Weed control efficacy and crop tolerance of mesotrione in sethoxydim resistant sweet corn at Waseca, MN - 2005. Becker, Roger L., Vincent A. Fritz, James B. Hebel, Douglas W. Miller, and Bradley D. Kinkaid. The objective of this experiment was to determine weed control efficacy and crop tolerance of mesotrione (Callisto) alone and in tank mix with sethoxydim in sethoxydim resistant sweet corn. This study was conducted on a Webster clay loam soil. The plot area was fertilized with 140 lb/A nitrogen. A randomized complete block design with three reps was utilized. Plots were 10 feet by 25 feet (4 rows). 'GH 2042' sweet corn was seeded at 23,000 plants/A on May 24, 2005. Herbicide application data are provided below. Corn was harvested from the two center 20 foot rows within each plot/subplot. Yields (ear plus husk) were determined. Weed control, injury, and yield data are provided in the tables below.

Application Data

Date	June 10, 2005
Air Temp (˚F)	73
Wind (mph)	calm
Sky	partly cloudy
Relative Humidity (%)	78
Sweet Corn Stage	2 leaf collars
Weed Stage	1-4 inches
Rainfall before Application	
Week 1 (inch)	1.54
Rainfall after Application	
Week 1 (inch)	0.63
Week 2 (inch)	1.00

By 33 DAT (July 13 rating), sethoxydim used alone resulted in similar giant foxtail control whether applied with crop oil concentrate (COC) or with nonionic surfactant (NIS). There was a non-significant trend, however, for a slight decrease in giant foxtail control or possibly consistency of control with the lower rate of sethoxydim when using NIS over COC. Mesotrione alone provided minimal suppression of giant foxtail at 20 DAT (June 30 rating) and no suppression of giant foxtail by 33 DAT when used with COC. Mesotrione applied alone with NIS provided virtually no suppression of giant foxtail. The addition of mesotrione to sethoxydim did not reduce giant foxtail control whether applied with COC or NIS at 20 DAT. By 33 DAT, there was a slight antagonism apparent when COC or NIS was used with either rate of sethoxydim applied with mesotrione or mesotrione plus atrazine. The only exception was with NIS where giant foxtail control at the high rate of sethoxydim did not differ from the high rate of sethoxydim with mesotrione, though there is reason to suspect antagonism may express there as well but was not apparent in this particular trial. Regardless, giant foxtail pressure was very heavy at this research site and giant foxtail control was good to excellent with treatments that included sethoxydim, whether tank mixed with mesotrione alone or mesotrione plus atrazine and whether used with NIS or COC surfactant systems. There is a slight increase in the risk of the loss of consistency in giant foxtail control with NIS adjuvant use.

Broadleaf weed control generally was excellent. The dominant species were redroot pigweed and common lambsquarters, with moderate to low levels of common ragweed and very sporadic populations of velvetleaf. By 20 DAT there were some indications of potential antagonism of mesotrione when sethoxydim was added to the tank mix with a slight reduction in control of redroot pigweed at the high rate of sethoxydim when compared to mesotrione used alone or to mesotrione plus sethoxydim and atrazine. By 33 DAT, there was no indication of antagonism and likely is not an issue for the performance of mesotrione on a relatively susceptible species such as redroot pigweed. Similarly, there appeared to be no antagonism with tank mix combinations in the performance of mesotrione on control of common lambsquarters.

With common ragweed, there is higher variability in the data set due to a more sporadic population of common ragweed, but there was a trend for increased control of common ragweed at 20 DAT when atrazine was added whether COC or NIS was used as the adjuvant. The use of mesotrione alone showed improved control of common ragweed with the use of COC over the use of NIS alone, as would be expected for weeds that are more difficult to control with mesotrione. By 33 DAT, all of the mesotrione treatments with COC whether applied alone or with the addition of atrazine or sethoxydim showed similar, excellent control of common ragweed. With the NIS adjuvant, by 33 DAT there was still some antagonism apparent with the use of mesotrione tank mixes with sethoxydim if not also tank mixed with atrazine.

Early sweet corn injury at 11 DAT (June 21 rating) was evident as chlorotic, temporary stripping of the sweet corn leaves parallel to the veins with sethoxydim used alone. With mesotrione used alone there was a general chlorosis progressing to necrosis of leaf tissue that was exposed at the whirl at the time of herbicide application. Tank mixing mesotrione with sethoxydim increased the incidence of chlorosis and necrosis over the use of either product alone. Using COC as the adjuvant increased chlorosis over the use of NIS alone. Adding atrazine had a trend for decreasing the injury of mesotrione tank mix with sethoxydim. This likely is due to the dry flowable formulation of atrazine which also expressed a trend for antagonism of sethoxydim control of giant foxtail when tank mixed with atrazine. Air temperatures and moisture were moderate at and following application without extremes that would be expected to promote the expression of crop injury. There was no injury apparent on leaves that emerged after herbicide application by 20 or 33 DAT that would be evident to the casual observer. Looking closely at lower leaves, the trained eye could still discern injury that had occurred earlier on the senescent lower leaves on sweet corn. There was no discernable growth reduction in sweet corn due to injury from any of the herbicide treatments at any rating time.

Yield is confounded between weed competition and herbicide crop injury. Yield reductions reflect weed competition more than anything else with similar, high yields when both sethoxydim and mesotrione were used together for broad-spectrum weed control. From this research it is apparent that the sethoxydim tolerant sweet corn technology provides a viable, non-transgenic means of adding a broader array of graminicide options for use in sweet corn. The use an aggressive COC adjuvant to maintain efficacy of sethoxydim appears to be a viable option for weeds that are more difficult to control with the use of mesotrione when low levels of atrazine would also be added to insure broad spectrum broadleaf weed control, while antagonism may also be adding a margin of crop safety without significant declines in grass control. If atrazine cannot be used, such as in atrazine-restricted zones, it appears that mesotrione should be used with NIS rather than COC adjuvants to slightly reduce the risk of unacceptable crop injury. (Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul).

Table 1. Weed control efficacy and crop tolerance of Callisto in sethoxydim resistant sweet corn at Waseca, MN - 2005. Weed control results. (Becker et al.).

		Weed Control							
		AMARE		AMBEL		CHEAL		SETFA	
Treatment	Rate	(6/30)	(7/13)	(6/30)	(7/13)	(6/30)	(7/13)	(6/30)	(7/13)
	(lb ai/A)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Sethoxydim + COC[1]	0.094 + 1%	0	0	0	0	0	0	91	98
Sethoxydim + COC	0.187 + 1%	0	0	0	0	0	0	97	99
Mesotrione + COC	0.094 + 1%	100	98	98	95	100	98	52	0
Sethoxydim + mesotrione + COC	0.094 + 0.094 + 1%	94	99	74	93	98	97	80	90
Sethoxydim + mesotrione + COC	0.187 + 0.094 + 1%	84	94	74	94	98	100	85	90
Sethoxydim + mesotrione + atrazine + COC	0.094 + 0.094 + 0.25 + 1%	98	100	97	100	98	100	83	90
Sethoxydim + mesotrione + atrazine + COC	0.187 + 0.094 + 0.25 + 1%	100	100	96	99	100	100	96	98
Sethoxydim + NIS[2]	0.094 + 0.25%	0	0	0	0	0	0	92	95
Sethoxydim + NIS	0.187 + 0.25%	0	0	0	0	0	0	99	99
Mesotrione + NIS	0.094 + 0.25%	92	98	77	95	92	98	10	0
Sethoxydim + mesotrione + NIS	0.094 + 0.094 + 0.25%	100	98	88	89	100	100	95	87
Sethoxydim + mesotrione + NIS	0.187 + 0.094 + 0.25%	95	94	83	88	99	99	98	98
Sethoxydim + mesotrione + atrazine + NIS	0.094 + 0.094 + 0.25 + 0.25%	100	99	100	97	100	100	91	86
Sethoxydim + mesotrione + atrazine + NIS	0.187 + 0.094 + 0.25 + 0.25%	100	100	93	99	100	100	92	90
Check		0	0	0	0	0	0	0	0
LSD (0.05)		8	6	14	6	6	5	15	6

[1] COC = Class Crop Oil Concentrate.
[2] NIS = Class Preference nonionic surfactant.

Table 2. Weed control efficacy and crop tolerance of Callisto in sethoxydim resistant sweet corn at Waseca, MN - 2005. Sweet corn injury and yield. (Becker et al.).

		Injury[1]		G.R.[2]		Green Husk
Treatment	Rate	6/21	6/30	6/30	7/13	Yield (8/8)
	(lb ai/A)	(%)	(%)	(%)	(%)	(lbs/A)
Check		0	0	0	0	1805
Sethoxydim + COC[3]	0.094 + 1%	1	0	0	0	9296
Sethoxydim + COC	0.187 + 1%	6	0	0	0	5968
Mesotrione + COC	0.094 + 1%	3	0	0	0	5577
Sethoxydim + mesotrione + COC	0.094 + 0.094 + 1%	16	0	0	0	15565
Sethoxydim + mesotrione + COC	0.187 + 0.094 + 1%	20	0	0	0	14461
Sethoxydim + mesotrione + atrazine + COC	0.094 + 0.094 + 0.25 + 1%	9	0	0	0	15733
Sethoxydim + mesotrione + atrazine + COC	0.187 + 0.094 + 0.25 + 1%	9	0	0	0	14666
Sethoxydim + NIS[4]	0.094 + 0.25%	2	0	0	0	6870
Sethoxydim + NIS	0.187 + 0.25%	2	0	0	0	10353
Mesotrione + NIS	0.094 + 0.25%	3	0	0	0	6810
Sethoxydim + mesotrione + NIS	0.094 + 0.094 + 0.25%	9	0	0	0	16185
Sethoxydim + mesotrione + NIS	0.187 + 0.094 + 0.25%	17	0	0	0	17070
Sethoxydim + mesotrione + atrazine + NIS	0.094 + 0.094 + 0.25 + 0.25%	8	0	0	0	15392
Sethoxydim + mesotrione + atrazine + NIS	0.187 + 0.094 + 0.25 + 0.25%	13	0	0	0	17281
LSD (0.05)		5	ns	ns	ns	3669

[1] Injury = leaf chlorosis and/or necrosis.
[2] G.R. = growth reduction.
[3] COC = Class Crop Oil Concentrate.
[4] NIS = Class Preference nonionic surfactant.