2009 Sharpen Herbicide in Spring Wheat

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Treatments were applied on May 12 to seedling common mallow (cmal) and wild buckwheat (wibw), ¼ inch tall kochia (kocz) and to ½ inch tall Russian thistle (ruth) with 68° F, 48% RH, cloudy sky and southeast wind at 6 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%. 'Reeder' HRSW was seeded on May 14. The trial was a randomized complete block design with four replications. Common mallow, wild buckwheat, kochia and Russian thistle populations averaged 0.8, 0.5, 14 and 26 plants per square foot, respectively. Plots were evaluated for crop injury on May 27 and June 12, and for broadleaf weed control on May 20, May 27, June 12 and on September 2. The trial was harvested on September 7.

Summary

Crop injury was not observed. All Sharpen treatments (trts 3 – 6) provided significantly higher season long kochia control than the glyphosate alone treatment (trt 2). The 1.5 oz/A Sharpen + glyphosate treatment (trt 5) provided significantly higher season long Russian thistle control than the other treatments. The Sharpen treatments appear to have good activity on common mallow. Grain yield and test weight of all herbicide treatments were significantly higher than the untreated check.

	Treatment	Product rate	May 20				May 27				June 12				September 2			Test weight	Grain yield
			kocz	ruth	wibw	cmal	inj	kocz	ruth	cmal	inj	kocz	ruth	fibw	kocz	ruth	wibw		
		oz/A	% control															lbs/bu	bu/A
1	Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53.8	33.6
2	Glyphosate +	32 +																	
	NIS + AMS	0.25% + 17 lb	92	99	99	.	0	90	97	.	0	79	81	25	55	72	99	55.1	41.3
3	Sharpen + Glyph. +	1.0 + 16 +																	
	MSO + AMS	1% + 17 lb	99	97	94	99	0	96	97	95	0	91	87	54	89	70	99	55.4	43.6
4	Sharpen + Glyph. +	1.0 + 32 +																	
	MSO + AMS	1% + 17 lb	97	97	.	99	0	93	97	85	0	92	91	.	91	72	99	57.0	42.8
5	Sharpen + Glyph. +	1.5 + 32 +																	
	MSO + AMS	1% + 17 lb	97	99	.	95	0	97	98	95	0	97	97	0	92	99	99	55.2	40.7
6	Sharpen + Clarity +	1.5 + 2.0 +																	
	Glyph+ MSO + AMS	32+ 1%+ 17lb	97	97	99	99	0	93	93	95	0	92	88	27	85	62	99	56.3	38.6
7	2,4-D + Glyph. +	8.0 + 32 +																	
	NIS + AMS	0.25% + 17 lb	92	94	99	.	0	94	98	.	0	91	90	23	80	76	99	55.7	44.4
	C.V. %		4.7	3.9	0.0	--	0	6.7	4.2	--	0	10	14	132	8.0	29	--	2.0	8.2
	LSD 5%		6	5	1	--	NS	8	5	--	NS	12	15	NS	8	28	--	1.6	4.9

NS = no statistical difference between treatments.

Saflufenacil pre-emergence in wheat. Howatt, Roach, and Harrington. Preplant treatments were applied May 21 to two- to four-leaf volunteer sunflower (2 to 50/yd^2) and wild mustard (2 to 30/yd^2) and cotyledon to two-leaf wild buckwheat (5 to 50/yd^2) and common mallow (5 to 50/yd^2) on May 21 with 70° F, 30% relative humidity, 2% cloud cover, 4 to 6 mph wind velocity at 315°, and wet soil at 59°F. 'Alsen' wheat was seeded May 20. Treatments were applied with a backpack sprayer delivering 8.5 gpa (with the exception of treatment 8 that was applied at 4 gpa) at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

		5/28	5/28	5/28	5/28	5/28	6/4	6/4	6/4
Treatment	Rate	Sufl	Wimu	Wibw	Fipc	Coma	Sufl	Wimu	Wibw
	oz/A					%			
Glyt+Flucarbazone+MSO+AMS	12+0.21+1%+22	40	33	23	40	30	75	88	75
Glyt+Pyroxasulfone+MSO+AMS	12+2.8+1%+22	40	33	20	37	27	72	82	67
Saflufenacil+MSO+AMS	0.26+1%+22	50	43	30	47	23	83	75	78
Glyt+MSO+AMS	12+1%+22	33	37	23	30	23	87	67	70
Saflufenacil+Glyt+MSO+AMS	0.26+12+1%+22	50	47	40	43	33	92	80	80
Saflufenacil+Glyt+MSO+AMS	0.36+12+1%+22	53	43	40	47	37	92	82	82
Glyt+Weedar 64+MSO+AMS	12+8+1%+24	63	60	33	50	27	88	88	75
Saflufenacil+Glyt+MSO+AMS	0.36+12+1%+11	50	37	33	43	37	85	78	78
Untreated	0	0	0	0	0	0	0	0	0
C.V.		13	14	14	16	18	8	5	5
LSD 5%		9	9	7	11	8	10	6	6

		6/4	6/4	6/29	6/29	6/29	6/29	6/29	6/29	9/21
Treatment	Rate	Fipc	Coma	Sufl	Wimu	Wibw	Fipc	Coma	Rrpw	Yield
	oz/A					%				bu/A
Glyt+Flucarbazone+MSO+AMS	12+0.21+1%+22	88	67	89	96	90	99	85	80	43
Glyt+Pyroxasulfone+MSO+AMS	12+2.8+1%+22	88	53	83	85	90	98	75	82	34
Saflufenacil+MSO+AMS	0.26+1%+22	93	82	85	87	77	72	47	65	32
Glyt+MSO+AMS	12+1%+22	82	60	95	90	89	97	77	27	44
Saflufenacil+Glyt+MSO+AMS	0.26+12+1%+22	90	78	94	93	83	99	82	75	37
Saflufenacil+Glyt+MSO+AMS	0.36+12+1%+22	90	78	96	96	93	99	88	75	54
Glyt+Weedar 64+MSO+AMS	12+8+1%+24	87	68	93	95	88	99	80	80	53
Saflufenacil+Glyt+MSO+AMS	0.36+12+1%+11	87	75	88	96	95	99	93	92	53
Untreated	0	0	0	0	0	0	0	0	0	14
C.V.		2	9	16	5	6	4	15	15	35
LSD 5%		3	10	22	7	7	6	18	17	21

Two weeks after treatment on June 4, flucarbazone and pyroxasulfone inhibited activity of glyphosate to but increased control of wild mustard and field pennycress. Control of wild buckwheat and common mallow was not changed with these two herbicides and glyphosate. Saflufenacil improved control of all weeds with glyphosate except sunflower because glyphosate alone was very effective on sunflower. Redroot pigweed emerged several days after application allowing evaluation for residual activity. Residual activity of saflufenacil was similar to flucarbazone and pyroxasulfone which gave 80 and 82% pigweed control, respectively. Wheat yield in plots treated with glyphosate and either 0.36 oz/A saflufenacil or 2,4-D exceeded 50 bu/A, while other wheat yields were as low as 32 bu/A in treated plots and 14 bu/A in untreated plots.

Triticale tolerance to Sharpen applied PRE. Jenks, Willoughby, and Hoefing. 'Croplan Trical 2700' spring triticale was planted May 19 in a conventionally tilled field. Herbicide treatments were applied preemergence (PRE) on May 21. Individual plots were 10 x 30 ft and replicated three times. At the heading stage, two 1-m^2 entire plant samples cut at ground level were collected and fresh/dry weights obtained. Discover + Affinity + Starane were applied postemergence to remove weed competition.

Slight chlorosis and stunting (8-13%) was observed 4 WAT. However, very little crop injury was visible 7 WAT. There were no differences in fresh weight or dry weight between treatments.

Table. Triticale tolerance to Sharpen applied PRE (0937).

		Triticale					
Treatment[a]	Rate/ha	Jun 05	Jun 18	Jul 08	Aug 14	Aug 21	Aug 25
		----------% injury----------				Fresh wt. kg/m2	Dry wt. kg/m2
Untreated		0	0	0	0	2.446	1.128
Sharpen	36 g	0	8	1	0	2.588	1.188
Sharpen	50 g	0	10	1	0	2.467	1.125
Sharpen	100 g	0	13	3	0	2.537	1.146
LSD (0.05)		NS	2.3	NS	NS	NS	NS
CV		0	15	130	0	8	7

[a] *Sharpen at 50 g/ha is equivalent to 2 fl oz/A*

Cereal response to saflufenacil. Adjacent bioassay strips, 6 ft each of 'Glenn' wheat, 'Tradition' barley, winter rye, and 'Tritical 2700' triticale, were seeded near Fargo on May 28. Treatments were applied on May 29 at 65°F, 52% relative humidity, clear sky, 5 to 7 mph wind velocity at 225°, and damp soil at 54°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa qt 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 20 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/15	6/15	6/15	6/15	6/22	6/22	6/22	6/22	7/10	7/10	7/10	7/10	8/03	8/03	8/03	8/03
Treatment	Rate	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye
	oz/A	%															
Saflufenacil	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saflufenacil	0.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saflufenacil	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C.V.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD 5%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Visible response of bioassay species to soil residues of saflufenacil were not detected. Stand, color, and development were consistent across the study for the duration of the season.

Saflufenacil rate structure evaluation in wheat. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 20. Preemergence treatments were applied May 21 with 70° F, 30% relative humidity, 2% cloud cover, 4 to 6 mph wind velocity at 315°, and wet soil at 59°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Weeds to emerge included wild mustard, redroot pigweed, common lambsquarters, and annual smartweed. Plots were harvested September 4.

		6/18	7/6	7/6	7/20	9/04
Treatment	Rate	Wht	Wht	Weeds	Weeds	Yield
	oz ai/A			%		bu/A
Saflufenacil	0.26	0	0	0	5	20
Saflufenacil	0.36	0	0	10	30	21
Saflufenacil	0.72	0	0	47	69	24
Saflufenacil	1.1	0	0	80	84	25
Saflufenacil	1.4	0	0	85	90	28
Saflufenacil	2.2	0	0	91	96	28
Saflufenacil	2.8	0	0	95	99	22
Untreated	0	0	0	0	0	24
C.V.		0	0	12	9	18
LSD 5%		0	0	9	7	6

Saflufenacil did not cause injury to wheat even at 2.8 oz/A, which is four times the maximum use rate. The greater labeled use rate gave approximately 50 and 70% control of broadleaf weeds present in the study at July 6 and 20, respectively. At 1.1 oz/A, weed control was 80% or greater. Saflufenacil at 2.2 oz/A was needed to achieve 90% control or better at all evaluations.

2009 Prepare Herbicide + Glyphosate on Winter Wheat

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'Wesley' HRWW was seeded on October 6, 2008 into dry soil. Pre-emergence treatments (PRE) were applied on October 7 to 2 leaf downy brome (dobr) with 62° F, 32% RH, clear sky and south wind at 5 mph. Fall post-emergence treatments (FPOST) were applied on November 1 to 2 leaf winter wheat and to 3 leaf downy brome with 57° F, 44% RH, partly cloudy sky and northwest wind at 7 mph. Winter crop survival was fairly good. Early spring post-emergence treatments (EPOST) were applied on April 20 to 3 1/2 leaf winter wheat and to tillering downy brome and 2 leaf Japanese brome (jabr) with 61° F, 29% RH, partly cloudy sky and north 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 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 5 / ft^2 at PRE, 32 / ft^2 at FPOST and 50+ /ft^2 at EPOST. Plots were evaluated for crop injury on May 12 and May 27 and for weed control on April 21, May 12, May 27 and on September 2. Plant height was measured on June 29, shortly after heading. The trial sustained moderate hail damage on June 22 and 24 and therefore was not harvested.

Summary

Crop injury consisted of slight leaf chlorosis when observed. Pre-emergence treatments alone (trts 2 – 5) provided very little brome control. This was probably due to the lack of emerged weeds at this application timing. With the exception of Prepare / PowerFlex (trt 8), PRE / FPOST treatments (trts 6 – 9) provided excellent season long downy brome and Japanese brome control. PRE / EPOST treatments (trts 10 – 13) provided only marginal bromegrass control. Fall POST applied treatments alone (trts 14 – 17) provided excellent season long Japanese brome control and with the exception of PowerFlex (trt 16), excellent season long downy brome control.

	Treatment	Product rate	App. timing	4/21	- May 12 -		- May 27 -		Plant	- Sept 2 -	
				dobr	inj	dobr	inj	cheat*	ht	dobr	jabr
		oz/A		---------- % control ----------					inches	% control	
1	Untreated			0	0	0	0	0	19	0	0
2	Glyphosate + AMS	11 + 1lb	PRE	0	0	0	0	0	20	18	2
3	Glyphosate + AMS + PrePare	11 + 1lb + 0.31	PRE	0	0	0	0	0	18	12	0
4	Glyphosate + AMS + PrePare + pyraflufen	11 + 1 lb + 0.31 + 1.5	PRE	25	0	18	0	18	20	45	5
5	Glyphosate + AMS + PrePare + tribenuron	11 + 1 lb + 0.31 + 0.1	PRE	22	0	5	0	0	18	28	0
6	Glyphosate + AMS + PrePare + pyraflufen / Everest + Basic Blend	11 + 1 lb + 0.31 + 1.5 / 0.31 + 1%	PRE / FPOST	90	0	90	2	92	21	90	90
7	Glyphosate + AMS + PrePare + pyraflufen / Olympus Flex + Basic Bl.	11 + 1 lb + 0.31 + 1.5 / 2.98 + 1%	PRE / FPOST	86	0	89	2	94	20	94	92
8	Glyphosate + AMS + PrePare + pyraflufen / PowerFlex + NIS	11 + 1 lb + 0.31 + 1.5 / 3.52 + 0.25%	PRE / FPOST	74	0	78	1	82	20	65	76
9	Glyphosate + AMS + PrePare + pyraflufen / Maverick + Basic Blend	11 + 1 lb + 0.31 + 1.5 / 0.67 + 1%	PRE / FPOST	90	0	88	1	93	20	90	92
10	Glyphosate + AMS + PrePare + pyraflufen / Everest + Basic Blend	11 + 1 lb + 0.31 + 1.5 / 0.31 + 1%	PRE / EPOST	0	0	70	2	82	21	52	55
11	Glyphosate + AMS + PrePare + pyraflufen / Olympus Flex + Basic Bl.	11 + 1 lb + 0.31 + 1.5 / 2.98 + 1%	PRE / EPOST	0	0	74	0	81	21	65	90
12	Glyphosate + AMS + PrePare + pyraflufen / PowerFlex + NIS	11 + 1 lb + 0.31 + 1.5 / 3.52 + 0.25%	PRE / EPOST	25	0	82	1	92	20	65	50
13	Glyphosate + AMS + PrePare + pyraflufen / Maverick + Basic Blend	11 + 1 lb + 0.31 + 1.5 / 0.67 + 1%	PRE / EPOST	2	0	86	1	89	20	65	72
14	Everest + Basic Blend	0.61 + 1%	FPOST	82	0	78	2	85	20	90	92
15	Olympus Flex + Basic Bl.	2.98 + 1%	FPOST	70	0	84	0	82	20	90	90
16	PowerFlex + NIS	3.52 + 0.25%	FPOST	85	0	82	0	79	19	58	90
17	Maverick + Basic Blend	0.67 + 1%	FPOST	90	0	95	0	98	21	96	92
	C.V. %			34	0	19	308	18	9	32	15
	LSD 5%			20	NS	16	NS	16	NS	27	12

* Cheat = downy brome / Japanese brome mixture.

NS = no statistical difference between treatments.

PrePare Herbicide in Spring Wheat

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'Reeder' HRSW was seeded on May 14. Pre-emergence treatments (PRE) were applied on May 19 to 2" tall mixed bromus species (downy brome and Japanese brome) with 68° F, 64% RH, partly cloudy sky and southeast wind at 8 mph. Post-emergence treatments (POST) were applied on June 3 to 3 leaf wheat and to downy brome (dobr) in the boot stage, tillering Japanese brome (jabr) and to 1 1/2 leaf Persian darnel (peda) with 48° F, 82% RH, cloudy sky and southwest 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 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, Japanese brome and Persian darnel populations averaged 5, 35 and 10 plants per square foot, respectively. Plots were evaluated for crop injury on June 3, June 12 and June 26 (data not shown), for plant height on July 17 and for weed control on June 3, June 12, June 26(data not shown) and on September 1. The trial was harvested on September 7.

Summary

Crop injury was not observed on any treatment. All herbicide treatments provided excellent season long downy brome and Japanese brome control with the exception of glyphosate alone (trt 15) which provided excellent season long downy brome control but only fair Japanese brome control. Some Persian darnel and Japanese brome emerged after PRE applications. None of the PRE treatments were effective in providing season long control of Persian darnel. The PrePare / Goldsky treatments (trts 9 & 10) provided excellent season long control of Persian darnel. Wild oats emerged in a very late June flush resulting in relatively poor and inconsistent herbicide control. All herbicide treatments had significantly higher yields than the untreated check.

	Treatment	Product rate	App. timing	-- June 3 -- inj	cheat*	------ June 12 ------ inj	cheat	peda	Plant height	------- September 1 ------- dobr	jabr	peda	wiot	Grain yield
		oz/A		---------- % control ----------					cm	--------- % control ---------				bu/A
1	Untreated			0	0	0	0	0	37	0	0	0	0	5.8
2	Glyphosate + AMS + PrePare	11.4 + 1lb + 0.3	PRE	0	99	0	96	23	56	96	92	0	17	33.5
3	Glyph + AMS + Olympus	11.4 + 1lb + 0.3	PRE	0	99	0	97	5	55	96	96	0	86	30.8
4	Glyph + AMS + Rimfire	11.4 + 1lb + 1.75	PRE	0	99	0	99	33	55	98	97	10	27	33.1
5	Glyph + AMS + Olympus	11.4 + 1lb + 0.6	PRE	0	99	0	97	70	56	99	98	0	70	30.7
6	Glyph + AMS + PrePare / ARY...105 + Basic Blend	11.4 + 1lb + 0.3 / 0.346 + 1%	PRE / POST	0	99	0	98	90	50	94	97	50	47	33.4
7	Glyph + AMS + PrePare / ARY...105 + Basic Blend	11.4 + 1lb + 0.3 / 0.52 + 1%	PRE / POST	0	98	0	98	80	51	93	97	50	57	26.7
8	Glyph + AMS + PrePare / Everest + Basic Blend	11.4 + 1lb + 0.3 / 0.3 + 1%	PRE / POST	0	99	0	96	70	52	92	99	0	10	33.9
9	Glyph + AMS + PrePare / GoldSky + Basic Blend	11.4 + 1lb + 0.3 / 8 + 1%	PRE / POST	0	99	0	99	40	56	98	96	97	37	34.7
10	Glyph + AMS + PrePare / GoldSky + Basic Blend	11.4 + 1lb + 0.3 / 16 + 1%	PRE / POST	0	98	0	98	65	54	97	96	99	50	36.7
11	Glyph + AMS + PrePare / Rimfire + Basic Blend	11.4 + 1lb + 0.3 / 1.75 + 1%	PRE / POST	0	99	0	99	0	52	98	99	0	50	32.2
12	Glyph + AMS / Everest + Basic Blend	11.4 + 1lb / 0.6 + 1%	PRE / POST	0	99	0	98	35	58	95	97	0	83	34.9
13	Glyph + AMS / ARY...105 + Basic Blend	11.4 + 1lb / 1.04 + 1%	PRE / POST	0	99	0	96	33	56	94	99	0	80	38.4
14	Glyph + AMS / GoldSky + Basic Blend	11.4 + 1lb / 16 + 1%	PRE / POST	0	99	0	97	20	54	97	99	23	94	36.7
15	Glyph + AMS	11.4 + 1lb	PRE	0	98	0	95	0	54	94	82	0	0	29.9
	C.V. %			0	1.0	0	2.4	48	11	4.0	4.4	77	59	6.3
	LSD 5%			NS	1	NS	3	25	9	5	6	25	39	2.8

* Cheat = downy brome & Japanese brome mixture. NS = no statistical difference between treatments.

Wild oat control with Pre-Pare and Everest. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 18 at 90 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicides treatments were applied either preemergence (PRE) on May 23 or postemergence (POST) on June 12 at the 3- to 4-leaf wheat stage. Wild oat (Wioa) ranged from 3- to 4-leaf with 0-15 plants/ft^2. Green foxtail (Grft) was 0.5-1 inch tall with 50-150 plants/ft^2. Individual plots were 10 x 30 ft and replicated three times.

Pre-Pare alone caused about 5% injury about 4 weeks after planting (WAP). Pre-Pare/Everest caused 10% injury 6 WAP while Everest alone applied postemergence (POST) caused 15% injury 6 WAP. None of the treatments provided good green foxtail control, with the best control provided by Pre-Pare/Everest and Everest alone at 60 and 67%, respectively. High weed pressure and multiple flushes likely contributed to the lower foxtail control. Pre-Pare alone provided about 52% wild oat control. Pre-Pare/Everest, Everest alone, and GoldSky provided 81-89% wild oat control on July 16 (~4 weeks after the POST application).

Glyphosate applied PRE improved wheat yield by 8 bu/A, whereas Pre-Pare improved yield by 14 bu/A compared to the untreated check. Pre-Pare/Everest, Everest alone, and GoldSky improved wheat yields by 19-23 bu/A.

Table. Wild oat control with Pre-Pare and Everest (0903).

			HRSW[b]		Grft[b]			Wioa[b]			HRSW	
Treatment[a]	Rate/ha	Timing	Jun 13	Jul 2	Jun 13	Jul 2	Jul 16	Jun 13	Jul 2	Jul 16	Yield	TW
			% injury		----------% control----------						bu/A	lb/bu
Untreated			0	0	0	0	0	0	0	0	39	61.8
Glyphosate + AMS	450 g + 1.12 kg	PRE	0	0	23	3	3	5	23	18	47	61.8
Pre-Pare	15 g	PRE	5	9	85	43	33	80	72	52	53	62.1
Pre-Pare / Everest + Quad 7	15 g / 15 g + 1%	PRE/3-4 leaf	5	10	85	72	60	80	81	85	62	62.9
Pre-Pare / EXP + Quad 7	15 g / 15 g + 1%	PRE/3-4 leaf	5	14	87	45	25	81	75	61	50	62.1
Pre-Pare / Audit + EXP + Quad 7	15 g / 21 g + 15 g + 1%	PRE/3-4 leaf	5	16	85	37	25	80	72	64	52	62.1
Everest + Quad 7	30 g + 1%	3-4 leaf	0	15	22	83	67	5	93	89	58	62.9
EXP + Quad 7	30 g + 1%	3-4 leaf	0	23	22	0	0	5	18	13	36	62.5
GoldSky + NIS	117.5 g + 0.25%	3-4 leaf	0	4	22	27	35	5	83	81	59	62.7
LSD (0.05)			0	4.3	5.8	9.2	7.8	0.7	7	15.1	9	0.8
CV			0	25	7	15	16	1	7	17	10	0.7

[a] *Glyphosate (450 g) + AMS (1.12 kg) applied PRE to all treatments*

[b] *HRSW=Hard Red Spring Wheat; Grft=Green foxtail; Wioa= Wild oat*

2009 Pre-Plant Burndown with 2,4-D in Spring Wheat

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Treatments were applied pre-plant on June 3 to 2 inch tall kochia (kocz), 3 inch tall Russian thistle (ruth), 3 leaf wild buckwheat (wibw), 2 inch tall birdsfoot trefoil (bftf), 4 inch tall field pennycress (fipc) and 1 inch tall common mallow (cmal) with 50° F, 78% RH, clear sky and southwest wind at 6 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. 'RB 07' HRSW was seeded no-till on June 3. 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. Kochia, Russian thistle and wild buckwheat populations were fairly uniform throughout the trial and averaged 12, 6 and 2 plants / ft^2, respectively. Birdsfoot trefoil was observed in two reps and averaged 2 plants / ft^2. Field pennycress and common mallow were observed in only one rep and averaged 3 and 1 plants / ft^2 respectively. Plots were evaluated for crop injury on June 26 and for weed control on June 4, June 12, June 26 and September 2. The trial sustained moderate hail damage on June 22 and June 24, and was harvested on September 7.

Summary

Crop injury was not observed on any treatment. Season long weed control was probably affected by the hail storms which set the crop back causing a reduction in crop competition and grain yields. Increasing herbicide rates tended to increase weed control. Herbicide treatments tended to provide only fair kochia control. All herbicide treatments provided excellent Russian thistle and field pennycress control. LI 6284 (trts 12–14) tended to provide better wild buckwheat control than the other treatments. The highest rates of all herbicide treatments, except for LI 6305 (trt 5), provided excellent control of birdsfoot trefoil, and LI 6306 (trts 1–3) appears to have better activity on this weed than the other treatments. Control of common mallow was relatively poor and generally inconsistent between treatment rates. There were no significant differences between treatments for grain yield, although all herbicide treatments had higher yields than the untreated check.

			June 4			June 12			June 26							9/7	Grain
	Treatment	Product rate	kocz	ruth	wibw	kocz	ruth	wibw	inj	kocz	ruth	wibw	bftf	fipc	cmal	kocz	yield
			%														bu/A
1	LI 6306	6.4	50	60	60	30	58	60	0	42	88	65	95	99	--	28	19.3
2	LI 6306	9.6	60	60	60	45	62	40	0	62	96	81	97	99	10	42	22.1
3	LI 6306	12.8	45	55	40	38	55	45	0	68	95	50	99	99	50	65	20.9
4	LI 6305	6.4	28	45	45	28	40	60	0	28	90	62	--	99	50	28	23.2
5	LI 6305	12.8	48	55	50	40	50	62	0	65	99	76	60	99	30	30	20.5
6	LI 6304	18.4	50	50	60	61	62	75	0	45	96	94	92	99	80	15	20.3
7	LI 6304	36.8	50	55	75	70	72	78	0	86	99	74	97	99	0	68	21,7
8	NuFarm LV4	8.3	35	50	45	55	65	72	0	62	91	72	75	99	70	70	25.9
9	NuFarm LV4	16.7	55	55	60	66	72	65	0	88	99	80	99	99	20	82	22.0
10	NuFarm LV6	5.9	25	35	38	45	50	38	0	45	88	78	85	99	10	55	24.7
11	NuFarm LV6	11.8	55	50	48	60	74	62	0	62	95	70	97	99	30	45	21.2
12	LI 6284	8.3	40	40	42	42	55	48	0	58	88	85	10	99	--	5	22.8
13	LI 6284	12.5	50	62	55	42	65	62	0	68	91	94	88	99	30	48	25.1
14	LI 6284	16.7	60	55	60	70	65	71	0	88	98	86	95	99	70	70	19.8
15	Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.7
	C.V. %		35	24	49	41	56	31	0	34	5	29	18	--	--	42	15.5
	LSD .05		22	16	22	27	21	25	NS	28	6	30	29	--	--	26	NS

NS = no statistical difference between treatments.

Timing of Flumioxazin in wheat. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on June 24. Treatments were as follows:

Treatment date	5/21/09	5/29/09	6/4/09	6/11/09	6/24/09
Temperature (F)	71	76		57	80
Humidity (%)	28	22		66	39
Sky (cloud cover)	0%	0%		0%	40%
Wind (mph)	4 to 6	5 to 7		2 to 3	5
direction (degrees)	315	315		270	135
Soil temperature (F)	61	68		50	75
condition	wet	moist		moist	damp
Wheat stage (leaf)	-	-		-	3 to 4
Wild buckwheat (leaf)	cotyledon to 2	cotyledon to 4		2 to 5	2 to 8
Wild mustard (leaf)	cotyledon to 4	2 to 4		bolted	cotyledon to bolt
Common mallow (leaf)	cotyledon to 2	1 to 3		4 to 8	10 to 15

All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with three replicates.

			6/19	6/29	6/29	6/29	6/29	7/13	7/13	7/13	9/21
Treatment	Rate	Timing	Wht	Wht	Wibw	Wimu	Coma	Wibw	Wimu	Coma	Yield
	oz/A	DBP					%				bu/A
Glyt (4.5)+Flum+AMS	12+1+40	21	0	0	73	49	42	0	0	0	-
Glyt (4.5)+Flum+AMS	12+1+40	14	0	0	63	66	57	64	61	27	26
Glyt (4.5)+Flum+AMS	12+1+40	7	0	0	96	98	85	90	84	67	20
Glyt (4.5)+Flum+AMS	12+1+40	0	0	0	97	96	89	94	95	84	33
Glyt (4.5)+Flcz+AMS	12+0.21+40	7	0	0	96	99	95	95	97	89	33
Glyt (4.5)+Flum+Flcz+AMS	12+1+0.21+40	7	0	0	96	98	90	94	97	84	36
Glyt (4.5)+Flum+AMS /Fenx+Brox&MCPA5	12+1+40 /1+8	7 /Post	0	0	98	99	98	98	99	96	43
Fenx+Brox&MCPA5	1+8	Post	0	0	65	67	57	86	91	25	31
Untreated	0		0	0	0	0	0	0	0	0	-
C.V.			0	0	33	36	34	21	20	14	32
LSD 5%			0	0	43	46	39	21	21	11	15

[a] Treatments 1 and 9 were not harvested due to extensive weed pressure.

LSDs were exceptionally large because weed control varied widely for treatments applied 21 and 14 DBP. Treatments did not cause visible injury to wheat. Treatments applied more than 7 DBP did not adequately manage the weed population because additional weeds emerged after treatment. Either flumioxazin or flucarbazone with glyphosate applied 7 DBP provided reasonable season-long control of weeds. Flucarbazone gave better control of common mallow than flumioxazin at the July evaluation, but combining the two residual herbicides with glyphosate didn't give better control than glyphosate plus flucarbazone. POST only treatment didn't give good overall weed control because common mallow was too large at application. PRE glyphosate and flumioxazin followed by POST fenoxaprop plus bromoxynil and MCPA maintained weed control above 95%, resulting in 43 bu/A wheat yield.

Wheat response to flumioxazin. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied preemergence on May 21 with 71°F, 28% relative humidity, 0% cloud cover, 6 to 10 mph wind at 315°, and wet soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/12	6/26	7/6
Treatment	Rate	Wht	Wht	Wht
Glyt (4.5)+Flumioxazin+AMS	12+0.5+40	0	0	0
Glyt (4.5)+Flumioxazin+AMS	12+1+40	0	0	0
Glyt (4.5)+Flumioxazin+AMS	12+1.5+40	0	0	0
Glyt (4.5)+Flucarbazone+AMS	12+0.21+40	0	0	0
Glyt (4.5)+Pyroxasulfone+AMS	12+2.8+40	0	0	0
Untreated	0	0	0	0
CV		0	0	0
LSD 5%		0	0	0

Flumioxazin did not cause injury to wheat. Current label requires 30 d between flumioxazin application and wheat seeding. This and other data have demonstrated that a shorter period could be viable. A shorter period between application and seeding would extend the soil residual benefits further into the season, which may allow canopy closure and increased competitive ability of wheat against later-emerging weeds.

Pyroxasulfone use in wheat, Fargo. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded May 20. Preemergence treatments were applied May 21 with 60°F, 47% relative humidity, 0% cloud cover, 5 mph wind at 360°, and moist soil at 55°F. Post treatments were applied to three-leaf wheat, one- to two-leaf yellow foxtail (50 to 200/yd^2), cotyledon to bolting wild mustard (10 to 40/yd^2), and two- to six-leaf smartweed (20 to 50/yd^2) and common lambsquarters (10 to 50/yd^2) on June 24 with 80°F, 39% relative humidity, 40% cloud cover, 5 mph wind at 135°, and damp soil at 75°F. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

			6/28	7/6	7/6	7/6	7/6	7/6	7/20	7/20	7/20	7/20	9/07
Treatment	Rate		Wht	Wht	Yeft	Wimu	Colq	Smwd	Yeft	Wimu	Colq	Smwd	Yield
	oz/A		%										bu/A
Flucarbazone	0.3	Pre	0	0	55	60	81	76	27	0	20	22	23
Pyroxasulfone	0.9	Pre	0	0	30	0	0	0	20	0	15	30	24
Pyroxasulfone	1.5	Pre	0	0	52	0	15	0	40	0	17	37	26
Pyroxasulfone	1.8	Pre	0	0	67	7	35	20	60	0	37	60	28
Pyroxasulfone	2.8	Pre	0	0	81	5	40	25	66	0	57	71	28
Pyroxasulfone	3.6	Pre	0	0	87	27	62	55	75	0	50	56	27
Pyroxasulfone	6	Pre	0	0	89	37	80	76	71	0	56	67	27
Flufenacet	5.4	Post	0	0	0	22	0	0	0	0	0	0	28
Flcz+Salvo+BB	0.42+4+1%	Post	0	0	84	96	93	92	86	98	96	96	28
Pnxd+Brox&MCPA	0.86+8	Post	0	0	89	94	95	94	93	99	98	98	30
Untreated	0	Post	0	0	0	0	0	0	0	0	0	0	27
C.V.			0	0	10	25	10	12	26	2	35	33	16
LSD 5%			0	0	88	12	7	7	18	1	20	23	6

Treatments did not cause visible or physiological injury to wheat. Yellow foxtail was more susceptible to pyroxasulfone than other weed species present. Pyroxasulfone at 2.8 oz/A was needed to reach 80% control of foxtail on July 6. Wild mustard exhibited slight response to proxasulfone on July 6, less than 40% control, and injury was not detected from this herbicide for wild mustard later in the season. Pyroxasulfone gave better control of common lambsquarters and smartweed than flucarbazone applied PRE, but POST treatments would be necessary to maximize weed control.

Pyroxasulfone use in wheat, Prosper. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded at Prosper, ND, on June 2. Preemergence treatments were applied June 3 with 60°F, 40% RH, 0 % cloud cover, 4 to 6 mph wind at 225°, and damp soil at 50°F. Post treatments were applied to two-leaf redroot pigweed (5 to 25/yd^2) and two-leaf yellow foxtail (10 to 40/yd^2) on June 25 with 78°F, 53% RH, 0% cloud cover, and moist soil at 70°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Application	6/24 wht	6/30 wht	6/30 rrpw	6/30 yeft	9/21 Yield
	oz/A				%		bu/A
Flucarbazone	0.3	Pre	0	0	81	57	21
Pyroxasulfone	0.9	Pre	0	0	52	45	25
Pyroxasulfone	1.5	Pre	0	0	69	77	24
Pyroxasulfone	1.8	Pre	0	0	81	75	25
Pyroxasulfone	2.8	Pre	0	0	97	97	24
Pyroxasulfone	3.6	Pre	0	0	93	95	27
Pyroxasulfone	6	Pre	0	0	96	96	24
Flufenacet	5.4	Post	0	0	15	15	25
Flcz+Salvo+Basic Blend	0.42+4+1%	Post	0	15	89	50	26
Pinoxaden+Broxl&MCPA	0.86+8	Post	0	4	80	89	29
Untreated	0	Post	0	0	0	0	23
C.V.			0	79	13	14	15
LSD 5%			0	2	13	13	6

Pyroxasulfone did not cause visible or physiological injury to wheat. Weed control with pyroxasulfone generally was better in Prosper than in Fargo. Weed competition aided control of small weeds that were present resulting in absence of weeds under the canopy later in the season. Seedlings emerged several weeks after treatment and grew for a short period before developing symptoms and dying. Pyroxasulfone at 1.8 oz/A gave 75 to 80% weed control but 2.8 oz/A provided 97% weed control.

Cereal response to pyroxasulfone. Howatt, Roach, and Harrington. Adjacent bioassay strips, 6 ft each of 'Glenn' wheat, 'Tradition' barley, winter rye, and 'Tritical 2700' triticale, were seeded near Fargo on May 28. Treatments were applied as follows:

Treatment date	May 29	June 11	June 24
Stage	Preemergence	1.5 leaf	4 leaf
Temperature (°F)	65	57	84
Relative humidity (%)	52	66	40
Sky cloud cover (%)	52	66	40
Wind (mph)	5 to 7	2 to 3	4
direction (degrees)	225	270	180
Soil condition	damp	moist	damp
temperature (F)	54	50	72

Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 20 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

			6/17	6/17	6/17	6/17	6/24	6/24	6/24	6/24	7/10	7/10	7/10	7/10	7/21	7/21	7/21	7/21	8/03	8/03	8/03	8/03
Treatment	Rate	Stage	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye	Wheat	Barley	Triticale	Rye
	oz/A		%																			
Pyroxasulfone	0.9	PRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	1.8	PRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	2.8	PRE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	0.9	1.5-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	1.8	1.5-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	2.8	1.5-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	0.9	3-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	1.8	3-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyroxasulfone	2.8	3-L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untreated	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CV			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD 5%			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Visible response of bioassay species to soil residues of pyroxasulfone were not detected. Stand, color, and development were consistent across the study for the duration of the season.

Pyroxasulfone control of wild oat. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Preemergence treatments were applied on May 21 with 55°F, 60% relative humidity, 0% cloud cover, 9 mph wind at 360°, and moist soil 52°F. Post treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 50°F, 70% relative humidity, 0% cloud cover, 1 to 2 mph wind at 270°, and moist soil at 48°F with dew present. All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

			6/10	6/10	6/26	6/26	7/10	7/10	7/21
Treatment		Stage	Wht	Wioa	Wht	Wioa	Wht	Wioa	Wioa
	Rate								
Flucarbazone	0.3	Pre	0	0	0	0	0	0	0
Pyroxasulfone	0.9	Pre	0	0	0	0	0	0	0
Pyroxasulfone	1.5	Pre	0	0	0	0	0	0	0
Pyroxasulfone	1.8	Pre	0	0	0	0	0	0	0
Pyroxasulfone	2.8	Pre	0	0	0	0	0	0	0
Pyroxasulfone	3.6	Pre	0	0	0	0	0	0	0
Pyroxasulfone	6	Pre	0	0	0	0	0	0	0
Flufenacet	5.4	Post	0	0	0	0	0	0	0
Flcz+Salvo+Basic Blend	0.42+4+1%	Post	0	0	0	84	0	97	93
Pinoxaden+Brox&MCPA	0.86+8	Post	0	0	0	89	0	96	96
Untreated	0		0	0	0	0	0	0	0
CV			0	0	0	7	0	2	3
LSD 5%			0	0	0	2	0	1	1

Preemergence treatments did not visibly delay emergence or reduce population of wild oat. Previous experiments with flucarbazone or pyroxasulfone applied PRE demonstrated herbicide control as fewer emerging plants, chlorosis, and developmental delay of early vegetative stages. Flufenacet did not cause noticeable effect on wild oat, but pinoxaden or flucarbazone applied POST provided 93% control or greater in July.

Comparison of standard grass herbicides for wild oat. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 63°F, 54% relative humidity, 25% cloud cover, 4 to 6 mph wind at 315°, and moist soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/26	6/26	7/10	7/10	8/3	9/2
Treatment	Rate	Wht	Wioa	Wht	Wioa	Wioa	Yield
	oz/A			%			bu/A
Mesosulfuron+Brox&MCPA5+MSO	0.036+8+1%	0	77	0	85	87	15
Flucarbazone+Brox&MCPA5+Basic Blend	0.32+8+1%	0	85	0	94	94	18
Prcz&Mess+Brox&MCPA5+Basic Blend	0.178+8+1%	0	84	0	87	89	20
Imazamethabenz+Brox&MCPA5+Basic Blend	5+8+1%	0	82	0	84	82	16
Propoxycarbazone+Brox&MCPA5+Basic Blend	0.32+8+1%	0	80	0	85	84	16
Pyroxsulam+Brox&MCPA5+Basic Blend	0.26+8+1%	0	89	0	91	90	18
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	89	0	87	85	19
Tral-SC+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	0	81	0	86	81	19
Fenoxaprop+Brox&MCPA5	0.8+8	0	77	0	82	82	16
Fenoxaprop+Brox&MCPA5	1.32+8	0	62	0	67	90	17
Clodinafop-ng+Brox&MCPA5	0.8+8	0	84	0	89	89	20
Pinoxaden+Brox&MCPA5	0.86+8	0	92	0	97	98	22
Difenzoquat+Brox&MCPA5	16+8	80	81	67	91	85	12
Untreated	0	0	0	0	0	0	7
CV		19	15	28	15	4	18
LSD 5%		1	17	2	17	5	4

Severe injury to wheat with difenzoquat was observed within days of application. Alsen is not included as a recommended cultivar on the product label, but other research in recent years had not indicated any injury. The injury persisted through the season causing substantial leaf damage, stunting, and developmental delay. However, control of wild oat exceeded 80%. When conditions are best for activity, this product still has the potential to control resistant wild oat. But use on some of the recent introductions involves risk of injury.

Flucarbazone, among ALS inhibitors, and pinoxaden, among ACCase inhibitors, provided the highest values for control of wild oat, 94 and 97% respectively in June. Control with all herbicides seemed to be delayed this season, perhaps because of weather. This was exemplified by fenoxaprop at 1.32oz/A in which control was less than 70% until the final evaluation when control jumped to 90%. Control with some herbicides, clodinafop for example, did not reach the level of control typically achieved even at the end of the season.

POST yellow foxtail control in durum wheat, Carrington, 2009. (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. 'Lebsock' durum was seeded May 14. 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 10 with 62 F, 38% RH, 75% cloudy sky, and 12 mph wind to 4-leaf wheat and 1- to 4-leaf yellow foxtail. Average plant density in untreated plots on June 11: wheat, 18 plants/ft^2 and 8 foxtail plants/ft^2. The trial was harvested by a plot combine on September 10.

Plant chlorosis (0 = green, 9 = yellow) visually evaluated 5 d after herbicide application was most prominent with Difenzoquat (Table). Crop response of <10% was noted among treatments except Difenzoquat when evaluated about 2 and 4 wk after application of herbicides. Seed yield was reduced with Difenzoquat compared to yield of the untreated check. Herbicide treatments numbered 2 and 6-12 provided good to excellent (85-96%) control of yellow foxtail.

Table.

Herbicide			Wheat response					Yellow foxtail control	
Treatment		Rate	6/15	6/25	7/13	Seed yield	Test weight	6/25	7/13
No.		oz ai/A	chlorosis (0-9)	injury (%)		bu/A	lb/bu	%	
1	Mesosulfuron+Brox&MCPA5+MSO	0.036+8+1%	2	3	0	57.8	61.0	70	27
2	Flucarbazone+Brox&MCPA5+Basic Blend	0.32+8+1%	2	5	6	54.7	60.6	80	88
3	Prcz&Mess+Brox&MCPA5+Basic Blend	0.178+8+1%	2	4	3	61.0	60.8	75	27
4	Immb+Brox&MCPA5+Basic Blend	5+8+1%	2	6	2	54.2	60.7	53	20
5	Prcz+Brox&MCPA5+Basic Blend	0.32+8+1%	2	6	2	52.8	60.6	75	10
6	Pyroxsulam+Brox&MCPA5+Basic Blend	0.26+8+1%	0	6	3	54.7	60.5	85	85
7	Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	1	6	4	48.7	60.6	88	87
8	TralSC+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	1	3	1	57.8	60.5	83	85
9	Fenoxaprop+Brox&MCPA5	0.8+8	0	2	0	58.1	60.7	63	85
10	Fenoxaprop+Brox&MCPA5	1.32+8	0	0	1	60.4	60.6	63	96
11	Clodinafop-ng+Brox&MCPA5	0.8+8	0	0	0	70.6	61.0	83	89
12	Pinoxaden+Brox&MCPA5	0.86+8	2	8	5	62.1	60.9	90	90
13	Difenzoquat+Brox&MCPA5	16+8	5	82	77	33.0	60.3	40	0
14	Untreated	0	0	0	0	60.1	60.7	0	0
C.V. (%)			61.1	38	39	12.6	0.7	7	10
LSD (0.05)			1	6	5	12	NS	8	9

Resistant wild oat response to grass herbicides. Howatt, Roach, and Harrington. 'Jerry' winter wheat was seeded at Portland in the fall of 2008. Treatments were applied to five- to eight-tiller, pre-joint wheat and one- to three-leaf wild oat (10 to 50/yd^2) on May 28 with 71°F, 45% relative humidity, 10% cloud cover, 5 to 6 mph wind at 45°, and damp soil at 69°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/8	6/26
Treatment	Rate	Wioa	Wioa
	oz/A	%	%
Flucarbazone+Brox&MCPA5+Basic Blend	0.35+8+1%	74	90
SP20887+Brox&MCPA5+MSO	0.63+8+24	77	87
Pyroxsulam+Brox&MCPA5+MSO	0.26+8+24	72	90
Difenzoquat+Brox&MCPA5	16+8	74	87
Tral-SC+Brox&MCPA5+Supercharge+AMS	2.9+8+0.5%+9.5	59	92
Fenx&Pyrasulfotol&Brox	4.2	59	89
Clodinafop-ng+Brox&MCPA5	0.8+8	84	95
Pinoxaden+Brox&MCPA5	0.86+8	84	95
Clethodim+Brox&MCPA5+MSO	1+8+24	90	94
A09+B09+Brox&MCPA5+MSO	1.4+0.35+8+1%	75	86
Imazamox+Sword+NIS+UAN	0.5+4+0.25%+32	91	84
CV		10	5
LSD 5%		11	6

Field history and previous work at this site indicated the wild oat population had resistance to ACCase-inhibiting and ALS-inhibiting herbicides. Activity of herbicides with these modes of action was higher than expected.

Evaluating wild oat herbicide programs for resistance management. Howatt, Roach, Harrington. 'Glenn' hard red spring wheat and 'IS 3057 RR' canola was planted May 17. Treatments were applied to four-leaf wheat, six- to ten-leaf canola, and four- to five-leaf wild oat (10 to 50/yd^2) on June 24 with 82°F, 54% RH, 35% cloud cover, 2 to 4 mph wind at 135°, and damp soil at 70°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 20 by 25 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment		Rate	7/21 wioa
		oz/A	%
Wheat3	Fenoxaprop+Brox&MCPA5	1.32+8	74
Wheat3	Pinoxaden+Brox&MCPA5	0.86+8	96
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
Canola4	Fenoxaprop+Clopyralid	1.32+2	92
Canola4	Clethodim+Clopyralid+PO	1+2+0.18	81
Canola4	Glyphosate (4.5)	6	99
Canola4	Clethodim+Clopyralid+PO	1+2+0.18	82
Canola4	Glyphosate (4.5)	6	99
Wheat1	Fenoxaprop+Brox&MCPA5	1.32+8	79
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	97
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	99
Wheat1	Pinoxaden+Brox&MCPA5	0.86+8	98
Wheat1	Pinoxaden+Brox&MCPA	0.86+8	99
Canola2	Fenoxaprop+Clopyralid	1.32+2	91
Canola2	Clethodim+Clopyralid+PO	1+2+0.18	87
Canola2	Glyphosate (4.5)	6	99
Canola2	Glyphosate (4.5)	6	99
Canola2	Glyphosate (4.5)	6	99
C.V.			9
LSD 5%			12

This is the third year of a rotation sequence that evaluates five herbicide programs ranging from ACCase inhibiting products every year to one ACCase inhibitor application every 4 yr. In 2008, a few wild oat survivors were observed, mainly in plots treated with fenoxaprop. The number of survivors was not large and weather conditions may not have favored wild oat control with ACCase inhibitors. In 2009, several treatments did not control all wild oats in the plots. Two of these treatments (74 and 79% control) were in the continuous fenoxaprop program, but the other two treatments in the continuous fenoxaprop program provided over 90% control. Still, 90% control means that some survivors were present and may be only 1 yr behind in resistance selection. Control with clethodim also was less than expected at 81 to 87% control. Two of these treatments are in rotation with pinoxaden and the other in rotation with pinoxaden, flucarbazone, and glyphosate. Treatments of pinoxaden, flucarbazone, or glyphosate provided 96% control or better. Wild oat seed was harvested for greenhouse evaluation of resistance.

Wild oat control with difenzoquat tank-mixes. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 15 with 68°F, 59% relative humidity, 95% cloud cover, 7 mph wind at 135°, and dry soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. The plots were harvested on September 2.

		6/26	6/26	7/10	7/10	8/3	8/3	9/02
Treatment	Rate	Wht	Wioa	Wht	Wioa	Wht	Wioa	Yield
	oz/A				%			bu/A
Difenzoquat	16	40	70	52	91	12	85	17
Dife+Brox&MCPA5	16+8	40	70	47	92	12	90	16
Dife+Brox&Pyst	16+2.9	40	70	60	92	17	86	17
Dife+Clpy&Flox	16+3	40	70	52	91	11	87	18
Dife+Carf&2,4-D	16+4.1	40	70	47	91	11	92	17
Dife+Thif-sg+Trib-sg+Sword	16+0.24+0.06+4	40	70	42	70	15	67	16
Dife+Brox&Pyst+Pyraclostrobin	16+2.9+2.3	40	70	55	91	12	87	20
Dife+Carf&2,4-D+Pyraclostrobin	16+4.1+2.3	20	70	32	93	1	92	18
Untreated	0	0	0	0	0	0	0	13
CV		0	0	28	20	57	20	16
LSD 5%		0	0	18	23	9	22	4

Severe injury to wheat with difenzoquat was observed within days of application. Alsen is not included as a recommended cultivar on the product label, but other research in recent years had not indicated any injury. The injury persisted through the season causing substantial leaf damage, stunting, and developmental delay. Wild oat control was consistent across herbicide treatments except for difenzoquat plus thifensulfuron and tribenuron with Sword. This combination resulted in very diverse control ratings, which led to large LSDs.

New active ingredient for wild oat control. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2), one- to three-leaf wild buckwheat (25 to 75/yd^2), and two- to six-leaf wild mustard (10 to 50/yd^2) on June 10 with 63°F, 54% relative humidity, 25% cloud cover, 4 to 6 mph wind at 315°, and moist soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested September 2.

		6/26	6/26	6/26	6/26	7/10	7/10	7/10	9/02
Treatment	Rate	Wht	Wioa	Wibw	Wimu	Wioa	Wibw	Wimu	Yield
	oz/A				%				bu/A
A09+B09+PO	0.7+0.17+1%	0	76	10	30	90	71	90	26
A09+B09+PO	1.1+0.26+1%	0	82	15	27	93	82	91	26
A09+B09+PO	1.4+0.35+1%	0	89	15	35	93	87	96	28
A09+B09+PO	2.1+0.53+1%	0	90	32	45	96	85	95	24
Pinoxaden	0.86	0	94	0	5	96	0	0	24
Fenoxaprop	1.32	0	92	0	0	95	0	0	25
Fluroxypyr+PO	1.5+1%	0	0	95	92	0	95	95	12
A09+B09+Fluroxypyr+PO	1.1+0.26+1.5+1%	0	91	92	94	95	94	97	28
Pinoxaden+Fluroxypyr	0.86+1.5	0	92	94	91	96	91	90	28
Clopyralid+PO	1.4+1%	0	0	91	50	0	97	22	14
A09+B09+Clopyralid+PO	1.1+0.26+1.4+1%	0	86	92	84	94	97	94	25
Pinoxaden+Clopyralid	0.86+1.4	0	92	91	37	97	95	15	26
Untreated	0	0	0	0	0	0	0	0	10
CV		0	4	19	30	1	4	10	14
LSD 5%		0	4	13	20	1	4	9	5

Herbicides did not cause visible injury to wheat. This new herbicide demonstrated efficacy to grass and broadleaf weeds. Control with this herbicide was slow to develop, especially for wild buckwheat and wild mustard. A09 at 1.4 oz/A gave 89% wild oat control in June but didn't appear to affect buckwheat or mustard very much, less than 40% control. By July, this treatment provided 93, 87, and 96% control of wild oat, wild buckwheat, and wild mustard, respectively. Increasing the rate of A09 to 2.1 oz/A did not substantially improve weed control.

Wild oat control with pyroxsulam and adjuvants. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat, two- to three-leaf wild oat (1500 to 2000/yd^2), one- to three-leaf wild buckwheat (25 to 75/yd^2), and two- to six-leaf wild mustard (10 to 50/yd^2) on June 10 with 63°F, 54% relative humidity, 25% cloud cover, 4 to 6 mph wind at 315°, and moist soil at 61°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Plots were harvested on September 2.

		6/26	6/26	6/26	6/26	7/10	7/10	7/10	9/02
Treatment	Rate	Wht	Wioa	Wibu	Wimu	Wioa	Wibw	Wimu	Yield
	oz ai/A				%				bu/A
Pxlm&Flas&Flox	1.4	0	85	91	94	87	95	98	20
Pxlm&Flas&Flox+N-Pak	1.4+56	0	86	90	93	94	96	98	22
Pxlm&Flas&Flox+Preference	1.4+0.5%	0	84	87	94	94	96	98	21
Pxlm&Flas&Flox+Class Act NG	1.4+2.5%	0	87	92	95	95	96	98	25
Pxlm&Flas&Flox+Class Act NG+AG02013	1.4+2.5%+4	0	85	91	95	91	96	98	23
Pxlm&Flas&Flox+Class Act NG+AG05017	1.4+2.5%+4	0	89	94	96	94	96	99	22
Pxlm&Flas&Flox+AG06011	1.4+6	0	86	92	95	95	95	98	21
Pxlm&Flas&Flox+Prime Oil	1.4+0.8%	0	87	92	95	91	96	97	22
Pxlm&Flas&Flox+SuperbHC	1.4+0.5%	0	85	92	96	90	94	98	25
Pxlm&Flas&Flox+SuperbHC+ AG07046+AG02013	1.4+0.5%+ 1.25%+4	0	90	95	93	94	96	98	22
Pxlm&Flas&Flox+Superb HC+ AG07046+AG05017	1.4+0.5%+ 1.25%+4	0	87	91	93	92	95	98	28
Pxlm&Flas&Flox+Destiny	1.4+0.8%	0	85	90	92	94	95	98	23
Pxlm&Flas&Flox+AG05006	1.4+0.5%	0	89	92	93	95	96	98	23
Pxlm&Flas&Flox+AG05006+ AG07046+AG02013	1.4+0.5%+ 1.25%+4	0	90	92	93	95	95	97	23
Pxlm&Flas&Flox+AG05006+ AG07046+AG02013	1.4+0.5%+ 1.25%+4	0	85	95	93	95	96	97	27
Pxlm&Flas&Flox+AG07090	1.4+1.25%	0	89	91	95	94	95	95	23
Pxlm&Flas&Flox+AG07043	1.4+1%	0	87	94	95	95	95	98	23
CV		0	3	3	3	3	2	1	16
LSD 5%		0	4	5	4	4	3	1	5

Visible injury to wheat with herbicides was not observed on July 26. A slightly reduced rate of herbicide was used to accentuate differences among treatments. However, activity of the herbicide was so great that improvement with adjuvants was unlikely. Control of broadleaf weeds was 90% or greater and improved from the first to the second evaluation. Wild oat control with herbicide was not improved by adjuvants at the June evaluation, but by July nearly all adjuvants improved herbicide activity by 7 to 8 percentage points resulting in 94 to 95% wild oat control.

Wild oat control with GoldSky in spring wheat. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 18 at 90 lb/A into 7.5-inch rows in conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 11 at the 3-4 leaf wheat stage. Weeds present included wild oat (3-leaf, 5/ft^2). Individual plots were 10 x 30 ft and replicated three times.

All GoldSky treatments caused about 10% chlorosis and 20% stunting 4-7 days after treatment (DAT). The plants recovered to 6-7% injury by 7 DAT. No chlorosis was observed 3 WAT. All GoldSky treatments provided 81-90% wild oat control on July 3 and 88-93% on July 17. Competitor products provided similar wild oat control (89-93%).

Table. Wild oat control with GoldSky in spring wheat (0935).

		Wheat							Wioa[b]	
Treatment[a]	Rate/ha	Jun 15	Jun 18	Jul 03	Jul 17	Jun 18	Jul 03	Jul 17	Jul 03	Jul 17
		---------% chlorosis----------				% growth reduc			---% control---	
Untreated		0	0	0	0	0	0	0	0	0
GoldSky + R-11 + AMS	117.5 g + 0.50% + 1.7 kg	10	6	0	0	19	5	0	85	92
GoldSky + Linkage	117.5 g + 0.50%	10	6	0	0	19	6	1	81	91
GoldSky + Superb HC	117.5 g + 0.50%	10	6	0	0	18	5	1	90	93
GoldSky + 2,4-De + AMS	117.5 g + 280 g + 1.7 kg	10	6	0	0	18	6	1	90	91
GoldSky + 2,4-Da + R-11 + AMS	117.5 g + 280 g + 0.5% + 1.7 kg	10	7	0	0	20	6	2	89	93
GoldSky + MCPAe + AMS	117.5 g + 280 g + 1.7 kg	10	6	0	0	18	5	0	87	91
GoldSky + MCPAa + R-11 + AMS	117.5 g + 280 g + 0.5% + 1.7 kg	10	6	0	0	18	6	2	81	88
Pyroxsulam + Superb HC	15 g + 0.50%	10	6	0	0	19	6	1	87	89
Pyroxsulam + Linkage	15 g + 0.50%	10	6	0	0	18	5	0	88	90
Pyroxsulam + R-11 + AMS	15 g + 0.50% + 1.7 kg	10	6	0	0	18	6	0	89	88
Axial + WideMatch + MCPAe	60 g + 210 g + 420 g	2	0	0	0	0	0	0	91	93
Discover NG + Affinity TM	56 g + 21 g	3	1	0	0	2	2	0	87	90
Everest + 2,4-De	20 g + 420 g	6	4	0	0	12	5	4	84	89
Rimfire + R-11 + AMS + Bronate Adv.	12.5 g + 0.25% + 1.7 kg + 560 g	9	4	0	0	11	4	0	89	92
LSD (0.05)		1	1.3	NS	NS	2.5	2.3	1.6	8.2	5.6
CV		8	18	0	0	12	33	157	6	4

[a] *All treatments were applied at the 3-4 leaf wheat stage*

[b] *Wioa =Wild oat*

Efficacy in spring wheat with Rimfire tankmixes. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 18 at 90 lb/A into 7.5-inch rows in conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 12. The Rimfire/Huskie split application was applied on June 12/17. Individual plots were 10 x 30 ft and replicated three times. Weeds present included wild oat (3-4 leaf, 0-20/ft^2).

All Rimfire treatments caused moderate crop injury in the form of chlorosis and slight stunting (7 DAT). The injury subsided to less than 10% by 3 WAT. All treatments provided good wild oat control (81-89%). There were no differences in wheat yield between Rimfire treatments, which were about 30 bu/A more than the untreated check.

Table. Efficacy in spring wheat with Rimfire tankmixes (0933).

		Wheat			Wioa[b]		Wheat	
Treatment[a]	Rate	Jun 19	Jul 04	Jul 17	Jul 04	Jul 17	Yield	Test wt.
		---------% injury--------			----% control----		bu/A	lb/bu
Untreated		0	0	0	0	0	23	62.6
Rimfire Max + Huskie + MSO	3 oz + 11 oz + 1.5 pt	18	8	3	93	88	49	61.6
Rimfire Max + Huskie + Quad 7	3 oz + 11 oz + 1%	18	8	3	93	87	54	61.9
Rimfire Max + Huskie + Denstiny HC	3 oz + 11 oz + 0.75 pt	18	8	3	93	86	56	61.9
Rimfire Max + Bronate Adv. + Quad 7	3 oz + 0.8 pt + 1%	18	9	3	92	81	54	61.7
Rimfire Max + Affinity TM + Starane Ultra + Quad 7	3 oz + 0.6 oz + 0.17 pt + 1%	18	8	3	93	86	54	61.2
Rimfire Max + Quad 7 / Huskie + AMS	3 oz + 1% / 11 oz + 0.5 lb	17	8	3	94	89	56	61.3
LSD (0.05)		0.8	0.8	3	2.7	5.3	9.7	NS
CV		3	6	0	2	4	11	2

[a] *Treatments applied at 3- to 4-leaf wheat*

[b] *Wioa =Wild oat*

Wild oat control with SP20887. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 22. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 66°F, 54% relative humidity, 10% cloud cover, 3 mph wind at 315°, and moist soil 53°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. The plots were harvested on September 2.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wioa	8/3 Wioa	9/2 Yield
	oz/A			%		bu/A
Prcz&Mess+Brox&MCPA5+MSO	0.178+8+24	0	82	91	90	21
SP20887+Basic Blend	0.63+1%	0	89	95	97	24
SP20887+Brox&Pyrasulfotol+MSO	0.63+2.9+24	0	75	95	95	25
SP20887+Brox&Pyrasulfotol+BB	0.63+2.9+1%	0	86	95	97	21
SP20887+Brox&Pyrasulfotol+HSOC	0.63+2.9+12	0	81	94	91	20
SP20887+Brox&MCPA5+BB	0.63+8+1%	0	77	95	97	21
SP20887+Thif-sg+Trib-sg+Flox+BB	0.63+0.24+0.06+1+1%	0	86	95	96	23
Untreated	0	0	0	0	0	8
CV		0	4	2	2	19
LSD 5%		0	4	2	2	6

Herbicides did not cause visible injury to wheat. SP20887 provided better wild oat control than propoxycarbazone and mesosulfuron in July and August. Differences among treatments were not dramatic, but treatments that included basic blend adjuvant tended to perform better than treatments with oil adjuvants.

Adjuvant effect for wild oat control with propoxycarbazone&mesosulfuron. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 50°F, 70% relative humidity, 0% cloud cover, 1 to 2 mph wind at 270°, and moist soil at 48°F with dew present. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wht	7/10 Wioa
	oz/A		%		
Prcz&Mess	0.14	0	60	0	72
Prcz&Mess+Class Act-NG	0.14+2.5%	0	80	0	91
Prcz&Mess+Class Act-NG+AG02013	0.14+2.5%+4	0	82	0	93
Prcz&Mess+Class Act-NG+AG05017	0.14+2.5%+4	0	82	0	87
Prcz&Mess+Destiny	0.14+24	0	69	0	80
Prcz&Mess+AG05006	0.14+12	0	69	0	80
Prcz&Mess+AG05006	0.14+16	0	66	0	76
Prcz&Mess+AG05006+AG02013	0.14+12+4	0	79	0	79
Prcz&Mess+AG05006+AG05017	0.14+12+4	0	72	0	76
Prcz&Mess+AG07090	0.14+1.25%	0	90	0	95
Prcz&Mess+AG07043	0.14+1%	0	85	0	93
CV		0	6	0	4
LSD 5%		0	6	0	5

Substantial increases in efficacy to wild oat with propoxycarbazone and mesosulfuron were determined for several adjuvants. AG07090 provided the most herbicide enhancement resulting in 90% control in June. AG07043 provided similar adjuvant support resulting in 85% control. All adjuvants improved wild oat control relative to the herbicide alone, but Destiny and AG05006 gave the least benefit. These ranks held fairly consistent in July with increases in all treatment ratings.

Adjuvant effect for wild oat control with flucarbazone. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 50°F, 70% relative humidity, 0% cloud cover, 1 to 2 mph wind at 270°, and moist soil at 48°F with dew present. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wht	7/10 Wioa
	oz/A			%	
Flcz	0.28	0	82	0	95
Flcz+Class Act NG	0.28+2.5%	0	90	0	97
Flcz+Class Act NG+AG02013	0.28+2.5%+4	0	89	0	96
Flcz+Class Act NG+AG05017	0.28+2.5%+4	0	90	0	97
Flcz+SuperbHC	0.28+16	0	87	0	97
Flcz+AG05006	0.28+12	0	86	0	97
Flcz+AG05006	0.28+16	0	89	0	96
Flcz+AG05006+AG02013	0.28+12+4	0	90	0	96
Flcz+AG05006+AG05017	0.28+12+4	0	89	0	96
Flcz+AG07090	0.28+1.25%	0	90	0	96
Flcz+AG07043	0.28+1%	0	90	0	97
CV		0	3	0	1
LSD 5%		0	4	0	1

All adjuvants improved wild oat control with flucarbazone. In June, this difference was 5 to 8 percentage points increase. There was not meaningful differences among the adjuvants for this improvement. In July, adjuvants again improved control but difference from flucarbazone alone, 95% control, to flucarbazone plus the best adjuvants, 97% control, was not a practical difference.

Wild oat and foxtail control with Wolverine. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 18 at 90 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 13 at the 3- to 4-leaf wheat stage. Wild oat (Wioa) ranged from 3- to 4-leaf with 0-15 plants/ft^2. Green foxtail (Grft) was 0.5-2 inch tall with 50-200 plants/ft^2. Individual plots were 10 x 30 ft and replicated three times.

Rimfire caused significant chlorosis and slight stunting 1 and 3 weeks after treatment (WAT), but the injury subsided to about 4% by 5 WAT. Wolverine and Rimfire + Huskie provided 93-95% wild oat control 5 WAT, while Puma + Huskie provided slightly less control at 88%. Puma + Bronate provided significantly less wild oat control at 77%. Wolverine provided excellent foxtail control (92%), while Puma + Huskie and Puma + Bronate were slightly less at 89 and 85%, respectively. Rimfire provided poor foxtail control (42%). Wheat yield generally correlated with weed control as Wolverine had the highest weed control and yield. Rimfire had the lowest foxtail control and the lowest yield of the herbicide treatments, but was still 17 bu/A more than the untreated check.

Table. Wild oat and foxtail control with Wolverine (0910).

		HRSW[b]			Wioa[b]		Grft[b]		HRSW[b]	
Treatment[a]	Rate	Jun 20	Jul 04	Jul 18	Jul 04	Jul 18	Jul 04	Jul 18	Yield	Test wt.
		----------% injury----------			----------% control----------				bu/A	lb/bu
Untreated		0	0	0	0	0	0	0	37	62.7
Wolverine	1.7 pt	0	0	0	95	93	96	92	65	62.2
Puma + Huskie	0.66 pt + 11 oz	0	0	0	91	88	91	89	61	62.2
Rimfire Max + Huskie + Quad 7	3 oz + 11 oz + 1%	17	13	4	93	95	47	42	54	62.7
Puma + Bronate Adv	0.66 pt + 0.8 pt	0	0	0	78	77	87	85	60	62.3
LSD (0.05)		1	3.5	1	7.1	7.8	4.9	3.1	7.7	NS
CV		1	2	1	4	4	3	2	7	1

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

[b] *HRSW =Hard Red Spring Wheat; Wioa =Wild oat; Grft =Green foxtail*

Spring wheat tolerance and weed control with Puma and tank mix partners. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 18 at 90 lb/A into 7.5-inch rows in conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 12. The Puma/Huskie split application was applied on June 12/17. Individual plots were 10 x 30 ft and replicated three times. Weeds present included wild oat (3-4 leaf, 0-15/ft^2), foxtail (0.5-2", 50-200/ft^2), kochia (0.5-1.5, 0-20/ft^2) and redroot pigweed (0.5", 0-15/ft^2). Yellow foxtail was dominant in rep 1, but reps 2 and 3 were mostly green foxtail. Only Rimfire provided slightly less foxtail control in rep 1.

Rimfire Max caused significant wheat chlorosis and slight stunting 1 and 3 weeks after treatment (WAT). This injury subsided to less than 10% by 5 WAT and there was no effect on wheat yield. Puma and Huskie provided excellent control of all weeds whether tank mixed or applied as a split application. Puma + Bronate provided good to excellent weed control, but foxtail and pigweed control was slightly lower than with Puma + Huskie. Rimfire + Huskie provided excellent control of wild oat, kochia, and pigweed, but provided poor foxtail control. All herbicide treatments provided similar wheat yield, which was about 16 bu/A higher than the untreated check.

Table. Spring wheat tolerance and weed control with Puma and tank mix partners (0926).

		Wheat			Wioa[a]		Fxtl[a]		Kocz[a]		Rrpw[a]		Wheat	
Treatment	Rate	Jun 19	Jul 04	Jul 17	Jul 04	Jul 17	Jul 04	Jul 17	Jul 04	Jul 17	Jul 04	Jul 17	Yield	TW
		------% injury------			----------% control----------								bu/A	lb/bu
Untreated		0	0	0	0	0	0	0	0	0	0	0	40	62.8
Puma / Huskie + AMS	0.66 pt / 11 oz + 0.5 lb	3	0	0	98	99	97	95	100	100	100	100	56	62.5
Puma + Huskie	0.66 pt + 11 oz	1	0	0	98	94	90	91	98	100	95	99	56	62.1
Puma + Bronate Adv.	0.66 pt + 0.8 pt	1	0	0	94	98	88	84	97	100	79	85	56	62.0
Rimfire Max + Huskie + MSO	3 oz + 11 oz + 1.5 pt	22	17	5	93	99	67	50	100	100	94	99	55	62.5
LSD (0.05)		1.7	1	NS	2.5	7.8	6.9	8.7	4.8	NS	7.4	7.1	7	NS
CV		16	15	0	2	5	5	7	3	0	5	5	7	1

[a] *Wioa =Wild oat, Fxtl =Foxtail, Kocz =Kochia, Rrpw =Redroot pigweed*

Wild oat control with Puma in durum wheat. Williston 2009. Neil Riveland. WREC.

'Grenora' durum wheat was planted notill into wheat stubble from 2008 in 7 inch rows at 90 lbs/a on May 4. All treatments were applied on May 30 with 62 F air temperature, 59 degree soil temperature, 33% relative humidity, 100% clear sky and wind at 2-4 mph from 98 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.

										----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	60.5	7.2
Puma	10.7	4	3	5	3	75	86	92	83	60.4	20.6
Puma+Huskie	10.7+11	4	2	3	4	84	90	90	88	60.9	22.1
Wolverine	27	6	4	1	1	78	90	95	94	60.3	22.3
EXP MEAN		3	2	2	2	59	66	69	66	60.5	18.1
C.V. %		38	99	122	162	9	7	4	6	.6	8.4
LSD 5%		2	NS	NS	NS	8	7	5	7	NS	2.4

a - Puma 1EC

Wolverine gave the best overall control of wild oats. All treatments had significant early crop injury ratings, perhaps due to cool weather conditions early in the growing season.

Wild oat control with fenoxaprop. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June10 with 66°F, 54% relative humidity, 10% cloud cover, 3 mph wind at 315°, and damp soil with 53°F. Treatments 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. Plots were harvested on September 2.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wioa	8/3 Wioa	9/02 Yield
	oz/A			%		bu/A
Fenoxaprop	1.32	0	87	91	91	24
Fenx+Brox&Pyrasulfotol	1.32+2.9	0	91	93	91	23
Fenx+Brox&MCPA5	1.32+8	0	87	93	90	24
Fenx&Pyrasulfotol&Brox	4.2	0	91	98	99	23
SP20887+Brox&Pyrasulfotol+MSO	0.63+2.9+24	0	87	94	87	23
Untreated	0	0	0	0	0	9
CV		0	4	1	2	8
LSD 5%		0	4	2	2	2

Wheat injury was not observed. Fenoxaprop, whether alone or tank-mixed, gave about 90% control of wild oat. This was essentially similar to wild oat control with SP20887. However, the premix of fenoxaprop with pyrasulfotole and bromoxynil provided better control of wild oat by June 10, 98%. This difference held through the end of the season, demonstrating the premix is a superior formulation to the tank-mix for wild oat control. This result confirms results of similar studies conducted in the past 2 years, although this relationship has not been statistically significant in all comparisons.

Wild oat control with broad-spectrum weed control options. Howatt, Roach, Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 66°F, 54% relative humidity, 10% cloud cover, 3 mph wind at 315°, and moist soil at 53°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wheat was harvested September 2.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wioa	8/3 Wioa	9/02 Yield
	oz/A			%		bu/A
Fenx&Pyst&Brox	4.2	0	87	95	94	25
Fenx+Brox&Pyst	1.32+2.9	0	86	95	94	23
SP20887+Brox&Pyst+Basic Blend	0.63+2.9+1%	0	81	93	87	19
Fenx+Brox&MCPA5	1.32+8	0	89	95	94	21
Pinoxaden+Brox&MCPA5	0.86+8	0	92	99	99	24
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	87	97	99	24
Untreated	0	0	0	0	0	13
CV		0	4	1	3	14
LSD 5%		0	4	1	3	4

Visible injury to wheat was not observed. Pinoxaden provided the greatest control of wild oat at each evaluation, although it was equal to pyroxsulam in August, 99%. SP20887 gave less control than other herbicides, but control always was above 80% and after June control was near 90% for this herbicide.

Wild oat control with Fenoxaprop and adjuvants. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and two- to three-leaf wild oat (1500 to 2000/yd^2) on June 10 with 66°F, 54% relative humidity, 10% cloud cover, 3 mph wind at 315°, and damp soil at 53°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/26 Wht	6/26 Wioa	7/10 Wioa
	oz/A		%	
Fenoxaprop	1.32	0	90	95
Fenoxaprop	1	0	81	93
Fenoxaprop+AG02013	1+4	0	86	94
Fenoxaprop+AG05017	1+4	0	84	94
Fenoxaprop+AG06011	1+6	0	82	92
Fenoxaprop+AG07090	1+1.25%	0	87	95
Fenoxaprop+AG07010	1+16	0	82	95
Fenoxaprop+SuperbHC	1+16	0	85	94
CV		0	3	2
LSD 5%		0	4	3

A reduced rate of fenoxaprop was used to accentuate the benefit of adjuvants. Wild oat control was less with 1 oz/A, 81%, than with 1.32 oz/A, 90%, on June 26. Three adjuvants resulted in improved wild oat control with the reduced rate of fenoxaprop. AG07090 gave the best improvement to 87%. AG02013 and Superb HC gave similar enhancement to fenoxaprop activity at 86 and 85% control, respectively. By July 10, there was not a difference in wild oat control across herbicide treatments regardless of fenoxaprop rate or adjuvant inclusion.

2009 Evaluation of Weed Control with Rimfire Max in Spring Wheat

Eric Eriksmoen, Hettinger, ND

'Reeder' HRSW was seeded on May 14. Treatments were applied on June 2 to 3 leaf wheat and to downy brome (dobr) in the boot stage, tillering Japanese brome (jabr), 3 leaf wild oat (wiot) and 2 leaf Persian darnel (peda) with 56° F, 42% RH, mostly cloudy sky and East wind at 2 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. Grassy weed populations were only present in the 4th rep. Weed populations for downy brome, Japanese brome, wild oat and Persian darnel were 5, 3, 0.2 and 0.25 plants per square foot, respectively. Plots were evaluated for crop injury on June 12 and June 27, and for weed control on June 27 and August 11. The trial was harvested on Sept 7.

			Grain	6/12	June 27				August 11			
	Treatment	Product rate	Yield	inj	inj	dobr	jabr	peda	dobr	jabr	wiot	peda
		oz / Acre	bu/A	% control								
1	Untreated		30.7	0	0	0	0	0	0	0	0	0
2	Rimfire Max + Huskie + MSO*	3.0 + 11 + 24	40.7	2.5	0	99	99	99	99	99	90	99
3	Rimfire Max + Huskie + BB*	3.0 + 11 + 1%	38.5	3.8	0	99	99	99	99	99	99	99
4	Rimfire Max + Huskie + HC*	3.0 + 11 + 12	39.5	1.2	0	99	99	99	99	99	99	99
5	Rimfire Max + Bro. Adv. + BB	3.0 + 12.8 + 1%	36.2	1.2	0	95	99	99	50	99	99	99
6	Rimfire Max+Affinity TM+Starane Ultra+BB	3.0+0.6+2.72+1%	34.8	1.2	0	95	99	99	90	99	99	99
7	Rimfire + Huskie + MSO	2.0 + 11 + 24	30.1	2.5	0	50	80	20	50	95	99	0
8	Silverado + Huskie + MSO	2.0 + 11 + 24	37.3	3.8	0	5	5	50	0	0	99	80
	C.V. %		8.5	122	0	--	--	--	--	--	--	--
	LSD .05		4.5	NS	NS	--	--	--	--	--	--	--

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

Summary

Crop injury was observed as slight leaf chlorosis and quickly diminished. All Rimfire Max treatments provided excellent season long Japanese brome, wild oat and Persian darnel control. All Rimfire Max treatments also provided excellent season long downy brome control except for Rimfire Max + Bronate Advance (trt 5). Rimfire + Huskie (trt 7) provided excellent season long control of Japanese brome and wild oats, marginal control of downy brome and no Persian darnel control. Silverado (trt 8) was not effective on either brome species but provided excellent season long control of wild oats and fair control of Persian darnel. All treatments had significantly higher grain yields than the untreated check except for Rimfire Max + Affinity TM + Starane Ultra (trt 6) and Rimfire + Huskie (trt 7).

2009 Evaluation of Fall and Spring Applications of Pyroxulam for Downy Brome and Japanese Brome Control in Winter Wheat

Eric Eriksmoen, Hettinger, ND

'Wesley' HRWW was seeded on October 6, 2008. Fall treatments were applied on October 23 to one leaf winter wheat and to two leaf downy brome (dobr) with 45° F, 41% RH, clear sky and north wind at 7 mph. Spring treatments were applied on April 20 as the winter wheat was starting to green up and to 3 leaf downy brome and one leaf Japanese brome (jabr) with 60° F, 31% RH, partly cloudy sky and NW wind at 6 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 sprayed with 8 oz/A Starane + 16 oz/A Buctril to control broadleaf weeds on June 19. The trial was a randomized complete block design with four replications. Downy brome populations were greater than 50 plants per square foot and Japanese brome were inconsistently scattered throughout the trial. Plots were evaluated for crop injury on April 27 (data not shown), May 4 (data not shown), May 20 and May 27 and for brome control on April 21, May 20, May 27 and on July 21. The trial was not harvested due to hail damage on June 22 and again on June 24.

	Treatment	Product rate	App. timing	4/21	-- May 20 --		-- May 27 --		-- July 21 --	
				dobr	inj.	brome*	inj.	brome*	dobr	jabr
		oz / acre		%						
1	GF-1274+Activator 90+AMS	3.5+0.5%+1.7kg	Fall	85	0	80	0	79	91	75
2	GF-1274+Activator 90+AMS	3.5+0.5%+1.7kg	Spg	0	0	82	0	82	91	60
3	Olympus + Activator 90	0.9 + 0.5%	Fall	89	0	82	0	88	94	72
4	Olympus + Activator 90	0.9 + 0.5%	Spg	0	10	95	5	98	97	97
5	Olympus Flex+Act. 90+AMS	3.17+0.5%+1.7kg	Fall	88	0	60	0	70	74	70
6	Olympus Flex+Act. 90+AMS	3.17+0.5%+1.7kg	Spg	0	0	88	0	90	92	92
7	Maverick + Activator 90	0.67 + 0.5%	Fall	62	0	80	0	84	82	84
8	Maverick + Activator 90	0.67 + 0.5%	Spg	0	0	64	0	66	55	68
9	Untreated	0		0	0	0	0	0	0	0
	C.V. %			15	0	11	346	15	14	17
	LSD 5%			8	1	11	3	16	15	17

* mixed downy and Japanese brome species.

Summary

The crop was seeded into dry soil causing delayed germination and emergence, however, winter survival and the spring stands were very good. Downy brome appeared to have more fall germination while the Japanese brome tended to have more spring germination. Crop injury was observed only on the spring applied Olympus treatment (trt 4). GF-1274 (trt 1) and Olympus (trt 3) were the only fall applied treatments to provide excellent season long downy brome control. The other fall applied treatments provided only moderate season long downy brome control. All of the fall applied treatments provided only moderate control of the spring emerging Japanese brome species. Olympus (trt 4) and Olympus Flex (trt 6) were the only spring applied treatments to provide excellent Japanese brome control.

Volunteer barley control with herbicide rates. Howatt, Roach, and Harrington. Twelve ft of 'Tradition' and 12 ft of 'Pinnacle' barley were seeded in each replicate near Fargo on May 28. Treatments were applied to three- to four-leaf barley on June 24 with 80° F, 28% RH, 30% cloud cover, 4 mph wind at 180°, and damp soil at 75° F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Plots were harvested for yield on September 16.

		7/06	9/16
Treatment	Rate	Barley	Yield
	oz/A	%	bu/A
Flcz+Brox&Pyst+BB	0.35+2.9+1%	50	25
Flcz+Brox&Pyst+BB	0.5+2.9+1%	73	26
Flcz+Brox&Pyst+BB	0.7+2.9+1%	72	22
Clfp-ng+Brox&Pyst	0.8+2.9	25	27
Clfp-ng+Brox&Pyst	1.2+2.9	35	26
Clfp-ng+Brox&Pyst	1.6+2.9	42	28
Pxlm&Flas&Flox+BB	1.69+1%	72	18
Pxlm&Flas&Flox+Brox&Pyst+BB	1.69+2.9+1%	70	24
Pxlm&Flas&Flox+Brox&Pyst+BB	2.5+2.9+1%	73	23
Pxlm&Flas&Flox+Brox&Pyst+BB	3.4+2.9+1%	75	23
Untreated	0	0	27
C. V.		10	18
LSD		8	6

These treatments have been suggested as causing too much injury to register in barley. For this reason, they were evaluated for potential control of volunteer barley in wheat. Substantial injury was present on July 6. The ALS-inhibiting herbicides were more damaging than the ACCase-inhibiting herbicide, but even at 2x rates, injury did not exceed 75%. While stunting and developmental delay occurred, very few plants were killed. If plants survived but did not produce grain, the practice would still have benefit for wheat growers. However, only one treatment resulted in less grain yield than untreated barley.

Volunteer barley control with herbicide timing. Howatt, Roach, and Harrington. Twelve ft of 'Tradition' and 12 ft of 'Pinnacle' barley were seeded near Fargo on May 28. Treatments were applied as follows:

Application date	June 22	June 24	July 8
Stage	2 leaf	3 – 4 leaf	jointing
Temperature (F)	84	80	67
RH (%)	67	39	68
Sky (cloud cover)	25%	40%	45%
Wind (mph)	2	4	2-3
direction (degrees)	225	180	45
Soil condition	damp	damp	moist
temperature (F)	70	75	68

All treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Plots were harvested for yield on September 16.

Treatment	Rate	Growth stage	7/6/09 Barley	9/16 Yield
	oz/A		%	bu/A
Flcz+Brox&Pyst+BB	0.42+2.9+1%	one-leaf	30	25
Clfp-ng+Brox&Pyst	0.8+2.9	one-leaf	22	24
Pxlm&Flas&Flox+Brox&Pyst+BB	1.69+2.9+1%	one-leaf	52	23
Flcz+Brox&Pyst+BB	0.42+2.9+1%	three-leaf	70	23
Clfp-ng+Brox&Pyst	0.8+2.9	three-leaf	42	24
Pxlm&Flas&Flox+Brox&Pyst+BB	1.69+2.9+1%	three-leaf	67	22
Flcz+Brox&Pyst+BB	0.42+2.9+1%	five-leaf	-	19
Clfp-ng+Brox&Pyst	0.8+2.9	five-leaf	-	17
Pxlm&Flas&Flox+Brox&Pyst+BB	1.69+2.9+1%	five-leaf	-	23
Untreated	0		0	24
C.V.			25	7
LSD 5%			10	2

Barley growth stage at application was evaluated to identify the best timing of three herbicides to minimize the effect of barley competition in wheat. Injury from each application timing persisted to the end of the season but was not severe enough to kill barley or reduce yield except when applied at the five-leaf stage. Unfortunately, when herbicides are applied at this late stage to wheat, potential for wheat injury increases dramatically. This is especially true with ALS inhibitors. Besides, seed production was not substantially less with any treatment compared to the untreated.

Volunteer barley control as influenced by adjuvant. Howatt, Roach, and Harrington. Twelve ft of 'Tradition' and 12 ft of 'Pinnacle' barley were seeded near Fargo on May 28. Treatments were applied to three- to four-leaf barley on June 24 with 80° F, 39% relative humidity, 4 mph wind at 180°, and damp soil at 75° F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Plots were harvested for yield on September 16.

		7/6/09	9/16
Treatment	Rate	Barley	Yield
	oz/A	%	bu/A
Pxlm&Flax&Flox	1.7	71	21
Pxlm&Flax&Flox+R-11	1.7+0.25%	66	22
Pxlm&Flax&Flox+Bronc Total	1.7+1%	70	21
Pxlm&Flax&Flox+Import	1.7+5.8	65	21
Pxlm&Flax&Flox+Linkage	1.7+1%	62	24
Pxlm&Flax&Flox+Destiny HC	1.7+16	67	20
Pxlm&Flax&Flox+Super Spread MSO	1.7+32	67	21
Pxlm&Flax&Flox+Superspread MSO+AMS	1.7+32+16	71	19
Pxlm&Flax&Flox+Renegade	1.7+32	65	22
C.V		7	13
LSD 5%		7	4

Adjuvants did not improve the activity of pyroxsulam to control volunteer barley. Also, barley yield did not differ between pyroxsulam premix alone and any pyroxsulam premix plus adjuvant.

Broadleaf weed control in wheat, Fargo. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to 2- to 3-inch weeds on June 22 with 84°F, 68% RH, 40% cloud cover, 2.5 mph wind at 225°, and damp soil at 70°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. Plots were harvested for yield on September 7.

		7/6	7/6	7/6	7/6	7/6	7/20	7/20	7/20	9/07
Treatment	Rate	Wht	Wibw	Wimu	Coma	Rrpw	Wibw	Coma	Rrpw	Yield
	oz ai/A				%					bu/A
Fluroxypyr&MCPA	8	0	85	96	93	96	91	95	97	41
Clopyralid&Fluroxypyr	3	0	84	93	87	85	94	90	89	31
Clpy&Flox+Thif-sg+Trib-sg	2+0.16+0.04	0	91	98	92	95	97	97	98	32
Thif-sg+Trib-sg+Sword+NIS	0.24+0.06+4+0.25%	0	95	98	95	99	96	97	99	31
Thif-sg+Trib-sg+Salvo+NIS	0.1+0.1+4+0.25%	0	95	99	93	97	94	95	98	30
Carfentrazone&2,4-D+NIS	4.06+0.25%	0	96	99	96	98	95	97	98	30
Pyraflufen+Salvo+NIS	0.013+4+0.25%	0	93	97	89	95	91	95	98	30
Bromoxynil&MCPA5	8	0	95	99	88	95	95	91	95	33
Bromoxynil&2,4-D	9	0	95	99	91	93	96	97	98	29
Bromoxynil&Pyrasulfotol	2.9	0	96	99	96	97	96	95	98	32
Bromoxynil&Fluroxypyr	5	0	96	97	94	92	92	97	91	31
Florasulam&MCPA+NIS	5.07+0.25%	0	86	96	86	96	93	96	97	32
Untreated	0	0	0	0	0	0	0	0	0	31
C.V.		0	3	2	4	3	2	2	2	14
LSD 5%		0	4	2	5	4	3	3	3	6

Wheat injury was not observed. Competitive wheat enhanced weed control of treatments resulting in control that was generally greater than 90% by July 20. Control of any species at either evaluation was 84% or greater. Clopyralid and fluroxypyr at a reduced rate plus thifensulfuron and tribenuron was one of the most effective treatments across all species. Premixes of bromoxynil with 2,4-D or pyrasulfotole also were very effective across species. Other treatments had at least one species where control dropped to near 90% on July 20, still very effective but less control than the most effective treatments.

Broadleaf weed control in spring wheat, Williston 2009. Neil Riveland.

'Mott' hard red spring wheat was planted on recrop (land cropped to safflower in 2008) in 7 inch rows at 90 lbs/a on April 23. All treatments were applied on June 2 with an air temperature of 58 F., 31% relative humidity, soil temp 61F, 85% clear sky and wind at 2-4 mph from 353 degrees to 4-4.5 leaf wheat, 1-3 inch Russian thistle (Ruth) and kochia (Kocz). 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 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. Weeds densities were 1-2 plts/sq ft for Russian thistle, and 3-4 plts/sq ft for kochia. Plots were evaluated for crop injury on June 12 and July 11 and for weed control on June 12, July 11 and August 2. Wheat was machine harvested for yield on August 21.

Treatmenta	Rate	Crop Injury 6-12	Crop Injury 7-11	Test Weight	Yield	Ruth 6/12	Ruth 7/11	Ruth 8/2	Kocz 6/12	Kocz 7/11	Kocz 8/2
		---- % ----		lbs/bu	bus/a	----------% Control----------					
Fluroxypyr & MCPA	8 oz/a	0	0	61.6	29.9	44	90	45	59	48	93
Clpy & Flox	3 oz/a	0	2	61.9	25.7	44	77	88	50	86	93
Clpy & Flox+Thif-sg+Trib-sg	2+0.16+0.04	0	1	61.7	26.0	29	55	72	25	68	65
Thif-sg+Trib-sg+Sword+NIS	0.24+0.06+4+0.25%	0	0	61.3	26.2	29	43	40	24	28	19
Thif-sg+Trib-sg+Salvo+NIS	0.1+0.1+4+0.25%	0	1	61.6	26.0	26	83	87	24	44	36
Carfentrazone&2,4-D+NIS	4.06+0.25%	6	1	61.7	25.8	79	77	65	83	49	40
Pyraflufen+Salvo+NIS	0.013+4+0.25%	0	0	61.6	27.1	71	77	83	64	54	46
Brox&MCPA5	8 oz/a	0	0	61.9	30.3	97	99	97	92	94	94
Brox&2,4-D	9 oz/a	0	1	61.8	28.2	93	98	97	90	96	96
Brox&Pyrasulfotol	2.9 oz/a	0	0	61.9	28.5	96	95	94	88	94	86
Brox&Fluroxypyr	5 oz/a	0	0	61.6	26.4	58	78	90	54	89	88
Florasulam&MCPA+NIS	5.07+0.25%	0	3	60.6	23.8	38	25	8	45	61	58
Untreated	0	0	0	61.1	24.9	0	0	0	0	0	0
EXP MEAN		0	1	61.5	26.8	54	66	67	54	65	62
C.V. %		202	213	.7	8.9	33	30	29	28	21	26
LSD 5%		1	2	NS	3.4	26	33	33	21	19	23

a - Thif = Thifensulfuron. Clopy - Clopyralid Brom = Bromoxynil
Carf = Carfentrazone Flox = Fluroxypry
NIS = R-11 from Wilbur-Ellis.

Summary: Bromoxynil+MCPA gave the best early weed control, resulting in the highest wheat yields.

Broadleaf weed control in barley with Audit and Obtain. Jenks, Willoughby, and Hoefing. 'Conlon' barley was seeded May 11 at 75 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicide treatments were applied postemergence (POST) on June 10 at the 4- to 5-leaf stage. Redroot pigweed (Rrpw) was very small (emerging to 1") with about 2 plants/ft^2. Kochia was also small (emerging to 2.5") with generally less than 1 plant/ft^2. Individual plots were 10 x 30 ft and replicated three times.

Audit is a 3:1 mixture of thifensulfuron and tribenuron (i.e., Harmony Extra), while Obtain is a dry formulation of fluroxypyr (i.e., Starane). Only a few of the treatments caused minor, temporary injury (≤6%). All of the treatments provided excellent pigweed control (<91%). All of the treatments containing fluroxypyr (Widematch, Obtain, Starane) or Huskie provided excellent kochia control. Only Audit alone did not control kochia, likely due to ALS-resistance.

Table. Broadleaf weed control in barley with Obtain and Audit (0904).

		Barley		Rrpw[b]		Kocz[b]	
Treatment[a]	Rate/ha	Jun 26	Jul 08	Jun 26	Jul 08	Jun 26	Jul 08
		---% injury---		----------% control----------			
Untreated		0	0	0	0	0	0
Audit + NIS	21 g + 0.5%	0	0	95	97	27	27
Audit + Widematch	7 g + 158 g	0	0	92	91	97	98
Audit + Obtain + NIS	16 g + 53 g + 0.5%	1	1	95	94	97	93
Audit + Obtain + NIS	21 g + 70 g + 0.5%	0	0	97	97	97	95
Audit + Obtain + NIS	26 g + 88 g + 0.5%	0	0	98	97	97	98
Audit + Obtain + NIS	31.4 g + 105 g + 0.5%	0	0	98	98	98	99
Audit + Obtain + MCPA	21 g + 70 g + 280 g	0	0	98	99	98	99
Audit + Obtain + MCPA + NIS	21 g + 70 g + 280 g + 0.25%	0	0	99	98	98	99
Obtain L + 2,4-De	70 g + 420 g	5	1	88	92	98	98
Obtain + 2,4-De	70 g + 420 g	5	1	88	93	97	99
Starane + 2,4-De	70 g + 420 g	6	0	89	96	98	99
Huskie + AMS	200 g + 227 g	0	0	100	100	100	100
LSD (0.05)		1.6	NS	2.6	6.3	5.4	6.9
CV		68	367	2	4	4	5

[a]*All treatments applied at 3-leaf stage*

[b]*Rrpw =Redroot pigweed; Kocz =Kochia*

Kochia control with Fluroxypyr. Howatt, Roach, and Harrington. 'AC Vista' hard red spring wheat was seeded in Valley City on May 4. Treatments were applied to three- to four-leaf wheat, 1- to 4-inch kochia (50 to 100/yd^2), four- to six-leaf volunteer sunflower (50 to 75/yd^2), and 1- to 2-inch common ragweed (2 to 10/yd^2) on June 9 with 55°F, 60% relative humidity, 95% cloud cover, 5 to 6 mph wind at 315°, and damp soil at 52°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

		6/22	6/22	6/22	6/22	7/7	7/7	7/23	7/23
Treatment	Rate	Wht	Kochia	Sufl	Corw	Kochia	Sufl	Kochia	Sufl
	oz/A					%			
A546+A547+NIS	0.23+0.08+0.5%	0	43	88	70	27	95	27	98
A546+A547+Clpy&Flox	0.08+0.03+2.3	0	87	80	82	78	96	88	97
A546+A547+flox-A+NIS	0.17+0.06+0.75+0.5%	0	77	85	83	78	96	83	97
A546+A547+flox-A+NIS	0.23+0.08+1+0.5%	0	80	90	83	77	98	89	99
A546+A547+flox-A+NIS	0.28+0.09+1.25+0.5%	0	90	90	87	78	98	88	99
A546+A547+flox-A+NIS	0.33+0.11+1.5+0.5%	0	87	92	88	82	97	93	99
A546+A547+flox-A+Sword	0.23+0.08+1+4	0	82	92	83	83	96	93	99
A546+A547+flox-A +Sword+NIS	0.23+0.08+1 +4+0.25%	0	87	93	93	80	98	93	99
Flox-AL+Salvo	1+6	0	85	85	82	78	98	93	99
Flox-A+Salvo	1+6	0	80	85	78	85	96	96	99
Flox+Salvo	1+6	0	88	94	94	80	98	94	98
Flox-A	1	0	63	53	60	82	82	92	91
Flox-A+NIS	1+0.5%	0	60	57	47	83	93	87	93
Flox-A+NIS+AMS	1+0.5%+8	0	77	63	43	78	91	83	94
Flox-A+Linkage	1+1%	0	82	68	57	77	92	85	95
Flox-A+MSO	1+16	0	70	67	43	72	92	83	96
Bromoxynil&Pyrasulfotol	2.9	0	90	94	92	67	94	43	94
CV		0	7	6	8	6	3	4	1
LSD 5%		0	9	9	10	7	4	6	2

Combinations of fluroxypyr with two numbered compounds, A546 and A547, gave similar weed control among ratios. Weed control among three fluroxypyr formulations did not differ across evaluations. Kochia control with fluroxypyr was not improved by the addition of adjuvant, but control of sunflower was improved at each evaluation. The greatest benefit occurred 14 DAT with the basic blend adjuvant Linkage or an MSO improving control ofsunflower with fluroxypyr by 15 percentage points. Later in the season, the benefit was 4 to 5 points. Initial control with bromoxynil and pyrasulfotole was 90%, but as the season progressed, kochia survivors quickly recovered and compensated for lost plants resulting in late-season ratings near 40%.

Fluroxypyr control of ALS-resistant kochia, Valley City. Howatt, Roach, and Harrington. 'Glenn' hard red spring wheat was seeded near Valley City on May 10. Treatments were applied to three- to four-leaf wheat, 1- to 4-inch kochia (100 to 200/yd^2), four- to six-leaf volunteer sunflower (50 to 75/yd^2), and 1- to 2-inch common ragweed (2 to 10/yd^2) on June 9 with 55°F, 60% relative humidity, 95% cloud cover, 6 mph wind at 315°, and damp soil at 52°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

		6/22	6/22	6/22	6/22	7/7	7/7	7/7	7/23	7/23
Treatment	Rate	Wht	Kocz	Sufl	Corw	Wht	Kocz	Sufl	Kocz	Sufl
	oz/A					%				
Trib-HA+NIS	0.25+0.25%	2	33	47	43	0	40	85	23	40
Trib-sg+NIS	0.25+0.25%	1	43	67	57	0	53	83	27	50
Flox-HA	1.5	0	85	83	73	0	82	92	90	99
Flox	1.5	0	67	63	47	0	73	93	92	98
Trib-HA+Flox-HA+NIS	0.25+1.5+0.25%	0	83	90	53	0	88	96	98	99
Thif-sg+Trib-sg+NIS	0.2+0.2+0.25%	11	40	90	68	3	40	95	27	99
Dicamba	2	7	77	83	88	9	87	96	93	99
Clopyralid&Flox	3	0	67	75	60	0	75	95	89	99
Brox&Pyrasulfotol+NIS+AMS	2.9+0.25%+8	0	92	95	93	0	92	99	90	99
Brox&MCPA5	8	0	80	87	82	0	73	93	73	99
Salvo	12	0	78	90	92	0	63	96	72	99
Untreated	0	0	0	0	0	0	0	0	0	0
CV		78	16	9	13	88	6	2	5	1
LSD 5%		2	17	11	14	1	7	3	5	1

Thifensulfuron and tribenuron or dicamba caused injury to wheat and was rated as 11 and 7% injury on June 22, respectively. This injury persisted into the season, but while the SU injury appeared to diminish, dicamba injury to wheat seemed to be more pronounced on July 7. Tribenuron formulation comparison favored trib-sg over trib-HA; however, this was opposite the result observed at the Wheatland site. Fluroxypyr formulation favored the –HA formulation for speed of control, which was consistent with the results at Wheatland. In either example, control evened between the two formulations later in the season.

Fluroxypyr control of ALS-resistant kochia, Wheatland. Howatt, Roach, and Harrington. Glenn hard red spring wheat was seeded at Wheatland, ND, on May 17. Treatments were applied to three- to four-leaf wheat, 0.5- to 3-inch kochia (5 to 30/yd^2), and 0.5- to 2-inch common lambsquarters (30 to 50/yd^2) on June 11 with 70°F, 52% relative humidity, 0% cloud cover, 2 to 4 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 an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

Treatment	Rate	6/25 Wht	6/25 Kocz	6/25 Colq	7/10 Kocz	7/10 Colq
	oz/A			%		
Trib-HA+NIS	0.25+0.25%	0	60	83	50	98
Trib-sg+NIS	0.25+0.25%	0	30	93	37	99
Flox-HA	1.5	0	93	50	98	63
Flox	1.5	0	93	37	95	57
Trib-HA+Flox-HA+NIS	0.25+1.5+0.25%	0	92	92	98	99
Thif-sg+Trib-sg+NIS	0.2+0.2+0.25%	0	57	95	57	98
Dicamba	2	0	87	85	97	95
Clopyralid&Flox	3	0	92	85	97	83
Brox&Pyrasulfotol+NIS+AMS	2.9+0.25%+8	0	93	93	95	96
Brox&MCPA5	8	0	73	93	92	98
Salvo	12	0	92	88	96	98
Untreated	0	0	0	0	0	0
CV		0	9	9	12	4
LSD 5%		0	10	12	15	6

Herbicides did not injure wheat at this location. The primary comparison of tribenuron and fluroxypyr formulation gave more consistent results here than at Valley City. For either tribenuron or fluroxypyr, the –HA formulation provided better control when the two formulations differed. For tribenuron, kochia was the differentiating species, while for fluroxypyr common lambsquarters provided the platform for separation. Marginal control in either case allowed greater divergence in control ratings. Tribenuron plus fluroxypyr or bromoxynil and pyrasulfotole provided excellent control of both species at either evaluation, 92% or better.

Broadleaf weed control with dicamba&fluroxypyr. Howatt, Roach, and Harrington. 'AC Vista' hard red spring wheat was seeded near Valley City on May 5. Treatments were applied to three- to four-leaf wheat, 1- to 4-inch kochia (100 to 200/yd^2), four- to six-leaf volunteer sunflower (50 to 75/yd^2), and 1- to 2-inch common ragweed (2 to 10/yd^2) on June 9 with 51°F, 57% relative humidity, 95% cloud cover, 4 to 5 mph wind at 315°, and damp soil at 51°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

		6/22	6/22	6/22	6/22	7/7	7/7	7/23	7/23
Treatment	Rate	Wht	Kocz	Sufl	Corw	Kocz	Sufl	Kocz	Sufl
	oz/A				%				
Untreated	0	0	0	0	0	0	0	0	0
Dicamba&Flox+NIS	1.7+0.25%	1	75	77	73	90	94	96	99
Dicamba&Flox+NIS	2.6+0.25%	3	83	83	82	93	95	98	99
Dicamba&Flox+Sword+NIS	1.7+4+0.25%	4	78	83	87	90	98	96	99
Dicamba&Flox+Sword+NIS	2.6+4+0.25%	3	83	87	87	94	98	97	99
Triasulfuron+Dicamba&Flox+NIS	0.21+1.7+0.25%	3	83	92	93	90	98	94	99
Triasulfuron+Dicamba&Flox+NIS	0.21+2.6+0.25%	2	83	92	90	93	95	98	99
Prosulfuron+Dicamba&Flox+NIS	0.14+1.7+0.25%	1	82	92	92	88	96	98	99
Prosulfuron+Dicamba&Flox+NIS	0.14+2.6+0.25%	4	85	95	90	90	96	98	99
Thif-sg+Trib-sg+Dicamba&Flox+NIS	0.24+0.06+1.7+0.25%	0	83	92	88	87	96	94	99
Thif-sg+Trib-sg+Dicamba&Flox+NIS	0.24+0.06+2.6+0.25%	0	85	93	90	89	96	96	99
Thif-sg+Trib-sg+Clopyralid&Flox+NIS	0.12+0.03+2+0.25%	0	75	88	87	82	98	93	99
Brox&Pyrasulfotol	2.9	0	90	94	95	77	96	85	96
CV		125	5	4	3	3	2	2	2
LSD 5%		3	6	6	4	5	2	2	2

Slight wheat response to many treatments was observed but the rating was less than 5% injury in all cases. The symptoms were slight discoloration and were not discernible at the second evaluation. Another study at this location had a treatment with dicamba that caused injury that persisted further into the season, but the rate of dicamba was more than included in these treatments. The premix of dicamba and fluroxypyr provided excellent weed control at either rate. Kochia response to this combination particularly was noted as being more complete than other treatments in this and adjacent studies. Bromoxynil and pyrasulfotole initially caused severe injury to kochia, but larger plants at application survived and produced a lot of biomass relative to dicamba and fluroxypyr.

Broadleaf weed control with Pulsar herbicide in spring wheat, Carrington, 2009. (Greg Endres). The experiment was conducted at the NDSU Carrington Research Extension Center in cooperation with Syngenta. The experimental design was a randomized complete block with three replicates. 'Glenn' HRS wheat was direct seeded May 11. 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. POST treatments were applied on June 3 with 71 F, 21% RH, 90% clear sky, and 13 mph wind to 2.5-leaf wheat, and 0.5- to 3-inch tall kochia and horseweed. Axial XL at 16.4 fl oz/A was applied on June 10 to plots not previously treated with a grass herbicide.

No crop response was noted on July 8 or August 14. Kochia control ranged from 79 to 93% with treatments 4-7 during both evaluation dates (Table). Excellent (≥90%) horseweed control was noted during both evaluation dates for treatments 2, 5, 7, 9, 11, 13, and 14.

Table.

Herbicide			Weed control (%)[2]			
Treatment[1]		Rate	7/8		8/14	
No.		fl oz product/A	kochia	howe	kochia	howe
1	untreated check		0	0	0	0
2	Axial TBC	8.9	27	99	13	99
	Adigor	9.6				
3	Pulsar	8.3	80	88	75	68
	NIS	0.25% v/v				
	MCPAe	8.6				
4	Pulsar	12.5	81	96	81	71
	NIS	0.25% v/v				
5	Pulsar	12.5	88	91	87	90
	NIS	0.25% v/v				
	MCPAe	8.6				
6	Pulsar	12.5	86	84	79	95
	NIS	0.25% v/v				
	Affinity TM	0.6 oz wt				
7	Pulsar	12.5	91	95	93	99
	NIS	0.25% v/v				
	WideMatch	16				
	Affinity TM	0.6 oz wt				
8	Orion	17	13	x	13	84
9	Orion	17	75	98	72	96
	WideMatch	16				
10	Orion	17	72	98	69	88
	Starane	5.3				
11	Orion	17	73	99	73	93
	Buctril	16				
12	Bronate Advanced	12.8	76	0	69	0
13	Wolverine	27.2	73	96	68	96
14	WideMatch	16	74	96	73	99
	MCPAe	8				
15	GoldSky	16	77	96	72	52
	NIS	0.25% v/v				
	AMS	48				
C.V. (%)			15.6	7.6	16.4	15.3
LSD (0.05)			17	11	17	19

[1]NIS=Preference (WinField Solutions); AMS=N-Pak AMS Liquid (WinField Solutions).

[2]howe=horseweed.

Efficacy and crop tolerance with Pulsar in barley. Jenks, Willoughby, and Hoefing. 'Conlon' barley was seeded May 11 at 75 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicide treatments were applied postemergence (POST) on June 10 at the 4- to 5-leaf stage. Redroot pigweed (Rrpw) was very small (emerging to 1") with 1-4 plants/ft^2. Individual plots were 10 x 30 ft and replicated three times.

All Pulsar treatments caused significant crop injury 6 days after treatment in the form of lodging and slight chlorosis. Injury ranged from 11-19% with injury increasing slightly with rate. The barley recovered by 2 WAT with injury at 5% or less. All treatments provided excellent pigweed control.

Table. Efficacy and crop tolerance with Pulsar in barley (0915).

		Barley[b]				Rrpw[b]	
Treatment[a]	Rate	Jun 16	Jun 26	Jul 04	Jul 20	Jul 04	Jul 20
		----------% injury----------				---% control---	
Untreated		0	0	0	0	0	0
Pulsar + NIS	8.3 fl oz + 0.25%	12	1	0	0	97	100
Pulsar + NIS	12.5 fl oz + 0.25%	14	3	0	0	98	100
Pulsar + MCPAe + NIS	8.3 fl oz + 0.54 pt + 0.25%	11	0	0	0	97	100
Pulsar + MCPAe + NIS	12.5 fl oz + 0.54 pt + 0.25%	19	4	0	0	100	100
Peak + Pulsar + NIS	0.25 oz + 8.3 fl oz + 0.25%	14	2	0	0	100	100
Peak + Pulsar + NIS	0.25 oz + 12.5 fl oz + 0.25%	17	5	3	0	100	100
Affinity TM + Pulsar + NIS	0.6 oz + 8.3 fl oz + 0.25%	13	1	0	0	100	100
Affinity TM + Pulsar + NIS	0.6 oz + 12.5 fl oz + 0.25%	14	3	0	0	100	100
Huskie + AMS	11 fl oz + 0.5 lb	0	0	0	0	100	100
LSD (0.05)		2.8	2.5	NS	NS	3.8	1
CV		2	1	1	0	2	0

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

[b] *HRSW =Hard Red Spring Wheat, Rrpw =Redroot pigweed*

2009 Pulsar Herbicide in Spring Wheat

Eric Eriksmoen, Hettinger, ND

'Reeder' HRSW was seeded on May 14. Treatments were applied on June 3 to 3 leaf wheat and to1 inch tall kochia (kocz) and to 2 inch tall Russian thistle (ruth) with 50° F, 80% RH, clear sky and southwest 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. Kochia and Russian thistle populations averaged 23 and 10 plants per square foot, respectively. Plots were evaluated for crop injury on June 15 and on June 30, and for broadleaf weed control on June 30 and on September 4. The trial sustained moderate hail damage on June 22. The trial was harvested on September 7.

	Treatment	Product rate	June 15	----- June 30 -----		-- Sept. 4 --		Grain
			inj.	inj	kocz	ruth	kocz	ruth	yield
		oz/A	---------- % control ----------						bu/A
1	Untreated		0	0	0	0	0	0	26.9
2	Axial TBC + Adigor	8.85 + 9.6	1.5	0	45	35	18	25	33.5
3	Pulsar + MCPA + NIS	8.3 + 8.6 + 0.25%	0.2	0	90	38	82	12	27.3
4	Pulsar + NIS	12.5 + 0.25%	0.2	0	95	65	84	50	30.5
5	Pulsar + MCPA + NIS	12.5 + 8.6 + 0.25%	0.5	0	94	80	95	80	26.7
6	Pulsar + Affinity TM + NIS	12.5 + 0.6 + 0.25%	0.5	0	92	94	95	96	29.8
7	Pulsar+WideMatch+Affinity TM+NIS	12.5+16+0.2+0.25%	0.8	0	95	94	99	99	26.6
8	Orion	17	1.2	0	52	60	32	18	28.2
9	Orion + WideMatch	17 + 16	0.5	0	94	91	94	20	24.3
10	Orion + Starane	17 + 5.33	1.5	0	82	68	92	25	29.7
11	Orion + Buctril	17 + 16	0.5	0	65	70	65	58	27.4
12	Bronate Advance	12.8	1.2	0	70	65	68	41	28.8
13	Huskie + NIS + AMS	11 + 0.25% + 0.5 lb	0.2	0	79	90	95	82	28.1
14	WideMatch + MCPA	16 + 8	0.2	0	89	91	94	97	28.4
15	Affinity TM + MCPA	0.6 + 8	0.2	0	25	36	50	28	26.7
	C.V. %		213	0	12.6	26.1	20.3	47.5	13.3
	LSD 5%		NS	NS	13	24	21	33	NS

NS = no statistical difference between treatments.

Summary

Crop injury was minor and diminished quickly. Axial TBC (trt 2), Orion alone (trt 8) and Affinity TM + MCPA (trt 15) provided relatively poor season long kochia and Russian thistle control. Pulsar + Affinity TM (trt 6), Pulsar + WideMatch + Affinity TM (trt 7) and WideMatch + MCPA (trt 14) provided excellent season long kochia and Russian thistle control. Pulsar + MCPA (trt 5), Orion + WideMatch (trt 9), Orion + Starane (trt 10) and Huskie (trt 13) provided excellent season long kochia control but only fair to poor season long Russian thistle control. There were no statistically significant differences between treatments for grain yield.

Broadleaf control with pyroxsulam tank-mixes. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three-leaf wheat, one-leaf yellow foxtail (100 to 150/yd^2), one- to five-leaf wild buckwheat (10 to 75/yd^2), and two- to eight-leaf wild mustard (10 to 50/yd^2) on June 12 with 71°F, 59% relative humidity, 25% cloud cover, 1 to 2 mph wind at 225°, and damp soil at 56°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/15	6/26	6/26	6/26	6/26	7/11	7/11	7/11	8/18	8/18
Treatment	Rate	Wheatt	Wheatt	Yellow foxtail	Wild buckwheat	Wild mustard	Yellow foxtail	Wild buckwheat	Wild mustard	Yellow foxtail	Wild buckwheat
	oz/A	%									
Pxlm-dry+NIS+AMS	0.21+0.5%+24	5	0	80	87	95	79	91	98	75	92
Pxlm&Flas&Flox+NIS+AMS	1.69+0.5%+24	5	0	89	91	96	89	94	99	86	95
Pxlm&Flas&Flox+Linkage	1.69+0.5%	5	0	85	89	96	89	93	99	82	94
Pxlm&Flas&Flox+SuperbHC	1.69+0.5%	5	0	85	91	96	87	92	95	91	96
Pxlm&Flas&Flox+Salvo+AMS	1.69+4+24	5	0	84	94	96	89	95	98	84	92
Pxlm&Flas&Flox+Saber+NIS+AMS	1.69+6+0.5%+24	5	0	85	90	95	82	91	97	81	95
Pxlm&Flas&Flox+Sword+AMS	1.69+5+24	5	0	86	92	96	85	91	98	87	96
Pxlm&Flas&Flox+MCPA+NIS+AMS	1.69+6+0.5%+24	5	0	84	93	96	90	94	99	84	98
GF-2489+NIS+AMS	3.2+0.5%+24	5	0	82	94	95	80	94	97	86	97
Pxdn+Clpy&Flox+Sword	0.86+3+6	5	0	81	95	93	86	95	99	85	98
Fenx+Brox&Pyrasulfotol+AMS	1.32+2.9+24	5	0	81	90	90	81	90	93	72	94
Clodinafop-ng+Thif-sg+Trib-sg+NIS	0.8+0.24+0.06+0.25%	5	0	76	95	97	84	95	99	81	97
Flcz+Salvo+Basic Blend	0.28+6+1%	5	0	84	91	97	86	90	98	79	89
Prcz&Mess+Brox&MCPA5+NIS+AMS	0.18+8+0.25%+24	5	0	5	85	94	10	89	97	27	86
Untreated	0	0	0	0	0	0	0	0	0	0	0
CV		0	0	6	4	2	5	2	2	10	4
LSD 5%		0	0	6	5	3	6	3	2	11	5

Slight injury was observed across all herbicide treatments 3 DAT. This injury was short-lived and could not be identified 14 DAT. Pyroxsulam alone provided exceptional wild mustard control, 95% or better, so addition of other broadleaf herbicides was not beneficial. With the addition of florasulam and fluroxypyr, control of wild buckwheat tended to be improved compared with pyroxsulam alone. Control of yellow foxtail with pyrxsulam also was improved by this addition occasionally, presumably from the florasulam.

Broadleaf weed control with GoldSky in spring wheat. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 12 at 90 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 12 at the 4-leaf wheat stage. Wild oat (Wioa) ranged from 3- to 4-leaf with 0-15 plants/ft^2. Redroot pigweed was emerging to 1-inch tall with 3-40 plants/ft^2. Individual plots were 10 x 30 ft and replicated three times.

GoldSky caused significant chlorosis (6-21%) and growth reduction (9-21%) seven days after treatment. The highest injury was caused by GoldSky tank mixed with 2,4-D amine. The amine formulations caused more injury than the ester formulations. Another group 2 herbicide, Everest, also caused significant injury at 1 and 3 WAT. In the GoldSky treatments, the wheat generally recovered to 10% or less injury by 3 WAT. All treatments provided excellent pigweed control. Despite the early crop injury, there were no differences in wheat yield and quality between treatments.

Table. Broadleaf weed control with GoldSky in spring wheat (0914).

		HRSW[a]						Rrpw[a]		HRSW[a]	
Treatment	Rate/ha	Jun 19	Jul 04	Jul 20	Jun 19	Jul 04	Jul 20	Jul 04	Jul 20	Yield	Test wt.
		----% chlorosis----			% growth reduction			--% control--		bu/A	lb/bu
Untreated		0	0	0	0	0	0	0	0	75	63.5
GoldSky + R-11 + AMS	117.5 g + 0.5% + 1.7 kg	6	0	0	12	5	0	95	99	73	63.3
GoldSky + Linkage	117.5 g + 0.5%	11	0	0	13	7	0	96	100	70	62.9
GoldSky + Superb HC	117.5 g + 0.5%	7	0	0	12	5	0	95	100	73	62.7
GoldSky + 2,4-De + AMS	117.5 g + 280 g + 1.7 kg	10	0	0	14	8	2	98	100	79	63.1
GoldSky + 2,4-Da + R-11 + AMS	117.5 g + 420 g + 0.5% + 1.7 kg	21	0	0	21	11	4	99	100	79	62.7
GoldSky + MCPAe + AMS	117.5 g + 350 g + 1.7 kg	5	0	0	9	5	0	99	100	78	63.4
GoldSky + MCPAa + R-11 + AMS	117.5 g + 420 g + 0.5% + 1.7 kg	11	0	0	12	10	3	99	100	73	63.3
EXP		5	0	0	9	4	0	98	100	72	63.0
Axial + WideMatch + MCPAe	60 g + 210 g + 420 g	0	0	0	0	0	0	93	100	74	63.0
Puma + Huskie + AMS	92 g + 200 g + 1.7 kg	0	0	0	0	0	0	100	100	74	63.2
Discover NG + Affinity TM	56 g + 21 g	0	0	0	0	0	0	95	98	77	63.6
Everest + 2,4-De	20 g + 420 g	22	0	0	21	15	7	91	98	77	63.5
Rimfire + R-11 + AMS + Bronate Adv.	12.5 g + 0.25% + 1.7 kg + 560 g	6	0	0	9	4	0	93	97	76	63.0
LSD (0.05)		2.9	NS	NS	3.1	2.7	1	3.6	3.1	NS	NS
CV		1.7	0	0	1.8	1.6	0.6	0.6	1.8	8	1

Tankmixes with florasulam for wild buckwheat control. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three-leaf wheat, one-leaf yellow foxtail (100 to 150/yd^2), one- to five-leaf wild buckwheat (10 to 75/yd^2), two- to eight-leaf wild mustard (10 to 50/yd^2), and 1- to 2-inch common lambsquarters (5 to 10/yd^2) on June 12 with 63°F, 65% relative humidity, 50% cloud cover, 2 to 3 mph wind at 225°, and damp soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6/15	6/26	6/26	6/26	6/26	6/26	7/6	7/6	7/6	7/6	7/20	7/20	7/20	7/20	8/18	8/18	8/18
Treatment	Rate	Wheat	Wheat	Yellow foxtail	Wild buckwheat	Wild mustard	Common lambsquarters	Yellow foxtail	Wild buckwheat	Wild mustard	Common lambsquarters	Yellow foxtail	Wild buckwheat	Wild mustard	Common lambsquarters	Yellow foxtail	Wild buckwheat	Common lambsquarters
	oz/A									%								
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pxdn&Florasulam+Adigor	0.93+9.6	0	0	90	89	94	30	89	79	93	42	88	45	96	32	88	70	60
Pxdn&Flas+Adigor+Brox&MCPA5	0.93+9.6+8	0	0	86	93	95	95	84	92	99	92	81	93	98	96	82	97	98
Pxdn-0.83+Adigor+Brox&MCPA5	0.86+9.6+8	0	0	89	91	94	94	90	86	92	93	89	93	99	96	89	95	97
Pxdn&Florasulam+Adigor+Flox	0.93+9.6+1	0	0	87	89	96	45	91	89	97	76	92	86	98	70	91	96	67
Pxdn-0.83+Adigor+Flox	0.86+9.6+1	0	0	87	81	82	25	90	80	91	25	92	86	97	42	93	89	45
Pxdn&Florasulam+Adigor+Brox&Flox	0.93+9.6+2.9	0	0	89	94	97	88	91	91	98	94	89	94	99	96	89	93	90
Pxdn-0.83+Adigor+Brox&Flox	0.86+9.6+2.9	0	0	86	92	77	82	85	89	87	92	93	89	91	95	87	90	90
Pxdn&Florasulam+Adigor+Flox&MCPA	0.93+9.6+5.3	0	0	91	95	96	91	94	91	95	95	80	90	98	96	86	94	98
Pxdn-0.83+Adigor+Flox&MCPA	0.86+9.6+5.3	0	0	91	81	96	93	93	80	95	95	89	84	99	94	91	88	97
Pxdn&Florasulam+Adigor+Clpy&Flox	0.93+9.6+1.9	0	0	90	94	96	82	92	94	98	80	89	94	98	92	91	97	93
Pxdn-0.83+Adigor+Clpy&Flox	0.86+9.6+1.9	0	0	89	89	77	79	94	90	89	79	92	94	89	72	93	97	88
Pxdn&Flas+Adigor+Brox&Pyst+AMS	0.93+9.6+2.9+8	0	0	87	94	95	95	90	89	97	92	85	93	96	97	85	93	95
Pxdn-0.83+Adigor+Brox&Pyst+AMS	0.86+9.6+2.9+8	0	0	86	93	95	94	91	91	96	97	84	85	92	92	82	93	97
Pxdn-0.83+Thif-sg+Trib-sg+Sword	0.86+0.24+0.06+5.6	0	0	89	94	97	96	95	94	99	97	86	90	99	94	87	94	95
Pxlm&Florasulam&Flox+Basic Blend	1.68+1%	0	0	89	94	96	62	94	96	99	20	91	94	99	70	91	94	80
Fenoxaprop&Pyst&Brox	4.2	0	0	91	91	96	94	94	95	99	97	90	97	99	98	68	94	98
CV		0	0	4	3	5	8	3	4	3	9	5	5	3	7	14	4	10
LSD 5%		0	0	5	4	6	9	4	5	4	9	5	6	5	8	16	5	11

Florasulam provided excellent control, at least 93%, of wild mustard. While florasulam alone did not control wild buckwheat or common lambsquarters, florasulam often improved control of these weeds with a tank-mix partner relative to the other herbicide applied alone. Many combinations of florasulam with another herbicide were able to control broadleaf weeds present; however, these combinations tended to reduce midseason yellow foxtail control, in some cases by 8 to 9 percentage points.

Efficacy and crop tolerance with Axial TBC in barley. Jenks, Willoughby, and Hoefing. 'Conlon' barley was seeded May 11 at 75 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicide treatments were applied postemergence (POST) on June 10 at the 4- to 5-leaf stage. Redroot pigweed (Rrpw) was very small (0.5-2") with 1-7 plants/ft^2. Individual plots were 10 x 30 ft and replicated three times.

The Axial treatments caused no or very slight chlorosis that disappeared by 12 DAT. GoldSky, which is not labeled for barley, caused severe injury; however, the barley recovered over time and the GoldSky yield was actually similar to the other treatments. Barley yields were similar across all treatments. All treatments provided excellent pigweed control except for Axial + Starane and Axial + WideMatch, which would be expected.

Table. Efficacy and crop tolerance with Axial TBC in barley (0920).

		Barley			Rrpw		Barley	
Treatment[a]	Rate	Jun 16	Jun 22	Jul 20	Jul 05	Jul 20	Yield	Test wt.
		--------% injury---------			-----% control----		bu/A	lb/bu
Untreated		0	0	0	0	0	78	49.5
Axial TBC + Adigor	8.85 fl oz + 0.6 pt	2	0	0	91	91	71	50.6
Axial TBC + Adigor + Bronate Adv.	8.85 fl oz + 0.6 pt + 0.8 pt	5	1	0	98	98	74	51.0
Axial + Adigor + Bronate Adv.	8.2 fl oz + 0.6 pt + 0.8 pt	1	0	0	100	100	80	50.6
Axial TBC + Adigor + Starane	8.85 fl oz + 0.6 pt + 0.33 pt	1	0	0	96	96	88	50.0
Axial + Adigor + Starane	8.2 fl oz + 0.6 pt + 0.33 pt	0	0	0	60	43	84	50.8
Axial TBC + Adigor + Starane NXT	8.85 fl oz + 0.6 pt + 8 fl oz	3	0	0	96	98	78	50.8
Axial + Adigor + Starane NXT	8.2 fl oz + 0.6 pt + 8 fl oz	0	0	0	96	99	88	50.7
Axial TBC + Adigor + Starane Sword	8.85 fl oz + 0.6 pt + 12 fl oz	3	0	0	99	96	80	51.1
Axial + Adigor + Starane Sword	8.2 fl oz + 0.6 pt + 12 fl oz	2	0	0	92	91	80	51.0
Axial TBC + Adigor + WideMatch	8.85 fl oz + 0.6 pt + 10 fl oz	3	0	0	87	91	83	48.9
Axial + Adigor + WideMatch	8.2 fl oz + 0.6 pt + 10 fl oz	1	0	0	55	37	77	50.0
Axial TBC + Adigor + Huskie + AMS	8.85 fl oz + 0.6 pt + 11 fl oz + 0.5 lb	4	0	0	100	99	89	49.8
Axial + Adigor + Huskie + AMS	8.2 fl oz + 0.6 pt + 11 fl oz + 0.5 lb	0	0	0	100	100	86	49.8
Axial XL + Affinity TM + MCPAe	16.4 fl oz + 0.6 oz + 0.75 pt	4	0	0	99	99	81	50.5
GoldSky + NIS	1 pt + 0.25%	63	58	21	94	93	86	49.2
Wolverine	1.7 pt	5	1	0	100	100	83	50.3
LSD (0.05)		2.1	3.2	1	6.2	6.8	NS	NS
CV		22	54	23	4	5	13	3

[a] *All treatments were applied at 4-5 leaf barley*

2009 Evaluation of Weed Control with Axial TBC in Spring Wheat

Eric Eriksmoen, Hettinger, ND

'Reeder' HRSW was seeded on May 14. Treatments were applied on June 3 to 3 leaf wheat and to 1 inch tall kochia (kocz), 2 inch tall Russian thistle (ruth), 2 inch tall wild buckwheat (wibw), downy brome (dobr) in the boot, tillering Japanese brome (jabr) and 3 leaf wild oat (wiot) with 49° F, 80% RH, clear sky and southwest 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. Kochia, Russian thistle, wild buckwheat, downy brome, Japanese brome and wild oat populations averaged 12, 7, 0.5, 3, 1 and 0.2 plants per square foot, respectively. Plots were evaluated for crop injury on June 15 and June 26, and for weed control on June 26 and September 4. The trial sustained moderate hail damage on June 22 and June 24, and was harvested on September 7.

			6/15	June 26					September 4				Grain
	Treatment	Product rate	inj	inj	kocz	ruth	wibw	dobr	kocz	ruth	jabr	wiot	yield
		oz/A	% control										bu/A
1	Untreated		0	0	0	0	0	0	0	0	0	0	27.9
2	Axial TBC + Adigor	8.85 + 9.6	3	0	95	96	96	0	62	28	0	99	29.6
3	Axial TBC + Adigor + MCPA ester	8.85 + 9.6 + 10.6	2	0	88	88	99	0	66	54	0	99	33.1
4	Axial TBC + Adigor + Starane	8.85 + 9.6 + 5.3	0	0	93	93	98	7	94	84	0	99	39.6
5	Axial TBC + Adigor + Starane & Sward	8.85 + 9.6 + 12	2	0	99	80	99	25	92	84	30	99	32.2
6	Axial TBC + Adigor + Starane NXT	8.85 + 9.6 + 14	2	0	98	98	96	25	99	92	0	99	36.2
7	Axial TBC + Adigor + Bronate Advanced	8.85 + 9.6 + 16	2	0	95	96	98	0	96	98	0	99	30.0
8	Axial TBC + Adigor + Widematch	8.85 + 9.6 + 10	0	0	90	70	99	0	80	52	0	99	38.1
9	Axial XL + Huskie + NIS + AMS	16.4 + 11 + 0.25%+0.5lb	1	0	92	99	99	0	96	97	0	99	28.1
10	Goldsky + NIS	16 + 0.25%	4	0	96	90	95	99	95	82	99	99	34.2
11	Wolverine + NIS	27.4+0.25%	2	0	88	94	96	0	81	98	0	99	32.1
12	Puma + Huskie + NIS + AMS	8 + 11 + 0.25%+0.5lb	2	0	95	96	93	0	91	99	0	99	38.2
13	Puma+ Widematch + MCPA ester	8 + 16 + 12	0	0	95	95	99	0	96	89	0	99	33.0
14	Everest + Bron. Adv.	0.4 + 12.8	2	0	85	99	98	99	71	96	99	99	36.6
15	Rimfire+Bron. Adv. + MSO	2.25 + 12 + 24	0	0	87	93	90	99	75	92	99	99	32.8
	C.V. %		138	0	4.2	8.4	3.6	51	13.5	18.0	--	0	9.3
	LSD .05		NS	NS	6	12	5	19	15	20	--	NS	4.4

NS = no statistical difference between treatments.

Summary

Crop injury was minor when observed and quickly diminished. All treatments provided good initial kochia and wild buckwheat control. All treatments provided very good initial Russian thistle control with the exception of Axial TBC + Starane & Sward (trt 5) and Axial TBC + Widematch (trt 8) which only provided marginal control. Hail damage opened up the crop canopy, allowing many noncompetitive weeds to grow and also cause some crop damage. Season long weed control and grain yield data should be interpreted with caution.

Broadleaf weed control with Huskie in spring wheat. Williston 2009. Neil Riveland. WREC.

'Mott' hard red spring wheat was planted notill into safflower stubble from 2008 in 7 inch rows at 90 lbs/a on April 23. All treatments were applied on June 2 with 61 F air temperature, soil temp of 64 degrees, 27% relative humidity, 90% clear sky and wind at 1-4mph from 5 degrees to 4-5 leaf wheat and 1-3 inch Russian thistle (Ruth) 1/2-2inch kochia (Kocz). 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 0.34 inches on June 6. Experimental design was a randomized complete block design with four replications. Kochia and Russian thistle densities averaged 4 and 3 plant/ft2, respectively. Plots were evaluated for crop injury and weed control on June 13, June 20, July 11,and August 2. Durum was machine harvested for yield on August 21.

		---Crop Injury---				-Kochia Control-				--Ruth Control--					
Treatment[a]	Product Rate	6/13	6/20	7/11	8/2	6/13	6/20	7/11	8/2	6/13	6/20	7/11	8/2	Test weight	Yield
	oz/A	------- % ------				------ % -------				------ % -------				lbs/bu	bus/A
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	60.7	26.0
Huskie+AMS	11+8	0	1	0	0	89	96	97	95	96	98	95	97	62.3	38.3
Huskie+AMS	13.5+8	0	1	0	0	76	80	80	85	95	95	92	95	62.1	35.5
Huskie+AMS	15+8	0	0	0	0	91	97	96	93	99	99	98	98	62.4	39.1
Huskie+AMS+NIS	13.5+8+0.25%	0	0	1	4	89	96	93	94	98	99	99	98	62.1	37.9
Widematch+MCPAester	16+8	0	0	3	4	44	69	89	86	40	74	85	89	62.2	32.6
Affinity TM+Starane+NIS	0.6+5.3+0.25%	1	0	2	6	36	78	86	85	25	48	54	64	61.6	33.2
EXP MEAN		0	0	1	2	61	74	77	77	65	73	75	77	61.9	34.6
C.V.		9	391	146	132	19	10	9	9	13	9	10	9	0.4	8.7
LSD 5%		NS	NS	2	4	17	11	11	10	12	10	11	11	0.6	4.5

[a] - AMS = Ammonium Sulfate at 0.5 lbs/a. NIS = Induce Nonionic Surfactant.

Huskie gave good early season control of Russian thistle and kochia. AMS increased Huskie efficacy on weeds only when Huskie was applied at the lowest rate of application.

Broadleaf weed control with Wolverine in durum wheat. Williston 2009. Neil Riveland. WREC.

'Grenora' durum wheat was planted no till into flax stubble from 2008 in 7 inch rows at 90 lbs/a on May 4. All treatments were applied on June 2 with 62 F air temperature, 25% Relative humidity, 95% clear sky and wind at 2-4mph from 343 degrees to 4 leaf wheat and 1-3 inch Russian thistle (Ruth) 1/2-2inch kochia (Kocz). 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. Kochia and Russian thistle densities averaged 1/2-1 plant/ft2. Plots were evaluated for crop injury and weed control on June 13, June 20 and July 11. Durum was machine harvested for yield on August 21.

		Crop --Injury--			Kocz --Control-			Ruth --Control-			Test Wght	Yield
Treatment[a]	Product Rate	6/13	6/20	7/11	6/13	6/20	7/11	6/13	6/20	7/11	lbs/bu	bus/a
	oz/A	----	%	-----	----	%	----	----	%	----		
Untreated	0	0	0	0	0	0	0	0	0	0	59.7	26.0
Wolverine	27.4	0	0	2	92	93	92	99	97	88	60.5	30.0
Widematch+MCPAester	12+8	1	0	0	60	73	74	78	88	82	60.3	26.1
Orion	17	0	0	1	53	91	59	74	84	75	60.1	28.8
GoldSky+Superb HC	16+0.25%	10	8	6	72	79	94	71	86	85	60.8	29.1
EXP MEAN		2	2	2	55	61	64	64	71	66	60.3	28.0
C.V. %		90	160	146	35	28	24	26	14	19	0.4	16.2
LSD 5%		3	4	4	30	27	24	26	16	19	NS	NS

[a] - "Superb HC"is an ionic surfactant by AgriSolutions.

Goldsky caused significant crop injury but no yield reduction occurred. Wolverine had the best early season weed control ratings.

Broadleaf weed control in spring wheat. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 12 at 90 lb/A into 7.5-inch rows in conventionally tilled field. Herbicides treatments were applied postemergence (POST) on June 12. Individual plots were 10 x 30 ft and replicated three times. Weeds were small and low in density. Weeds present included kochia (1-2", <1/ft^2) and redroot pigweed (0.5-2", 2/ft^2).

GoldSky, a Group 2 herbicide, caused significant chlorosis and slight stunting 1 week after treatment (WAT); however, this injury subsided to less than 10% by 3 WAT. Orion did not control kochia, likely due to ALS resistance. WideMatch + MCPA provided only fair pigweed control. Huskie, Affinity + Starane, and GoldSky provided excellent control of all weeds. There were no significant differences in wheat yield or test weight between treatments.

Table. Broadleaf weed control in spring wheat (0925).

		Wheat			Kocz[b]		Rrpw[b]		Wheat	
Treatment[a]	Rate	Jun 19	Jul 04	Jul 20	Jul 04	Jul 20	Jul 04	Jul 20	Yield	Test wt.
		--------% injury--------			----------% control----------				bu/A	lb/bu
Untreated		0	0	0	0	0	0	0	80	62.8
Huskie + AMS	11 oz + 0.5 lb	0	0	0	100	100	98	94	81	61.7
WideMatch + MCPA	0.75 pt + 0.5 pt	0	0	0	95	98	78	81	83	62.5
Affinity TM + Starane + NIS	0.6 oz + 0.33 pt + 0.25%	5	1	1	95	98	97	95	78	62.3
Orion	17 oz	2	0	0	40	40	91	93	86	62.6
GoldSky + NIS	16 oz + 0.25%	16	6	2	95	98	96	95	84	62.0
LSD (0.05)		2.7	1.1	0.4	1	1	6.4	8.6	NS	NS
CV		39	49	53	0	0	5	6	5	1

[a] *Weeds at application were less than 2" tall.*

[b] *Kocz = Kochia, Rrpw =Redroot pigweed*

Broadleaf weed control with wheat herbicides. Jenks, Willoughby, and Hoefing. This study was conducted in a fallow field. Herbicides treatments were applied postemergence (POST) on June 19. Individual plots were 10 x 30 ft and replicated three times. Weeds present included prickly lettuce (6-18", 0-4/ft^2), kochia (2-4, 0-20/ft^2) and common lambsquarters (2-4", 0-2/ft^2).

All treatments provided excellent control of prickly lettuce. Orion provided poor kochia control, likely due to ALS resistance. WideMatch + MCPA and Affinity + Starane still provided good kochia control, despite the lower use rates. Lambsquarters control with GoldSky was about 20% lower than other treatments. Huskie provided excellent control of all weeds.

Table. Broadleaf weed control with wheat herbicides (0936).

		Prle[b]		Kocz[b]		Colq[b]	
Treatment[a]	Rate	Jul 05	Jul 22	Jul 05	Jul 22	Jul 05	Jul 22
		----------% control----------					
Untreated		0	0	0	0	0	0
Huskie + AMS	11 oz + 0.5 lb	98	99	95	93	100	100
WideMatch + MCPA	0.75 pt + 0.5 pt	93	96	82	86	94	96
Affinity TM + Starane + NIS	0.6 oz + 0.33 pt + 0.25%	96	98	83	84	93	96
Orion	17 oz	93	96	17	20	92	96
GoldSky + NIS	16 oz + 0.25%	94	93	91	91	87	79
LSD (0.05)		2.8	2.8	6.9	9	3	1.7
CV		2	2	6	8	2	1

[a] *All treatments were applied postemergence in a fallow field*

[b] *Prle=Prickly lettuce; Kocz =Kochia; Colq =Common lambsquarters*

Broadleaf weed control with Wolverine. Jenks, Willoughby, and Hoefing. 'Howard' spring wheat was seeded May 12 at 90 lb/A into 7.5-inch rows in a conventionally tilled field. Herbicide treatments were applied postemergence (POST) on June 12 at the 4- to 5-leaf stage. Redroot pigweed (Rrpw) was very small (emerging to 2") with about 2 plants/ft^2. Kochia was also small (1-2 inches) with generally less than 1 plant/ft^2. Individual plots were 10 x 30 ft and replicated three times.

Only GoldSky caused crop injury in this trial. This was likely due to cold conditions after application. The slight stunting and chlorosis is similar to what we observed from other Group 2 herbicides in 2009. By mid-July, the symptoms were barely visible. Wolverine, Puma + Huskie, and GoldSky provided excellent pigweed and kochia control. Widematch and Orion provided good pigweed control. Widematch provided excellent kochia control, whereas Orion provided poor kochia control. There was no significant difference in wheat yield or test weight between treatments.

Table. Broadleaf weed control with Wolverine (0906).

			HRSW[a]			Rrpw[a]		Kocz[a]		HRSW[a]	
Treatment	Rate	Timing	Jun 19	Jul 04	Jul 20	Jul 04	Jul 20	Jul 04	Jul 20	Yield	Test wt.
			--------% injury--------			----------% control----------				bu/A	lb/bu
Untreated			0	0	0	0	0	0	0	77	62.0
Wolverine	27.4 fl oz	4-5 leaf	0	0	0	98	99	100	100	82	61.3
Puma + Huskie	0.66 pt + 11 fl oz	4-5 leaf	0	0	0	98	97	100	100	84	61.5
WideMatch + MCPA / Puma	0.75 pt + 0.5 pt / 0.66 pt	4-5 leaf / +5 day	0	0	0	83	87	95	98	83	62.1
Orion / Puma	17 oz / 0.66 pt	4-5 leaf / +5 day	0	0	0	85	88	37	33	82	62.0
GoldSky + NIS	16 oz + 0.25%	4-5 leaf	15	6	2	93	97	95	98	80	61.8
LSD (0.05)			0.9	0.9	0.9	3.6	7	4.3	4.3	NS	NS
CV			18	45	121	3	5	3	3	4	1

[a]*HRSW =Hard Red Spring Wheat; Rrpw =Redroot pigweed; Kocz =Kochia*

Prepackaged broad spectrum broadleaf weed control options in wheat. Howatt, Roach, and Harrington. 'Glenn' hard red spring wheat was seeded in Wheatland, ND, on May 17. Treatments were applied to three- to four-leaf wheat, 0.5- to 3-inch kochia (5 to 30/yd^2), and 0.5- to 2-inch common lambsquarters (30 to 50/yd^2) on June 11 with 63° F, 53% relative humidity, 0% cloud cover, 2 to 4 mph wind at 360°, and moist soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates for evaluation taken on June 25 and July 10 and two replicates for the August 26 evaluation.

		6/25	6/25	6/25	7/10	7/10	8/26	8/26	9/04
Treatment	Rate	Wht	Kochia	Colq	Kochia	Colq	Kochia	Colq	Yield
	oz/A				%				bu/A
Fenx&Pysl&Broxl	4.2	0	92	95	98	99	97	99	63
Fenx+Broxl&Pysl	1.32+2.9	0	93	92	96	98	94	99	68
Clpy&Flox+MCPA	2.2+4	0	92	92	98	98	94	99	61
Florasulam&MCPA	5.1	0	23	78	30	99	60	99	69
Pxlm&Florasulam&Flox+NIS	1.68+0.25%	0	93	87	98	98	85	99	57
Carf&2,4-D+NIS	4.1+0.25%	0	92	95	97	98	96	99	61
Untreated	0	0	0	0	0	0	0	0	40
CV		0	5	5	6	1	10	0	17
LSD 5%		0	6	6	8	1	18	0	25

Herbicide treatments did not inure wheat. This population of kochia was suspected to be resistant to ALS-inhibiting herbicides. All herbicides provided at least 90% control of kochia except florasulam and MCPA. MCPA does not have enough activity on kochia to compensate for lack of activity from florasulam for ALS-resistant kochia. This treatment also gave less control of common lambsquarters on June 25, but by July 10, all herbicides provided at least 98% control of lambsquarters.

Broadleaf control with pyrasulfotole, Fargo. Howatt, Roach, and Harrington. 'Glenn' hard red spring wheat was seeded May 17. Treatments were applied to three-leaf wheat, two- to eight-leaf wild mustard (5 to 25/yd^2), one- to five-leaf wild buckwheat (5 to 50/yd^2), and 1- to 2-inch common lambsquarters (5 to 10/yd^2) on June 12 with 59°F, 61% RH, 40% cloud cover, 3 to 4 mph wind at 225°, and damp soil at 54°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates. The plots were harvested for yield on September 7.

Treatment	Rate	6/26 Wht	6/26 Wibw	6/26 Wimu	6/26 Colq	7/11 Wibw	7/11 Wimu	7/11 Colq	8/18 Wibw	8/18 Colq	9/07 Yield
	oz/A					%					bu/A
Broxl&Pyst+AMS	2.9+8	0	91	93	91	80	91	91	95	97	30
Clopyralid&Flox+MCPA	2.3+4	0	93	89	94	93	96	97	99	99	26
Thif-sg+Trib-sg+Flox+NIS	0.24+0.06+1+0.25%	0	95	92	95	94	96	97	98	98	29
Florasulam&MCPA	5	0	94	95	94	93	96	97	96	99	30
Pxlm&Florasulam&Flox+NIS	2.3+0.25%	0	89	89	94	89	90	96	91	94	27
Bromoxynil&MCPA5	8	0	86	89	94	89	93	96	94	97	34
Carfentrazone&2,4-D	4.1	0	91	95	95	91	95	96	96	97	28
Untreated	0	0	0	0	0	0	0	0	0	0	24
CV		0	4	3	3	4	2	1	2	2	21
LSD 5%		0	4	4	3	5	2	2	2	2	8

Herbicides did not cause wheat injury. In general, herbicides provided exceptional weed control, 89% or better. Symptoms and control were slower to develop in this study than other studies with bromoxynil and pyrasulfotole, but control with this treatment was 95 to 100% by the end of the season. Early in the season, florasulam and MCPA was one of the better treatments providing 94 to 95% control of all species by June 26, 14 DAT. Carfentrazone and 2,4-D or thifensulfuron and tribenuron plus fluroxypyr also provided greater than 90% control of all species at each evaluation.

Broadleaf control with pyrasulfotole, Wheatland. Howatt, Roach, and Harrington. 'Glenn' hard red spring wheat was seeded at Wheatland, ND, on May 17. Treatments were applied to three- to four-leaf wheat, 0.5- to 3-inch kochia (5 to 30/yd^2), and 0.5- to 2-inch common lambsquarters (30 to 50/yd^2) on June 11 with 62°F, 52% RH, 0% cloud cover, 1 to 3 mph wind at 360°, and moist soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates for evaluations taken on 6/25 and 7/10 and two replicates for the 8/26/ evaluation.

Treatment	Rate	6/25 Wht	6/25 Kocz	6/25 Colq	7/10 Kocz	7/10 Colq	8/26 Kocz	8/26 Colq	9/4/08 Yield
	oz/A	%							bu/A
BroxI&Pyst+AMS	2.9+8	0	95	93	98	98	99	99	67
Clopyralid&Flox+MCPA	2.3+4	0	95	93	98	98	94	99	58
Thif-sg+Trib-sg+Flox+NIS	0.24+0.06+1+0.25%	0	95	92	98	98	96	99	61
Florasulam&MCPA	5	0	53	93	67	99	60	99	65
Pxlm&Florasulam&Flox+NIS	2.3+0.25%	0	95	88	98	98	92	99	60
Brox&MCPA5	8	0	95	93	99	98	98	99	72
Carfentrazone&2,4-D	4.1	0	95	95	98	96	97	99	75
Untreated	0	0	0	0	0	0	0	0	64
C.V.		0	5	3	3	1	5	0	10
LSD 5%		0	7	5	4	1	10	0	16

Treatments did not cause visible wheat injury. Most herbicide treatments provided rapid and nearly complete control of kochia and common lambsquarters. The population of kochia was suspected to contain resistance to ALS-inhibiting herbicides. Consistent with this suspicion, florasulam and MCPA gave poor kochia control, less than 70%. The population contained susceptible plants that demonstrated typical ALS symptoms and died. But MCPA was not sufficient to control or even cause visible injury to ALS-resistant kochia. Pyroxsulam with florasulam and fluroxypr gave less control of lambsquarters on June 25, 88% compared with 92 to 95%, but lambsquarters control was similar across herbicides later in the season.

Kochia control with sulfonylurea tank-mixes. Howatt, Roach, and Harrington. 'AC Vista' hard red spring wheat was seeded near Valley City on May 4. Treatments were applied to three- to four-leaf wheat, 1- to 4-inch kochia (100 to 200/yd^2), and four- to six-leaf volunteer sunflower (50 to 75/yd^2) on June 9 with 53°F, 60% relative humidity, 95% cloud cover, 5 to 6 mph wind at 315°, and damp soil at 51°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

Treatment	Rate	6/22 Wht	6/22 Kocz	6/22 Sufl	7/7 Kocz	7/7 Sufl	7/23 Kocz	7/23 Sufl
	oz/A				%			
Thif-sg+Trib-sg+Salvo+NIS	0.24+0.06+4+.25%	0	27	88	53	98	50	99
Flox	1.5	0	77	80	82	91	99	99
Clpy&Flox	2.25	0	73	85	87	94	93	99
Brox&Pyst	2.1	0	68	85	67	92	85	99
Brox&Pyst	2.9	0	83	90	75	90	88	99
Brox&Pyst+NIS+AMS	2.9+0.25%+8	0	87	92	90	96	93	99
Thif-sg+Trib-sg+Flox+NIS	0.24+0.06+1.5+0.25%	0	80	90	87	96	95	99
Thif-sg+Trib-sg+Clpy&Flox+NIS	0.24+0.06+2.25+0.25%	0	80	88	83	94	95	99
Thif-sg+Trib-sg+Brox&Pyst+NIS	0.24+0.06+2.1+0.25%	0	75	83	73	95	73	99
Thif-sg+Trib-sg+Brox&Pyst+NIS	0.24+0.06+2.9+0.25%	0	88	92	85	98	82	99
Untreated	0	0	0	0	0	0	0	0
CV		0	9	4	6	3	6	0
LSD 5%		0	10	5	8	5	8	0

The study was established in a field with suspected to be infested with kochia resistant to ALS inhibitors. Thifensulfuron and tribenuron with 2,4-D gave about 50% control of kochia. treatments that included bromoxynil and pyrasulfotole quickly removed small kochia, but larger plants at application survived and recovered quickly, resulting in 70 to 85% kochia control. Treatments that included fluroxypyr were slow to cause symptoms, but control of kochia was 93 to 95% by July 23. All treatments provided excellent control of volunteer sunflower.

Wild Buckwheat control with SU herbicides. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three-leaf wheat, one- to five-leaf wild buckwheat (5 to 50/yd^2), and two- to eight-leaf wild mustard (5 to 25/yd^2) on June 12 with 63°F, 65% relative humidity, 50% cloud cover, 2 to 3 mph wind at 225°, and damp soil at 58°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Plots were harvested September 7.

Treatment	Rate	6/26 Wht	6/26 Wibw	6/26 Wimu	7/11 Wibu	8/18 Wibw	9/07 Yield
	oz/A			%			bu/A
Pyraflufen-G+NIS+UAN	0.019+0.25%+1%	0	32	47	20	7	26
GWN-9794+NIS+UAN	0.22+0.25%+1%	0	93	94	93	98	26
GWN-9795+NIS+UAN	1.15+0.25%+1%	0	95	96	95	98	27
Thif&Trib+Fluroxypyr+NIS+UAN	0.37+1.5+0.25%+1%	0	95	96	95	97	27
Brox&Pyrasulfotol	2.9	0	91	86	92	94	27
Brox&MCPA5	8	0	91	94	95	97	27
Carfentrazone+NIS+UAN	0.13+0.25%+1%	0	71	45	50	47	26
Untreated	0	0	0	0	0	0	24
CV		0	6	8	10	10	7
LSD 5%		0	6	9	11	10	3

Pyraflufen or carfentrazone alone is not suggested for total broadleaf weed control. However, carfentrazone gave better control than pyraflufen in this study. The numbered compounds provided excellent weed control of 93% or better, comparable to other standard combination treatments for broad spectrum broadleaf weed control.

SU comparison for broadleaf weed control in wheat. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Treatments were applied to three- to four-leaf wheat and wild oat (1500/yd^2), one- to four-leaf wild buckwheat (40 to 50/yd^2), and two- to six-leaf wild mustard (40 to 50/yd^2) on June 12 with 56°F, 67% relative humidity, 20% cloud cover, 1 to 2 mph wind at 180°, and damp soil at 55°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/26 Wht	6/26 Wioa	6/26 Wibu	6/26 Wimu	7/6 Wioa	7/6 Wibu	7/6 Wimu
	oz/A	%						
Thif&Trib CN(TM)+Sword+Fenx+NIS	0.4+4+1+0.25%	0	82	91	96	91	97	99
Thif&Trib+Fenx+NIS	0.5+1+0.25%	0	85	91	96	94	93	99
Thif+Trib+Sword+Fenx+NIS	0.2+0.2+4+1+0.25%	0	82	91	94	94	96	99
Thif-sg+Trib-sg+Fenx+NIS	0.25+0.25+1+0.25%	0	89	89	94	95	92	99
Trib-CN+Fenoxaprop+NIS	0.25+1+0.25%	0	85	81	95	93	82	99
Trib-sg+Fenx+NIS	0.25+1+0.25%	0	85	81	94	91	76	99
Trib-HA+Fenx+NIS	0.25+1+0.25%	0	82	81	94	90	65	99
Untreated	0	0	0	0	0	0	0	0
C.V.		0	3	4	2	3	5	0
LSD 5%		0	4	4	3	4	5	0

Treatment	Rate	7/1 Wioa	7/1 Wibu	7/1 Wimu	7/22 Wioa	7/22 Wibu	7/22 Wimu
	oz/A	%					
Thif&Trib CN(TM)+Sword+Fenx+NIS	0.4+4+1+0.25%	92	95	99	91	94	99
Thif&Trib+Fenx+NIS	0.5+1+0.25%	93	93	99	95	93	99
Thif+Trib+Sword+Fenx+NIS	0.2+0.2+4+1+0.25%	87	96	99	89	93	99
Thif-sg+Trib-sg+Fenx+NIS	0.25+0.25+1+0.25%	95	94	99	92	87	99
Trib-CN+Fenoxaprop+NIS	0.25+1+0.25%	92	91	99	93	87	99
Trib-sg+Fenx+NIS	0.25+1+0.25%	93	82	99	91	82	99
Trib-HA+Fenx+NIS	0.25+1+0.25%	91	76	99	85	75	99
Untreated	0	0	0	0	0	0	0
CV		2	2	0	4	4	0
LSD 5%		2	3	0	4	4	0

Treatments did not cause visible injury. All herbicide treatments provided similar and high level control of wild mustard, 94% or greater. Herbicides also gave essentially similar control of wild oat with slight variability only at the very end of the season. Wild buckwheat control was better with treatments containing thifensulfuron and tribenuron than tribenuron alone, 81 versus 91% control on June 26, respectively. This separation remained evident throughout the season. Formulation source of tribenuron seemed to be a factor in buckwheat control after June 26. However, differences such as this have been observed in the past with the rank order reversed on different weeds. This interaction deserves further study before conclusions can be drawn.

Kochia control with F7121. Howatt, Roach, and Harrington. 'AC Vista' hard red spring wheat was seeded near Valley City on May 4. Treatments were applied to three- to four-leaf wheat, 1- to 4-inch kochia (100 to 200/yd^2), and four- to six-leaf volunteer sunflower (50 to 75/yd^2) on June 9 with 52°F, 45% relative humidity, 100% cloud cover, 5 to 6 mph wind at 315°, and damp soil at 51°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with three replicates.

Treatment	Rate	6/22 Wht	6/22 Kocz	6/22 Sufl	7/7 Kocz	7/7 Sufl	7/23 Kocz	7/23 Sufl
	oz/A				%			
Brox&Pyrasulfotol	2.9	0	75	92	73	96	60	98
Carfentrazone&2,4-D	4.1	0	85	92	91	97	83	99
Fluroxypyr	2	0	78	85	87	91	97	99
Brox&MCPA	8	0	78	92	88	96	80	98
F7121+NIS	0.07+0.25%	0	43	57	77	27	37	37
F7121+MCPA+NIS	0.07+8+0.25%	0	73	88	78	98	77	99
F7121+Thif-sg+NIS	0.07+0.25+0.25%	0	43	83	63	94	37	99
F7121+Fluroxypyr+NIS	0.07+2+0.25%	0	90	87	88	96	98	99
CV		0	9	4	4	3	10	2
LSD 5%		0	11	7	6	5	13	4

Treatments with fluroxypyr provided the best kochia control, 97% on July 23. But this activity was slow to develop when fluroxypyr was applied alone. Addition of F7121 resulted in quicker response of kochia and 90% control by June 22 compared with 78% for fluroxypyr alone. Efficacy of this combination increased to the end of the season rather than decline as was the case with bromoxynil and pyrasulfotole, which is strictly a contact combination. Kochia control with F7121 alone was poor and addition of thifensulfuron did not improve activity because the site had a moderate population of ALS-resistant kochia. Carfentrazone and 2,4-D gave reasonable kochia control throughout the season of 83 to 91%. Volunteer sunflower was easily controlled by all herbicides except F7121, 37%.

Experimental 2,4-D formulations. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 20. Treatments were applied to two- to four-leaf wild buckwheat and four- to six-leaf wild mustard (each 2 to 10/yd^2) on June 22 with 84°F, 68% relative humidity, 28% cloud cover, and damp soil at 71°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		7/6	7/6	7/20
Treatment	Rate	Wibw	Wimu	Wibw
	oz product/A		%	
AGH 02007	5	69	84	85
AGH 02007+AG06011	5+6	69	85	93
2,4-D LV6	5.3	65	82	87
AGH 08009	8	70	87	91
AGH 08009+Preference	8+0.25%	65	85	85
AGH 08009+AG06011	8+6	62	86	91
2,4-DA4	8	72	84	91
AGH 02007	10	84	92	91
AGH 02007+AG06011	10+6	80	89	96
2,4-D LV6	10.6	84	91	88
AGH 08009	16	86	94	92
AGH 08009+Preference	16+0.25%	84	92	92
AGH 08009+AG06011	16+6	85	92	91
2,4-DA4	16	86	92	95
CV		6	5	5
LSD 5%		6	6	6

Products were applied at rates such that amount of acid equivalent was consistent across formulations. Within rate equivalency, there were minimal differences in response of wild buckwheat and wild mustard. And differences that were identified were not consistent across species or evaluation date. All formulations generally were similar in efficacy.

Flumioxazin to aid wheat harvest. Howatt, Roach, and Harrington. 'Alsen' hard red spring wheat was seeded near Fargo on May 18. Pre-harvest treatments were applied to physiologically mature plants with 35% grain moisture on August 25 with 63°F, 85% RH, partly cloudy sky, 1 to 2 mph wind at 0°, and dry soil at 65°F. Treatments were applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 11001 TT nozzles to an area 7 feet wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with 3 replicates.

Treatment	Rate	8/28 Wibw	8/28 Yeft	8/28 Vema	9/2 Wibw	9/2 Yeft
	oz/A			%		
Glyt-(4.5)+AMS	12+11	30	32	32	92	93
Glyt-(4.5)+Flumioxazin+AMS	12+0.5+11	30	32	30	92	95
Glyt-(4.5)+Flumioxazin+AMS	12+0.75+11	32	33	33	93	91
Glyt-(4.5)+Flumioxazin+AMS	12+1+11	32	35	32	93	96
Glyt-(4.5)+Flumioxazin+MSO+AMS	12+1+0.25G+11	53	60	57	95	96
Flumioxazin+MSO+AMS	1+0.25G+11	78	83	82	97	97
Untreated	0	0	0	0	0	0
CV		8	6	8	4	3
LSD 5%		5	4	6	5	5

Flumioxazin did not improve weed control with glyphosate unless MSO was added. Control with glyphosate and flumioxazin at 1 oz/A was increased by 20 to 25 percentage points when MSO was included. Desiccation with flumioxazin at 1 oz/A was near 80% for all species at 3 DAT demonstrating that initial plant response to flumioxazin was antagonized by glyphosate. However, all treatments provided greater than 90% control by 8 DAT.

Post harvest weed control. Howatt, Roach, and Harrington. Treatments were applied near Fargo on wheat stubble to flowering to mature wild buckwheat (10 to 30/yd^2) and yellow foxtail (50 to 100/yd^2) on September 3 with 80°F, 51% relative humidity, 30% cloud cover, 1 to 3 mph wind at 225°, 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 an area 7 ft wide the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

		9/7	9/7	9/14	9/14	9/28	9/28
Treatment	Rate	Wibw	Yeft	Wibw	Yeft	Wibw	Yeft
	oz/A	%					
Glyt (4.5)+AMS	12+40	32	57	88	98	89	98
Pyraflufen-G+Glyt (4.5)+AMS	0.025+12+40	52	52	86	97	90	99
GWN-9794+MSO+AMS	0.34+1%+40	30	20	69	37	91	37
Thif&Trib-G+Pyff-G+MSO+AMS	0.38+0.025+1%+40	55	22	76	45	93	35
Thif&Trib-G+MSO+AMS	0.38+1%+40	32	17	65	40	90	37
Thif&Trib-G+Flox+MSO+AMS	0.38+2+1%+40	35	2	60	40	86	30
GWN-9795+MSO+AMS	2.31+1%+40	57	17	85	50	96	52
Carfentrazone+Glyt (4.5)+AMS	0.18+12+40	32	35	91	97	91	97
Untreated	0	0	0	0	0	0	0
CV		12	15	5	10	4	11
LSD 5%		6	5	6	8	5	8

Pyraflufen initially improved control of wild buckwheat with glypgosate by 20 percentage points and control exceeded 50%. But buckwheat control at later evaluations was similar between the two treatments. GWN-9795 was the best treatment for wild buckwheat across all evaluation dates but only gave about 50% control of yellow foxtail. Carfentrazone did not improve control of wild buckwheat or yellow foxtail with glyphosate and pyraflufen did not improve control of foxtail with glyphosate. Treatments with thifensulfuron and tribenuron gave less weed control than treatments with glyphosate.