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Oil Adjuvant for Fomesafen in Soybean. Dr. Howatt and Mettler. 'CZ0301LL/CZ0729GTLL' soybean was planted near Fargo, ND on May 20, 2020. Preemergence treatments were applied on May 21 at 58°F, 86% relative humidity, 0% cloud-cover, 8 mph hour wind velocity at 135°, and dry soil surface at 58°F. Post application treatments were applied to V2 soybeans, 2 to 4 inch common ragweed, 1 inch common purslane, 2 inch venice mallow, 2 to 4 inch waterhemp, 2 to 4 inch redroot pigweed, and 2 to 4 inch common lambsquarters on June 22 with 79°F, 43% relative humidity, 5% cloud-cover, 5 mph hour wind velocity at 360°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/7	7/7	7/7	7/7	7/23	7/23	7/23
		Soy	Wahe	Corw	Colq	Wahe	Corw	Colq
	-----OZ AI/A, %V-----	-----%-----						
Pend + Fome-F + Prime Oil + AMS	16 / 1.9 + 1% + 11	4	72	71	60	37	20	23
Pend + Fome-F + AgriSyst COC + AMS	16 / 1.9 + 1% + 11	7	80	86	72	72	40	50
Pend + Fome-F + MSO + AMS	16 / 1.9 + 1% + 11	11	85	86	81	73	50	57
Pend + Fome-F + MaxSO + AMS	16 / 1.9 + 1% + 11	12	84	86	77	37	27	40
Pend + Fome-F + Preference + AMS	16 / 1.9 + 0.38% + 11	8	88	93	82	60	40	27
Pend + Fome-F + AgraSyst 90 + AMS	16 / 1.9 + 0.38% + 11	6	72	76	72	53	40	40
Fomesafen + Clet-2EC + Prime Oil + AMS	1.9 + 1 + 1% + 11	6	86	89	66	77	73	50
Fome-F + Clet-2EC + AgriSyst COC + AMS	1.9 + 1 + 1% + 11	9	89	91	70	70	60	47
CV		29	5	6	5	25	36	43
LSD P=0.5		3	6	8	5	27	27	32

Surfactants for Glufosinate in Soybean. Dr. Howatt and Mettler. CZ0301LL/CZ0729GTLL soybean was planted near Fargo, ND on May 20, 2020. Treatments were applied to V2 soybeans, 5 to 6 leaf oat, 5 to 6 leaf barley, 1 to 4-inch waterhemp, 1 to 4-inch venice mallow, 1 to 4-inch redroot pigweed, and 1 to 4-inch common ragweed on June 22 with 81°F, 37% relative humidity, 40% cloud-cover, 4 mph hour wind velocity at 360°, and dry soil surface at 69°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/7	7/7	7/7	7/7	7/7	7/7	7/23	7/23	7/23	7/23
		Soy	Bar	Oat	Wahe	Corw	Colq	Bar	Wahe	Corw	Colq
	--OZ AI/A, %V--	-----%									
Gluf + Preference + AMS	4.4 + 0.25% + 48	0	87	99	86	98	93	85	81	98	93
Gluf + Agrasyst 90 + AMS	4.4 + 0.25% + 48	0	90	99	91	99	99	81	89	98	96
Gluf + Full Load + AMS	4.4 + 0.25% + 24	0	91	99	94	99	98	87	88	98	96
Gluf + Preference + AMS	8.5 + 0.25% + 48	0	89	99	93	98	98	86	86	98	94
Gluf + Agrasyst 90 + AMS	8.5 + 0.25% + 48	0	88	99	89	99	98	91	87	98	96
Gluf + Full Load + AMS	8.5 + 0.25% + 24	0	90	99	94	99	99	85	94	98	94
CV		0	2	0	3	1	3	5	8	4	3
LSD P=0.5		.	3	.	5	1	2	7	10	2	4

Adjuvants with Glufosinate. Dr. Howatt and Mettler. 'CZ0301LL/CZ0729GTLL' soybean was planted near Fargo, ND on May 20, 2020. Location 1 treatments were applied on a non-cropped area with 2 to 8-inch waterhemp, 2 to 8-inch common ragweed, 4 to 10 inch wild buckwheat, on June 12 with 76°F, 39% relative humidity, 0% cloud-cover, 8 mph hour wind velocity at 90°, and dry soil surface at 71°F. Location 2 treatments were applied to V3 soybean with 2 to 7 inch waterhemp, 2 to 8 inch venice mallow, 4-8 inch common ragweed, 2 inch purslane, and 3 leaf yellow foxtail on June 30 with 84°F, 80% relative humidity, 100% cloud cover, 7 mph wind velocity at 135°, and dry soil surface at 82°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Location 1: (A) Non-Crop Area

Treatment	Rate OZ A/A, %V/V	6/15	6/15	6/15	6/15	6/19	6/19	6/19	6/19	6/25	6/25	6/25	6/25
		Wahe	Corw	Wibw	Colq	Wahe	Corw	Wibw	Colq	Wahe	Corw	Wibw	Colq
Untreated Check		0	0	0	0	0	0	0	0	0	0	0	0
Gluf-S	6.4	70	69	75	70	77	74	76	62	77	74	76	62
Gluf-S + ALB-5015	6.4 + 4	72	54	74	57	75	67	75	45	75	67	75	45
Gluf-S + ALB-5015	4.7 + 4	64	62	75	56	75	70	67	32	75	70	67	32
Gluf-S + ALB-5015	3.2 + 4	59	51	75	47	71	65	65	35	71	65	65	35
Gluf-S + ALB-2039	4.7 + 8	57	59	75	50	77	72	71	35	77	72	71	35
ALB-2043	6.4	62	59	64	65	79	75	74	57	79	75	74	57
ALB-2043	4.7	64	57	72	66	70	72	66	59	70	72	66	59
ALB-2043	3.2	62	66	66	55	74	70	65	42	74	70	65	42
ALB-2043 + ALB-2039	4.7 + 8	57	50	66	45	70	67	66	35	70	67	66	35
CV		8	14	8	10	7	9	9	16	7	9	9	16
LSD P=0.05		8	12	9	8	8	9	9	9	8	9	9	9

Location 2: (B)

Treatment	Rate OZ AI/A, %V/V	7/2	7/2	7/2	7/2	7/2	7/2	7/2	7/2	7/7	7/7	7/7
		Soy	Wahe	Colq	Corw	Vema	Copu	Wht	Yeft	Wahe	Colq	Corw
Untreated Check		0	0	0	0	0	0	0	0	0	0	0
Gluf-S	6.4	0	75	76	70	55	60	60	60	82	74	74
Gluf-S + ALB-5015	6.4 + 4	0	71	75	62	57	60	60	61	82	74	67
Gluf-S + ALB-5015	4.7 + 4	0	72	67	72	52	60	65	61	79	71	71
Gluf-S + ALB-5015	3.2 + 4	0	45	50	45	42	52	50	57	55	45	55
Gluf-S + ALB-2039	4.7 + 8	0	71	75	71	61	60	60	64	74	72	72
ALB-2043	6.4	0	71	75	64	55	60	60	66	77	77	72
ALB-2043	4.7	0	64	72	61	52	60	60	59	71	72	72
ALB-2043	3.2	0	60	74	55	52	60	50	59	62	72	57
ALB-2043 + ALB-2039	4.7 + 8	0	71	74	69	62	60	60	66	75	72	71
CV		0	3	2	7	9	3	-	5	4	4	6
LSD p=0.05		-	3	3	6	7	2	-	4	4	4	6

Treatment	Rate OZ AI/A, %V/V	7/7	7/7	7/7	7/7	7/15	7/15	7/15	7/15	7/15	7/15
		Vema	Copu	Wht	Yeft	Wahe	Colq	Corw	Copu	Wht	Yeft
Untreated Check		0	0	0	0	0	0	0	0	0	0
Gluf-S	6.4	55	60	85	60	91	82	81	0	95	52
Gluf-S + ALB-5015	6.4 + 4	55	60	70	64	84	59	67	0	90	42
Gluf-S + ALB-5015	4.7 + 4	55	60	85	64	82	62	65	0	90	35
Gluf-S + ALB-5015	3.2 + 4	42	52	75	60	59	32	40	0	70	27
Gluf-S + ALB-2039	4.7 + 8	62	60	80	64	69	55	66	0	85	32
ALB-2043	6.4	65	62	75	69	77	70	67	0	90	42
ALB-2043	4.7	52	60	75	62	72	66	71	0	80	35
ALB-2043	3.2	52	60	65	60	67	55	57	0	70	27
ALB-2043 + ALB-2039	4.7 + 8	62	60	65	66	67	50	50	0	75	25
CV		8	4	-	5	7	11	7	0	-	21
LSD p=0.05		7	3	-	5	8	9	6	-	-	10

Adjuvant Effects on Glufosinate Applications. Dr. Howatt and Mettler. CZ0301LL/CZ0729GTL soybean was planted near Fargo, ND on May 20, 2020. Treatments were applied to V2 soybeans, 6 leaf barley, 6 leaf oats, 3 inch common ragweed, 3 inch common lambsquarters, 3 inch redroot pigweed, 4 inch waterhemp, 4 inch volunteer canola, on June 22 with 69°F, 62% relative humidity, 70% cloud-cover, 5 mph hour wind velocity at 360°, and dry soil surface at 68°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/29	6/29	6/29	6/29	6/29	6/29	7/7	
		Soy	Bar	Oat	Wahe	Corw	Col	Bar	
-----OZ AI/A, %V-----		-----%-----							
1	Gluf	5.3	0	52	71	87	88	76	55
2	Gluf + AMS	5.3 + 32	0	70	80	93	94	90	66
3	Gluf + AMS	5.3 + 48	0	70	77	87	85	85	70
4	Gluf + KLA	5.3 + 35.2	0	70	80	91	92	89	70
5	Gluf + AMS + KLA	5.3 + 16 + 35.2	0	70	80	92	87	86	73
6	Gluf-I + NGL + AMS	5.3 + 12 + 32	0	70	80	89	90	91	70
7	Gluf-I + NGL + AMS	5.3 + 12 + 48	0	70	80	93	93	91	70
8	Gluf-I + NGL + KLA	5.3 + 12 + 35.2	0	70	80	92	90	90	72
9	Gluf-I + NGL + KLA + AMS	5.3 + 12 + 35.2 + 16	0	70	79	94	93	89	71
CV			0	0	0	2	3	3	6
LSD P=0.5			.	.	2	3	3	4	6

Treatment	Rate	7/7	7/7	7/7	7/7	7/15	7/15	7/15	7/15	7/15	10/13	
		Oat	Wahe	Corw	Colq	Bar	Oat	Wahe	Corw	Colq	Yield	
-----OZ AI/A, %V-----		-----%-----										
		-----bu/acre-----										
1	Gluf	5.3	80	64	87	79	40	77	59	84	75	12
2	Gluf + AMS	5.3 + 32	89	89	94	93	69	88	88	91	92	18
3	Gluf + AMS	5.3 + 48	91	75	86	84	61	88	69	84	84	16
4	Gluf + KLA	5.3 + 35.2	91	90	94	92	61	91	85	91	89	17
5	Gluf + AMS + KLA	5.3 + 16 + 35.2	93	83	87	86	67	93	83	84	80	17
6	Gluf-I + NGL + AMS	5.3 + 12 + 32	94	89	93	93	62	91	86	92	92	15
7	Gluf-I + NGL + AMS	5.3 + 12 + 48	92	84	87	86	62	90	81	85	83	21
8	Gluf-I + NGL + KLA	5.3 + 12 + 35.2	94	89	90	91	66	93	85	86	89	18
9	Gluf-I + NGL + KLA + AMS	5.3 + 12 + 35.2 + 16	91	87	92	91	67	88	85	90	91	21
CV			4	4	5	7	6	3	6	5	6	21
LSD P=0.5			5	6	7	8	6	4	8	6	7	6

Crop Safety on Adjuvants for Glufosinate. Dr. Howatt and Mettler. Dr. Howatt and Mettler. CZ0301LL/CZ0729GTLL soybean was planted near Fargo, ND on May 20, 2020. Preemergence treatments were applied on May 20 at 58°F, 86% relative humidity, 0% cloud cover, 8 mph wind velocity at 135°, and damp soil surface at 58°F. POST treatments were applied on June 22 with 79°F, 43% relative humidity, 10% cloud-cover, 5 mph wind velocity at 360°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7 foot wide area the length of 10 by 30 foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/29	6/29	6/29	6/29	6/29	6/29	7/7
		Soy	Bar	Oat	Wahe	Corw	Col	Bar
	-----OZ AI/A, %V-----	-----%-----						
1 Pxsf&Saff&Imep (Zidua Pro) weeded	2.3	0	99	99	99	99	97	99
2 Gluf	5.3	0	59	71	77	84	76	60
3 Gluf + AMS	5.3 + 32	0	66	79	82	90	90	62
4 Gluf + AMS	5.3 + 48	0	66	79	87	91	88	64
5 Gluf + KLA	5.3 + 35.2	0	65	74	85	89	90	61
6 Gluf + KLA	12.7 + 35.2	0	74	84	93	94	96	85
7 Gluf + RTP	12.7 + 35.2	0	71	85	95	96	97	84
8 Gluf + RTP + PTM	12.7 + 35.2 + 8	0	74	85	94	95	96	87
9 Gluf + RTP + DRT	12.7 + 35.2 + 8	0	71	85	95	95	97	87
10 Gluf + RTP + LGE	12.7 + 35.2 + 32	0	70	84	90	93	94	74
CV		0	4	2	3	4	4	4
LSD P=0.5		.	4	3	4	3	4	4

Treatment	Rate	7/7	7/7	7/7	7/7	7/15	7/15	7/15	7/15	7/15	10/13
		Oat	Wahe	Corw	Colq	Bar	Oat	Wahe	Corw	Colq	Yield
	---OZ AI/A, %V---	-----%-----									-bu/acre-
1 Pxsf&Saff&Imep (Zidua Pro) weeded	2.3	99	97	96	98	99	99	98	96	97	35
2 Gluf	5.3	81	74	84	75	52	80	55	76	61	26
3 Gluf + AMS	5.3 + 32	87	79	92	88	55	87	75	86	84	29
4 Gluf + AMS	5.3 + 48	88	81	85	80	57	85	73	85	77	30
5 Gluf + KLA	5.3 + 35.2	87	85	90	88	55	85	77	86	85	31
6 Gluf + KLA	12.7 + 35.2	97	93	97	98	72	97	93	98	96	31
7 Gluf + RTP	12.7 + 35.2	97	93	96	96	70	97	92	95	96	35
8 Gluf + RTP + PTM	12.7 + 35.2 + 8	98	91	95	94	72	98	86	95	93	33
9 Gluf + RTP + DRT	12.7 + 35.2 + 8	98	93	97	95	72	98	92	96	94	37
10 Gluf + RTP + LGE	12.7 + 35.2 + 32	94	91	96	96	62	93	85	94	92	38
CV		2	5	4	4	7	1	5	3	3	17
LSD P=0.5		2	5	3	5	7	2	5	3	4	8

Soil Adjuvants for Pendimethalin. Dr. Howatt and Mettler. The experiment was established in a non-cropped field near Fargo, North Dakota on June 2, 2020. Preemergence treatments were applied on June 2 at 66°F, 44% relative humidity, 60% cloud-cover, 2 mph wind velocity at 45°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/24 Yeft	6/24 Vema	6/24 Rrpw	6/24 Colq	7/6 All
	---OZ AI/A, %V---	-----%-----				
1 Pend (Prowl H20)	20	71	67	76	79	79
2 Pend + Adhere	20 + 8	76	70	77	74	74
3 Pend + Adhere	20 + 16	84	80	84	86	86
4 Pend + Adhere	20 + 24	89	82	86	88	88
5 Pend + OroRZ	20 + 32	87	80	79	77	77
6 Pend + Grounded	20 + 32	81	76	76	80	80
7 Pend + Extend	20 + 16	81	71	69	76	76
8 Pend + Wet-Sol	20 + 16	80	74	71	79	79
CV		3	6	7	6	6
LSD P=0.5		4	6	8	7	7

*7/6 Entire plot rating

Soil Adjuvants for Acetochlor. Dr. Howatt and Mettler. The experiment was established in a non-cropped field near Fargo, North Dakota on June 2, 2020. Preemergence treatments were applied on June 2 at 66°F, 53% relative humidity, 30% cloud-cover, 2 mph wind velocity at 45°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/24	6/24	6/24	6/24	7/6
		Yeft	Vema	Rrpw	Colq	All
	----OZ AI/A, %V----	-----%-----				
1 Acet-S (Surpass NXT)	32	85	87	94	88	88
2 Acet-S + Adhere	32 + 8	89	89	94	88	88
3 Acet-S + Adhere	32 + 16	90	91	95	86	86
4 Acet-S + Adhere	32 + 24	94	94	95	91	91
5 Acet-S + OroRZ	32 + 32	90	89	94	87	87
6 Acet-S + Grounded	32 + 32	91	89	94	87	87
7 Acet-S + Extend	32 + 16	86	91	93	85	85
8 Acet-S + Wet-Sol	32 + 16	88	89	92	89	89
CV		3	2	2	4	4
LSD P=0.5		4	3	3	5	5

*7/6 a whole plot rating

Soil Adjuvants for Metribuzin. Dr. Howatt and Mettler. The experiment was established in a non-cropped field near Fargo, North Dakota on June 2, 2020. Preemergence treatments were applied on June 2 at 66°F, 53% relative humidity, 40% cloud-cover, 3 mph wind velocity at 45°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/24 Yeft	6/24 Vema	6/24 Rrpw	6/24 Colq	7/6 All
	----OZ AI/A, %V----	-----%-----				
1 Metr-4F	4	50	91	92	89	89
2 Metr-4F + Adhere	4 + 8	61	86	89	91	91
3 Metr-4F + Adhere	4 + 16	61	89	89	91	91
4 Metr-4F + Adhere	4 + 24	66	94	94	94	94
5 Metr-4F + OroRZ	4 + 32	66	91	91	91	91
6 Metr-4F + Grounded	4 + 32	52	91	87	90	90
7 Metr-4F + Extend	4 + 16	66	90	91	91	91
8 Metr-4F + Wet-Sol	4 + 16	55	79	80	76	76
CV		9	9	9	8	8
LSD P=0.5		8	11	12	11	11

*7/6 Entire plot rating

Soil Adjuvants for Pyroxasulfone. Dr. Howatt and Mettler. The experiment was established in a non-cropped field near Fargo, North Dakota on June 2, 2020. Preemergence treatments were applied on June 2 at 70°F, 44% relative humidity, 60% cloud-cover, 7 mph wind velocity at 45°, and dry soil surface at 70°F. Treatments were applied with a backpack sprayer delivering 17 gpa at 40 psi through 11002 TT nozzles to a 7-foot-wide area the length of 10 by 30-foot plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/24 Yeft	6/24 Vema	6/24 Rrpw	6/24 Colq	7/6 All
	----OZ AI/A, %V----	-----%-----				
1 Pxf-SC (Zidua SC)	2.1	81	87	84	81	81
2 Pxf-SC + Adhere	2.1 + 8	81	89	89	82	82
3 Pxf-SC + Adhere	2.1 + 16	85	90	92	85	85
4 Pxf-SC + Adhere	2.1 + 24	88	93	92	90	90
5 Pxf-SC + OroRZ	2.1 + 32	85	92	91	87	87
6 Pxf-SC + Grounded	2.1 + 32	82	92	91	82	82
7 Pxf-SC + Extend	2.1 + 16	89	92	91	91	91
8 Pxf-SC + Wet-Sol	2.1 + 16	85	92	90	89	89
CV		4	3	4	5	5
LSD P=0.5		5	4	5	6	6

*7/6 Entire plot rating