Glyphosate formulations. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Prosper, ND, to evaluate weed efficacy to glyphosate formulations. POST treatments were applied on June 21 at 3:45 pm with 84 F air, 82 soil surface, 35% relative humidity, 25% cloud cover, 3 to 5 mph S wind, dry soil surface, and moist subsoil to non-crop land. Weed species present in plots were: 6 to 14 inch (10 to 75/ft^2) yellow foxtail; 4 to 12 inch (3 to 7/yd^2) common cocklebur; 6 to 16 inch (3 to 5/yd^2) common lambsquarters; 3 to 6 inch (1 to 10/ft^2) hairy nightshade; 6 to 16 inch (1 to 10/ft^2) common ragweed; 6 inch to bloom (1 to 15/yd^2) wild mustard; and 4 inch to vining (1 to 2/yd^2) wild buckwheat. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

All treatments completely controlled yellow foxtail, wild mustard, common lambsquarters, and common cocklebur at 11 and 21 DAT. The objective was to find a Monsanto glyphosate formulation that would provide an increase in control for weeds such as: velvetleaf, common lambsquarters, purslane, and kochia control. This study was conducted at many locations by university researchers and Monsanto representatives throughout the U.S. in 2007. The formulation that Monsanto choose was called Roundup PowerMax. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Glyphosate formulations (Zollinger and Ries).

		11 DAT			21 DAT		
Treatment[1]	Rate	Wibw	Hans	Corw	Wibw	Hans	Corw
	(product/A)	------ % control ------			------ % control ------		
Roundup OriginalMax	10.8fl oz	47	40	52	47	47	53
Roundup WeatherMax	10.8fl oz	42	30	40	42	30	40
Roundup PowerMax	10.8fl oz	43	37	40	43	33	40
Candidate formulation - 76204	10.8fl oz	42	40	43	42	40	43
Candidate formulation - 76165	10.8fl oz	38	37	40	43	43	48
Candidate formulation - 76111	12.2fl oz	30	30	30	47	47	50
Candidate formulation - 76351	10.8fl oz	33	32	30	43	42	43
Candidate formulation - 76105	10.8fl oz	52	43	53	52	47	58
Roundup OriginalMax	16fl oz	86	68	73	84	76	77
Roundup WeatherMax	16fl oz	68	63	71	68	58	70
Roundup PowerMax	16fl oz	78	71	77	84	82	85
Candidate formulation - 76204	16fl oz	78	65	73	82	82	78
Candidate formulation - 76165	16 fl oz	70	63	63	79	80	82
Candidate formulation - 76111	18fl oz	80	62	69	80	65	69
Candidate formulation - 76351	16fl oz	66	63	65	70	72	75
Candidate formulation - 76105	16fl oz	60	45	55	67	52	57
Glyphosate + LI700 - 79614	14.3fl oz+0.25% v/v	57	60	70	57	57	70
Glyphosate - 79616	17fl oz	67	60	63	75	77	82
Glyphosate - 79685	18fl oz	89	75	81	88	84	85
LSD (0.05)		11	8	7	10	10	10

[1]Candidate formulation compounds = glyphosate compounds provided from Monsanto.

Roundup OriginalMax and RT3 comparisons. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy from glyphosate formulations. Pioneer '39F27' conventional corn, DeKalb 'DKC35-51' Roundup Ready corn, Pioneer '63M91' sunflower, tame buckwheat, 'York' flax, and Quinoa (*Chenopodium quinoa*) were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 12, at 10:50 am with 76 F air, 78 F soil surface, 41% relative humidity, 5% cloud cover, 2 to 6 mph W wind, wet soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 24 to 36 inch (20 to 25/yd^2) conventional and Roundup Ready corn; 14 to 24 inch (V6 to V12, 2 to 8/yd^2) sunflower; 4 to 8 inch (1 to 5/ft^2) tame buckwheat; 3 to 8 inch (5 to 10/ft^2) flax; and 6 to 12 inch (3 to 8/yd^2) quinoa. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

There was no injury to Roundup Ready corn. Glyphosate was applied at a reduced rate for treatment separation. AMS at 8.5 lb/100 gal usually provided greater weed control than other treatments. Weed control was: RT3>RUOM and AMS at 8.5 lb>R-11+AMS=CL NG>AMS at 4 lb=N-Tense=WC 061>CWM. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Roundup OriginalMax and RT3 comparisons (Zollinger and Ries).

		14 DAT					28 DAT				
Treatment[1]	Rate	Quin[2]	Flax	Tabw[3]	Snfl[4]	C Corn[5]	Quin	Flax	Tabw	Snfl	C Corn
	(product/A)	% control					% control				
RUOM	8fl oz	60	70	37	50	58	82	80	50	50	82
RT3	8fl oz	78	72	50	60	69	87	87	50	70	82
RUOM + AMS	8fl oz+4lb/100gal	72	72	60	60	63	99	90	57	70	95
RT3 + AMS	8fl oz+4lb/100gal	80	90	62	77	72	95	98	62	82	92
RUOM + AMS	8fl oz+8.5lb/100gal	84	99	70	80	95	94	99	80	85	95
RT3 + AMS	8fl oz+8.5lb/100gal	97	97	73	90	96	99	99	93	87	96
RUOM + R-11 + AMS	8floz+0.5% v/v+4lb/100gal	89	89	67	70	85	99	99	63	70	92
RT3 + R-11 + AMS	8floz+0.5% v/v+4lb/100gal	95	95	68	82	92	99	99	75	90	99
RUOM + Class Act Next Generation	8fl oz+2.5% v/v	93	93	60	72	77	99	99	60	82	93
RT3 + Class Act Next Generation	8fl oz+2.5% v/v	91	96	67	80	87	99	99	68	85	93
RUOM + Choice WeatherMaster	8fl oz+0.5% v/v	72	80	53	60	67	87	85	50	70	70
RT3 + Choice WeatherMaster	8fl oz+0.5% v/v	72	79	50	72	60	82	83	53	72	70
RUOM + N-Tense	8fl oz+0.5% v/v	78	92	50	66	65	92	99	60	80	85
RT3 + N-Tense	8fl oz+0.5% v/v	80	95	50	70	69	95	99	60	80	80
RUOM + WC 061	8fl oz+0.5% v/v	80	95	60	67	72	95	99	60	83	83
RT3 + WC 061	8fl oz+0.5% v/v	82	96	57	68	73	93	99	63	75	73
RUOM+AMS	44fl oz+8.5lb/100gal	86	98	82	82	92	93	99	88	88	94
RT3+AMS	44fl oz+8.5lb/100gal	95	99	92	90	95	95	99	95	93	98
LSD (0.05)		4	4	6	4	7	4	2	6	4	5

[1]RUOM = Roundup OriginalMax; AMS = ammonium sulfate; R-11 = nonionic surfactant; Class Act Next Generation = surfactants + fertilizer; Choice WeatherMaster = water conditioning agents; N-Tense = surfactants + water conditioning agents; WC 061 = proprietary compound from West Central.
[2]Quin = quinoa.
[3]Tabw = tame buckwheat.
[4]Snfl = sunflower.
[5]C corn = conventional corn.

UAP glyphosates with adjuvants. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy from glyphosate formulations. Pioneer '39F27' conventional corn, Pioneer '63M91' sunflower, tame buckwheat, 'York' flax, Quinoa *(Chenopodium quinoa),* and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 12 at 10:30 am with 72 F air, 73 F soil surface, 38% relative humidity, 5% cloud cover, 4 to 9 mph W wind, wet soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 24 to 36 inch (12 to 20/yd^2) corn; 18 to 30 inch (V6 to V12, 1 to 6/yd^2) sunflower; 6 to 10 inch (1 to 5/ft^2) tame buckwheat; 4 to 8 inch (2 to 10/ft^2) flax; 10 to 12 inch (1 to 5/yd^2) quinoa; and 10 to 20 inch (1 to 3/yd^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

(Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. UAP glyphosates with adjuvants (Zollinger and Ries).

		7 DAT						14 DAT						28 DAT					
Treatment[1]	Rate	Quin[2]	Amar[3]	Flax	Tabw[4]	Snfl[5]	Corn	Quin	Amar	Flax	Tabw	Snfl	Corn	Quin	Amar	Flax	Tabw	Snfl	Corn
	(product/A)	% control						% control						% control					
LI-6139+LI-6209	24fl oz+0.25% v/v	72	90	78	58	65	70	82	99	96	70	83	83	82	99	96	70	86	87
LI-6139+LI-6209	24fl oz+0.375% v/v	78	96	93	67	67	72	87	98	99	72	89	88	99	99	99	72	90	95
LI-6139+LI-6209	24fl oz+0.5% v/v	82	97	94	68	62	67	90	99	99	76	80	83	99	99	99	80	90	85
LI-6139+LI-6218	24fl oz+0.25% v/v	75	93	73	55	60	72	83	98	95	72	75	87	99	99	99	82	85	88
LI-6139+LI-6218	24fl oz+0.5% v/v	75	95	77	53	60	63	83	93	90	63	73	87	99	99	99	78	85	92
LI-6139+LI-6218	24fl oz+0.75% v/v	80	89	80	60	57	67	87	95	87	67	75	77	96	99	96	83	93	83
Makaze+AMS	24fl oz+8.5lb/100gal	83	97	95	62	60	72	85	99	99	74	72	88	95	99	99	87	88	93
Makaze+Choice WM	21fl oz+0.5% v/v	75	91	90	50	55	70	83	95	99	67	75	82	93	99	99	83	92	83
LI-6243+AMS	24fl oz+8.5lb/100gal	75	86	88	60	55	67	85	94	99	67	72	72	95	98	99	87	92	82
LI-6243+Choice WM	24fl oz+0.5% v/v	83	87	82	57	60	67	87	96	98	70	78	82	93	99	99	82	82	83
LSD (0.05)		7	7	10	8	6	10	6	6	6	7	5	7	3	1	3	6	4	5

[1]LI compounds = proprietary compounds from UAP; AMS = ammonium sulfate; Choice WM = Choice WeatherMaster = water conditioning agents.
[2]Quin = quinoa.
[3]Amar = amaranth.
[4]Tabw = tame buckwheat.
[5]Snfl = sunflower.

Glyphosate efficacy with Coverage G-20. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy from glyposate and a drift control agent. Pioneer '39F27' conventional corn, Pioneer '63M91' sunflower, tame buckwheat, 'York' flax, and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 12 at 10:00 am with 72 F air, 73 F soil surface, 49% relative humidity, 2% cloud cover, 3 to 6 mph W wind, wet soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 24 to 36 inch (18 to 25/yd^2) corn; 18 to 24 inch (V8 to V12, 1 to 5/yd^2) sunflower; 6 to 8 inch (1 to 5/ft^2) tame buckwheat; 4 to 8 inch (8 to 10/ft^2) flax; and 10 to 20 inch (8 to 10/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Treatments were applied at a water test of 423 ppm calcium. Bronc Max was added first and thoroughly mixed, then glyphosate was added next, and then Coverage G-20 was added last. Drift studies show a wide range of active ingredient lost from fine droplets (150 micron) that do not reach the target area. Even at minimal wind speeds 17 to 40% of the active ingredient can be lost. Coverage G-20 can reduced the amount of fine droplets lost and deliver them to the target area increasing weed control. Many treatments below show that a reduced herbicide rate with Coverage G-20 can provide greater weed control as the herbicide applied with a efficacious deposition product. As noted above wind speed was 3 to 6 mph for POST applied treatments. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Glyphosate efficacy with Coverage G-20 (Zollinger and Ries).

		14 DAT					28 DAT				
Treatment[1]	Rate	Amar[2]	Flax	Tabw[3]	Snfl[4]	Corn	Amar	Flax	Tabw	Snfl	Corn
	(product/A)	% control					% control				
Buccaneer Plus+Bronc Max	12fl oz+2qt/100gal	70	77	53	70	72	70	78	57	72	70
Buccaneer Plus+Bronc Max+Coverage G-20	12fl oz+2qt/100gal+3oz	87	82	57	75	77	90	83	60	78	75
Roundup Original Max+Bronc Max	8fl oz+2qt/100gal	60	75	60	55	65	60	73	60	55	65
Roundup Original Max+Bronc Max+Coverage G-20	8fl oz+2qt/100gal+3oz	77	77	65	77	75	80	73	67	80	75
RT3+Bronc Max	8fl oz+2qt/100gal	77	70	52	70	67	73	73	53	70	65
RT3+Bronc Max+Coverage G-20	8fl oz+2qt/100gal+3oz	84	88	67	80	80	84	88	67	80	80
Roundup WeatherMax+Bronc Max	8fl oz+2qt/100gal	70	77	73	77	63	70	78	77	77	62
Roundup WeatherMax+Bronc Max+Coverage G-20	8fl oz+2qt/100gal+3oz	80	80	77	83	78	82	83	77	85	80
Durango+BroncMax	9fl oz+2qt/100gal	71	73	65	72	63	71	75	68	72	63
Durango+BroncMax+Coverage G-20	9fl oz+2qt/100gal+3oz	78	78	70	78	77	73	78	70	78	77
Touchdown Total+Bronc Max	8.6fl oz+2qt/100gal	68	65	67	72	60	70	67	68	72	57
Touchdown Total+Bronc Max+Coverage G-20	8.6fl oz+2qt/100gal+3oz	83	87	73	77	65	83	90	73	77	68
Credit Xtra Mixed Salt+Bronc Max	12fl oz+2qt/100gal	78	63	47	65	55	78	67	47	70	62
Credit Xtra Mixed Salt+Bronc Max+Coverage G-20	12fl oz+2qt/100gal+3oz	88	76	62	75	78	88	78	62	77	78
Liberty 200+Bronc Max	34fl oz+0.5% v/v	33	88	82	50	37	33	88	82	57	42
Liberty 200+Bronc Max+Coverage G-20	34fl oz+0.5% v/v+3oz	57	93	95	81	57	60	93	95	84	61
LSD (0.05)		9	8	7	8	8	7	7	6	6	5

[1]Bronc Max = water conditioning agents; Coverage G-20 = deposition aid + drift management agent.
[2]Amar = amaranth.
[3]Tabw = tame buckwheat.
[4]Snfl = sunflower.

Coverage G-20 and weed efficacy. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy from a drift control agent. Pioneer '39F27' conventional corn, Pioneer '63M91' sunflower, tame buckwheat, 'York' flax, and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 11 at 9:50 am with 68 F air, 70 F soil surface, 79% relative humidity, 0% cloud cover, 7 to 10 mph W wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 20 to 32 inch (V7 to V8, 3 to 5/ft^2) corn; 16 to 30 inch (V8 to V12, 3 to 20/yd^2) sunflower; 6 to 16 inch (3 to 10/ft^2) tame buckwheat; 4 to 10 inch (20 to 30/ft^2) flax; and 16 to 24 inch (1 to 2/yd^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Treatments were applied with a water test at 423 ppm calcium. Cut-rate, Bronc Max or AMS was added first and thoroughly mixed then Buccaneer Plus was added next, and then Coverage G-20 was added last. AMS + Coverage G-20 enhanced glyphosate more than other adjuvants. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Coverage G-20 and weed efficacy (Zollinger and Ries).

		14 DAT					28 DAT				
Treatment[1]	Rate	Amar[2]	Flax	Tabw[3]	Snfl[4]	Corn	Amar	Flax	Tabw	Snfl	Corn
	(product/A)	% control					% control				
Buccaneer Plus +	8fl oz +	17	17	13	20	17	17	17	13	20	17
Cut Rate+Coverage G-20	3lb/100gal+2oz	67	50	42	60	47	73	50	45	60	47
Cut Rate+Coverage G-20	4lb/100gal+2oz	60	35	32	37	37	60	35	32	37	37
Bronc Max+Coverage G-20	1qt/100gal+2oz	38	20	27	32	32	38	20	27	32	32
Bronc Max+Coverage G-20	2qt/100gal+2oz	47	28	42	50	25	47	28	42	50	25
AMS+Coverage G-20	17lb/100gal+2oz	80	57	60	75	72	88	57	60	75	77
LSD (0.05)		8	8	8	9	8	4	8	8	8	8

[1]Cut Rate and Bronc Max = water conditioning agents; Coverage G-20 = deposition aid + drift management agent; AMS = ammonium sulfate.
[2]Amar = amaranth.
[3]Tabw = tame buckwheat.
[4]Snfl = sunflower.

Corn herbicides with In-Place. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed species control from corn herbicide tank-mixes. Pioneer '63M91' sunflower, 'Westford' forage barley, 'Siberian' foxtail millet, 'York' flax, Quinoa *(Chenopodium quinoa),* and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. PRE treatments were applied on June 12 at 10:45 am with 88 F air, 71 F soil at a four inch depth, 52% relative humidity, 25% cloud cover, 8 to 16 mph SE wind, dry soil surface, and wet subsoil. Soil characteristics were 3.4% sand, 60.2% silt, 36.4% clay, silty clay loam texture, 4.5% organic matter, and pH 7.7. POST treatments were applied on July 5 at 10:35 am with 85 F air, 86 F soil surface, 55% relative humidity, 0% cloud cover, 1 to 4 mph W wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 12 to 18 inch (8 to 10/yd^2) sunflower; 3 leaf 10 to 14 inch (3 leaf, 12 to 15/ft^2) forage barley; 4 leaf (10 to 18 inch, 15 to 20/ft^2); 6 to 8 inch (10 to 15/ft^2) flax; 8 to 10 inch (1 to 15/yd^2) quinoa; and 12 to 16 inch (5 to 10/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

All PRE treatments controlled quinoa, foxtail millet and amaranth. All POST treatments controlled quinoa at 14 and 28 DAT (data not shown). Drift studies show a wide range of active ingredient lost from fine droplets (150 micron) that do not reach the target area. Even at minimal wind speeds 17 to 40% of the active ingredient can be lost. In-Place can reduced the amount of fine droplets lost and deliver them to the target area increasing weed control. Many treatments below show that, at least initially, a reduced herbicide rate with In-Place can provide similar weed control as the herbicide applied at a higher rate. As noted above wind speed was 8 to 16 mph for soil applied treatments and only 1 to 4 mph for POST applied treatments. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Corn herbicides with In-Place (Zollinger and Ries).

Treatment[1]	Rate	PRE Ratings			14 DAT - POST					28 DAT - POST				
		Flax	Foba[2]	Snfl[3]	Amar[4]	Flax	Ftmi	Foba	Snfl	Amar	Flax	Ftmi	Foba	Snfl
	(product/A)	--- % control ---			-------- % control --------					-------- % control --------				
PRE														
KIH-485+Atrazine	3.5oz+0.42lb	87	73	50	99	90	99	65	30	99	90	99	65	30
KIH-485+Atrazine	2.6oz+0.32lb	63	42	43	99	63	98	30	20	99	63	98	30	20
KIH-485+Atrazine+In-Place	2.6oz+0.32lb+1.6oz	72	62	52	99	70	99	43	17	99	70	99	43	17
Harness+Atrazine	2pt+0.42lb	92	89	60	99	91	99	82	23	99	91	99	82	23
Harness+Atrazine	1.5pt+0.32lb	77	67	50	99	77	99	65	20	99	77	99	65	20
Harness+Atrazine+In-Place	1.5pt+0.32lb+1.6oz	91	76	68	99	93	99	67	40	99	93	99	67	40
POST														
Impact+Atrazine+MSO SS+28% N	0.75fl oz+0.42lb+1% v/v+1.5qt				47	18	70	27	53	40	17	67	30	62
Impact+Atrazine+MSO SS+28% N	0.56fl oz+0.32lb+1% v/v+1.5qt				43	17	57	13	48	43	17	53	13	43
Impact+Atrazine+MSO SS+28% N+In-Place	0.56fl oz+0.32lb+1% v/v+1.5qt+1.5oz				53	23	65	33	63	53	23	65	45	68
Status+Atrazine+MSO SS+28% N	5oz+0.42lb+1% v/v+1.5qt				50	52	35	25	62	60	52	38	32	72
Status+Atrazine+MSO SS+28% N	3.75oz+0.32lb+1% v/v+1.5qt				40	32	25	20	43	40	30	25	20	45
Status+Atrazine+MSO SS+28% N+In-Place	3.75oz+0.32lb+1% v/v+1.5qt+1.5oz				52	54	32	30	55	53	40	32	30	53
Callisto+Atrazine+MSO SS+28% N	3fl oz+0.42lb+1% v/v+1.5qt				90	53	40	47	93	93	50	37	47	96
Callisto+Atrazine+MSO SS+28% N	2.25fl oz+0.32lb+1% v/v+1.5qt				62	10	10	15	75	60	10	10	15	90
Callisto+Atrazine+MSO SS+28% N+In-Place	2.25fl oz+0.32lb+1% v/v+1.5qt+1.6oz				83	60	36	83	95	83	60	68	53	96
Option+Atrazine+MSO SS+28% N	1.75oz+0.42lb+1% v/v+1.5qt				65	67	70	58	47	75	70	83	93	60
Option+Atrazine+MSO SS+28% N	1.3oz+0.32lb+1% v/v+1.5qt				55	65	63	50	40	60	72	73	95	60
Option+Atrazine+MSO SS+28% N+In-Place	1.3oz+0.32lb+1% v/v+1.5qt+1.6oz				57	65	65	52	45	57	72	72	95	60
Laudis+Atrazine+MSO SS+28% N	3fl oz+0.42lb+1% v/v+1.5qt				98	33	52	32	92	99	72	42	43	95
Laudis+Atrazine+MSO SS+28% N	2.25fl oz+0.32lb+1% v/v+1.5qt				90	30	32	20	90	99	50	42	40	95
Laudis+Atrazine+MSO SS+28% N+In-Place	1.3oz+0.32lb+1% v/v+1.5qt+1.6oz				93	42	33	33	92	93	52	42	50	99
LSD (0.05)		12	10	9	5	10	8	9	8	4	9	7	8	6

[1]KIH-485 = pyroxasulfone from Kumiai America; In-Place = deposition + drift retardants; MSO SS = MSO SuperSpread = methylated seed oil.
[2]Foba = forage barley.
[3]Snfl = sunflower.
[4]Amar = amaranth.

Glyphosate with micronutrients. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy when adding micronutrients to glyphosate. Pioneer '39F27' conventional corn, Pioneer '63M91' sunflower, tame buckwheat, 'York' flax, Quinoa *(Chenopodium quinoa),* and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 11 at 9:30 am with 68 F air, 70 F soil surface, 78% relative humidity, 0% cloud cover, 7 to 10 mph W wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 16 to 24 inch (V5 to V7, 3 to 5/ft^2) corn; 12 to 24 inch (V6 to V12, 3 to 15/yd^2) sunflower; 4 to 10 inch (10 to 30/ft^2) tame buckwheat; 4 to 10 inch (20 to 30/ft^2) flax; 4 to 14 inch (5 to 50/yd^2) quinoa; and 4 to 18 inch (5 to 15/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Class Act NG was able to partially and sometimes fully overcome salt antagonism from micronutrient antagonistic ions. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Glyphosate with micronutrients (Zollinger and Ries).

		14 DAT					28 DAT				
Treatment[1]	Rate	Amar[2]	Flax	Tabw[3]	Snfl[4]	Corn	Amar	Flax	Tabw	Snfl	Corn
	(product/A)	% control					% control				
RUOM +	11fl oz +	80	53	53	63	60	72	53	53	63	60
ClassAct NG	2.5% v/v	95	75	86	90	83	98	75	93	90	80
Max-In for Beans	1qt	20	0	0	22	22	20	0	0	22	22
Max-In for Beans+Class Act NG	1qt+2.5% v/v	68	35	30	72	55	58	35	30	70	55
Max-In MN	1qt	40	20	7	17	30	40	20	7	17	30
Max-In MN+Class Act NG	1qt+2.5% v/v	80	40	67	80	70	80	40	70	80	70
AGM 06018	1.5pt	27	20	17	20	22	27	20	17	20	22
AGM 06018+Class Act NG	1.5pt+2.5% v/v	86	43	63	90	50	83	43	83	95	60
AGM 07007	3pt	55	20	23	40	33	55	20	23	40	33
AGM 07007+Class Act NG	3pt+2.5% v/v	82	71	52	95	70	96	90	72	96	70
AGM 07027	2pt	10	13	17	13	10	10	13	17	13	10
AGM 07027+Class Act NG	2pt+2.5% v/v	75	40	77	70	67	70	40	77	70	67
LSD (0.05)		8	9	12	9	8	5	9	9	8	6

[1]RUOM = Roundup OriginalMax; ClassAct NG = Class Act Next Generation = surfactants + fertilizer; Max-In for Beans, Max-In MN, AGM 06018, 07007, 07027 = micronutrients and experimental compounds from Agriliance.
[2]Amar = amaranth.
[3]Tabw = tame buckwheat.
[4]Snfl = sunflower.

Liberty and Impact with NIS adjuvants. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed species efficacy from Liberty tank-mixes. Pioneer '39D85' LibertyLink corn, Pioneer '63M91' sunflower, 'Westford' forage barley, 'York' flax, 'Quinoa' *(Chenopodium quinoa)* and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 11:50 am with 87 F air, 89 F soil surface, 50% relative humidity, 0% cloud cover, 4 to 9 mph N wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 24 to 30 inch (7 to 10/ft^2) corn; 12 to 16 inch (2 to 3/ft^2) sunflower; 10 to 14 inch (10 to 12/ft^2) forage barley; 4 to 6 inch (8 to 10/ft^2) flax; 6 to 8 inch (3 to 4/ft^2) quinoa; and 10 to 12 inch (6 to 8/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

AG 05055 did not enhance Liberty and AG 05006 usually enhanced weed control from Liberty. There were no differences in weed control when mixed with Impact. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Liberty and Impact with NIS adjuvants (Zollinger and Ries).

		14 DAT						28 DAT					
Treatment[1]	Rate	Corn	Quinoa	Amar[2]	Flax	Foba[3]	Snlf[4]	Corn	Quinoa	Amar	Flax	Foba	Snlf
	(product/A)	% control						% control					
Liberty +	22fl oz +	0	87	68	70	50	94	0	99	68	70	50	94
AMS	3 lb	0	92	76	84	68	99	0	99	76	94	68	99
Class Act NG	2.5% v/v	0	95	77	87	57	93	0	99	70	93	97	98
Class Act NG+AG 02013	2.5% v/v+4fl oz	0	95	73	78	57	94	0	99	75	75	57	99
AG 05055	2.5% v/v	0	95	64	70	45	86	0	99	55	70	42	93
AG 05006	0.5% v/v	0	99	89	93	74	96	0	99	88	94	77	99
Impact+AG 05055	0.38fl oz+2.5% v/v	0	96	97	96	78	99	0	99	97	96	82	99
Impact+AG 05006	0.38fl oz+0.5% v/v	0	98	96	95	57	98	0	99	97	95	83	99
LSD (0.05)		NS	3	5	4	11	9	NS	NS	5	3	8	8

[1]AMS = ammonium sulfate; Class Act Next Generation (NG) = surfactants + fertilizers; AG compounds = proprietary compounds from Agriliance.
[2]Amar = amaranth.
[3]Foba = forage barley.
[4]Snfl = sunflower.

Express with NIS adjuvants. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed species efficacy from tank-mixes of Express and adjuvants. Pioneer '39F27' conventional corn, tame buckwheat, 'York' flax, 'Quinoa' *(Chenopodium quinoa)* species, and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 11:30 am with 82 F air, 85 F soil surface, 47% relative humidity, 0% cloud cover, 4 to 8 mph N wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 18 to 24 inch (6 to 8/ft^2) corn; 6 to 8 inch (2 to 3/ft^2) tame buckwheat; 4 to 6 inch (8 to 10/ft^2) flax; 4 to 8 inch (3 to 4/ft^2) quinoa; and 10 to 12 inch (6 to 8/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

The greatest weed control was weed and adjuvant dependant but AG 06001 enhanced weed control of most weed species. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Express with NIS Adjuvants (Zollinger and Ries).

		14 DAT					28 DAT				
Treatment[1]	Rate	Corn	Quinoa	Amar[2]	Flax	Tabw[3]	Corn	Quinoa	Amar	Flax	Tabw
	(product/A)	% control					% control				
Express +	0.5 oz +										
Preference	0.25% v/v	43	80	67	12	80	47	99	63	12	91
AG 05045	0.25% v/v	42	90	62	8	77	38	99	60	8	88
AG 06001	0.25% v/v	60	95	78	22	83	68	98	85	32	91
AG 06011	5fl oz	50	88	73	27	90	50	99	73	33	99
AG 06099	0.25% v/v	53	87	67	18	86	53	99	67	18	69
AG 07008	0.25% v/v	37	80	43	0	63	40	99	30	0	99
R-11	0.25% v/v	52	88	60	17	78	42	93	50	13	99
Activator 90	0.25% v/v	53	92	69	17	82	58	99	72	20	90
LSD (0.05)		7	5	10	10	10	5	2	9	8	12

[1]AG adjuvants = proprietary products from Agriliance; Preference, R-11, and Activator 90 = nonionic surfactants.
[2]Amar = amaranth.
[3]Tabw = tame buckwheat.

Adjuvant category screen with Laudis. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to weed efficacy from Laudis and adjuvant types. 'Siberian' foxtail millet, Pioneer '63M91' sunflower, 'Westford' forage barley, 'York' flax, Quinoa' *(Chenopodium quinoa),* and 'Plainsman' amaranth were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 8:50 am with 79 F air, 82 F soil surface, 70% relative humidity, 0% cloud cover, 3 to 5 mph N wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: 12 to 14 inch (T2 to T3, 20/ft^2) foxtail millet; 12 to 16 inch (V6 to V8, 12 to 15/yd^2) sunflower; 10 to 12 inch (T2 to T3, 15/ft^2) forage barley; 4 to 6 inch (15 to 20/ft^2) flax; 6 to 8 inch (5 to 15/yd^2) quinoa; and 8 to 12 inch (10 to 20/ft^2) amaranth. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

At 14 and 28 DAT, all treatments controlled quinoa and gave 0% control of flax and foxtail barley. There was variability within and between adjuvant classes. Generally, herbicide enhancement was MSO/OS>HSOC>MSO>PO>NIS. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Adjuvant category screen with Laudis (Zollinger and Ries).

		14 DAT			28 DAT		
Treatment	Rate	Ftmi[1]	Amar[2]	Snfl[3]	Ftmi	Amar	Snfl
	(product/A)	------ % control ------			------ % control ------		
Laudis + 28%	1fl oz + 2.5% v/v	0	12	15	0	12	15
Nonionic surfactant							
Induce+28%	0.25% v/v+2.5% v/v	20	25	27	20	25	27
Purity 100+28%	0.25% v/v+2.5% v/v	20	33	28	20	33	28
Penetrate II+28%	0.25% v/v+2.5% v/v	15	25	23	15	25	23
Preference+28%	0.25% v/v+2.5% v/v	20	30	37	20	30	37
Activator 90+28%	0.25% v/v+2.5% v/v	25	37	37	25	37	37
Petroleum oil concentrate							
Herbimax+28%	1% v/v+2.5% v/v	42	42	47	42	42	47
Premium COC+28%	1% v/v+2.5% v/v	37	37	42	37	37	42
Prime Oil+28%	1% v/v+2.5% v/v	43	43	47	43	43	47
R-Way+28%	1% v/v+2.5% v/v	33	33	40	33	33	40
Agridex+28%	1% v/v+2.5% v/v	32	42	35	32	42	35
Exchange+28%	0.5% v/v+2.5% v/v	38	38	55	38	38	55
Methylated seed oil							
Destiny+28%	1% v/v+2.5% v/v	42	42	62	42	42	62
MSO Conc+28%	1% v/v+2.5% v/v	47	40	53	47	40	53
Premium MSO+28%	1% v/v+2.5% v/v	38	42	55	38	42	55
Sundance II+28%	1% v/v+2.5% v/v	47	47	60	47	47	60
MSO Ultra+28%	1% v/v+2.5% v/v	38	40	53	38	40	53
High surfactant oil concentrates							
Superb HC+28%	0.5% v/v+2.5% v/v	38	47	57	38	47	57
Between+28%	0.5% v/v+2.5% v/v	43	72	82	43	72	82
Destiny HC+28%	0.5% v/v+2.5% v/v	47	45	70	47	45	70
MSO + organosilicone surfactant							
Dyne-Amic+28%	0.5% v/v+2.5% v/v	60	60	75	60	60	75
Untreated		0	0	0	0	0	0
LSD (0.05)		6	7	8	6	7	8

[1]Ftmi = foxtail millet.
[2]Amar = amaranth.
[3]Snfl = sunflower.

Influence of spray pH on Laudis efficacy. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate weed efficacy from various pH levels in Laudis tank-mixtures. 'Westford' forage barley, 'Siberian' foxtail millet, and Asgrow "AG0801" soybean were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 9:35 am with 79 F air, 80 F soil surface, 58% relative humidity, 5% cloud cover, 2 to 4 mph N wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at the time of applications were: 10 to 12 inch (T2 to T3, 5 to 15/ft^2) forage barley; 12 to 14 inch (T2 to T3, 15 to 20/ft^2) foxtail millet, and 8 to 12 inch (8 to 10/yd^2) soybean. Weed species present in plots at time of application were: 2 to 4 inch (1 to 5/yd^2) biennial wormwood. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

HCl and NH_4O_4 were used to adjust pH to desired levels of 5, 7, and 9. Herbicide enhancement was MSO (Destiny)>PO (Prime Oil)>NIS (Preference) and pH 9>pH 7>pH 5. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Influence of spray pH on Laudis efficacy (Zollinger and Ries).

		14 DAT				28 DAT			
Treatment[1]	Rate	Ftmi[2]	Foba[3]	Biww[4]	Soyb[5]	Ftmi	Foba	Biww	Soyb
	(product/A)	% control				% control			
Laudis +	1floz +								
Spray solution - pH 5									
Preference+28%	0.25% v/v+2.5% v/v	10	0	10	58	10	0	10	58
Prime Oil Conc+28%	1% v/v+2.5% v/v	28	20	43	73	28	20	43	73
Destiny+28%	1% v/v+2.5% v/v	37	27	77	73	37	27	77	73
Spray solution - pH 7									
Preference+28%	0.25% v/v+2.5% v/v	23	20	32	63	23	20	32	63
Prime Oil Conc+28%	1% v/v+2.5% v/v	52	32	78	77	52	32	78	77
Destiny+28%	1% v/v+2.5% v/v	60	40	87	90	60	40	87	90
Spray solution - pH 9									
Preference+28%	0.25% v/v+2.5% v/v	32	32	57	67	32	32	57	67
Prime Oil Conc+28%	1% v/v+2.5% v/v	65	43	93	94	65	43	93	94
Destiny+28%	1% v/v+2.5% v/v	82	58	99	99	82	58	99	99
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		6	6	6	7	6	6	6	7

[1]Preference = nonionic surfactant; Prime Oil Conc = petroleum oil concentrate; Destiny = methylated seed oil.
[2]Ftmi = foxtail millet.
[3]Foba = forage barley.
[4]Biww = biennial wormwood.
[5]Soyb = soybean.

Volunteer Roundup Ready corn control in soybean. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate volunteer corn control in soybean. Pioneer '39F27' conventional corn, Asgrow 'AG 0801' Roundup Ready soybean, and 'Maverick' pinto bean were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 11:05 am with 86 F air, 84 F soil surface, 48% relative humidity, 0% cloud cover, 2 to 6 mph N wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present. Species stages at time of application were: V6 to V8 (18 to 24 inch, 20 to 25/yd^2) corn; V8 to V10 (1 to 3/ft^2) soybean; and V6 to V10 (1 to 2/ft^2) pinto bean. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Quizalofop provides greater corn control than clethodim. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Volunteer Roundup Ready corn control in soybean (Zollinger and Ries).

		7 DAT			14 DAT			28 DAT		
Treatment[1]	Rate	Corn	R soy[2]	Pinto	Corn	R soy	Pinto	Corn	R soy	Pinto
	(product/A)	---- % control ----			---- % control ----			---- % control ----		
Targa+RUOM+ Activator 90+AMS	4fl oz+22fl oz+ 0.125%v/v+2.5lb	90	0	99	99	0	99	99	0	99
Targa+RUOM+ Herbimax+AMS	4fl oz+22fl oz+ 0.5%v/v+2.5lb	99	0	99	99	0	99	99	0	99
Targa+RUOM+ Activator 90+AMS	5fl oz+22fl oz+ 0.125%v/v+2.5lb	96	0	99	99	0	99	99	0	99
Select+RUOM+ Activator 90+AMS	4fl oz+22fl oz+ 0.125% v/v+2.5lb	99	0	99	99	0	99	99	0	99
Select Max+RUOM+ Activator 90+AMS	6fl oz+22fl oz+ 0.125% v/v+2.5lb	77	0	99	88	0	99	88	0	99
RUOM+Activator 90+AMS	22fl oz+0.125% v/v+2.5lb	96	0	99	96	0	99	96	0	99
Targa+Herbimax	5fl oz+1% v/v	99	0	0	99	0	0	99	0	0
Select+Herbimax	4fl oz+1% v/v	63	0	0	73	0	0	88	0	0
Select Max+Herbimax	6fl oz+1% v/v	53	0	0	68	0	0	83	0	0
LSD (0.05)		8	NS	NS	8	NS	NS	8	NS	NS

[1]RUOM = Roundup OriginalMax; Activator 90 = nonionic surfactant; AMS = ammonium sulfate; Herbimax = petroleum oil concentrate.
[2]R soy = Roundup Ready soybean.

Volunteer Roundup Ready corn control with glyphosate plus oil adjuvants. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate volunteer grass control. Pioneer '39F27' conventional corn, DeKalb 'DKC35-51' Roundup Ready corn, 'Westford' forage barley, and 'Siberian' foxtail millet were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 11 at 9:00 am with 67 F air, 69 F soil surface, 70% relative humidity, 0% cloud cover, 5 to 10 mph W wind, damp soil surface, moist subsoil, excellent crop vigor, and dew present. Species stages at the time of applications were: 18 to 30 inch (20 to 25/yd^2) conventional corn and Roundup Ready corn; 6 to 12 inch (T4 to T5, 15 to 30/ft^2) forage barley; and 8 to 16 inch (T4 to T5, 20 to 40/ft^2) foxtail millet. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Oil adjuvants enhanced control of corn than NIS or nitrogen. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Volunteer Roundup Ready corn control with glyphosate plus oil adjuvants (Zollinger and Ries).

		14 DAT				28 DAT			
Treatment[1]	Rate	Ftmi[2]	Foba[3]	R corn[4]	C corn[5]	Ftmi	Foba	R corn	C corn
	(product/A)	- - - - - - - - % control - - - - - - - -				- - - - - - - - % control - - - - - - - -			
TD HiTech +	9.7oz +								
Select	2fl oz	40	47	15	30	90	88	13	57
Select+N-Pac AMS	2fl oz+2.5% v/v	73	58	15	40	99	99	15	65
Select+Preference+N-Pac AMS	2fl oz+0.25% v/v+2.5% v/v	83	73	33	42	99	99	32	82
Select+Prime Oil+N-Pac AMS	2fl oz+0.25% v/v+ 2.5% v/v	87	83	70	80	99	99	68	95
Select+Superb HC+N-Pac AMS	2fl oz+0.5% v/v+ 2.5% v/v	84	90	53	72	99	99	53	72
Select+AG 05055	2fl oz+2.5% v/v	92	92	70	83	99	99	78	85
Select+AG 05006+N-Pac AMS	2fl oz+0.5% v/v+2.5% v/v	95	93	62	90	99	99	65	95
Select	4fl oz	85	73	18	50	99	99	15	70
Select+N-Pac AMS	4fl oz+2.5% v/v	67	67	35	62	99	99	27	65
Select+Preference+N-Pac AMS	4fl oz+0.25% v/v+2.5% v/v	83	80	40	70	99	99	30	70
Select+Superb HC+N-Pac AMS	4fl oz+0.5% v/v+2.5% v/v	93	91	75	83	99	99	75	85
Select+AG 05055	4fl oz+2.5% v/v	92	93	83	82	99	99	97	85
Select+AG 05006+N-Pac AMS	4fl oz+0.5% v/v+2.5% v/v	95	95	79	87	99	99	77	87
LSD (0.05)		7	7	10	5	NS	1	5	13

[1]TD HiTech = Touchdown HiTech; N-Pac AMS = liquid ammonium sulfate; Preference = nonionic surfactant; Prime Oil = petroleum oil concentrate; Super HC = high surfactant oil concentrate; AG 05055 and 05006 = proprietary compounds from Winfield Solutions.
[2]Ftmi = foxtail millet.
[3]Foba = forage barley.
[4]R corn = Roundup Ready corn.
[5]C corn = conventional corn.

POST grass control. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate POST applications for grass control. Pioneer '39F27' conventional corn, 'Westford' forage barley, and 'Siberian' foxtail millet were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 5 at 10:10 am with 83 F air, 85 F soil surface, 64% relative humidity, 0% cloud cover, 2 to 4 mph N wind, dry soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at the time of applications were: 18 to 24 inch (V6 to V8, 10 to 15/yd^2) conventional corn; 8 to 14 inch (T2 to T3, 10 to 12/ft^2) forage barley; and 16 to 24 inch (T2 to T3, 10 to 15/ft^2) foxtail millet. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

(Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. POST grass control (Zollinger and Ries).

Treatment[1]	Rate	14 DAT			28 DAT		
		Ftmi[2]	Foba[3]	Corn	Ftmi	Foba	Corn
	(product/A)	----- % control -----			----- % control -----		
Assure II+	3fl oz+	48	37	27	43	33	17
Premiuim COC+Premium AMS	1qt+2lb	57	80	93	67	99	99
Premium COC+N-Tense	1qt+0.5% v/v	65	85	90	75	99	95
Trophy Gold+Premium AMS	0.25% v/v+2lb	43	63	60	47	73	63
Trophy Gold+N-Tense	0.25% v/v+0.5% v/v	53	70	84	67	90	93
Premier 90+Premium AMS	0.5% v/v+2lb	45	70	83	53	86	93
Volunteer+	3fl oz+	33	23	7	33	20	7
Premiuim COC+Premium AMS	1qt+2lb	45	75	55	52	99	73
Premium COC+N-Tense	1qt+0.5% v/v	53	73	77	65	83	87
Trophy Gold+Premium AMS	0.25% v/v+2lb	42	70	55	53	83	70
Trophy Gold+N-Tense	0.25% v/v+0.5% v/v	50	70	55	53	83	70
Premier 90+Premium AMS	0.5% v/v+2lb	37	65	43	40	80	48
LSD (0.05)		9	7	9	8	5	7

[1]Premium COC = petroleum oil concentrate; Premium AMS = ammonium sulfate; N-Tense = surfactants + water conditioning agents; Trophy Gold = oil based surfactants; Premier 90 = nonionic surfactant.
[2]Ftmi = foxtail millet.
[3]Foba = forage barley.

Comparing clethodim and quizalofop formulations. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Casselton, ND, to evaluate grass control from tank-mixes. DeKalb 'DKC35-51' corn, 'Drummond' barley, and 'Briggs' wheat, were planted perpendicular to each plot length on May 30, 2006. POST treatments were applied on June 5 at 12:30 pm with 81 F air, 99 F soil surface, 31% relative humidity, 0 % cloud cover, 1 to 2 mph W wind, dry soil surface and subsoil, excellent vigor, and do dew present. Species stages at time of application were: V4 to V5 (1 to 5/ft^2) corn; 8 to 18 inch (20 to 30/ft^2) barley; 6 to 16 inch (5 to 50/ft^2) wheat. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

Several formulations of clethodim (Select) and two formulations of quizalofop (Assure II) are registered. This study was conducted to compare weed control from some of these products. Select Max, a 1 lb ai/ gallon formulation, is different than Select, a 2 lb ai/gallon formulation, by containing adjuvant components in the formulation. Previous studies show NIS such as R-11 with Select Max can give equal or greater grass than Select applied with an oil adjuvant. In this study, the two adjuvants, a NIS type R-11 and an oil type Superb HC gave similar grass control. Comparing Herbimax or Superb HC with the other clethodim formulations of Volunteer, Clethodim, Arrow and Section, Herbimax generally gave the greatest enhancement and the Agsco Clethodim + Herbimax was among the treatments that gave the greatest grass control. However, comparing Herbimax or Superb HC with Assure II or Targa at 5 fl oz/A, Superb HC generally gave the greatest enhancement and the Targa + Superb HC gave the greatest grass control. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. Comparing clethodim and quizalofop formulations (Zollinger and Ries).

		14 DAT			28 DAT		
Treatment[1]	Rate	Wheat	Barley	Corn[2]	Wheat	Barley	Corn
	(product/A)	-------- % control --------			-------- % control --------		
Select Max+R-11	9fl oz+0.25% v/v	50	43	53	53	47	53
Select Max+ Superb HC	9fl oz+0.5% v/v	48	48	68	52	48	48
Volunteer+Herbimax	6fl oz+1qt	53	53	71	63	53	89
Volunteer+Superb HC	6fl oz+0.5% v/v	50	45	67	60	45	77
Agsco Clethodim+Herbimax	6fl oz+1qt	62	60	73	82	60	93
Agsco Clethodim+Superb HC	6fl oz+0.5% v/v	52	52	71	52	52	81
Arrow+Herbimax	6fl oz+1qt	50	50	72	60	50	92
Arrow+Superb HC	6fl oz+0.5% v/v	42	42	62	52	52	72
Section+Herbimax	6fl oz+1qt	55	57	72	55	57	82
Section+Superb HC	6fl oz+0.5% v/v	52	52	67	52	52	70
Assure II+Herbimax	5fl oz+1qt	60	68	76	60	68	76
Assure II+Superb HC	5fl oz+0.5% v/v	52	60	78	62	60	89
Targa+Herbimax	5fl oz+1qt	68	69	84	78	69	93
Targa+Superb HC	5fl oz+0.5% v/v	62	67	80	82	92	92
Targa+Herbimax	8fl oz+1qt	72	83	93	83	83	96
Targa+Superb HC	8fl oz+0.5% v/v	63	69	92	90	88	98
LSD (0.05)		6	7	7	5	5	5

[1]R-11 = nonionic surfactant; Superb HC = high surfactant oil concentrate; Herbimax= petroleum oil concentrate.
[2]Corn = Roundup Ready corn.

18 inch volunteer Roundup Ready corn control from UAP products. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate volunteer grass control. Pioneer '39F27' conventional corn, DeKalb 'DKC35-51' Roundup Ready corn, 'Westford' forage barley, and 'Siberian' foxtail millet were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on July 11 at 8:45 am with 67 F air, 69 F soil surface, 70% relative humidity, 0% cloud cover, 3 to 5 mph N wind, moist soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at the time of applications were: 24 to 30 inch (20 to 25/yd^2) conventional corn; 24 to 30 inch (20 to 25/yd^2) Roundup Ready corn; 10 to 12 inch (T4 to T5, 20 to 30/ft^2) forage barley; and 14 to 16 inch (T4 to T5, 30 to 40/ft^2) foxtail millet. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

(Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. 18 inch volunteer Roundup Ready corn control from UAP products (Zollinger and Ries).

		7 DAT				14 DAT				28 DAT			
Treatment[1]	Rate	Ftmi[2]	Foba[3]	R corn[4]	C corn[5]	Ftmi	Foba	R corn	C corn	Ftmi	Foba	R corn	C corn
	(product/A)	% control				% control				% control			
LI-6190+Mirage Plus+Choice WM	4fl oz+2pt+0.5% v/v	87	80	35	82	99	99	43	92	99	99	48	98
LI-6190+Mikaze+Choice WM	4fl oz+2pt+0.5% v/v	83	83	43	83	99	99	43	93	99	99	40	98
LI-6190+Mirage Plus+Choice WM	6fl oz+2pt+0.5% v/v	87	90	50	83	99	99	50	93	99	99	62	98
LI-6190+Mikaze+Choice WM	6fl oz+2pt+0.5% v/v	83	80	53	75	99	99	53	95	99	99	53	99
LI-6190+Mirage Plus+Choice WM+Liberate	4fl oz+2pt+0.5% v/v+0.25% v/v	72	70	20	62	99	99	20	80	99	99	20	90
LI-6190+Mikaze+Choice WM+Liberate	4fl oz+2pt+0.5% v/v+0.25% v/v	83	72	32	58	99	99	10	83	99	99	40	96
LI-6190+Mirage Plus+Choice WM+Liberate	6fl oz+2pt+0.5% v/v+0.25% v/v	82	83	42	62	99	99	42	82	99	99	40	92
LI-6190+Mikaze+Choice WM+Liberate	6fl oz+2pt+0.5% v/v+0.25% v/v	72	83	48	63	99	99	48	83	99	99	48	93
LI-6190+Mirage Plus+Choice WM+LI-6193	4fl oz+2pt+0.5% v/v+1% v/v	88	87	52	72	99	99	52	75	99	99	62	88
LI-6190+Mikaze+Choice WM+LI-6193	4fl oz+2pt+0.5% v/v+1% v/v	92	88	52	76	99	99	40	86	99	99	48	96
LI-6190+Mirage Plus+Choice WM+LI-6193	6fl oz+2pt+0.5% v/v+1% v/v	92	85	53	73	99	99	50	85	99	99	68	96
LI-6190+Mikaze+Choice WM+LI-6193	6fl oz+2pt+0.5% v/v+1% v/v	90	73	53	78	99	99	58	87	99	99	60	96
LI-6190	4fl oz	40	33	3	13	10	63	33	13	50	35	13	17
LI-6190	6fl oz	22	23	17	20	22	23	27	32	33	33	43	32
LI-6190+LI-6193	4fl oz+1% v/v	22	35	25	18	22	35	57	22	23	43	27	22
LI-6190+LI-6193	6fl oz+1% v/v	25	37	27	27	25	37	63	38	42	93	63	38
LSD (0.05)		5	7	7	6	3	4	7	5	4	3	5	5

[1]LI-6160 and 6193 = proprietary compounds from UAP; Choice WM = Choice WeatherMaster = water conditioning agents; Liberate = nonionic surfactant.
[2]Ftmi = foxtail millet.
[3]Foba = forage barley.
[4]R corn = Roundup Ready corn.
[5]C corn = conventional corn.

36 inch volunteer Roundup Ready corn control UAP products. Zollinger, Richard K. and Jerry L. Ries. An experiment was conducted near Mapleton, ND, to evaluate volunteer grass control. Pioneer '39F27' conventional corn, DeKalb 'DKC35-51' RUR corn, 'Westford' forage barley, and 'Siberian' foxtail millet were planted perpendicular to each plot length on June 5, 2007. POST treatments were applied on June 18 at 10:15 am with 79 F air, 84 F soil surface, 57% relative humidity, 10% cloud cover, 3 to 5 mph N wind, moist soil surface, moist subsoil, excellent crop vigor, and no dew present. Species stages at the time of applications were: 30 to 40 inch (V6 to V10, 1 to 5/ft^2) conventional corn; 30 to 40 inch (V6 to V10, 1 to 5/ft^2) Roundup Ready corn; 8 to 14 inch (T3 to T4) (1 to 20/ft^2) forage barley; and 16 to 28 inch (T3 to T4) (20 to 30/ft^2) foxtail millet. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles. The experiment had randomized complete block design with three replicates per treatment.

(Dept. of Plant Sciences, North Dakota State University, Fargo).

Table. 36 inch Volunteer Roundup Ready corn control from UAP products (Zollinger and Ries).

		7 DAT				14 DAT				28 DAT			
Treatment[1]	Rate	Ftmi[2]	Foba[3]	R corn[4]	C corn[5]	Ftmi	Foba	R corn	C corn	Ftmi	Foba	R corn	C corn
	(product/A)	% control				% control				% control			
LI-6190+Mirage Plus+Choice WM	4fl oz+2pt+0.5% v/v	83	84	32	40	93	96	32	60	99	96	43	73
LI-6190+Mikaze+Choice WM	4fl oz+2pt+0.5% v/v	77	83	22	42	96	99	22	62	99	99	32	77
LI-6190+Mirage Plus+Choice WM	6fl oz+2pt+0.5% v/v	87	94	48	43	98	99	38	60	99	99	42	88
LI-6190+Mikaze+Choice WM	6fl oz+2pt+0.5% v/v	83	90	42	47	93	98	40	67	99	98	48	87
LI-6190+Mirage Plus+Choice WM+Liberate	4fl oz+2pt+0.5% v/v+0.25% v/v	96	86	42	52	75	99	38	73	99	99	48	82
LI-6190+Mikaze+Choice WM+Liberate	4fl oz+2pt+0.5% v/v+0.25% v/v	73	80	37	52	93	99	33	65	99	99	42	75
LI-6190+Mirage Plus+Choice WM+Liberate	6fl oz+2pt+0.5% v/v+0.25% v/v	67	84	43	55	87	99	37	18	99	99	37	90
LI-6190+Mikaze+Choice WM+Liberate	6fl oz+2pt+0.5% v/v+0.25% v/v	67	86	33	48	93	99	30	60	99	99	33	82
LI-6190+Mirage Plus+Choice WM+LI-6193	4fl oz+2pt+0.5% v/v+1% v/v	67	90	43	57	90	99	40	67	90	99	47	87
LI-6190+Mikaze+Choice WM+LI-6193	4fl oz+2pt+0.5% v/v+1% v/v	70	90	47	57	96	99	47	70	96	99	52	90
LI-6190+Mirage Plus+Choice WM+LI-6193	6fl oz+2pt+0.5% v/v+1% v/v	67	88	60	57	87	99	30	70	98	99	40	88
LI-6190+Mikaze+Choice WM+LI-6193	6fl oz+2pt+0.5% v/v+1% v/v	77	89	32	55	96	99	32	67	96	99	42	88
LI-6190	4fl oz	20	20	10	10	20	20	10	10	20	50	10	10
LI-6190	6fl oz	12	25	22	10	12	25	22	10	12	50	25	22
LI-6190+LI-6193	4fl oz+1% v/v	13	27	18	22	13	27	18	22	17	53	33	33
LI-6190+LI-6193	6fl oz+1% v/v	18	27	28	27	18	27	28	27	20	55	43	38
LSD (0.05)		7	8	8	7	7	4	7	8	5	4	9	4

[1]LI-6160 and 6193 = proprietary compounds from UAP; Choice WM = Choice WeatherMaster = water conditioning agents; Liberate = nonionic surfactant.
[2]Ftmi = foxtail millet.
[3]Foba = forage barley.
[4]R corn = Roundup Ready corn.
[5]C corn = conventional corn.