

Weed control in imidazolinone-resistant sunflower. Endres, Gregory J. and Richard K. Zollinger. Weed control and crop response to selected herbicide treatments in imidazolinone-resistant (Clearfield™) sunflower were investigated. The trial had a randomized complete block design with a strip-split arrangement and three replicates. The main plots were herbicide treatments and the split plots were the sunflower lines stripped across the main plots. The experiment was conducted on a loam soil with 8.0 pH and 2.5% organic matter at Carrington, ND in 2001. On June 1, the trial area was cultivated at a 2-inch depth with a Melroe culti-harrow. Cargill 'SF290', a conventional hybrid, and USDA experimental line 'CMSH425 xRHA426' and Mycogen experimental line 'x81350' were planted on June 1 in 30-inch rows at the rate of three seeds/ft of row. The trial was hand-thinned to a population of about 20,000 plants/A on July 17. Herbicide treatments were applied to the center 6.7 ft of 10 by 30 ft plots with a CO₂ pressurized hand-held plot sprayer. PRE treatments were applied on a dry soil surface at 14 gal/A and 30 psi through 8002 flat fan nozzles on June 2 with 55 F, 81% RH, clear sky, and 6 mph wind. A total of 2.15 inches of rainfall occurred during the 10-day period following application of PRE treatments. POST treatments were applied at 14 gal/A and 30 psi through 80015 flat fan nozzles on June 28 with 79 F, 84% RH, clear sky, and 5 mph wind to V4-stage sunflower, 3- to 5-leaf green and yellow foxtail, 0.5- to 1-inch tall common lambsquarters, 0.5- to 2-inch tall redroot and prostrate pigweed, 1- to 4-inch tall wild mustard, 1- to 2-inch tall wild buckwheat, and 0.5-inch tall eastern black nightshade. The late-POST (LPOST) treatments were applied on July 5 with 55 F, 84% RH, clear sky, and 5 mph wind to V8-stage sunflower, 1- to 6-inch tall green and yellow foxtail, 2- to 3-inch tall common lambsquarters, 0.5- to 2-inch tall redroot and prostrate pigweed, 3- to 4-inch tall wild mustard, 1- to 2-inch tall wild buckwheat, and 0.5- to 1-inch tall eastern black nightshade.

Weed control was generally good to excellent (78 to 99%) with PRE treatments followed by POST imazamox or imazamox+imazapyr (Table 1). Without a PRE treatment, imazamox provided good to excellent control (81-99%) of foxtail, pigweed, and eastern black nightshade. Common lambsquarters and wild buckwheat control improved with a tank mixture of imazamox and imazapyr compared to imazamox alone. The low rate of sequentially-applied imazamox+imazapyr+Quad7 provided 80 to 99% weed control. Sunflower height was reduced in the imidazolinone-resistant lines with imazamox or imazamox+imazapyr, but the effect lessened as plants developed (Table 2). (Carrington Research Extension Center, North Dakota Agric. Exp. Stn., North Dakota State Univ., Carrington.)

Table 1. Weed control in imidazolinone-resistant sunflower (Endres and Zollinger).

Treatment ^a	Rate (lb/A)	4 wk after treatment					8 wk after treatment					
		SETSS	CHEAL	AMASS	SINAR	POLCO	SOLPT	SETSS	CHEAL	AMASS	POLCO	SOLPT
		----- (% control) -----										
Untreated	---	0	0	0	0	0	0	0	0	0	0	0
<u>PRE</u>												
Pendimethalin	1.24	62	63	58	70	91	61	69	62	62	65	57
Sulfentrazone	0.14	63	99	75	35	75	78	65	99	92	92	93
Sulfentrazone	0.16	59	99	97	58	70	99	69	99	99	76	95
Pend+suen	1.24+0.14	76	99	97	70	87	99	79	99	97	82	97
Pend+suen	1.24+0.16	75	99	98	78	99	99	77	99	97	92	97
<u>PRE/POST</u>												
Pend+suen/Imazamox+NIS +28%N	1.24+0.14/0.031+ 0.25%+2.5%	95	99	99	99	96	99	94	99	99	87	99
Pend+suen/Immx+NIS+ 28%N	1.24+0.14/0.039+ 0.25%+2.5%	96	99	99	99	92	99	94	99	99	99	99
Pend+suen/Immx+ imazapyr+NIS+28%N	1.24+0.14/0.039+ 0.016+0.25%+2.5%	90	99	99	99	99	99	89	99	99	99	99
Pend/Immx+NIS+ 28%N	1.24/0.031+0.25%+2.5%	93	95	98	99	81	91	93	95	99	78	88
Pend/Immx+MSO+28%N	1.24/0.031+1.25%+2.5%	94	96	96	99	93	99	93	98	97	90	97
<u>POST</u>												
Pend+immx+NIS+ 28%N	1.24+0.031+0.25%+2.5%	91	98	98	99	72	99	91	91	98	81	87
Pend+immx+MSO+28%N	1.24+0.031+1.25%+2.5%	94	97	97	99	79	96	94	91	99	76	94
Immx+MSO+28%N	0.031+1.25%+2.5%	91	87	98	99	71	96	92	78	99	73	94
Immx+NIS+28%N	0.031+0.25%+2.5%	84	86	98	99	69	96	81	67	99	70	91
Immx+MSO+28%N	0.039+1.25%+2.5%	91	86	97	99	70	90	91	76	96	68	92
Immx+NIS+28%N	0.039+0.25%+2.5%	93	78	96	99	72	94	94	73	94	72	88
Immx+impr+NIS+ 28%N	0.25%+2.5%	94	94	99	99	91	98	93	91	98	85	99
Immx+impr+MSO+28%N	1.25%+2.5%	91	93	98	99	94	98	84	89	99	92	99
Immx+impr+Quad7	0.031+0.016+1%	90	97	99	99	96	98	87	96	96	96	99
Immx+impr+Quad7	0.063+0.031+1%	98	99	99	99	98	99	97	98	99	99	99
<u>POST/LPOST</u>												
Immx+impr+Quad7/Immx+ impr+Quad7	0.016+0.008+1%/ 0.016+0.008+1%	97	99	99	99	93	99	97	98	98	90	98
Immx+impr+Quad7/Immx+ impr+Quad7	0.012+0.006+1%/ 0.012+0.006+1%	95	98	99	99	84	99	96	96	98	80	99
LSD (0.05)		10	8	12	18	20	14	7	8	7	16	10

^aNIS=Induce, a nonionic surfactant from Helena Chemical Co., Memphis, TN; MSO=Destiny, a methylated seed oil from Agrilience, St. Paul, MN; Quad7=a surfactant blend from AGSCO, Grand Forks, ND.

Table 2. Imidazolinone-resistant sunflower response to herbicide treatments (Endres and Zollinger).

Treatment ^a	Rate (lb/A)	Growth reduction ^b					
		2 WAT			4 WAT		
		Con	Imi1	Imi2	Con	Imi1	Imi2
Untreated		0	0	0	0	0	0
<u>PRE</u>							
Pendimethalin	1.24	0	0	0	0	0	0
Sulfentrazone	0.14	0	0	0	0	0	0
Sulfentrazone	0.16	0	0	0	0	0	0
Pend+suen	1.24+0.14	5	9	7	0	3	0
Pend+suen	1.24+0.16	0	9	7	0	0	0
<u>PRE/POST</u>							
Pend+suen/Imazamox+NIS+28%N	1.24+0.14/0.031+0.25%+2.5%	95	14	10	98	7	8
Pend+suen/Immx+NIS+28%N	1.24+0.14/0.039+0.25%+2.5%	95	17	13	98	6	7
Pend+suen/Immx+imazapyr+NIS+28%N	1.24+0.14/0.039+0.016+0.25%+2.5%	96	17	13	99	4	6
Pend/Immx+NIS+28%N	1.24/0.031+0.25%+2.5%	96	15	12	99	16	8
Pend/Immx+MSO+28%N	1.24/0.031+1.25%+2.5%	96	15	17	98	3	0
<u>POST</u>							
Pend+immx+NIS+28%N	1.24+0.031+0.25%+2.5%	95	21	21	98	12	7
Pend+immx+MSO+28%N	1.24+0.031+1.25%+2.5%	95	19	19	97	13	8
Immx+MSO+28%N	0.031+1.25%+2.5%	95	17	12	99	11	5
Immx+NIS+28%N	0.031+0.25%+2.5%	95	11	5	99	9	2
Immx+MSO+28%N	0.039+1.25%+2.5%	96	13	7	95	7	5
Immx+NIS+28%N	0.039+0.25%+2.5%	95	14	12	98	5	3
Immx+impr+NIS+28%N	0.031+0.016+0.25%+2.5%	98	13	11	99	7	3
Immx+impr+MSO+28%N	0.031+0.016+1.25%+2.5%	96	11	14	98	4	5
Immx+impr+Quad7	0.031+0.016+1%	97	10	9	99	9	0
Immx+impr+Quad7	0.063+0.031+1%	99	31	23	99	16	11
<u>POST/LPOST</u>							
Immx+impr+Quad7/Immx+impr+Quad7	0.016+0.008+1%/0.016+0.008+1%	97	7	9	97	0	3
Immx+impr+Quad7/Immx+impr+Quad7	0.012+0.006+1%/0.012+0.006+1%	93	13	3	96	3	3
LSD (0.05)		4	9	9	3	9	NS

^aNIS=Induce, a nonionic surfactant from Helena Chemical Co., Helena, TN; MSO=Destiny, a methylated seed oil from Agrilience, St. Paul, MN; Quad7=a surfactant blend from AGSCO, Grand Forks, ND.

^bGrowth reduction=height or biomass reduction; WAT=weeks after treatment; Con=Cargill 'SF290', Imi1=USDA 'CMSH425 xRHA426', Imi2=Mycogen 'x81350'.