

Sunflower response to KIH-485

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KIH-485

KIH-485 (pyroxasulfone) – Kumiai America

- PPI/PRE corn herbicide (rainfall needed)
- 2.8 to 5.6 oz ai/A (60 WDG)
- Unknown mode of action
- Compare to acetanilides – Dual, Lasso, etc.
- Excellent corn safety (Registration 2008)
- Season-long grass and broadleaf weed control.
- Few rotation restrictions

Poor cocklebur, ragweed, sunflower control

Materials and Methods

- Weed efficacy and crop safety studies

- Four years (2004-2007)

- 3 locations and soil types

Casselton, ND – clay loam 4.9% OM

Carrington, ND – loam 5.6% OM

Valley City, ND – sandy loam 2.5% OM

Casselton, ND – Fine Texture

Treatment	Rate (prod/A)	42 DAT		73 DAT				
		Yeft	Wimu	Yeft	Wimu	Rrpw	Colq	Wibw
		% control		----- % control -----				
KIH-485	1.5 oz	87	87	99	50	99	99	50
	3.0 oz	99	78	99	83	99	99	88
	*3.6 oz	99	83	99	91	99	99	95
	4.3 oz	99	95	99	99	99	99	99
Dual Magnum	1.5 pt	70	20	82	0	73	73	0
	2 pt	83	40	87	0	78	75	0
Harness/Surpass	2 pt	99	63	99	53	72	99	62
	3 pt	98	75	99	69	99	99	63
Outlook	10 fl oz	75	30	72	0	99	99	0
	21 fl oz	90	40	90	40	99	99	0
Define	11 fl oz	80	20	77	0	90	90	0
	22 fl oz	93	30	83	0	95	95	0
LSD (0.05)		3	4	3	2	2	2	4

Carrington, ND – Med. texture

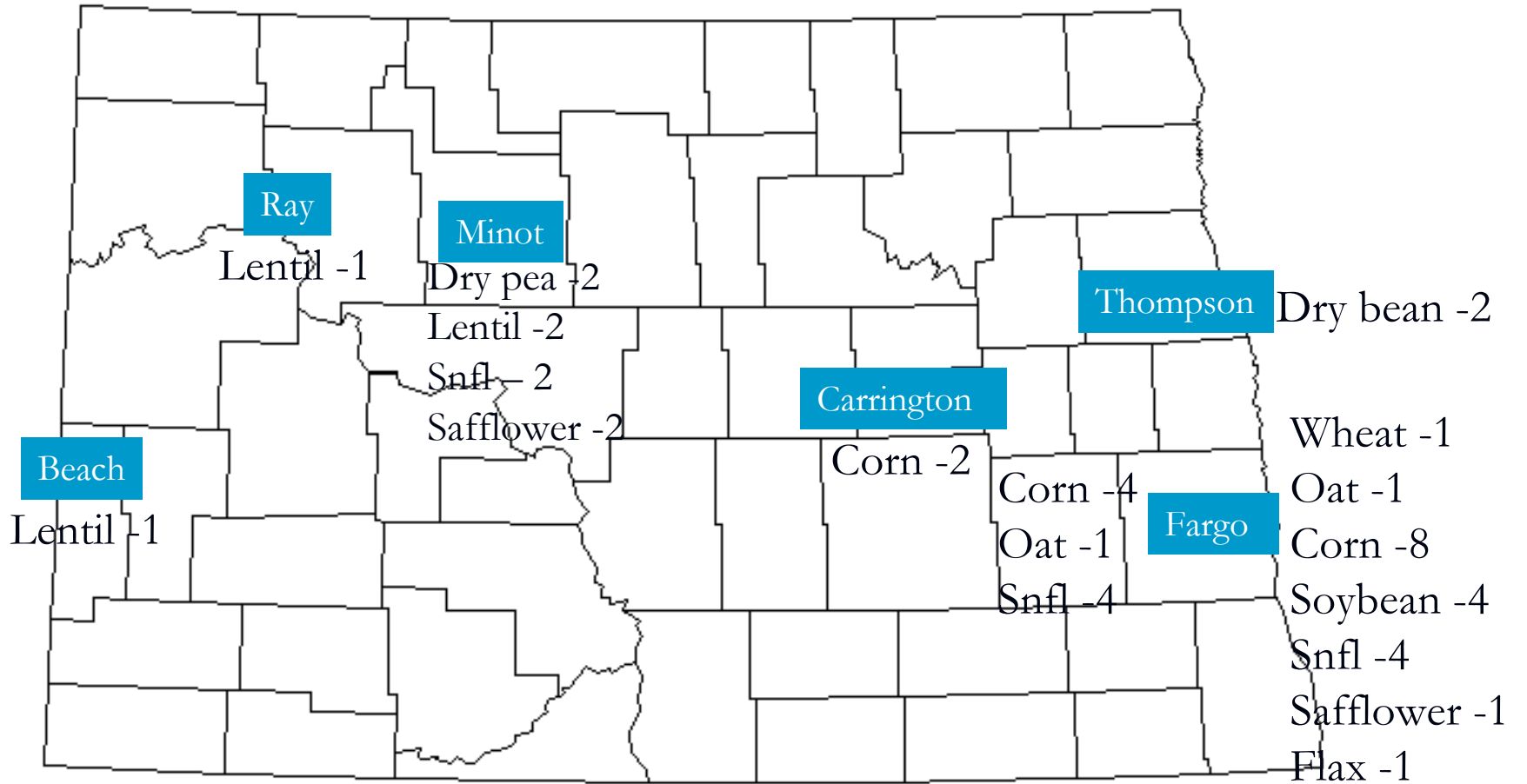
Treatment	Rate (prod/A)	Fxtl	Rrpw	Colq	Wibw	Fxtl	Rrpw	Colq	Wibw	Koch
		- - - - % control - - - -				- - - - - % control - - - -				
KIH-485	1.2 oz	99	99	95	87	99	99	95	87	80
	2.4 oz	99	99	99	92	99	99	99	92	70
	*3.0 oz	99	99	99	99	99	99	99	99	99
	3.6 oz	99	99	99	99	99	99	99	99	99
Dual Magnum	0.65 pt	99	80	68	53	99	67	60	23	20
	1.3 pt	99	83	80	57	99	70	70	30	30
Harness/ Surpass	1.4 pt	99	99	98	93	99	99	85	50	50
	2 pt	99	99	99	99	99	99	91	96	68
Outlook	9 fl oz	99	90	73	67	99	90	65	30	20
	19 fl oz	99	99	83	77	99	99	83	47	37
Define	10 fl oz	93	57	73	40	88	37	37	0	0
	20 fl oz	99	85	92	50	99	70	80	30	30
LSD (0.05)		5	5	6	5	4	4	7	5	3

Fxtl = green and yellow foxtail

Valley City, ND – Coarse texture

Treatment	Rate (prod/A)	35DAT	42 DAT				82 DAT			
		Grft % cntrl	Grft	Corw	Mael	Wibw	Grft	Corw	Mael	Wibw
			- - - - % control - - - -				- - - - % control - - - -			
KIH-485	0.9 oz	80	80	40	40	80	80	79	79	83
	1.8 oz	96	96	99	99	85	96	99	99	99
	*2.4 oz	98	98	99	99	99	97	99	99	99
	3.0 oz	99	99	99	99	99	99	99	99	99
Dual Magnm	0.5 pt	78	50	0	0	0	50	0	0	0
	1 pt	80	77	30	60	30	77	30	30	30
Harness/ Surpass	0.6 pt	99	99	75	75	40	99	99	60	40
	1.2 pt	99	99	83	83	50	99	99	90	90
Outlook	8 fl oz	99	87	70	70	20	85	99	70	20
	16 fl oz	97	87	80	80	40	90	99	80	50
Define	9 fl oz	68	60	57	57	30	60	90	57	30
	18 fl oz	88	87	70	70	30	90	90	70	30
LSD (0.05)		3	4	3	3	5	3	15	15	13

NORTH DAKOTA



Conclusions – 2004-2007

- KIH-485 weed efficacy is = or > at rates 3 to 8 times lower than other labeled products
- Active in coarse, medium, and fine textured soils

- KIH-485 controlled:

foxtail

lambsquarters

redroot pigweed

wild mustard

kochia

nightshade

wild buckwheat

common ragweed

marshelder

common cocklebur – 13-30% at 4.3 oz/A

KIH-485

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- Excellent corn safety (Registration 2008)
- Excellent grass and broadleaf weed control.

Poor cocklebur, giant ragweed, sunflower control

NSA Proposal

- Weed control demonstrated

- Objectives:

 - Sunflower response to KIH-485

 - Regional trials conducted in 2006

 - Report findings from 2007

 - Addition of KIH-485 + Spartan

NSA Proposal

- Regional Sunflower Herbicide Study
 - Richard Zollinger NDSU, Fargo
 - Brian Jenks NDSU, Minot, ND
 - Mike Moechnig SDSU, Brookings, SD
 - Curtis Thompson KSU, Garden City, KS
 - Phil Stahlman KSU, Hayes, KS
 - Brian Olson KSU, Colby, KS
 - Dallas Peterson KSU, Manhattan, KS
 - Alan Helms CSU, Julesburg, CO

NSA Proposal

- Regional Sunflower Herbicide Protocol
 - KIH-485 rate by soil type

<u>Medium texture</u>	<u>Coarse texture</u>
2.8 oz/A	2.1 oz/A
3.5 oz/A	2.8 oz/A
4.2 oz/A	3.5 oz/A
7 oz/A	5.6 oz/A

Apply according to normal practices at location

No-till, conventional, Clearfield, Express Resistant

Helm – CO - 2006

		<u>Sunflower</u>	
	Rate	% injury	Yield
KIH-485	*2.1 oz	0	3098
	2.8 oz	0	3099
	3.5 oz	0	2588
	5.6 oz	0	3314
Control		0	3322
LSD (0.05)		0	808

* = x rate for soil type

Injury data averaged over 22, 43, 62, 95 DAA

Conditions were dry after application.

Helm – CO - 2007

Sunflower

	% injury		Yield
KIH 485 + Spartan	Ave	76 daa	lb/A
*2.1 + 3 oz	7	0	2014
2.8 +3 oz	7	0	2040
2.1 + 4 oz	12	0	1320
2.8 + 4 oz	9	0	2216
Control	0	0	2008
LSD (0.05)	0	0	ns

* = x rate for soil type

Injury data averaged over 18, 39, and 48 DAA

Helm – Colorado - 2006

	Grft	Dand	Koch	Ruth	Rrpw
	----- % control -----				
KIH-485					
2.1 oz	62-88	43-83	53-93	50-92	53-92
*2.8 oz	83-92	47-83	58-88	57-88	47-88
3.5 oz	80-92	50-85	53-92	55-90	47-83
5.6 oz	87-93	52-82	62-92	55-93	52-88
Untreated	0	0	0	0	0
LSD (0.05)	9	8	4	6	9

* = x rate for soil type.

Control ratings averaged over 22, 43, 62, 95 DAA

Conditions were dry after application.

Helm – CO - 2007

	Sunflower			
	Dand	Koch	Ruth	Amar
KIH 485 + Spartan	----- % control -----			
*2.1 + 3 oz	7-82	92	95	95
2.8 +3 oz	10-83	95	92	93
2.1 + 4 oz	12-80	93	93	93
2.8 + 4 oz	7-80	95	93	90
Control	0	0	0	0
LSD (0.05)	-	3	3	2

* = x rate for soil type

Injury data averaged over 18, 39, and 48 DAA

Olsen - Colby, KS - 06

		Sunflower		
	Rate	% injury	pl/A	Yield
KIH-485	2.8 oz ai/A	3	18,300	2308
	*3.5 oz ai/A	3	18,590	2121
	5.6 oz ai/A	4	17,140	2227
	7.0 oz ai/A	10	16,260	2194
Control		0	17,420	2248
LSD (0.05)		ns	ns	ns

* = x rate for soil type

Injury data averaged over 13, 22, 40 DAA

Conditions were dry after application.

Olsen - Colby, KS - 07

	Rate	Sunflower	
		% injury (3-28 DAA)	Yield
KIH-485	2.1 oz	0	1540
	*2.8 oz	0	1730
	3.5 oz	0	1490
	5.6 oz	0	1640
KIH + Spart	2.8 + 3 oz	0	1670
	3.5 + 3 oz	0	1430
	2.8 + 4 oz	0	1290
	3.5 + 4 oz	0	1250
Control		0	-
LSD (0.05)		ns	ns

* = x rate for soil type

Olsen - Colby, KS – 06-07

	Tupw-06	Tupw-07	Punctrvine-07
	----- % control -----		
KIH-485			
2.1 oz	97	99	99
2.8 oz	99	99	99
3.5 oz	99	99	99
5.6 oz	99	99	99
Untreated	0	0	0
LSD (0.05)	ns	ns	ns

* = x rate for soil type.

Control ratings averaged over all evaluations.

Thompson - Tribune, KS - 06

	Rate	Sunflower		
		% injury	pl/A	Yield
KIH-485	2.4 oz	0	26,300	1300
	*3.0 oz	0	24,850	1570
	4.8 oz	0	21,780	1770
	6.0 oz	1	23,400	1410
Control		0	29,600	1370
LSD (0.05)		ns	3,100	ns

* = x rate for soil type

Injury data July 20, 2006

Conditions were dry after application.

Thompson - Tribune, KS - 07

	Rate	Sunflower	
		% injury (3-28 DAA)	Yield
KIH-485	2.8 oz	0	1280
	*3.5 oz	0	1460
	4.2 oz	0	1480
	7 oz	3	1410
KIH + Spart	2.8 + 3 oz	1	1380
	4.2 + 3 oz	3	1610
	2.8 + 4 oz	6	1370
	4.2 + 4 oz	3	1540
Control		0	1590
LSD (0.05)		4	ns

* = x rate for soil type

Thompson – Tribune, KS - 06

	Koch	Ruth	Tupw	Rrpw	Puvi
	----- % control -----				
KIH-485					
2.4 oz	65	83	93	90	86
*3.0 oz	70	91	95	90	88
4.8 oz	63	94	95	92	91
6 oz	71	93	98	99	92
Untreated	0	0	0	0	0
LSD (0.05)	ns	ns	ns	ns	ns

* = x rate for soil type.

Control ratings July 20, 2006

Conditions were dry after application.

Thompson – Tribune, KS - 07

	Ruth	Tupw	Puvi
	----- % control -----		
KIH-485			
2.8 oz	74	99	77
*3.5 oz	68	98	75
4.2 oz	60	99	82
7 oz	86	75	96
KIH 485 + Spartan			
all rates	99	99	96
Untreated	0	0	0
LSD (0.05)	10	8	12

* = x rate for soil type.

Control ratings average of two evaluations.

Stahlman – Hays, KS - 06

		<u>Sunflower</u>	
	Rate	% injury	Yield
KIH-485	2.4 oz	0	-
	*3 oz	0	-
	4.8 oz	0	-
	6 oz	0	-
Control		0	-
LSD (0.05)		ns	-

* = x rate for soil type

Injury data July 17, 2006 = 59 DAA

Conditions were dry after application.

Stahlman, Hays, KS - 07

		Sunflower	
	Rate	% injury (3-28 DAA)	Yield
KIH-485	2.8 oz	0	1770
	*3.5 oz	0	1900
	5.6 oz	0	1970
	7 oz	0	1880
KIH + Spart	2.8 + 3 oz	0	2150
	4.2 + 3 oz	0	2210
	2.8 + 4 oz	0	2000
	4.2 + 4 oz	0	2140
Control		0	1870
LSD (0.05)		-	ns

* = x rate for soil type

Stahlman, **Australia** - 07

Sunflower

	Rate	% injury (3-28 DAA)
KIH-485	2.8 oz	0
	*3.5 oz	0
	5.6 oz	0
	7 oz	0
KIH + Spart	2.8 + 3 oz	0
	4.2 + 3 oz	0
	2.8 + 4 oz	0
	4.2 + 4 oz	0
Control		0
LSD (0.05)		-

Voice communication
11/2007

* = x rate for soil type

Stahlman – Hays, KS – 06

No weed control reported in 2007

	Grft	Koch	Tupw	Rrpw	Prsp
	----- % control -----				
KIH-485					
2.4 oz	83	38	95	93	85
*3.0 oz	94	53	98	98	85
4.8 oz	93	63	99	95	85
6 oz	94	62	95	99	85
Untreated	0	0	0	0	0
LSD (0.05)	ns	16	ns	ns	ns

* = x rate for soil type.

Control ratings July 17, 2006 = 59 DAA.

Conditions were dry after application.

Peterson – Manhattan, KS - 06

		<u>Sunflower</u>	
	Rate	% injury	Yield
KIH-485	2.4 oz	0	-
	*3 oz	0	-
	4.7 oz	0	-
	6 oz	0	-
Control		0	-
LSD (0.05)		ns	-

* = x rate for soil type

Injury data averaged over 0.75, 1, 2, 4 MAA.

Conditions were dry after application – 2.8 inches 1st 4 WAA.

Peterson, Manhattan, KS - 07

		Sunflower	
	Rate	% injury (4 evals)	Yield
KIH-485	2.1 oz	0	-
	*2.8 oz	0	-
	3.5 oz	0	-
	5.6 oz	0	-
KIH + Spart	2.8 + 3 oz	0	-
	3.5 + 3 oz	0	-
	2.8 + 4 oz	0	-
	3.5 + 4 oz	0	-
Control		0	-
LSD (0.05)		-	

* = x rate for soil type

Peterson – Manhattan, KS – 06-07

	Lacg		Paam		Vele	
	----- % control -----					
KIH-485	<u>06</u>	<u>07</u>	<u>06</u>	<u>07</u>	<u>06</u>	<u>07</u>
2.4 oz	92	97	95	95	70	72
*3.5 oz	94	99	96	98	80	87
4.2 oz	98	99	96	99	84	92
5.6 oz	98	99	99	99	90	95
Dual Mag (LR)	-	97	-	93	-	0
Spartan (LR)	-	53	-	95	-	57
Untreated	0	0	0	0	0	0
LSD (0.05)	6	6	6	3	12	11

* = x rate for soil type.

Control ratings averaged over four evaluations.

Peterson, Manhattan, KS - 07

	Lacg	Paam	Vele
	----- % control -----		
KIH-485 + Spartan			
2.8 + 3 oz	99	99	99
*3.5 + 3.5 oz	99	99	99
2.8 + 4 oz	99	99	99
3.5 + 4 oz	99	99	99
Untreated	0	0	0
LSD (0.05)	6	3	11

* = x rate for soil type.

Control ratings average of four evaluations.

Moechnig – Highmore, SD - 06

		<u>Sunflower</u>	
	Rate	% injury	Yield
KIH-485	2.8 oz	0	-
	*3.5 oz	0	-
	5.6 oz	0	-
	7 oz	0	-
Control		0	-
LSD (0.05)		ns	-

* = x rate for soil type

Injury data averaged over 1 and 4 MAA

Conditions were dry after application.

Moechnig, Highmore, SD - 07

		Sunflower	
	Rate	% injury (2 evals)	Yield
KIH-485	2.8 oz	0	-
	*3.5 oz	0	-
	5.6 oz	3	-
	7 oz	15	-
KIH + Spart	2.8 + 3 oz	0	-
	3.5 + 3 oz	0	-
	2.8 + 4 oz	0	-
	3.5 + 4 oz	0	-
Control		0	-
LSD (0.05)		-	

* = x rate for soil type

Moechnig – Highmore, SD – 06-07

	2006		2007	
	Grft	Koch	Grft	Wioa
	-- % control --		--% control --	
KIH-485				
2.8 oz ai/A	85	89	90	80
*3.5 oz ai/A	88	88	91	85
5.6 oz ai/A	93	87	98	94
7 oz ai/A	94	93	97	91
Untreated	0	0	0	0
LSD (0.05)	7	ns	7	6

* = x rate for soil type.

Jenks – Minot, ND – 06-07

	Sunflower					
	---- 2006 ----		Yield	---- 2007 ----		Yield
	- % injury -		lb/A	- % injury -		lb/A
KIH-485						
2.4 oz ai/A	2	2	814	0	0	1680
*3.0 oz ai/A	10	8	599	1	0	1650
4.8 oz ai/A	23	17	852	3	0	1560
6 oz ai/A	24	20	1082	7	2	1442
Untreated	0	0	255	0	0	1764
LSD (0.05)	6	6	670	3	3	ns

* = x rate for soil type.

Zollinger – Prosper, ND - 06

		<u>Sunflower</u>	
	Rate	injury	Yield
KIH-485	2.8 oz	0	-
	*3.5 oz	0	-
	4.2 oz	0	-
	7 oz	0	-
Control		0	-
LSD (0.05)		ns	-

* = x rate for soil type

Injury data averaged over 9, 21, and 35 DAA

Conditions were dry after application.

Zollinger – Mapleton, ND - 07

		<u>Sunflower</u>	
	Rate	% injury	Yield
KIH-485	2.8 oz		
	*3.5 oz	Study lost to standing water	
	4.2 oz		
	7 oz		
Control			
LSD (0.05)			

* = x rate for soil type

Zollinger – Prosper, ND - 06

	Yrft	Rrpw	Colq	Hans	Corw
	----- % control -----				
KIH-485					
2.8 oz ai/A	75	70	77	80	42
*3.5 oz ai/A	78	91	92	88	62
4.2 oz ai/A	88	96	96	91	78
7 oz ai/A	86	97	97	94	83
Untreated	0	0	0	0	0
LSD (0.05)	9	4	8	7	6

* = x rate for soil type.

Control ratings averaged over 9, 21, and 35 DAA.

Conditions were dry after application.

Zollinger – Valley City, ND - 06

	Snfl	Mael
	% injury	% control
KIH-485		
2.8 oz ai/A	0	82
*3.5 oz ai/A	0	91
4.2 oz ai/A	0	92
7 oz ai/A	5	93
Untreated	0	0
LSD (0.05)	ns	ns

* = x rate for soil type.

Injury and control ratings averaged over 7, 14, and 42 DAA

Conditions were dry after application.

Zollinger – Valley City, ND

	Rate (/A)	Sunflower			Mael % control
		7 DAA	14 DAA	42 DAA	
		----- % injury -----			
KIH-485 + Spartan	2.8 oz 3 fl oz	11	8	0	94
KIH-485 + Spartan	3.5 oz 3 fl oz	8	3	0	93
KIH-485 + Spartan	2.8 oz 4 fl oz	22	18	0	91
KIH-485 + Spartan	3.5 oz 4 fl oz	12	9	0	94
Untreated		0	0	0	0
LSD (0.05)		6	10	0	4

Zollinger, Valley City, ND - 07

	Rate	Snfl	Weed Control %			
			Yeft	Wioa	Ebns	Mael
KIH-485	2.8 oz	0	99	55	99	55
	*3.5 oz	0	99	55	99	55
	5.6 oz	0	99	96	95	85
	7 oz	20	99	99	99	99
KIH + Spart	2.8 + 3 oz	2	99	99	99	99
	3.5 + 3 oz	0	95	90	99	99
	2.8 + 4 oz	7	99	95	99	99
	3.5 + 4 oz	8	99	99	99	99
Control		0	0	0	0	0
LSD (0.05)		3	ns	5	3	9

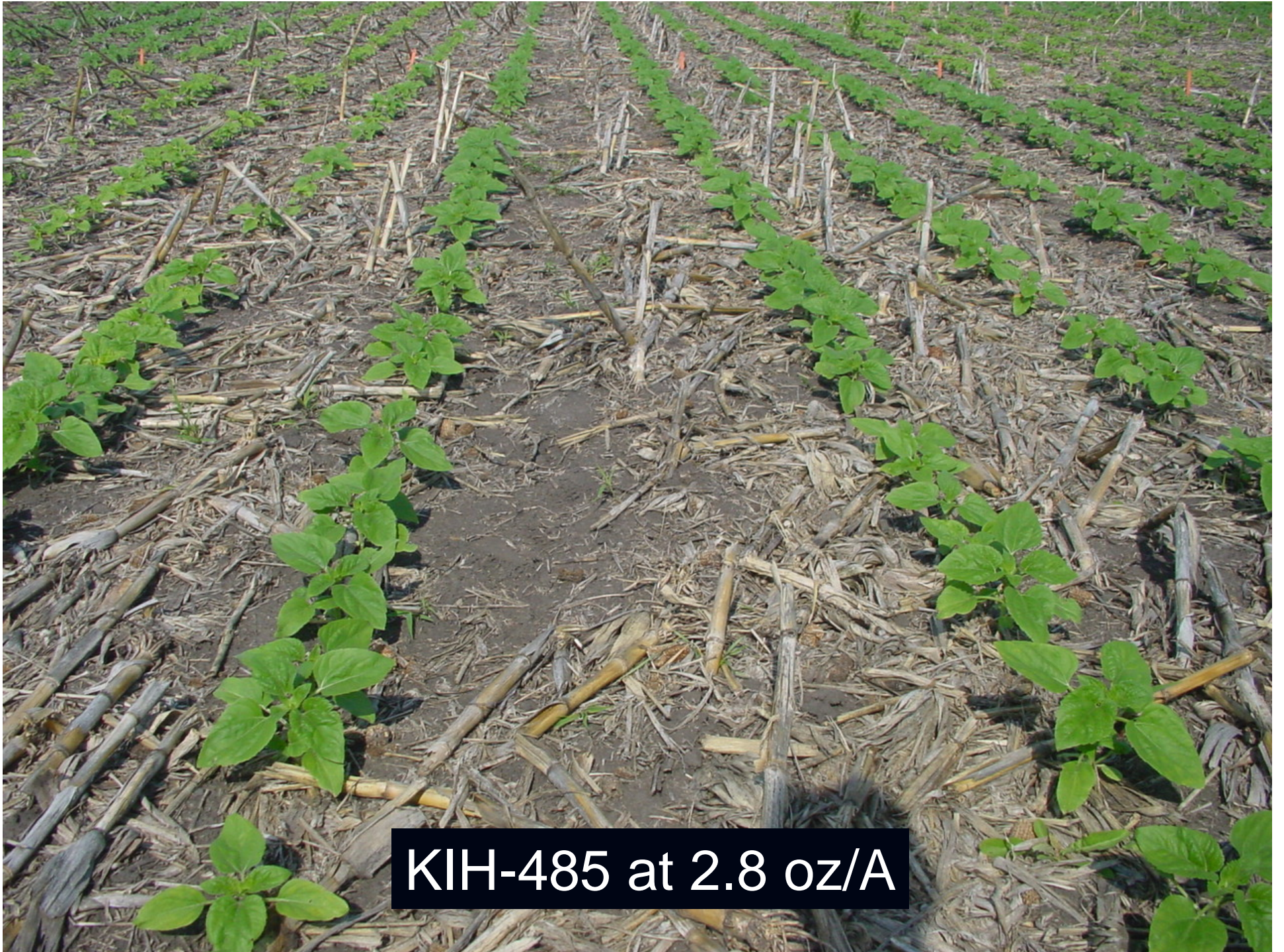
* = x rate for soil type

HRS Wheat Tolerance to KIH-485

	Rate (ai/A)	Wheat		Yeft % control
		6/13 - % injury -	6/28	
KIH-485	1 oz	0	0	92
	1.5 oz	0	0	95
	2 oz	0	0	96
	2.8 oz	0	0	98
	3.5 oz	0	0	99
Control		0	0	0
LSD (0.05)		-	-	2

Oat Tolerance to KIH-485

		Oat	
	Rate	6/19	6/29
	(ai/A)	---- % injury ----	
KIH-485	3 oz	96	99
	4 oz	99	99
Mesotrione	3 oz	0	0
Brox+Pyrulfatole	3 oz	0	0
Control		0	0
LSD (0.05)		1	-



KIH-485 at 2.8 oz/A



KIH-485 at 3.5 oz/A



KIH-485 at 4.2 oz/A



KIH-485 at 7 oz/A



KIH-485 at 2.8 oz +
Spartan at 3 fl oz



KIH-485 at 3.5 oz +
Spartan at 3 fl oz



KIH-485 at 2.8 oz +
Spartan at 4 fl oz



KIH-485 at 3.5 oz +
Spartan at 4 fl oz



Untreated









Summary

- Sunflower injury from KIH-485 at

2006

x rate <3% (10% at Minot)

2x rate <10% (24% at Minot)

No apparent yield penalty

-

2007

x rate <2%

2x rate <5% (15% at SD, 20% at ND)

<12% - KIH + Spartan – all rates

No apparent yield loss

KIH alone or KIH + Spartan

Summary

- Weeds controlled (80-99%):

foxtail

kochia

russian thistle

crabgrass

pigweed sp

amaranth

wild oat

velvetleaf

puncture vine

lambsquarters

nightshade

c. ragweed

marshelder

Summary

- Studies should be repeated in 2007:
 - Sunflower response to KIH-485 + Spartan should be well documented under diverse conditions where herbicide is activated.
- Sunflower safety has been documented to KIH-485
- Sunflower registration through IR-4 should be requested
- Money from the NDDOA Minor Use Fund should be petitioned to support IR-4 registration.



KIH-485 study at Prosper