%	%	%	%
Mess+Brox&MCPA5+MSO	0.036+8+24	0	30	0	50
Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	0	76	0	93
Prcz+Brox&MCPA5+Basic Blend	0.42+8+1%	0	50	0	82
Prcz&Mess+Brox&MCPA5+Basic Blend	0.2+8+1%	0	90	0	98
Pxlm+Brox&MCPA5+Basic Blend	0.26+8+1%	0	94	0	98
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	93	0	99
Tral+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	0	82	0	75
Fenoxaprop+Brox&MCPA5	0.8+8	0	64	0	64
Fenoxaprop+Brox&MCPA5	1.32+8	0	86	0	82
Clodinafop-ng+Brox&MCPA5	0.8+8	0	85	0	75
Pinoxaden+Brox&MCPA5	0.86+8	0	94	0	97
Difenzoquat+Brox&MCPA5	16+8	74	91	36	84
Untreated	0	0	0	0	0
CV		12	8	47	5
LSD 5%		1	8	2	6

Defenzoquat caused extensive and persistent injury to wheat, expressed as severe stunting and developmental delay, chlorosis, and necrotic leaf margins. This field area was confirmed to have ACCase-resistant wild oat to fenoxaprop and clodinafop. Pinoxaden provided 97% control in contrast to 75 and 82% control with clodinafop and fenoxaprop, respectively. Tralkoxydim also gave only 75% control. Pyroxsulam was very effective, 98 and 99% control. Propoxycarbazone and mesosulfuron, 98%, provided better control than propoxcarbazone, 82%, or mesosulfuron, 50%, alone. Flucarbazone ultimately gave good control at 93%.

Wild oat control in durum wheat, Williston 2009. Neil Riveland.

'Grenora' durum wheat was planted on recrop (land cropped to wheat in 2008) in 7 inch rows at 90 lbs/a on May 5. All treatments were applied on June 2 with air temperature of 54 ., 44% RH, soil temp 56 F, 95% clear sky and wind at 1-6 mph from 297 degrees to 3.5-4 leaf durum wheat and 2-4 leaf wild oats (most in the 3 leaf stage). We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 8.5 gals/a at 30 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 24 ft plots. First rain received after application was 0.34 inches on June 6. Experimental design was a randomized complete block design with four replications. Wild oat density averaged 10-12 plants/ft2. Plots were evaluated for wild oat control June 13, July 11 and August 2. Gopher damage was significant and rep 4 was abandon. Durum wheat was harvested for yield on September 1.

		Crop Injury		Wioa Control				
Treatment a	Rate	6/13	7/11	6/13	7/11	8/2	Test Weight	Yield
	oz/a	----------		%	----------		lb/b	bu/a
Mess+Brox&MCPA5+MSO	0.036+8+1%	0	1	53	65	63	59.6	13.1
Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	4	5	80	97	96	60.1	21.2
Prcz&Mess+Brox&MCPA5+Basic Blend	0.178+8+1%	0	0	83	95	90	60.3	20.3
Immb+Brox&MCPA5+Basic Blend	5+8+1%	1	4	88	93	88	59.6	19.9
Prcz+Brox&MCPA5+ Basic Blend	0.32+8+1%	3	5	75	95	95	59.8	18.4
Pxlm+Brox&MCPA5+Basic Blend	0.26+8+1%	4	5	75	94	90	60.4	21.8
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	6	90	96	98	60.1	23.5
Tral-SC+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	1	2	78	83	90	60.3	26.2
Fenoxaprop+Brox&MCPA5	0.8+8	3	2	47	75	73	60.9	22.7
Fenoxaprop+Brox&MCPA5	1.32+8	4	4	42	75	80	60.5	16.6
Clodinafop-ng+Brox&MCPA5	0.8+8	0	3	70	89	87	60.3	19.9
Pinoxaden+Brox&MCPA5	0.86+8	1	3	74	98	92	59.9	30.4
Difenzoquat+Brox&MCPA5	16+8	1	2	35	40	27	60.3	15.8
Untreated	0	0	0	0	0	0	61.0	8.5
HIGH MEAN		4	6	90	98	98	61.0	30.4
LOW MEAN		0	0	0	0	0	59.6	8.5
EXP MEAN		2	3	64	78	76	60.2	19.9
C.V. %		117	98	20	10	9	1.4	25.6
LSD 5%		3	NS	22	14	11	NS	8.5
LSD 1%		NS	NS	29	18	15	NS	11.5
# OF REPS		3	3	3	3	3	2	3
F-TRT		3	1	11	36	55	.5	3.4

a - MSO, a methylated seed oil from Loveland;Quad 7 used as the basic blend adjuvant

Summary: Gopher damage to the crop may have influenced ratings and yield data.

Wolverine for grass control in durum wheat. Williston 2009. Neil Riveland. WREC.

'Grenora' durum wheat was planted no-till into wheat stubble from 2008 in 7 inch rows at 90 lbs/a on May 4. All treatments were applied on May 30 with 58 F air temperature, 59 degree soil temperature, 41% relative humidity, 95% clear sky and wind at 2-4mph from 134 degrees to 3.4 leaf wheat and 2-4 inch Wild Oats (Wioa). We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 10 gals/a at 40 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 25 ft plots. First rain received after application was 0.34 inches on June 6. Experimental design was a randomized complete block design with four replications. Wild oat densities averaged 10-14 plant/ft2. Plots were evaluated for crop injury and weed control on June 13, June 19, July 11 and August 2. Durum was machine harvested for yield on September 1.

						-----Control------				----Crop-----	
	Product	----Crop Injury---				---Wioa Control---				Test	
Treatment a	Rate	6/13	6/19	7/11	8/2	6/13	6/19	7/11	8/2	Weight	Yield
	oz/a	-------- % -------				------- % --------				lbs/bu	bus/a
Untreated	0	0	0	0	0	0	0	0	0	60.8	6.9
Wolverine	27	5	1	3	4	75	86	94	89	60.3	24.7
Puma+Huskie	10.7+11	4	2	3	3	76	85	90	74	60.7	20.1
SP102+Huskie+Quad7	3+11+1%v/v	1	1	14	3	48	63	66	48	60.3	14.3
EXP MEAN		2	1	5	2	50	58	62	53	60.5	16.5
C.V. %		57	155	51	133	10	9	6	24	.4	19.2
LSD 5%		2	NS	4	NS	8	8	6	20	NS	5.0

a - SP102 = SP1020000420887

Wolverine and Puma+Huskie caused early season crop injury, perhaps due to cool weather conditions at application time.
These herbicides also gave the best early season control of wild oats and the highest grain yields.

Wild oat control in durum with Rimfire Max. Williston 2009. Neil Riveland. WREC.

'Grenora' durum wheat was planted notill into wheat stubble from 2008 in 7 inch rows at 0 lbs/a on May 4. All treatments were applied on May 30 with 58 F air temperature, 59 degree soil temperature, 41% relative humidity, 95% clear sky and wind at 2-3 mph from 135 degrees to 3.4 leaf wheat and 2-4 inch Wild Oats (Wioa). We used a small plot prayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 10 gals/a at 40 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 25 ft plots. First rain received after application was 0.34 inches on June 6. Experimental design was a randomized complete block design with four replications. Wild oat densities averaged 10-14 plant/ft2. Plots were evaluated for crop injury and weed control on June 13, June 19, July 11 and August 2. Durum was machine harvested for yield on August 21.

						-----Control------				----Crop-----	
	Product	----Crop Injury---				---Wioa Control---				Test	
Treatment a	Rate	6/13	6/19	7/11	8/2	6/13	6/19	7/11	8/2	Weight	Yield
	oz/a	--------	%	-------		-------	%	--------		lbs/bu	bus/a
Untreated	0	0	0	0	0	0	0	0	0	59.8	13.66
SP102+Huskie+MSO	3+11+24	1	1	8	5	55	69	74	73	59.9	20.10
SP102+Huskie+Quad 7	3+11+12.8	1	0	8	5	53	71	81	71	60.4	20.36
Wolverine	27.4	7	6	4	5	74	88	95	94	60.1	24.39
EXP MEAN		2	2	5	4	45	57	62	59	60.0	19.65
C.V. %		53	106	48	50	12	15	12	22	.4	11.34
LSD 5%		2	3	4	3	9	13	12	21	NS	3.65

a - SP102 = SP1020000220887. MSO concentrate = methylated seed oil adjuvant.
Quad 7 = Basic pH blend adjuvant

Wolverine gave the best early season control of wild oats and had the highest wheat yield.

Wolverine for grass control in durum wheat. Williston. 2010. Neil Riveland.

'Alkabo' durum wheat was planted notill into wheat stubble from 2009 in 7 inch rows at 90 lbs/a on April 28. All treatments were applied on June 2 with 62 F air temperature, 61 degree soil temperature, 47% relative humidity, 50% clear sky and wind at 3-4 mph from 146 degrees to 4.2-4.5 leaf wheat and 2-4.5 leaf Wild Oat (Wioa); 75% in the 3-3.5 leaf stage. We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 10 gals/a at 40 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. First rain received after application was 0.35 inches on June 3. Experimental design was a randomized complete block design with three replications. Wild oat densities were very heavy; 30-40/ft2. Plots were evaluated for crop injury on June 10 and weed control and crop injury on June 15, and July 11. No crop injury was observed for any treatment at any time. Durum was machine harvested for yield on August 20.

Treatment a	Product Rate oz/a	Wioa Control 6/15	7/11	Test Weight lb/bus	Yield bus/a
		---- % ----			
Untreated	0	0	0	58.2	5.7
Wolverine	27.4	82	97	59.7	21.6
Rimfire Max+Huskie+Quad 7	3+11+1% v/v	57	91	59.8	17.8
Rimfire Max+Huskie+MSO	3+11+1.3 pt/a	57	86	59.8	18.0
HIGH MEAN		82	97	59.8	21.6
C.V. %		12	12	.6	14.9
LSD 5%		12	17	1.2	4.7

a - MSO = MSO Concentrate

Summary: Rimfire Max did not kill the wild oats as quickly as did Wolverine.

Flucarbazone plus safener (ARY454) activity on wild oat. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments (2L) were applied to 2 leaf wheat and 2 to 3 leaf wild oat on May 21 with 69°F, 60% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and dry soil at 55°F. Treatments (5L) were applied to 5 to 6 leaf wheat and wild oat on June 3 with 74°F, 50% relative humidity, 20% cloud cover, and dry soil at 60°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to 7-foot wide area the length of 10- by 30-foot plots. The experiment was a randomized complete block design with four replicates. Harvest was on August 17.

Treatment	Rate	Stage	6/4 Wheat	6/4 Wioa	6/21 Wioa	7/1 Wioa	7/29 Height	8/17 Yield
	oz ai/A		%	%	%	%	cm	bu/A
ARY454113+Clpy&Flox+BB	0.28+3+1%	2L	0	75	77	71	74	15
ARY454105+Clpy&Flox+BB	0.28+3+1%	2L	0	75	75	70	74	12
ARY454113+ARY548018+BB	0.28+1.6+1%	2L	0	75	77	76	74	15
Pinoxaden+Clpy&Flox+MCPA	0.86+3+4	2L	0	82	65	0	75	7
Pxlm&Flas&Flox+BB	1.67+1%	2L	0	79	90	91	75	18
ARY454113+Clpy&Flox+BB	0.28+3+1%	5L	0	0	85	74	71	8
ARY454105+Clpy&Flox+BB	0.28+3+1%	5L	0	0	82	69	72	8
ARY454113+ARY548018+BB	0.28+1.6+1%	5L	0	0	85	70	73	9
ARY548019+2,4-D	1.78+6	5L	0	0	82	66	73	8
ARY454105+Clpy&Flox+BB	0.43+3+1%	5L	0	0	85	76	72	8
Pinoxaden+Clpy&Flox+MCPA	0.86+3+4	5L	0	0	90	95	71	11
Pxlm&Flas&Flox+BB	1.67+1%	5L	0	0	85	80	69	7
Fenx&Brox&Pyst	3.9	5L	0	0	90	91	65	8
Prcz&Mess+Clpy&Flox+BB	0.2+3+1%	5L	0	0	76	45	73	6
Untreated	0		0	0	0	0	74	7
CV			0	4	3	8	6	27
LSD 5%			0	1	4	7	6	4

Herbicides did not cause injury to wheat. On June 4, pinoxaden provided the greatest control of wild oat, followed by pyroxsulam, and then flucarbazone for treatments applied to 2 leaf plants. A second flush of wild oat was not obvious but could explain why control at this application timing declined over time. Pyroxsulam activity improved to 90% while flucarbazone control of wild oat held steady at about 75%. For the later application timing, pinoxaden or fenoxaprop provided the best control, 91 to 95%. ALS control of well developed wild oat always has been difficult. In this study, flucarbazone or pyroxsulam applied to 5 leaf wild oat gave 70 to 80% control, while propoxycarbazone and mesosulfuron was at 45%. Height essentially was similar across all treatments.

Broad spectrum control with flucarbazone and fluroxypyr (ARY548). Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 2 leaf wheat, 2 to 3 leaf wild oat, and coleoptile yellow foxtail on May 21 with 69°F, 60% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/4 Wheat	6/4 Wioa	6/4 Yeft	6/21 Wioa	7/29 Height
	oz ai/A	%	%	%	%	cm
ARY548019+BB	1.8+1%	0	79	62	76	70
Pxdn&Flas+Brox&MCPA+Adigor	0.93+8+9.6	0	84	81	91	74
ARY548019+2,4-D	1.8+6	0	77	45	67	76
ARY548019+Brox&MCPA	1.8+8	0	79	45	72	75
ARY548019+ARY-0546+ARY-0547+BB	1.8+0.23+0.075+1%	0	77	62	76	71
ARY454113+ARY548018+BB	0.28+1.6+1%	0	77	64	89	76
Pxlm&Flas&Flox+BB	1.67+1%	0	75	52	64	76
Fenx&Brox&Pyst	3.9	0	81	80	94	67
Untreated	0	0	0	0	0	77
CV		0	6	14	7	8
LSD 5%		0	6	11	7	9

Herbicides did not cause injury to wheat. Pinoxaden and fenoxaprop provided the best control of both wild oat and yellow foxtail at the June 4 evaluation. 2,4-D or bromoxynil and MCPA severely antagonized yellow foxtail control with flucarbazone. Wild oat control with ALS inhibitors did not improve as the season progressed. The shortest wheat was treated with fenoxaprop, which was considered to be safer than other treatments except pinoxaden.

Wild oat control with Propoxycarbazone&Mesosulfuron and adjuvants. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 2 leaf wheat and 2 to 3 wild oat on May 21 with 69°F, 60% relative humidity, 100% cloud cover, 3 to 4 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 three replicates.

Treatment	Rate	6/4 Wheat	6/4 Wioa	6/21 Wioa
	ai/A	%	%	%
Prcz&Mess+MCPA	0.2+6	0	70	62
Prcz&Mess+MCPA+Basic Blend	0.2+6+1%	0	70	78
Prcz&Mess+MCPA+MSO	0.2+6+16	0	70	72
Prcz&Mess+MCPA+ClassANG	0.2+6+2.5%	0	70	80
Prcz&Mess+MCPA+ClassANG+AG 02013	0.2+6+2.5%+4	0	70	77
Prcz&Mess+MCPA+AG 10003	0.2+6+2%	0	70	73
Prcz&Mess+MCPA+AG 10004	0.2+6+2%	0	70	75
Prcz&Mess+MCPA+AG 10009	0.2+6+2%	0	70	75
Prcz&Mess+MCPA+Destiny	0.2+6+24	0	70	68
Prcz&Mess+MCPA+Destiny HC	0.2+6+12	0	70	67
Prcz&Mess+MCPA+Destiny HC	0.2+6+16	0	70	70
Prcz&Mess+MCPA+Destiny HC+AG 02013	0.2+6+12+4	0	70	70
Prcz&Mess+MCPA+AG 10021	0.2+6+1%	0	70	77
Prcz&Mess+MCPA+AG 09012	0.2+6+1%	0	70	77
Prcz&Mess+MCPA+AG 09053	0.2+6+1.5%	0	70	88
Prcz&Mess+MCPA+AG 07043	0.2+6+1%	0	-	-
CV		0	0	5
LSD 5%		0	0	6

None of the treatments caused injury to wheat. Treatments were not different in wild oat control on June 4. By June 21, minor differences were detected among treatments, with all treatments that included adjuvant giving at least slightly better control than herbicide alone. Among adjuvants, AG 09053 improved the control of wild oat with the herbicide by 26 percentage points, 88% control. Treatments that included Destiny or Destiny HC gave the least enhancement of herbicide activity.

Wild Oat control with Propoxycarbazone&Mesosulfuron. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 2 leaf wheat, 2 to 3 leaf wild oat, and coleoptile yellow foxtail on May 21 with 60°F, 60% relative humidity, 100% cloud cover, 1 to 2 mph wind at 135°, and dry soil at 55°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest was on August 17.

Treatment	Rate	5/28 Wheat	5/28 Wioa	5/28 Yeft	6/4 Wioa	6/4 Yeft	6/21 Wioa	8/17 Yield
	oz ai/A	%	%	%	%	%	%	bu/A
Prcz&Mess+Brox&Pyst+MSO	0.2+2.83+24	0	57	27	85	40	76	11
Prcz&Mess+Brox&Pyst+BB	0.2+2.83+1%	0	64	30	85	40	86	12
Prcz&Mess+Brox&Pyst+HSOC	0.2+2.83+12	0	40	5	85	40	87	10
Prcz&Mess+Brox&MCPA5+BB	0.2+8+1%	0	65	25	85	40	90	11
Prcz&Mess+Thif-sg +Trib-sg+Flox+BB	0.2+0.24 +0.06+1+1%	0	72	35	85	40	87	11
Prcz&Mess+Dicamba&Flox +BB	0.2+1.75 +1%	0	57	25	85	40	81	12
Fenx&Brox&Pyst	3.9	0	50	50	86	72	30	7
Untreated	0	0	0	0	0	0	0	7
CV		0	8	28	1	2	7	18
LSD 5%		0	6	10	1	1	7	3

Wheat response was not observed with any herbicides. Basic Blend adjuvant generally provided more rapid response in wild oat and foxtail control with propoxycarbazone and mesosulfuron than other adjuvants. However, mid-season rating of control for both weeds was similar across propoxycarbazone and mesosulfuron treatments. MSO did not provide as much benefit to herbicide activity as basic blend or high surfactant load oil concentrate on June 21, and dicamba and fluroxypyr seemed to antagonize activity compared with other herbicides for propoxycarbazone and mesosulfuron.

POST wild oat control in spring wheat, Cathay, 2010. (Greg Endres). The experiment was conducted in a commercial field of Barlow HRS wheat planted April 22. The experimental design was a randomized complete block with three replicates. Herbicide treatments were applied with a backpack-type 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 June 1 to 5-leaf wheat and 4-leaf wild oat.

No crop response was noted when visually evaluated on June 26 and July 29. Wild oat control with Rimfire Max generally was good (78 to 92%) except with a tank mixture with Bronate Advanced, which resulted in control at 71-72% (table).

Table.

Herbicide			Wild oat control	
Treatment[1]		Rate	6/26	7/29
No.		product/A	%	
1	untreated check	x	0	0
2	Rimfire Max+Huskie+MSO	3.0 oz+11 oz+1.5 pt	90	88
3	Rimfire Max+Huskie+Basic Blend	3.0 oz+11 oz+1% v/v	92	88
4	Rimfire Max+Huskie+HSOC	3.0 oz+11 oz+0.75 pt	86	82
5	Rimfire Max+Bronate Advanced+Basic Blend	3.0 oz+0.8 pt+1% v/v	72	71
6	Rimfire Max+Affinity Tankmix+Starane+Basic Blend	3.0 oz+0.6 oz+0.33 pt+1% v/v	78	85
C.V. (%)			8.8	8.3
LSD (0.05)			11	10

[1]Basic Blend=Quad7, Loveland; HSOC=Destiny HC, WinField Solutions.

2010 Evaluation of Weed Control with Rimfire Max on Spring Wheat

Eric Eriksmoen, Hettinger, ND

'Howard' HRSW was seeded on April 15. Treatments were applied on May 23 to 3 leaf wheat and to jointing downy brome (dobr), tillering Japanese brome (jabr), 4 leaf wild oat (wiot) and 2 leaf Persian darnel (peda) with 62° F, 55% RH, mostly sunny sky and east 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. Weed populations for downy brome, Japanese brome, wild oat and Persian darnel were 4, 12, 0.5 and 0.5 plants per square foot, respectively. Plots were evaluated for crop injury on June 1 and June 14, and for weed control on June 14, July 1 and July 28. The trial was harvested on August 9.

			6/1	June 14		------- July 1 -------			---------- July 28 ----------			Test	Grain
	Treatment	Product rate	inj	inj	dobr	jabr	peda	wiot	wiot	dobr	jabr	peda	weight	yield
		oz/A	% Control										lbs/bu	bu/A
1	Untreated		0	0	0	0	0	0	0	0	0	0	55.1	30.2
2	Rimfire Max + Huskie + MSO*	3.0 + 11 + 24	2	0	65	81	99	99	99	70	99	99	57.7	48.4
3	Rimfire Max + Huskie + BB*	3.0 + 11 + 1%	0	0	59	70	99	96	99	50	99	99	58.3	47.8
4	Rimfire Max + Huskie + HSOC*	3.0 + 11 + 12	1	0	74	79	99	69	96	86	99	99	58.1	47.4
5	Rimfire Max + Bro. Adv. + BB	3.0 + 12.8 + 1%	3	0	72	76	99	99	99	58	99	99	58.9	51.7
6	Rimfire Max+Affinity TM+Starane+BB	3.0+0.6+5.28+1%	2	0	40	62	15	76	66	38	98	0	58.3	42.9
	C.V. %		160	0	20	18	13	33	30	38	1	0	3.3	7.5
	LSD .05		NS	NS	15	17	16	38	36	29	1	1	NS	5.1

* MSO = methylated seed oil, BB = basic blend, HC = high surfactant oil concentrate NS = no statistical difference between treatments

Summary

Crop injury was minimal when observed and quickly diminished. All herbicide treatments provided excellent season long control of Japanese brome, wild oats and Persian darnel with the exception of Rimfire Max + Affinity TM + Starane (trt 6) which appeared to have antagonistic effects on grassy weed control resulting in a lower grain yield than the other herbicide treatments. It appears that HSOC (trt 4) enhanced downy brome control by Rimfire Max + Huskie compared to other adjuvants (trts 2 & 3). Rimfire Max provided only marginal control of downy brome.

2010 Rimfire Max on Winter Wheat, Eric Eriksmoen, Hettinger, ND

'Jerry' HRWW was seeded on October 17, 2009 into cool dry soil. Fall pre-emergence treatments (PRE) were applied on October 25 with 37° F, 64% RH, clear sky and NW wind at 5 mph to 1 leaf downy brome (dobr). Winter wheat survival was excellent. Spring post-emergence treatments (SPOST) were applied on May 23 to 4 leaf winter wheat and to downy brome in the late boot stage and tillering Japanese brome with 68° F, 39% RH, mostly clear sky and SE 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 trial was a randomized complete block design with four replications. The soil is classified as a silt-loam with a pH of 6.2 and OM of 3.2%. Downy brome populations averaged 7 / ft^2 in the fall and 10 /ft^2 in the spring. Japanese brome, Persian darnel and wild oat populations averaged 2, 0.8 and 0.5 / ft^2 respectively. Plots were evaluated for crop injury and weed control on May 3, June 8, June 24 and July 28. The trial was harvested on August 2.

	Treatment	Product rate	App. timing	- May 3 -		- June 8 -		-------- June 24 --------				---------- July 28 ----------					Test weight	Grain yield
		oz/A		inj	dobr	inj	dobr	inj	jabr	wiot	peda	inj	dobr	jabr	wiot	peda	lbs/bu	bu/A
				% Control														
1	Untreated			0	0	0	0	0	0	0	0	0	0	0	0	0	55.4	46.2
2	Olympus + NIS	0.6 + 0.5%	PRE	0	82	0	73	0	71	94	66	0	93	99	0	0	55.1	46.1
3	Olympus + NIS	0.9 + 0.5%	PRE	0	92	0	87	0	87	83	50	0	91	99	60	0	56.5	50.6
4	Rimfire Max + MSO	3.0 + 20	PRE	0	84	0	60	0	40	66	0	0	71	72	37	0	54.2	47.4
5	Olympus + NIS / Rimfire Max + MSO	0.6 + 0.5% / 3.0 + 20	PRE / SPOST	5	90	9	97	3	98	99	99	0	98	99	90	99	56.4	48.3
6	Olympus + NIS / Rimfire Max + MSO	0.9 + 0.5% / 3.0 + 20	PRE / SPOST	0	90	10	96	5	99	99	99	0	97	99	99	99	56.6	48.4
7	Rimfire Max + MSO	3.0 + 20	SPOST	0	0	1	92	0	84	99	87	0	96	99	99	50	57.1	51.3
8	Osprey+ NIS+ UAN	4.75+0.5%+64	SPOST	0	0	0	94	0	82	99	99	0	84	94	96	99	56.2	53.6
9	PrePare + NIS / Everest + NIS	0.3 + 0.5% / 0.3 + 5%	PRE / SPOST	0	92	0	85	0	70	99	0	0	92	99	99	0	56.1	49.4
	C.V. %			342	11	284	24	398	34	19	44	275	16	11	53	--	1.6	15.6
	LSD 5%			3	9	NS	27	NS	35	22	35	NS	18	13	47	--	1.3	NS

NS = no statistical difference between treatments.

Summary

Crop injury was relatively minor or non-existent except for Olympus / Rimfire Max split applications (trts 5 & 6) which caused crop stunting. Fall applied Olympus (trts 2 & 3) provided excellent season long control of downy and Japanese brome but did not provide season long control of wild oats or Persian darnel. Fall applied Rimfire Max (trt 4) provided marginal control of downy and Japanese brome, poor control of wild oat and no control of Persian darnel. Olympus/Rimfire Max split applications (trts 5 & 6) provided excellent season long control of downy & Japanese brome, wild oat and Persian darnel. Spring applied Rimfire Max (trt 7) provided excellent season long control of downy brome, Japanese brome and wild oat but only marginal season long control of Persian darnel. Spring applied Osprey (trt 8) provided excellent season long control of Japanese brome, wild oat and Persian darnel but was a little weak at controlling downy brome. PrePare / Everest split application (trt 9) provided very good season long control of downy brome, Japanese brome and wild oats but did not control Persian darnel.

Japanese brome control in Spring Wheat. Jenks, Willoughby, and Hoefing.The objective of this study was to evaluate Japanese brome control in spring wheat. Pre-Pare, KIH-485, and Valor were applied PRE. Note that KIH-485 and Valor are not labeled for use in spring wheat. Everest, Rimfire Max, GoldSky, and Puma were applied at the 5-leaf stage. Glyphosate was applied preplant and PRE as the Japanese brome density was very high. Pre-Pare, Valor, and Puma did not control Japanese brome. KIH-485, Everest, Rimfire Max, and GoldSky provided good to excellent Japanese brome control. The study was not harvested due to rains that flooded part of the research plot.

Table. Japanese brome control in Spring Wheat. (1032)

			Weed Control
			Jabr[a]
Treatment	Rate	Timing	13 Aug
			----%----
Untreated			0
Pre-Pare	0.3 oz	PRE	17
Pre-Pare / Everest + NIS	0.3 oz / 0.3 oz + 0.25%	PRE / 5-leaf	86
KIH-485	0.15 lbai	PRE	98
KIH-485 / Everest + NIS	0.15 lbai / 0.4 oz + 0.25%	PRE / 5-leaf	99
Valor	2 oz	PRE	30
Everest + NIS	0.4 oz + 0.25%	5-leaf	94
Rimfire Max + MSO	3 oz + 1.5 pt	5-leaf	95
GoldSky + NIS	1 pt + 0.25%	5-leaf	98
Puma	0.67 pt	5-leaf	0
LSD (0.05)			21

[a]*Jabr=Japanese Brome*

[b]*Glyphosate applied preplant and preemergence to all treatments.*

POST foxtail control in spring wheat, Carrington, 2010. (Kirk Howatt and Greg Endres). The experiment was conducted at the NDSU Carrington Research Extension Center on a conventionally-tilled Heimdal-Emrick loam soil. The experimental design was a randomized complete block with three replicates. 'Glenn' HRS wheat was seeded April 23. 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 28 with 84 F, 48% RH, 75% clear sky, and 7 mph wind to 3-leaf wheat and 1- to 3-leaf green and yellow foxtail. Average plant density in untreated plots on May 28: wheat = 25 plants/ft^2 and foxtail = 26 plants/ft^2. The trial was harvested by a plot combine on August 6.

Plant chlorosis/necrosis and reduction in biomass was prominent with Difenzoquat, with minimal or no crop response among other herbicide treatments (Table). Highest seed yield (47.7-54.9 bu/A) was associated with herbicide treatment numbers 1-2 and 5-11. Herbicide treatments numbered 9-11 provided good (80-85%) control of foxtail when evaluated about 2 and 4 wk after treatment (WAT). Herbicide treatments numbered 5-6 and 9-11 provided good to excellent (80-95%) control of green and yellow foxtail when evaluated about 8 WAT.

Table.

Herbicide			Wheat response					Weed control			
								Foxtail		Green foxtail	Yellow foxtail
	Treatment	Rate	3-Jun	11-Jun	20-Jul	Seed yield	Test weight	11-Jun	25-Jun	20-Jul	
No.		oz ai/A	chlorosis (%)	biomass reduction (%)		bu/A	lb/bu	%			
1	Mess+Brox&MCPA5+MSO	0.036+8+24	1	0	0	47.7	62.7	59	33	13	7
2	Flcz+Brox&MCPA5+Basic Blend	0.32+8+1%	6	0	0	48.2	62.9	78	73	96	78
3	Prcz+Brox&MCPA5+Basic Blend	0.42+8+1%	2	0	0	43.3	62.6	64	30	7	7
4	Prcz&Mess+Brox&MCPA5+Basic Blend	0.2+8+1%	5	0	0	45.5	62.4	70	48	33	33
5	Pxlm+Brox&MCPA5+Basic Blend	0.26+8+1%	1	0	0	49.2	63.3	78	72	92	80
6	Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	0	0	54.9	63.2	79	78	91	93
7	Tral+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+ 9.5	1	0	0	54.4	63.2	73	70	53	63
8	Fenoxaprop+Brox&MCPA5	0.8+8	0	0	0	51.5	62.4	73	70	92	73
9	Fenoxaprop+Brox&MCPA5	1.32+8	2	0	0	53.5	63.0	84	80	95	92
10	Clodinafop-ng+Brox&MCPA5	0.8+8	0	0	0	51.3	63.6	81	82	83	87
11	Pinoxaden+Brox&MCPA5	0.86+8	1	0	0	50.2	63.4	85	84	84	92
12	Difenzoquat+Brox&MCPA5	16+8	45	60	17	36.0	62.7	37	27	13	17
13	Untreated	0	0	0	0	37.9	62.7	0	0	0	0
C.V. (%)			88.2	30.0	61.9	9.6	0.8	10.3	24.2	12.4	15.0
LSD (0.05)			8	2	1	8.2	NS	12	25	13	15

Broadleaf weed control with Huskie herbicide in spring wheat, Carrington, 2010. (Greg Endres). 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 April 23 on a conventionally-tilled loam soil. 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 June 2 with 64 F, 42% RH, 90% cloudy sky, and 7 mph wind to 4-leaf wheat, 0.5- to 3-inch tall common lambsquarters, 1-inch tall prostrate and redroot pigweed, and 2-inch tall wild buckwheat. Puma herbicide at 6.4 fl oz/A was sequentially applied on June 2 to plots previously receiving treatment numbers 2-4 and 6. Average plant density (ft^2) in untreated plots on June 2: wheat=26, common lambsquarters=103, pigweed species=7 and wild buckwheat=1. The trial was harvested with a plot combine on August 6.

Common lambsquarters and pigweed control was excellent (91-94%) with Huskie when visually evaluated on June 11 (Table). Also, wild buckwheat control was good (80-87%) with all herbicides except Pulsar (73%). Broadleaf weed control was excellent (96-99%) with all herbicides except Pulsar when evaluated on July 1 and 30. A dense stand of green and yellow foxtail was present below the crop canopy on July 30. No crop response was noted when visually evaluated on June 11. Seed yield was similar among herbicide treatments and greater than the untreated check.

Table.

		Weed control[1]							Wheat
Herbicide		11-Jun			1-Jul		30-Jul		Seed
Treatment[2]	Rate	Colq	Piwe	Wibw	Colq	Piwe	Colq	Piwe	yield
	fl oz product/A	%							bu/A
Untreated check	x	0	0	0	0	0	0	0	28.8
Huskie + AMS	11 + 64	94	91	87	99	99	99	99	50.0
WideMatch + Sword	12 + 6	80	52	81	99	91	99	96	47.1
Affinity Tankmix + Starane + NIS	0.6 oz + 5.3 + 0.25%	80	73	83	99	99	99	99	51.5
Goldsky + NIS	16 + 0.25%	72	80	80	94	99	98	99	49.8
Pulsar + NIS	8.3 + 0.25%	78	58	73	75	78	76	88	48.2
C.V. (%)		4.3	22.6	8.5	0.9	5.1	1.3	4.3	14.2
LSD (0.05)		5	24	11	1	7	2	6	12.1

[1]Colq=Common lambsquarters; Piwe=prostrate and redroot pigweed; Wibw=wild buckwheat.

[2]AMS=N-Pak (Agri-Solutions); NIS=Preference (Winfield Solutions).

Broadleaf herbicide antagonism to yellow foxtail control. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 28. Treatments were applied to 3 to 4 leaf wheat and 2 to 3 leaf yellow foxtail on June 7 with 74°F, 51% relative humidity, clear sky, 1 to 3 mph wind at 135°, and dry soil at 60°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/22 Wheat	6/22 Yeft	7/7 Yeft
	oz ai/A	%	%	%
Fenx	0.8	0	95	97
Fenx+Brox&MCPA5	0.8+8	0	94	98
Fenx+Brox&Pyst	0.8+2.83	0	91	98
Fenx+Dica&Flox	0.8+1.75	0	95	97
Clfp-ng	0.72	0	90	97
Clfp-ng+Brox&MCPA5	0.72+8	0	89	92
Clfp-ng+Brox&Pyst	0.72+2.83	0	86	97
Clfp-ng+Dica&Flox	0.72+1.75	0	89	89
Pxdn	0.77	0	91	97
Pxdn+Brox&MCPA5	0.77+8	0	90	96
Pxdn+Brox&Pyst	0.77+2.83	0	90	98
Pxdn+Dica&Flox	0.77+1.75	0	90	97
Untreated	0	0	0	0
CV		0	1	2
LSD 5%		0	2	2

Herbicides did not cause injury to wheat. Fenoxaprop activity was antagonized slightly by bromoxynil and pyrasulfotole on June 22, but control was similar across fenoxaprop treatments by July 7. Clodinafop was antagonized by bromoxynil and pyrasulfotole on June 22, but by July 7, bromoxynil and MCPA or dicamba and fluroxypyr were the herbicides to cause antagonism of 5 to 8 percentage points. Pinoxaden control of yellow foxtail was not antagonized by broadleaf herbcides included in this study.

Foxtail control with Everest herbicide plus safener formulations in spring wheat, Carrington, 2010. (Greg Endres). The experiment was conducted at the NDSU Carrington Research Extension Center in cooperation with Arysta LifeScience. Experimental design was a randomized complete block with three replicates. 'Glenn' HRS wheat was seeded April 23 on a conventionally-tilled loam soil. 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. POSTA treatments were applied on May 28 with 88 F, 45% RH, 85% clear sky, and 6 mph wind to 3-leaf wheat and 1- to 3-leaf yellow and green foxtail. POSTB treatments were applied on June 7 with 75 F, 33% RH, 10% clear sky, and 11 mph wind to 5-leaf wheat and 3-leaf yellow and green foxtail. Average plant density (ft^2) in untreated plots on May 28: wheat=30 and foxtail=43; on June 7: foxtail=68. The trial was harvested with a plot combine on August 6.

Foxtail (primarily yellow) control ranged from 68 to 85% with POSTA treatments when visually evaluated on June 8 and 21, and August 2 (Table). Foxtail control with Axial XL and Wolverine was excellent (90 to 94%) on June 21 and July 2. On August 2, foxtail control with Axial XL and Wolverine was 79 to 80%, while other POSTB treatments were 72% or less. No crop response was noted when visually evaluated on June 8 (POSTA treatments), June 21 (POSTB treatments), and July 2. Plant height at harvest ranged from 76 to 83 cm. Seed yield generally was similar among herbicide treatments (43.6 to 52.3 bu/A) and greater than the untreated check (30.4 bu/A).

Table.

Treatment					Foxtail control %				Wheat	
									Height	Yield
No.	Name	Rate	Unit	POST timing	8-Jun	21-Jun	2-Jul	2-Aug	cm	bu/A
1	Untreated Check				0	0	0	0	83	30.4
2	ARY-0454-113	0.68	oz wt/A	A	71	78		68	78	48.4
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
3	ARY-0454-105	0.69	fl oz/A	A	68	75		67	78	50.5
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
4	ARY-0454-113	0.68	oz wt/A	A	75	85		72	80	47.6
	ARY-0548-018	5	oz wt/A							
	Basic Blend	1	% v/v							
5	ARY-0454-113	0.68	oz wt/A	B		58	64	13	77	46.5
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
6	ARY-0454-105	0.69	fl oz/A	B		68	74	68	78	47.1
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
7	ARY-0454-113	0.68	oz wt/A	B		70	71	53	78	47.9
	ARY-0548-018	5	oz wt/A							
	Basic Blend	1	% v/v							
8	ARY-0548-019	7	fl oz/A	B		69	71	48	81	47.5
	2,4-D Ester	0.75	pt/A							
9	ARY-0454-105	1.04	fl oz/A	B		68	77	72	83	47.3
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
10	Axial XL	16.4	fl oz/A	B		94	93	81	78	47.8
	Widematch	1	pt/A							
	MCPA	0.5	pt/A							
11	Goldsky	1	pt/A	B		70	72	59	76	49.1
	Basic Blend	1	% v/v							
12	Wolverine	1.7	pt/A	B		90	90	79	82	52.3
13	Rimfire Max	3	oz wt/A	B		53	40	0	76	43.6
	Widematch	1	pt/A							
	Basic Blend	1	% v/v							
C.V. (%)					6.7	7.5	11.4	19.4	3.6	10.9
LSD (0.05)					7	9	13	17	5	8.6

Flucarbazone with safener (ARY454) activity on yellow foxtail. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 28. Treatments were applied to 2 to 3 leaf wheat and 2 to 3 leaf yellow foxtail on June 7 with 67°F, 71% relative humidity, 10% cloud cover, 1 to 2 mph wind at 135°, and dry soil at 58°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/22 Wht	6/22 Yeft	7/7 Yeft
	oz ai/A	%	%	%
Flcz+Clpy&Flox+BB	0.35+3+1%	0	75	72
ARY454113+Clpy&Flox+BB	0.35+3+1%	0	67	80
ARY454105+Clpy&Flox+BB	0.35+3+1%	0	60	35
ARY454113+ARY548018+BB	0.35+1.6+1%	0	71	91
Fenx+Clpy&Flox	1+3	0	95	97
Pinoxaden+Clpy&Flox	0.86+3	0	90	97
Pxlm&Flas&Flox+BB	1.67+1%	0	72	93
Untreated	0	0	0	0
CV		0	2	6
LSD 5%		0	2	7

None of the herbicides caused visible injury to wheat. Yellow foxtail control with ARY454113 than dry flucarbazone, but foxtail recovered from ARY454105 and produced substantial biomass before the end of the season. Fenoxaprop and pinoxaden provided more rapid control of yellow foxtail, but foxtail control was barely similar across commercial standards and ARY454 plus ARY548.

Crop response to flucarbazone (ARY454) tank-mixes. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 28. Treatments were applied to 3 to 4 leaf wheat and 2 to 3 leaf yellow foxtail on June 7 with 70°F, 50% relative humidity, clear sky 3 to 4 mph wind at 135°, and dry soil at 60°F. Applications were made with a backpack sprayer delivering 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 four replicates.

Treatment	Rate	6/22 Wheat	6/22 Yeft	7/7 Yeft
	oz ai/A	%	%	%
ARY454105+NIS	0.28+0.25%	0	65	94
ARY454105+MSO	0.28+16	0	65	93
ARY454105+Basic Blend	0.28+1%	0	65	95
ARY454105+MSOBB	0.28+16	0	65	93
ARY454105+2,4-D LV4+NIS	0.28+8+0.25%	0	65	86
ARY454105+2,4-D LV4+MSO	0.28+8+16	0	65	87
ARY454105+2,4-D LV4+Basic Blend	0.28+8+1%	0	65	92
ARY454105+2,4-D LV4+MSOBB	0.28+8+16	0	65	84
ARY454105+2,4-D LV4	0.28+8	0	65	91
Untreated	0	0	0	0
CV		0	0	5
LSD 5%		0	0	5

Treatments did not cause injury to wheat. Yellow foxtail control did not differ across herbicide treatments 14 DAT. Inclusion of 2,4-D decreased foxtail control by 6 to 9 points for most adjuvants compared to similar treatment without 2,4-D.

Adjuvant evaluation for safened flucarbazone (ARY454). Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 28. Treatments were applied to 2 to 3 leaf wheat and 2 to 3 leaf yellow foxtail on June 7 with 70°F, 47% relative humidity, clear sky, 2 to 3 mph wind at 135°, and dry soil at 60°F. Applications were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/22 Wht	6/22 Yeft	7/7 Yeft	7/29 Height
	oz ai/A	%	%	%	cm
ARY454105	0.28	0	60	91	78
ARY454105+NIS	0.28+0.25%	0	66	91	79
ARY454105+MSO	0.28+1%	0	67	89	80
ARY454105+MSOBB	0.28+1%	0	65	85	79
ARY454105+HSMSO	0.28+0.5%	0	67	89	81
ARY454105+BB	0.28+1%	0	66	89	77
ARY454105+NIS+AMS	0.28+0.25%+12	0	66	86	80
ARY454105+MSO+AMS	0.28+1%+12	0	67	84	78
ARY454105+OBS	0.28+0.25%	0	65	92	78
ARY454105+ARY-0546+ARY-547+BB	0.28+0.23+0.075+1%	0	69	94	77
Pinoxaden+Clpy&Flox+MCPA	0.86+3+4	0	89	97	78
Pxlm&Flas&Flox+MSO	1.67+1%	0	71	96	74
Untreated	0	0	0	0	81
CV		0	4	3	4
LSD 5%		0	4	4	5

Herbicides did not cause injury to wheat. Adjuvants initially promoted more injury from flucarbazone to yellow foxtail. However, flucarbazone without adjuvant provided 91% control of foxtail on July 7. This was similar across all flucarbazone treatments except with MSOBB, which only gave 85% control, MSO plus AMS at 84%, and NIS plus AMS at 86%. This research differs from several other yellow foxtail studies that indicated nitrogen improved flucarbazone activity. Although it should be noted that in those other studies the nitrogen source was UAN. And in one study, flucarbazone appeared to precipitate when AMS was included in the treatment. Pinoxaden and pyroxsulam ultimately provided better control than the average of flucarbazone treatments. Wheat height was not adversely affected by flucarbazone, but slightly shorter wheat was measured in pyroxsulam plots.

Foxtail control with flucarbazone (ARY454) and adjuvants. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Prosper, North Dakota on May 20. Treatments were applied to 2 leaf wheat, 3 to 10 inch pigweed, and 1 to 2 leaf yellow foxtail on June 14 with 61°F, 90% relative humidity, 90% cloud cover, 2 to 4 mph wind at 45°, and dry soil at 57°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/30 Wheat	6/30 Yeft	6/30 Rrpw	7/8 Yeft
	oz ai/A	%	%	%	%
ARY454105	0.28	0	50	80	50
ARY454105+NIS	0.28+0.25%	0	71	86	77
ARY454105+ClassANG	0.28+2.5%	0	75	90	50
ARY454105+ClassANG+AG 02013	0.28+2.5%+4	0	76	90	78
ARY454105+AG 10003	0.28+2%	0	75	90	67
ARY454105+AG 10004	0.28+2%	0	74	87	62
ARY454105+AG 10009	0.28+2%	0	85	92	82
ARY454105+SuperbHC	0.28+16	1	72	90	60
ARY454105+Destiny HC	0.28+16	0	82	90	62
ARY454105+AG 10021	0.28+1%	0	81	92	80
ARY454105+AG 09012	0.28+1%	0	87	89	82
ARY454105+AG 09053	0.28+1.5%	0	82	90	75
ARY454105+AG 07043	0.28+1%	0	74	80	77
Untreated	0	0	0	0	0
CV		748	7	5	9
LSD 5%		1	7	6	9

Treatments essentially did not injure wheat. On June 30, all adjuvants improved control of yellow foxtail with flucarbazone by more than 20 percentage points. Adjuvants also increased control of redroot pigweed by 6 to 12 points, except AG 07043. AG 09012 and 10009 improved control of foxtail by the greatest margin across both evaluation dates.

Enhance foxtail control with Tribenuron. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 28. Treatments were applied to 3 to 4 leaf wheat and 2 to 3 leaf yellow foxtail on June 7 with 67°F, 71% relative humidity, 10% cloud cover, 1 to 2 mph wind at 135°, and dry soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

	Rate	6/22 Wheat	6/22 Yeft	7/7 Wheat	7/7 Yeft
Treatment	ai/A	%	%	%	%
Flcz+2,4-D+BB	0.32+2.5+1%	6	71	8	93
Flcz+2,4-D+Thif-sg+BB	0.32+2.5+0.2+1%	7	75	13	93
Flcz+2,4-D+Trib-sg+BB	0.32+2.5+0.2+1%	7	76	6	95
Flcz+2,4-D+Thif-sg+Trib-sg+BB	0.32+2.5+0.1+0.1+1%	10	74	8	96
Flcz+2,4-D+Thif-sg+Trib-sg+BB	0.32+2.5+0.15+0.15+1%	8	75	10	94
Prcz&Mess+MSO	0.2+24	3	25	1	35
Prcz&Mess+Trib-sg+MSO	0.2+0.2+24	1	42	1	84
Prcz&Mess+Thif-sg+Trib-sg+MSO	0.2+0.15+0.15+24	1	52	1	82
Pxlm&Flas&Flox+BB	1.69+1%	3	69	1	93
Pxlm&Flas&Flox+Trib-sg+BB	1.69+0.2+1%	1	72	1	95
Pxlm&Flas&Flox+Thif-sg+Trib-sg+BB	1.69+0.15+0.15+1%	3	75	1	92
Trib-sg+BB	0.2+1%	1	40	0	82
Thif-sg+Trib-sg+BB	0.15+0.15+1%	2	3	2	79
Untreated	0	0	0	0	0
CV		57	10	93	4
LSD 5%		3	8	5	5

Flucarbazone caused substantial injury mainly observed as stunting of plants. This injury persisted through the season but did not appear to affect grain production. Inclusion of tribenuron tended to improve consistency and control of yellow foxtail, especially for propoxycarbazone and mesosulfuron, which typically provides minimal yellow foxtail suppression. In this study, foxtail control with tribenuron alone was near 80% aided by vigorous crop competition. This degree of control typically is not observed with tribenuron alone on yellow foxtail.

Volunteer barley control in wheat. Howatt, Roach, Harrington. 'Faller' hard red spring wheat and Lacey barley were seeded at Fargo April 27. Preemergence treatments were applied April 29 with 54°F, 80% relative humidity, 100% cloud cover, 6 mph wind at 135° and moist soil at 50° F. Post treatments were applied May 26 to 3 leaf wheat and barley and 2 to 6 leaf wild mustard on May 26 with 75° F, 37% relative humidity, clear sky, 4.5 mph wind at 315° and dry soil at 60° F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. The experiment was over sprayed for broadleaf weed control.

Treatment	Rate	Grow	6/9 Voba	6/29 Voba
	oz ai/A	Stg	%	%
Flucarbazone	0.21	Pre	0	7
Flucarbazone	0.42	Pre	0	35
Propoxycarbazone	0.21	Pre	0	2
Propoxycarbazone	0.42	Pre	0	5
Mesosulfuron	0.057	Pre	0	2
Mesosulfuron	0.085	Pre	0	0
Flucarbazone	0.42	2-L	30	81
Flucarbazone	0.84	2-L	42	90
Propoxycarbazone	0.42	2-L	65	97
Propoxycarbazone	0.84	2-L	77	99
Mesosulfuron	0.057	2-L	0	2
Mesosulfuron	0.085	2-L	0	0
Pyroxsulam&Florasulam&Fluroxypyr	1.69	2-L	0	16
Pyroxsulam&Florasulam&Fluroxypyr	3.4	2-L	0	39
Untreated	0		0	0
CV			14	24
LSD 5%			3	11

Flucarbazone at 0.42 (2X label rate) gave 35% control of volunteer barley when applied PRE, while other herbicides were not different from the untreated. Of POST treatments, propoxycarbazone and flucarbazone provided the best activity. Propoxycarbazone at 0.42 oz ai/A provided 97% control. The highest rate of flucarbazone allowed by the label gave 81% control. These two products greatly reduced the contamination of wheat with barley grains (data still in processing to determine extent).

Broad spectrum weed control in cereals. Howatt, Roach, and Harrington. 'Lacy' barley was seeded May 18. Treatments were applied to 2 to 3 leaf barley, 6 to 12 inch wild mustard, 2 to 3 inch wild buckwheat, and 1 to 4 inch common ragweed on June 14 with 53°F, 99% relative humidity, 80% cloud cover, 1 to 2 mph wind at 135° and wet soil at 55°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles 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. Harvest was on August 9.

	Rate	6/29 Barley	6/29 Yeft	6/29 Wibw	6/29 Wimu	7/16 Barley	7/16 Yeft	7/16 Wibw	8/9 Yield
Treatment	oz ai/A	%	%	%	%	%	%	%	bu/A
Pxdn&Flas+MCPA+Adigor	0.93+4+9.6	0	90	94	97	0	91	50	63
Pxdn&Flas+Brox&MCPA5+Adigor	0.93+8+9.6	0	91	92	98	0	97	98	64
Pxdn&Flas+Dica&Flox+Adigor	0.93+1.75+9.6	0	85	86	96	0	95	92	62
Pxdn&Flas+Clpy&Flox+Adigor	0.93+3+9.6	1	93	93	92	0	92	98	64
Pxdn+Flas&MCPA	0.86+0.38	0	90	93	98	0	97	98	65
Pxdn+Brox&MCPA5	0.86+8	0	91	94	98	0	96	97	67
Pxdn+Dicamba&Flox	0.86+1.75	0	91	82	96	0	98	93	62
Pxdn+Clpy&Flox+MCPA	0.86+3+4	0	93	89	96	1	95	97	61
Fenx&Brox&Pyst	3.9	0	92	93	98	0	98	94	64
Pxlm&Flas&Flox+MSO	1.69+24	11	89	89	96	3	91	93	59
Prcz&Mess+Clpy&Flox+MSO	0.2+3+24	4	27	30	94	0	69	0	53
Flcz+Carf&2,4-D+Basic Blend	0.32+4.13+1%	22	86	88	98	10	74	82	54
Untreated	0	0	0	0	0	0	0	0	55
CV		60	3	4	1	115	4	4	6
LSD 5%		2	3	5	2	2	5	5	5

Grass herbicides that inhibit ALS caused as much as 22% barley injury on June 29. Flucarbazone was the most injurious to barley, still causing 10% injury July 16. The effect of this injury resulted in less barley yield than from other herbicide-treated plots with similar weed control. Many treatments that included pinoxaden provided greater than 90% weed control. Pyroxsulam and florasulam and fluroxypyr also gave more than 90% control, but barley with pinoxaden treatments tended to provide greater yield than with pyroxsulam.

Station Broadleaf Control. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Blanchard on April 25. Treatments were applied to 3 leaf wheat, 2 to 3 inch common lambsquarters, and 1 to 3 inch kochia on June 2 with 62°F, 55% relative humidity, clear sky, 1 to 2 mph wind at 45°, and moist soil at 55°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles 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. Harvest of Reps 2, 3 and 4 was on August 9.

Treatment	Rate	6/8 Wht	6/21 Wht	6/21 Kocz	6/21 Colq	7/9 Koch	7/9 Colq	8/9 Yield
	oz ai/A	%	%	%	%	%	%	bu/A
Fluroxypyr&MCPA	8	4	0	95	94	98	99	63
Clopyralid&Fluroxypyr	3	5	0	95	90	96	96	75
Clpy&Flox+Thif-sg+Trib-sg	2+0.1+0.1	1	0	95	91	99	99	66
Thif-sg+Trib-sg+Sword+NIS	0.24+0.06+4+0.25%	1	0	92	95	95	97	64
Thif-sg+Trib-sg+Salvo+NIS	0.15+0.15+4+0.25%	1	0	94	91	97	98	61
Carfentrazone&2,4-D+NIS	4.1+0.25%	12	0	94	94	98	98	59
Pyraflufen+Salvo+NIS	0.013+4+0.25%	9	0	95	94	92	94	69
Brox&MCPA5	8	6	0	91	94	95	96	61
Brox&Pyrasulfotol	2.9	6	0	93	95	97	97	72
Florasulam&MCPA+NIS	5.07+0.25%	3	0	84	92	98	97	62
Dicamba&Fluroxypyr	1.85	11	0	94	92	96	96	55
Clopyralid&MCPA	9.4	6	0	76	92	69	94	63
Untreated	0	0	0	0	0	0	0	53
CV		31	0	3	3	3	2	18
LSD 5%		2	0	3	3	4	2	19

All herbicides caused visible plant response, and most responses were different from the untreated except when thifensulfuron and tribenuron were included in the treatment. Wheat injury was not observed on June 21 from any treatment. All herbicides provided at least 90% control of lambsquarters. Only florasulam and MCPA or clopyralid and MCPA gave less than 90% control of kochia. All herbicides tended to result in greater wheat yield than the control, but few differences were determined because of large variation within treatment.

Broadleaf weed control in wheat, Langdon. Lukach, Howatt, and Harrington. Hard red spring wheat was seeded at Langdon. Treatments were applied to 3 leaf wheat, cotyledon to 4 leaf wild mustard, and 1 to 3 inch common chickweed. Treatments were applied with a tractor sprayer delivering 10 gpa at 35 psi 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	6/30 wht	6/30 wimu	6/30 cocw	7/22 wht	7/22 wimu	7/22 cocw
	oz ai/A	%	%	%	%	%	%
Flox&MCPA	8	0	95	77	0	99	79
Clpy&Flox	3	0	89	81	0	75	85
Clpy&Flox+Thif-sg+Trib-sg	2+0.1+0.1	0	96	94	0	97	99
Thif-sg+Trib-sg+Sword+NIS	0.24+0.06+4+0.25%	0	95	93	0	99	98
Thif-sg+Trib-sg+Salvo+NIS	0.15+0.15+4+0.25%	0	94	94	0	97	98
Carfentrazone&2,4-D+NIS	4.1+0.25%	16	98	80	14	99	37
Pyraflufen+Salvo+NIS	0.013+4+0.25%	0	95	84	0	99	57
Bromoxynil&MCPA5	8	0	98	56	0	99	5
Bromoxynil&Pyrasulfotol	2.9	0	98	82	0	99	82
Florasulam&MCPA+NIS	5.07+0.25%	0	95	94	0	99	95
Dicamba&Flox	1.85	0	89	89	0	70	65
Clpy&MCPA	9.4	0	93	70	0	99	66
Untreated	0	0	0	0	0	0	0
CV		55	2	6	66	15	20
LSD 5%		1	3	7	1	18	19

Carfentrazone and 2,4-D caused wheat injury that persisted through most of the growing season. This injury was observed as necrotic flecks and spots giving the foliage a ragged appearance. Wild mustard control with clopyralid and fluroxypyr or dicamba and fluroxypyr was less than with other herbicides, leaving some pants to flower while mustard was nearly absent in other herbicide plots. Treatments that included ALSinhibiting herbicides provided better control of common chickweed than other treatments. Chickweed control with bromoxynil and MCPA was almost non-distinguishable from the untreated because of vigorous regrowth.

Kochia control in wheat. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Blanchard on April 25. Treatments were applied June 2 to 3 leaf wheat, flowering common dandelion, 2 to 3 inch common lambsquarters, and 1 to 3 inch kochia on June 2 with 62°F, 55% relative humidity, clear sky, 1 to 2 mph wind at 45°, and moist soil at 55°F. Treatments were applied with a backpack type sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles 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. Harvest of Reps 2, 3, and 4 was on August 16.

		6/8	6/8	6/8	6/8	6/21	6/21	6/21	7/9	7/9	8/03	8/03	8/16
Treatment	Rate	Wheat	Kochia	Common Lambsquarters	Common dandelion	Wheat	Kochia	Common lambsquarters	Kochia	Commom lambsquarters	Kochia	Common lambsquarters	Yield
	ai/A	%	%	%	%	%	%	%	%	%	%	%	bu/A
Brox&Pyst+AMS	2.83+8	8	76	81	57	0	95	95	99	97	99	99	75
Clpy&Flox+MCPA	2.25+4	4	72	72	40	0	95	95	99	99	99	99	81
Thif-sg+Trib-sg+Flox+NIS	0.24+0.06+1+0.25%	1	69	71	47	0	95	95	97	97	99	99	72
Pxlm&Flax&Flox+NIS	1.69+0.25%	15	64	65	42	0	95	93	98	98	99	99	73
Dicamba&Flox+NIS	1.75+0.25%	3	71	72	32	0	95	95	96	95	99	99	80
Brox&Flox+NIS	5+0.25%	6	76	76	32	0	95	91	96	84	99	99	72
Carf&2,4-D+NIS	4.13+0.25%	17	87	91	47	0	94	95	97	97	99	99	78
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	73
CV		35	7	5	25	0	1	1	1	3	0	0	8
LSD 5%		4	7	5	14	0	1	1	1	4	0	0	10

All herbicides caused noticeable wheat response, and most responses were determined greater than the untreated in severity. These responses were not apparent on June 21, even for carfentrazone that caused necrotic lesions. Carfentrazone and 2,4-D also provided the most rapid control of kochia and lambsquarters, near 90% in 6 days. All herbicides gave greater than 90% control of kochia and lambsquarters by June 21. Injury to dandelion diminished as the season progressed.

Kochia control in wheat, Exp 2. Lukach, Howatt, and Harrington. Barley was seeded at Langdon. Treatments were applied to 2 to 4 leaf barley and 1 to 3 inch kochia. Treatments were applied with a tractor sprayer delivering 10 gpa at 35 psi 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	6/30 Barley	6/30 Kochia	7/22 Kochia
	oz ai/A	%	%	%
Brox&Pyst+AMS	2.83+8	0	70	93
Clpy&Flox+MCPA	2.25+4	0	75	86
Thif-sg+Trib-sg+Flox+NIS	0.24+0.06+1+0.25%	0	74	88
Pxlm&Flas&Flox+NIS	1.69+0.25%	0	74	94
Dicamba&Flox+NIS	1.75+0.25%	0	77	94
Brox&Flox+NIS	5+0.25%	0	81	92
Carfentrazone&2,4-D+NIS	4.13+0.25%	6	89	87
Untreated	0	0	0	0
CV		135	4	3
LSD 5%		2	4	3

Typical carfentrazone injury of necrotic speckling was evident on barley June 30, but lesions were not observed at the July evaluation. Carfentrazone and 2,4-D again resulted in the most rapid control of kochia, 89% compared with 70 to 81%, on June 30. Kochia control with bromoxynil and pyrasulfotole at the end of the season was as effective as several treatments that included fluroxypyr.

BAS810H use in wheat. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Blanchard, ND on April 25. Treatments (2.5 leaf) were applied to 2.5 leaf wheat, flowering dandelion, 2 to 3 inch common lambsquarters, and 1 to 3 inch kochia on June 2 with 65°F, 50% relative humidity, clear sky, 3 mph wind at 45°, and moist soil at 60°F. Treatments (5 leaf) were applied to 5 leaf wheat, flowering dandelion, and 4 to 5 inch common lambsquarters and kochia on June 11 with 60°F, 79% relative humidity, 100% cloud cover, 3 mph wind at 135°, and wet soil at 55°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest of Reps 2, 3, and 4 was August 16.

Treatment	Rate	Grow	6/8 Wheat	6/8 Kochia	6/8 Common lambsquarters	6/8 Common dandelion	6/21 Wheat	6/21 Kochia	6/21 Common lambsquarters
	oz ai/A	Stg							
BAS810+2,4-D+NIS	2+8+0.25%	2.5 L	11	75	71	61	3	94	91
Dicamba-B+2,4-D+NIS	2+8+0.25%	2.5 L	19	74	75	50	5	95	91
Brox&MCPA5+NIS	8+0.25%	2.5 L	6	67	72	57	0	95	94
Flox+Thif-sg+NIS	1.5+0.2+0.25%	2.5 L	5	70	71	55	1	94	93
BAS810+2,4-D+NIS	2+8+0.25%	5L					4	85	82
Dicamba-B+2,4-D+NIS	2+8+0.25%	5L					14	85	84
Brox&Pyst+NIS+AMS	2.83+0.25+8	5L					0	80	77
Flox+Thif-sg+NIS	1.5+0.2+0.25%	5L					0	85	81
Untreated							0	0	0
CV			18	4	6	9	36	2	3
LSD 5%			3	5	7	8	1	2	3

Table cont.

Treatment	Rate	Grow	7/9 Wheat	7/9 Kochia	7/9 Common lambsquarters	8/3 Reduction height	8/3 Kochia	8/3 Commom lambsquarters	8/16 Yield
	oz ai/A	Stg				cm			bu/A
BAS810+2,4-D+NIS	2+8+0.25%	2.5 L	2	98	98	2	99	99	82
Dicamba-B+2,4-D+NIS	2+8+0.25%	2.5 L	9	99	99	6	99	99	74
Brox&MCPA5+NIS	8+0.25%	2.5 L	0	98	98	0	99	99	76
Flox+Thif-sg+NIS	1.5+0.2+0.25%	2.5 L	0	97	98	0	99	99	84
BAS810+2,4-D+NIS	2+8+0.25%	5L	7	96	97	4	99	99	73
Dicamba-B+2,4-D+NIS	2+8+0.25%	5L	24	93	95	18	98	98	59
Brox&Pyst+NIS+AMS	2.83+0.25+8	5L	0	91	89	0	97	97	77
Flox+Thif-sg+NIS	1.5+0.2+0.25%	5L	0	85	85	0	99	99	79
Untreated			0	0	0	0	0	0	76
			31	2	1	29	1	1	7
			2	2	2	1	1	1	9

Dicamba plus 2,4-D caused the most injury to wheat, especially when applied to wheat with 5 leaves. BAS810 also caused injury that lasted through the season, with damage from either herbicide causing height reduction. Herbicide injury when applied to 2.5 leaf wheat did not seem to affect wheat yield, but dicamba plus 2,4-D applied to 5 leaf wheat resulted in 30% less yield than wheat in the best treatment.

Dicamba&Fluroxypyr efficacy at different kochia sizes. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Blanchard, North Dakota on April 25. Treatments (1 thought 6) were applied to 3.5 leaf wheat, 2 to 3 inch common lambsquarters, and 1 to 3 inch kochia on June 2 with 65°F, 50% relative humidity, clear sky, 3 mph wind at 45°, and moist soil at 60°F. Treatments (7 through 12) were applied to 5 leaf wheat and 5 inch common lambsquarters and kochia on June 11 with 60°F, 79% relative humidity, 100% cloud cover, 3 mph wind at 135°, and wet soil at 55°F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest of Reps 2, 3, and 4 was on August 16.

Treatment	Rate	6/4 Wheat	6/8 Wheat	6/21 Wheat	6/21 Kochia	6/21 Common lambsquarters	7/9 Wheat	7/9 Kochia	7/9 Common lambsquarters	8/3 Reduction height	8/3 Kochia	8/3 Common lambsquarters	8/16 Yield
	oz ai/A	%	%	%	%	%	%	%	%	cm	%	%	bu/A
Dica&Flox+NIS	1.75+0.25%	3	6		95	95	0	99	99	0	99	99	77
Dica&Flox+NIS	2.2+0.25%	3	8		95	95	1	99	99	0	99	99	66
Dica&Flox+NIS	2.6+0.25%	4	15		95	95	1	99	99	0	99	99	66
Dica&Flox+MCPA+NIS	1.75+4+0.25%	4	6		95	95	1	98	98	0	99	99	67
Dica&Flox+MCPA+NIS	2.2+4+0.25%	4	11		95	95	2	98	99	0	99	99	59
Brox&Pyst+NIS+AMS	2.83+0.25%+16	0	6		99	96	2	99	98	0	99	99	62
Dica&Flox+NIS	1.75+0.25%			0	84	71	10	89	90	6	99	99	69
Dica&Flox+NIS	2.2+0.25%			0	85	75	10	93	93	6.8	99	99	58
Dica&Flox+NIS	2.6+0.25%			0	87	76	12	92	94	6.8	99	99	61
Dica&Flox+MCPA+NIS	1.75+4+0.25%			0	85	79	11	95	95	8.5	99	99	65
Dica&Flox+MCPA+NIS	2.2+4+0.25%			0	85	80	11	92	95	9	99	99	63
Brox&Pyst+NIS+AMS	2.83+0.25%+16			0	79	72	0	89	91	0	92	98	53
Untreated	0			0	0	0	0	0	0	0	0	0	64
CV		26	20	0	2	2	26	1	1	29	1	1	16
LSD 5%		1	3	0	2	2	2	2	2	1	1	1	18

Substantial injury was observed that was typical of dicamba symptoms. This injury increased with increasing dicamba rate when applied early but was quite consistent when applied late. Injury from the early application of dicamba and fluroxypyr diminished as the season progressed, but injury noticed at the later application, which was beyond the suggested application window, persisted and resulted in nearly 10 cm shorter plants. The injuries sustained did not adversely affect yield. In general, weedcontrol was similar within an application timing.

2010 Evaluation of Weed Control with Orion and Pulsar Tank Mixes on Spring Wheat

Eric Eriksmoen, Hettinger, ND

'Howard' HRSW was seeded on April 15. Treatments were applied on May 29 to 4 leaf wheat and to 1" kochia (kocz), 1" Russian thistle (ruth), 2 leaf volunteer Roundup Ready canola (vcan) and to 4" field bindweed (fibw) with 75° F, 80% RH, mostly sunny sky and east 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 trial was over-sprayed with 16 oz/A Axial XL on June 6 to control grassy weeds. 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. Weed populations for kochia, Russian thistle, volunteer canola and field bindweed were 38, 14, 3 and 1 plants per square foot, respectively. Plots were evaluated for crop injury on June 15 and for weed control on July 1 and July 29. The trial was harvested on August 2.

			6/15	July 1				July 29			Test	Grain
	Treatment	Product rate	inj	kocz	ruth	vcan	fibw	kocz	ruth	fibw	weight	yield
		oz/A	% control								lbs/bu	bu/A
1	Untreated		0	0	0	0	0	0	0	0	56.2	28.4
2	Pulsar + NIS	8.3 + 0.25%	2	96	94	58	88	98	95	87	56.1	38.9
3	Pulsar + MCPA ester + NIS	8.3 + 8.64 + 0.25%	1	98	94	99	96	98	94	97	55.8	27.9
4	Pulsar + Affinity TM + NIS	8.3 + 0.6 + 0.25%	1	97	98	99	94	99	97	89	57.0	38.2
5	Orion + Starane	17 + 5.33	0	90	90	99	92	92	74	76	56.0	38.4
6	Orion + Buctril	17 + 16	0	94	99	99	97	68	99	91	57.1	38.6
7	Orion	17	0	60	55	99	91	28	25	89	57.0	37.2
8	Pulsar + WideMatch + Affinity TM + NIS	8.3 + 16 + 0.2 + 0.25%	2	98	99	99	97	98	98	97	58.4	39.2
9	Huskie + AMS + NIS	11 + 0.5 lb + 0.25%	0	90	99	99	45	60	94	46	55.9	27.6
10	WideMatch + MCPA ester	16 + 8	0	91	94	99	94	94	98	96	57.6	35.4
11	Affinity TM + MCPA ester	0.6 + 8	0	32	82	99	95	12	90	91	56.7	36.4
	C.V. %		191	14	10	13	13	21	14	17	2.5	11.5
	LSD .05		NS	16	11	16	15	21	16	19	NS	5.9

NS = no statistical difference between treatments

Summary

Crop injury was minimal when observed and quickly diminished. Pulsar alone (trt 2) provided excellent season long control of kochia and Russian thistle, good control of field bindweed but was weak on volunteer canola. Pulsar tank mixes (trts 3, 4 & 8) all provided excellent season long control of kochia, Russian thistle, volunteer canola and field bindweed. Orion alone (trt 7) provided good season long control of volunteer canola and field bindweed but was weak on kochia and Russian thistle. The addition of Starane (trt 5) enhanced season long control of both kochia and Russian thistle but Russian thistle control was still marginal. The addition of Buctril to Orion (trt 6) also enhanced control of both kochia and Russian thistle but season long kochia control was marginal. Statistical differences between treatments for grain yield were observed but are believed to be mostly due to effects of an uncontrolled downy brome infestation.

Huskie for broadleaf weed control in durum wheat. Williston. 2010. Neil Riveland.

'Alkabo' durum wheat was planted notill into wheat stubble from 2009 in 7 inch rows at 90 lbs/a on April 28. All treatments were applied on June 2 with 63 F air temperature, 58 degree soil temperature, 65% relative humidity, 50% clear sky and wind at 3-5 mph from 152 degrees to 4.5 leaf wheat and 1-2 inch Russian thistle (Ruth), common lambsquarters (Colq), and wild buckwheat (Wibu). We used a small plot sprayer with wind cones, mounted on a G-Allis Chalmers tractor to apply the treatments, delivering 10 gals/a at 40 psi through 8001vs flat fan nozzles to a 6.67 ft wide area the length of 10 by 30 ft plots. First rain received after application was 0.35 inches on June 3. Experimental design was a randomized complete block design with three replications. Broadleaf weed densities were moderate to heavy. Plots were evaluated for crop injury on June 10 and weed control and crop injury on June 15 and July 11. No crop injury was observed for any treatment at any time. Drought stress was evident on wild buckwheat at the July 11 rating. Durum was machine harvested for yield on August 20.

		% Control						Crop	
		Ruth		Colq		Wibw			
Treatment a	Product Rate oz/a	6/15	7/11	6/15	7/11	6/15	7/11	Test Weight lbs/bu	Yield bus/a
Untreated	0	0	0	0	0	0	0	58.3	12.3
Huskie+Dry AMS	11+8	98	99	99	99	99	99	59.3	17.5
Huskie+Dry AMS	13.5+8	96	99	99	99	96	96	59.3	16.7
Huskie+Dry AMS	15.0+8	97	96	99	99	98	98	59.2	17.0
Huskie+Dry AMS +NIS	13.5+8+0.25%V/V	98	98	99	99	96	96	59.2	16.2
Widematch+MCPA Ester	16+8	72	95	73	98	83	93	59.5	15.1
Affinity TM+Starane+NIS	0.6+5.28+0.25%	89	94	93	99	75	90	59.3	19.5
Huskie+Dry AMS+MCPA	11+8+4	98	96	99	99	99	99	59.1	18.1
HIGH MEAN		98	99	99	99	99	99	59.5	19.5
LOW MEAN		0	0	0	0	0	0	58.3	12.3
EXP MEAN		81	85	83	86	81	84	59.2	16.5
C.V. %		5	5	8	1	6	3	.3	12.4
LSD 5%		7	8	11	2	9	4	.5	3.6
LSD 1%		10	11	15	2	12	6	.7	NS
# OF REPS		3	3	3	3	3	3	2	3
F-TRT		226	4173	92	994	145	534	7.1	3.3

a - NIS - Induce

Summary: All herbicide treatments adequately controlled broadleaf weeds present. Wudematch was slower to control all weeds present and tended to yield less than other herbicide treatments.

Broadleaf weed control with Wolverine herbicide in spring wheat, Carrington, 2010. (Greg Endres). 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 April 23 on a conventionally-tilled loam soil. 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 June 2 with 65 F, 42% RH, 50% clear sky, and 8 mph wind to 4-leaf wheat, 0.5- to 3-inch tall common lambsquarters, 1-inch tall prostrate and redroot pigweed, and 2-inch tall wild buckwheat. Puma herbicide at 6.4 fl oz/A was sequentially applied on June 2 to plots previously receiving treatment numbers 3 and 4. Average plant density (ft^2) in untreated plots on June 2: wheat=26, common lambsquarters=103, pigweed species=7 and wild buckwheat=1. The trial was harvested with a plot combine on August 6.

Common lambsquarters and redroot pigweed control was good to excellent (88-92%) with Wolverine when visually evaluated on June 11 (Table). Broadleaf weed control generally was excellent among herbicides when evaluated on July 1 and 30. A dense stand of green and yellow foxtail was present below the crop canopy on July 30. No crop response was noted when visually evaluated on June 11. Highest seed yield was associated with Wolverine, WideMatch plus Sword, and Goldsky.

Table.

		Weed control[1]						Wheat
Herbicide		11-Jun		1-Jul		30-Jul		Seed
Treatment[2]	Rate	Colq	Rrpw	Colq	Rrpw	Colq	Rrpw	yield
	fl oz product/A	%						bu/A
Untreated check	x	0	0	0	0	0	0	37.0
Wolverine	27.4	92	88	99	96	99	99	55.1
WideMatch + Sword	12 + 6	73	57	98	80	96	95	48.5
Orion	17	70	68	97	90	99	99	44.4
Goldsky + NIS	16 + 0.25%	71	NA	92	99	87	99	52.4
C.V. (%)		5.2	13.8	2.0	6.8	6.5	2.9	10.7
LSD (0.05)		6	15	3	9	9	4	9.6

[1]Colq=Common lambsquarters; Rrpw=redroot pigweed.

[2]NIS=Preference (Winfield Solutions).

2010 Evaluation of Broadleaf Herbicides on Spring Wheat, Trial #1

Eric Eriksmoen, Hettinger, ND

'Howard' HRSW was seeded on April 15. Treatments were applied on May 31 to 4 leaf wheat and to1" kochia (kocz), 2" Russian thistle (ruth), 6" field bindweed (fibw), 4 leaf wild buckwheat (wibw) and to 4 leaf volunteer Roundup Ready canola (vcan) with 57° F, 81% RH, mostly sunny sky and southwest 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 trial was over-sprayed on June 5 with 16 oz/A Axial XL to control grassy weeds. 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. Weed populations for kochia, Russian thistle, field bindweed, wild buckwheat and volunteer canola were 17, 6, 0.75, 0.75 and 1.5 plants per square foot, respectively. Plots were evaluated for crop injury on June 7 and June 15, and for weed control on June 15, July 1 and July 29.

	Treatment	Product rate	6/7	June 15				
			inj	inj	kocz	ruth	wibw	fibw	vcan
		oz/A	% control						
1	Untreated		0	0	0	0	0	0	0
2	Wolverine	27.4	0	0	90	91	91	35	95
3	WideMatch + MCPA	12 + 8	0	0	58	69	88	72	92
4	Orion	17	0	0	13	27	87	47	88
5	GoldSky + NIS	16 + 0.25%	0	0	88	89	90	72	95
	C.V. %		0	0	24	23	4	48	4
	LSD .05		NS	NS	19	20	4	34	4

NS = no statistical difference between treatments

	Treatment	Product rate	July 1					July 29			
			kocz	ruth	wibw	fibw	vcan	kocz	ruth	wibw	fibw
		oz/A	% control								
1	Untreated		0	0	0	0	0	0	0	0	0
2	Wolverine	27.4	92	97	97	82	99	89	99	94	50
3	WideMatch + MCPA	12 + 8	90	94	98	90	92	91	91	94	78
4	Orion	17	77	76	93	90	99	18	65	92	48
5	GoldSky + NIS	16 + 0.25%	94	97	96	90	99	91	88	99	70
	C.V. %		13	12	5	6	5	18	21	5	65
	LSD .05		15	14	6	6	6	16	22	6	49

NS = no statistical difference between treatments

Summary

Crop injury was not observed. All herbicide treatments provided excellent season long control of wild buckwheat and volunteer canola. With the exception of Orion (trt 4), all herbicide treatments provided good season long control of kochia and Russian thistle. Herbicide treatments provided poor season long control of field bindweed.

2010 Evaluation of Broadleaf Herbicides on Spring Wheat, Trial #2

Eric Eriksmoen, Hettinger, ND

'Howard' HRSW was seeded on April 15. Treatments were applied on May 31 to 4 leaf wheat and to1" kochia (kocz), 2" Russian thistle (ruth), 6" field bindweed (fibw), 4 leaf wild buckwheat (wibw) and to 4 leaf volunteer Roundup Ready canola (vcan) with 63° F, 61% RH, sunny sky and south wind at 4 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 trial was over-sprayed on June 5 with 16 oz/A Axial XL to control grassy weeds. 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. Weed populations for kochia, Russian thistle, field bindweed, wild buckwheat and volunteer canola were 50+, 12, 0.75, 0.75 and 2 plants per square foot, respectively. Plots were evaluated for crop injury on June 7 and June 15, and for weed control on June 15, July 1 and July 29. The trial was harvested on August 2.

	Treatment	Product rate	6/7	June 15					July 1			
			inj	inj	kocz	ruth	fibw	wibw	vcan	kocz	ruth	fibw	vcan
		oz/A	% control										
1	Untreated		0	0	0	0	0	0	0	0	0	0	0
2	Wolverine	27.4	0	0	85	90	58	80	91	92	94	63	99
3	WideMatch + MCPA	12 + 8	0	0	89	84	90	89	92	92	96	97	99
4	Orion	17	0	0	71	84	50	75	92	50	30	96	98
5	GoldSky + NIS	16 + 0.25%	0	0	90	90	76	78	90	92	95	91	99
	C.V. %		0	0	10	5	29	16	3	4	17	23	1
	LSD .05		NS	NS	11	6	24	16	3	4	16	25	1

NS = no statistical difference between treatments

	Treatment	Product rate	July 29			Test weight	Grain yield
			kocz	ruth	fibw		
		oz/A	% control			lbs/bu	bu/A
1	Untreated		0	0	0	58.5	49.3
2	Wolverine	27.4	84	99	45	57.5	53.0
3	WideMatch + MCPA	12 + 8	92	96	88	58.9	47.8
4	Orion	17	26	50	96	59.0	48.1
5	GoldSky + NIS	16 + 0.25%	90	90	68	56.2	53.6
	C.V. %		21	8	36	2.4	8.4
	LSD .05		19	8	33	NS	NS

NS = no statistical difference between treatments

Summary

Crop injury was not observed. All herbicide treatments provided excellent control of volunteer canola. Wolverine (trt 2) provided excellent season long control of Russian thistle but only marginal control of wild buckwheat and kochia, and poor control of field bindweed. WideMatch + MCPA (trt3) provided excellent season long control of kochia, Russian thistle and wild buckwheat, and good control of field bindweed. Orion (trt 4) provided excellent season long control of field bindweed but only marginal control of kochia, Russian thistle and wild buckwheat. GoldSky (trt 5) provided excellent season long control of kochia and Russian thistle but only marginal control of wild buckwheat and field bindweed. There were no statistical differences for test weight or grain yield between treatments.

Wild buckwheat control with pyrasulfotol. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Fargo on April 21. Treatments were applied to 3 leaf wheat, 3 leaf wild mustard, 2 to 3 leaf common lambsquarters, and 1 to 4 leaf wild buckwheat on June 1 with 65°F, 63% relative humidity, 80% cloud cover, 6 mph wind at 360° and moist soil at 60°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest was on August 17.

Treatment	Rate	6/10 wht	6/10 wimu	6/10 wibw	6/10 colq	6/19 wimu	6/19 wibw	6/19 colq	6/30 wimu	6/30 wibw	6/30 colq	8/17 Yield
	oz ai/A	%	%	%	%	%	%	%	%	%	%	bu/A
Brox&MCPA5	8	0	90	82	85	96	89	93	95	87	96	27
Fenx&Brox&Pyst	3.9	0	93	73	80	98	92	85	98	83	80	26
Brox&Pyst	2.83	0	93	82	83	98	78	80	98	90	93	26
Carf&2,4-D	4.13	0	87	83	85	96	72	83	95	68	95	25
Dicamba&Flox	1.75	0	77	73	73	85	83	80	89	92	89	27
Thif+Trib+MCPA+NIS	0.24+0.06+4+0.25%	0	85.	82	85	92	92	94	95	95	96	25
Flas&MCPA	5	0	85	72	70	97	90	87	98	89	95	25
Pxlm&Flas&Flox+NIS	1.69+0.25%	10	83	73	72	96	92	85	98	96	85	31
Untreated	0	0	0	0	0	0	0	0	0	0	0	17
CV		0	2	4	4	2	5	5	3	4	4	30
LSD 5%		0	3	5	5	3	7	6	5	6	5	13

Pyroxulam and florasulam and fluroxypyr caused 10% injury as chlorosis and stunting that was not detected by June 19. But weed control with this treatment was excellent through most of the season and wheat grain yield tended to be greater than other treatments. Bromoxynil and pyrasulfotole provided more rapid control of broadleaf weeds than the pyroxsulam combination and several other treatments. Across this broadleaf complex, bromoxynil and pyrasulfotole or thifensulfuron and tribenuron (3:1 ratio) plus MCPA provided the most consistent control.

Wild buckwheat control with flucarbazone premix. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded at Fargo on April 21. Treatments were applied to 3.5 leaf wheat, 3 to 5 leaf wild mustard, 4 leaf common lambsquarters, and 1 to 4 leaf wild buckwheat on June 1 with 65°F, 63% RH, 80% cloud cover, 6 mph wind at 360°, and moist soil at 60°F. Applications were applied with a backpack sprayer delivering 8.5 gpa at 35 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 three replicates.

Treatment	Rate	6/19 Wheat	6/19 Wild mustard	6/19 Wild buckwheat	6/19 Common lambsquarters	6/30 Wild mustard	6/30 Wild buckwheat	6/30 Common lambsquarters	7/29 Height
	oz ai/A	%	%	%	%	%	%	%	cm
ARY548018[a] +NIS	1.25+0.5%	0	94	85	92	95	93	96	81
ARY548018+NIS	1.56+0.5%	0	96	93	94	97	93	95	79
ARY548018+NIS	1.86+0.5%	0	96	94	96	98	96	92	78
ARY548018+MCPA	1.56+4	0	95	87	92	98	96	97	81
ARY548018+2,4-D	1.56+6	0	96	92	93	97	93	96	76
ARY548018+Brox&MCPA	1.56+8	0	97	92	96	98	92	96	80
ARY548019+ARY-thif +ARY-trib+NIS	1.8+0.23 +0.075+0.5%	0	97	93	95	96	95	97	81
ARY548003+ARY-thif +ARY-trib+NIS	1.3+0.23 +0.075+0.5%	0	96	88	92	98	93	98	80
Brox&MCPA	8	0	97	77	90	97	77	95	81
Clpy&Flox+MCPA	3+4	0	93	88	92	96	93	97	80
Brox&Pyst	2.83	0	98	73	87	95	73	85	81
Dicamba&Flox+Thif-sg +NIS	1.75+0.1 +0.5%	0	92	78	88	97	90	95	82
Untreated	0	0	0	0	0	0	0	0	78
CV		0	2	5	3	2	5	4	4
LSD %		0	3	7	5	4	7	5	5

[a] ARY548 compounds contain flucarbazone and fluroxypyr.

Treatments that included flucarbazone combinations generally gave more than 90% control of weeds present. Bromoxynil and MCPA or bromoxynil and pyrasulfotole had particular difficulty controlling wild buckwheat. None of the treatments adversely affected wheat height compared to the untreated wheat.

Wild buckwheat control with Pyraflufen. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 3 leaf wheat, 3 to 4 leaf wild mustard, 2 to 3 leaf common lambsquarters, and 1 to 4 leaf wild buckwheat on June 1 with 63°F, 60% relative humidity, 40% cloud cover, 8 to 12 mph wind at 360° and moist soil at 60°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to a 7-ft wide area the length of 10- by 30-ft plots. The experiment was a randomized complete block design with three replicates. Harvest was on August 17.

		6/10	6/10	6/10	6/10	6/19	6/19	6/19	6/30	6/30	6/30	8/17
Treatment	Rate	Wheat	Wild mustard	Wild buckwheat	Common lambsquarters	Wild mustard	Wild buckwheat	Common lambsquarters	Wild mustard	Wild buckwheat	Common lambsquarters	Yield
	oz ai/A	%	%	%	%	%	%	%	%	%	%	bu/A
GWN-9794+MCPA +NIS+UAN	0.22+5.7 +0.25%+1%	0	82	80	85	98	93	96	99	87	96	24
GWN-9795+MCPA +NIS+UAN	1.15+5.7 +0.25%+1%	0	83	77	85	95	83	92	97	83	93	25
Pyff+2,4-D +NIS+UAN	0.02+5.7 +0.25%+1%	0	83	80	87	96	80	92	97	77	95	23
Pyff+Thif&Trib+MCPA +NIS+UAN	0.02+0.375+5.7 +0.25%+1%	0	88	83	90	97	94	96	98	94	98	23
Clpy&Flox	3	0	70	67	70	90	87	85	88	95	83	21
Dicamba&Flox	1.75	0	67	70	72	87	83	85	83	90	85	17
Flas&MCPA +NIS+UAN	0.38 +0.25%+1%	0	78	65	65	97	90	87	98	89	95	21
Brox&MCPA5	8	0	92	73	82	95	78	88	95	86	96	24
Carf&2,4-D +NIS+UAN	4.13 +0.25%+1%	0	85	75	83	97	80	90	98	82	94	22
Brox&Flox	5	0	87	78	80	92	82	78	95	92	85	26
Untreated	0	0	0	0	0	0	0	0	0	0.0	0.0	19
CV		0	5	7	4	3	5	5	2	4	4	7
LSD 5%		0	6	8	5	4	7	7	3	5	5	3

Bromoxynil and MCPA provided more rapid control of wild mustard than other herbicides, but nearly all herbicides were controlling wild mustard by at least 95% by mid-June. Wild buckwheat control with clopyralid and fluroxypyr lagged behind other herbicides at first evaluation, but by mid-season, clopyralid provided 95% control of wild buckwheat. Pyraflufen plus SU and MCPA gave 94% control of buckwheat, but pyraflufen plus 2,4-D only gave 77 to 80% control. All herbicide combinations that did not include fluroxypyr eventually controlled lambsquarters by at least 93%.

Weed control with AGH 0935. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 21. Treatments were applied to 3.5 leaf wheat, 3 to 4 leaf wild mustard, 1 to4 leaf wild buckwheat, and 4 leaf common lambsquarters on June 1 with 65°F, 63% relative humidity, 80% cloud cover, 6 mph wind at 360°, and moist soil at 60°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 three replicates.

Treatment	Rate	6/19 wht	6/19 wimu	6/19 wibw	6/19 colq	6/30 wimu	6/30 wibw	6/30 colq
	oz ai/A	%	%	%	%	%	%	%
AGH 02007	7.9	0	95	87	92	98	82	96
2,4-D LV6	7.4	0	94	88	92	98	80	96
2,4-D Amine	7.6	0	93	87	92	98	80	96
AGH 09008	7	0	96	87	92	97	83	96
Unison	7	0	95	80	83	98	78	96
AGH 0935	5.8	0	94	89	93	99	96	97
AGH 0935+AG 02013	5.8+4	0	96	89	92	98	94	97
AGH 0935	8.7	0	94	96	96	99	95	97
AGH 0935+AG 02013	8.7+4	0	95	92	93	99	97	98
Brox&Pyst	2.83	0	97	88	87	99	90	95
Brox&MCPA5	8	0	97	88	90	95	87	95
Clpy&Flox	3	0	91	90	87	87	96	82
Thif-sg+2,4-D	0.3+4	0	97	95	95	98	94	98
Untreated	0	0	0	0	0	0	0	0
CV		0	2	5	4	2	3	2
LSD 5%		0	4	7	7	3	5	3

Herbicide treatments did not cause injury to wheat. AGH0935 provided similar control to 2,4-D formulations at a lower use rate. At the second evaluation, AGH0935 provided better control of wild buckwheat than 2,4-D formulations. AGH0935 gave control similar to broad spectrum commercial standards.

Gibberellic acid (GA3) effects on broadleaf weed control. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 23. Treatments were applied to 3.5 leaf wheat, 3 to 5 leaf wild mustard, 1 to 3 leaf wild buckwheat, cotyledon to 2 leaf lanceleaf sage, and 6 to 18 inch curly dock. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates.

Treatment	Rate	6/21 Wheat	6/21 Wimu	6/21 Wibw	6/21 Llsa	6/21 Cudo
	oz ai/A	%	%	%	%	%
Clfp-ng+Brox&Pyst	0.8+2.1	0	96	88	86	46
GA3+Clfp-ng+Brox&Pyst	0.4+0.8+2.1	0	96	69	87	47
Clfp-ng+Flas&MCPA	0.8+0.3	0	92	92	90	52
GA3+Clfp-ng+Flas&MCPA	0.4+0.8+0.3	0	92	89	89	62
Clfp-ng+Clpy&Flox	0.8+2.2	0	81	91	94	42
GA3+Clfp-ng+Clpy&Flox	0.4+0.8+2.2	0	80	90	74	52
Clfp-ng+Brox&MCPA5	0.8+6	0	93	80	85	45
GA3+Clfp-ng+rox&MCPA5	0.4+0.8+6	0	96	75	91	50
Clfp-ng+Dicamba&Flox	0.8+1.4	0	80	91	81	54
GA3+Clfp-ng+Dica&Flox	0.4+0.8+1.4	0	80	81	80	45
Untreated	0	0	0	0	0	0
CV		0	5	5	6	39
LSD 5%		0	6	6	7	26

The inclusion of GA3 generally did not alter the response of weed species to herbicides.

Wheat response to GA142. Howatt, Roach, and Harrington. 'Faller' hard red spring wheat was seeded near Fargo on April 23. The entire plot was over sprayed for total weed control 7 days before treatments. Treatments were applied to 5 leaf wheat, cotyledon to 3 leaf redroot pigweed, 2 to 5 leaf wild mustard, and cotyledon to 4 leaf mallow on June 3 with 78°F, 35% relative humidity, 70% cloud cover, 8 mph wind at 135°, dry soil at 63°F. Applications were made with a backpack sprayer delivering 8.5 gpa at 35 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 four replicates. Harvest was August 17.

Treatment	Rate	6/7 Wht	6/9 Wht	6/19 Wht	7/1 Wht	7/23 Wht	8/10 Wht	8/17 Yield
	oz ai/A	%	%	%	%	%	%	bu/A
GA142	16	0	0	0	0	0	0	33
GA142+2,4-D-BHF	16+5.3	0	0	0	0	0	0	37
GA142+2,4-D-BHF+CoRon	16+5.3+2G	0	0	0	0	0	0	34
GA142+Thifensulfuron	16+0.45	0	0	0	0	0	0	37
GA142+Pyraclostrobin	16+1.5	0	0	0	0	0	0	34
GA142+CoRon	16+2G	0	0	0	0	0	0	39
GA142+Thif+CoRon	16+0.45+2G	0	0	0	0	0	0	35
GA142+Thif+Pyraclostrobin+CoRon	16+0.45+1.5+2G	0	0	0	0	0	0	35
GA142+Fenx+Brox&MCPA5+CoRon	16+1.32+8+2G	0	3	0	0	0	0	34
GA142+Fenx+Brox&MCPA5+ Pyraclostrobin+CoRon	16+1.32+8+ 1.5+2G	0	3	0	0	0	0	37
Untreated	0	0	0	0	0	0	0	37
CV		0	0	0	0	0	0	8
LSD 5%		0	0	0	0	0	0	4

GA142 did not cause adverse wheat response. Short-lived wheat response was observed on June 9 that was attributed to fenoxaprop plus bromoxynil and MCPA. This injury was typical to past occasional response of wheat to this combination. None of the treatments resulted in yield that was dramatically different from the untreated, either in positive or negative direction. There were minor yield differences among treatments, but these were not consistent to any treatment component.