Weed Control in Horticultural Crops

Sweet corn herbicide weed management trial at Waseca, MN - 2002. Becker, Roger L., Vincent A. Fritz, James B. Hebel, Douglas W. Miller, and Bradley D. Kinkaid. The objective of this experiment was to evaluate weed management systems with preemergence and postemergence herbicides in conventional 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). 'Jubilee' and 'Empire' sweet corn were seeded (two row subplots per plot) at 22,000 plants/A on May 16, 2002. Herbicide application data are provided below. Corn was harvested from a 20 foot row within each plot/subplot. Total ear yield, husked ear yield, and kernel yield were determined. In addition, total ears, 'usable' ears, average ear length, and average ear diameter were measured. Usable ears are defined as ears suitable for use as frozen corn-on-the-cob product. Weed control and yield data are provided in the tables below.

Application Data

Treatment	Preemergence	Postemergence
Date	5/17/02	6/14/02
Air Temp (°F)	46	55
Wind (mph)	NE 7	NW 10
Sky	Partly Cloudy	Partly Cloudy
Grassy weeds		
Size (inch)	--	1.5-2.0
Broadleaf weeds		
Size (inch)	--	0.5-5.0
Rainfall before Application		
Week 1 (inch)	0.41	1.28
Rainfall after Application		
Week 1 (inch)	0.00	0.53
Week 2 (inch)	0.74	2.85

All weed species were patchy thereby adding to variability in experimental error, resulting in rather large LSD values. Some clear trends emerged however. Giant foxtail control was excellent with all grass herbicide programs (Table 1). As expected, nicosulfuron gave poor control of all broadleaf weed species present without the addition of a broadleaf herbicide. Most of the broadleaf herbicides resulted in excellent control with the following notations. Carfentrazone enhanced control of broadleaf weeds present, though still was not acceptable in common ragweed control without atrazine. AE F130360 gave good to excellent control of foxtail and broadleaf weeds without crop injury to either Jubilee (putative SU susceptible) or Empire (putative SU tolerant) varieties. Common cocklebur and common ragweed control was good with AE F130360, though atrazine would likely make it excellent and more consistent. Carfentrazone needed the addition of the other broadleaf herbicides to move from good to excellent control. Halosulfuron as expected, was only fair to good on common lambsquarter. Growth regulator and sulfonyl urea herbicides were relatively slow in achieving complete kill of weeds, but provided excellent control by the 7/10 ratings.

May temperatures were slightly cool (- 74 GGD) and soil moisture conditions were 2.25 inches below normal for May. Following preemergence applications, it was 8 days to the first rain of only 0.16 inch, 12 days to >0.33 inch precipitation. However, June was warmer (+76 GGD) and wetter (+2.93 inches) than normal following POST applications. A light rain, 0.04 inch, occurred later the day POST treatments were applied, resulting in severe carfentrazone injury. Necrosis was at times severe on both Jubilee and Empire varieties (Tables 2 and 3). Tank mixing with SU's halosulfuron or nicosulfuron increased carfentrazone injury over carfentrazone alone. Chlorosis occurred with the sulfonyl herbicides halosulfuron and nicosulfuron on both varieties as well. Chlorosis was minimal and not significant compared to controls with AE F130360. Chlorosis and necrosis symptoms were not evident by 7/10

ratings. Growth reduction was evident with halosulfuron by the 7/10 rating with both varieties. Empire is reported to be more tolerant of nicosulfuron than Jubilee, though clear visual evidence of increased tolerance of Empire to SU's was not apparent in this study. Also, by the 7/10 rating, 3 of 4 treatments of dicamba & San 1269H showed abnormally upright leaf architecture (data not shown, P=0.05) with Empire. This was not as evident with this herbicide on Jubilee, with abnormally upright leaf architecture visible on 2 of 4 treatments, though not significantly different than the controls with any dicamba & San 1269H treatment.

Of all the yield parameters taken, only usable ears and ear length differed with Jubilee, and all but total ears differed with Empire (Tables 2 and 3). However, decreases in yield parameters values were due to poor weed control and thus, competition with nicosulfuron without a broadleaf herbicide and as expected , in the weedy checks. Injury previously noted apparently did not result in decreased yield with the notable exception of nicosulfuron + carfentrazone and nicosulfuron + carfentrazone + atrazine with Jubilee, which had fewer usable ears even though weed control was excellent. Ear length had a trend for shorter ears as well, but was statistically equal to most treatments. Yield parameter values did not differ for other herbicide treatments despite significant injury earlier in the season with both Jubilee and Empire. (Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul).

Table 1. Sweet corn herbicide weed management trial at Waseca, MN - 2002. Weed control results. (Becker et al.).

Treatment[1]	Rate[1]	Weed Control									
		SETFA		XANST		CHEAL		AMBEL		ABUTH	
		6/19	7/10	6/19	7/10	6/19	7/10	6/19	7/10	6/19	7/10
	(lb ai/A)	(%)									
Postemergence											
Nicosulfuron + COC[2] + 28%N[3]	0.031 + 1.0% + 2.5%	95	99	61	37	25	56	30	24	40	33
Nicosulfuron + atrazine + COC + 28%N	0.031 + 1.0 + 1.0% + 2.5%	95	99	81	94	85	98	82	96	85	95
Nicosulfuron + carfentrazone-ethyl + NIS[4] + 28%N	0.031 + 0.008 + 0.25% + 0.625%	97	99	90	87	98	96	88	58	98	96
Nicosulfuron + carfentrazone-ethyl + atrazine + NIS + 28%N	0.031 + 0.008 + 0.5 + 0.25% + 0.625%	97	99	94	98	98	98	93	96	99	98
AE F130360 + MSO[5] +28%N	0.032 + 1.0% + 2.5%	98	99	75	80	15	94	55	86	63	93
AE F130360 + MSO+28%N	0.038 + 1.0% + 2.5%	93	99	52	84	25	94	50	93	57	94
AE F130360 + atrazine +MSO +28%N	0.032 + 1.0 + 1.0% + 2.5%	93	95	67	96	86	99	72	99	78	96
(Preemergence) and Postemergence											
(s-metolachlor & CGA-154281)[6] + halosulfuron + NIS	(1.9) + 0.016 + 0.25%	97	96	56	98	26	65	45	99	71	98
(s-metolachlor & CGA-154281) + halosulfuron + NIS	(1.9) + 0.032 + 0.25%	98	95	86	98	50	75	60	99	70	98
(s-metolachlor & CGA-154281) + halosulfuron + carfentrazone-ethyl + NIS	(1.9) + 0.032 + 0.008 + 0.25%	97	93	91	99	95	99	96	99	92	99
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + NIS	(1.9) + 0.008 + 0.25%	99	99	88	89	90	99	86	80	93	99
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.5 + 0.25%	98	97	99	96	98	99	91	99	99	99
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.75 + 0.25%	98	98	92	99	97	99	96	96	99	99
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + mesotrione + COC	(1.9) + 0.008 + 0.063 + 1.0%	97	94	99	99	95	99	96	99	99	99
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine & bentazon[7] + NIS	(1.9) + 0.004 + 0.625 & 0.625 + 0.25%	97	96	98	99	97	99	98	99	98	99
(s-metolachlor & CGA-154281) + atrazine & bentazon + COC + 28%N	(1.9) + 0.625 & 0.625 + 1.25% + 0.625%	98	98	96	99	99	99	99	99	93	99
(s-metolachlor & CGA-154281) + dicamba & San 1269H[8] + NIS	(1.9) + 0.031 & 0.012 + 0.25%	99	99	75	99	75	99	75	99	73	99
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.0625 & 0.025 + 0.25%	98	99	88	99	72	99	72	99	83	99
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.094 & 0.037 + 0.25%	96	99	81	99	65	99	67	99	80	99
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.125 & 0.05 + 0.25%	98	98	68	99	73	99	73	99	70	99
(s-metolachlor & CGA-154281) + mesotrione + COC	(1.9) + 0.094 + 1.0%	95	96	85	99	65	99	71	99	75	99
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.25 + 1.0%	98	96	94	99	95	99	90	99	96	99
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.5 + 1.0%	98	98	90	99	97	99	95	99	98	99
Premergence											
s-metolachlor & mesotrione & CGA-154281[9]	1.16 & 0.11 & --	99	99	99	99	99	99	99	99	99	99
s-metolachlor + mesotrione + atrazine	1.9 + 0.2 + 0.5	99	99	99	99	99	99	99	99	99	99
s-metolachlor & atrazine & mesotrione & CGA-154281[10]	1.46 & 0.15 & 0.54 & --	99	99	99	99	99	99	99	99	99	99
Hand weeded check		99	99	88	99	96	99	99	99	99	99
Weedy check		--	--	--	--	--	--	--	--		
LSD (0.05)		ns	ns	26	14	14	19	17	12	20	10

[1] Treatments and rates in parenthesis represent a separate application.
[2] COC = Class Crop Oil Concentrate.
[3] 28%N = 28% UAN fertilizer solution.
[4] NIS = Class Preference nonionic surfactant.
[5] MSO = Methylated soy oil.
[6] Dual II Magnum.
[7] Premix = Laddok S-12.
[8] Premix = Distinct.
[9] Premix = Camix
[10] Premix = Lumax

Table 2. Sweet corn herbicide weed management trial at Waseca, MN - 2002. Jubilee sweet corn injury and yield. (Becker et al.).

		Jubilee										
		Chlorosis	Nec.[1]	G.R.[2]		Total	Husked	Kernel	Total	Usable	Ear	Ear
Treatment[3]	Rate[3]	6/19	6/19	6/19	7/10	Yield	Yield	Yield	Ears	Ears	Length	Dia[4]
	(lb ai/A)	---------- (%) ----------				-------- (ton/A) --------			----- (#/A) -----		(inch)	(cm)
Postemergence												
Nicosulfuron + COC[5] + 28%N[6]	0.031 + 1.0% + 2.5%	14	0	0	0	5.4	4.3	2.7	20328	8131	7.9	4.3
Nicosulfuron + atrazine + COC + 28%N	0.031 + 1.0 + 1.0% + 2.5%	10	0	3	0	6.0	4.7	3.1	20909	11906	8.4	4.5
Nicosulfuron + carfentrazone-ethyl + NIS[7] + 28%N	0.031 + 0.008 + 0.25% + 0.625%	12	20	8	0	6.1	4.7	3.0	22651	10745	7.8	4.2
Nicosulfuron + carfentrazone-ethyl + atrazine + NIS + 28%N	0.031 + 0.008 + 0.5 + 0.25% + 0.625%	27	30	6	0	6.1	4.8	3.0	22651	9874	7.9	4.4
AE F130360 + MSO[8] +28%N	0.032 + 1.0% + 2.5%	9	4	0	0	6.5	5.0	3.2	21780	11616	8.2	4.5
AE F130360 + MSO+28%N	0.038 + 1.0% + 2.5%	8	2	0	0	6.4	5.0	3.2	22651	11326	8.2	4.4
AE F130360 + atrazine +MSO + 28%N	0.032 + 1.0 + 1.0% + 2.5%	7	2	2	0	7.6	5.9	3.9	24103	15391	8.2	4.5
(Preemergence) and Postemergence												
(s-metolachlor & CGA-154281)[9] + halosulfuron + NIS	(1.9) + 0.016 + 0.25%	15	1	0	4	6.3	5.0	3.3	22070	12487	8.1	4.4
(s-metolachlor & CGA-154281) + halosulfuron + NIS	(1.9) + 0.032 + 0.25%	27	1	5	18	6.9	5.5	3.5	24684	13068	8.1	4.4
(s-metolachlor & CGA-154281) + halosulfuron + carfentrazone-ethyl + NIS	(1.9) + 0.032 + 0.008 + 0.25%	14	20	5	10	7.4	5.8	3.7	25846	14810	8.5	4.4
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + NIS	(1.9) + 0.008 + 0.25%	3	16	0	4	6.4	5.3	3.4	21199	13939	8.3	3.3
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.5 + 0.25%	5	18	2	0	7.1	5.6	3.6	22651	14520	8.2	4.4
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.75 + 0.25%	5	17	1	0	6.7	5.3	3.4	22942	12197	8.1	4.3
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + mesotrione + COC	(1.9) + 0.008 + 0.063 + 1.0%	4	13	0	0	6.6	5.5	3.5	23813	13358	8.2	4.5
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine & bentazon[10] + NIS	(1.9) + 0.004 + 0.625 & 0.625 + 0.25%	5	12	0	0	6.8	5.6	3.8	23522	13649	8.2	4.5
(s-metolachlor & CGA-154281) + atrazine & bentazon + COC + 28%N	(1.9) + 0.625 & 0.625 + 1.25% + 0.625%	4	2	0	3	7.0	5.6	3.6	22942	14230	8.2	4.4
(s-metolachlor & CGA-154281) + dicamba & San 1269H[11] + NIS	(1.9) + 0.031 & 0.012 + 0.25%	0	1	0	2	6.8	5.6	3.7	24394	14230	8.2	4.5
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.0625 & 0.025 + 0.25%	0	0	0	3	7.1	5.6	3.8	24103	14810	8.3	4.5
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.094 & 0.037 + 0.25%	3	2	2	4	6.5	5.4	3.6	23232	13068	8.1	4.4
(s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.125 & 0.05 + 0.25%	1	0	0	1	6.9	5.3	3.5	24103	13358	8.0	4.4
(s-metolachlor & CGA-154281) + mesotrione + COC	(1.9) + 0.094 + 1.0%	0	0	0	5	6.2	4.9	3.2	22361	10745	7.9	4.4
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.25 + 1.0%	1	1	1	0	7.0	5.7	3.8	22651	13651	8.1	4.6
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.5 + 1.0%	7	0	0	6	6.7	5.5	3.7	22942	13939	8.2	4.6
Premergence												
s-metolachlor & mesotrione & CGA-154281[12]	1.16 & 0.11 & --	2	0	0	0	6.0	4.7	3.1	20328	11906	8.1	4.6
s-metolachlor + mesotrione + atrazine	1.9 + 0.2 + 0.5	0	0	0	0	5.8	5.0	3.3	21780	11616	7.9	4.4
s-metolachlor & atrazine & mesotrione & CGA-154281[13]	1.46 & 0.15 & 0.54 & --	1	0	0	0	6.5	5.1	3.5	21490	13068	8.3	4.5
Hand weeded check		8	3	2	0	7.2	5.7	3.7	24103	14520	8.1	4.5
Weedy check		0	0	0	0	4.1	3.2	2.0	16843	4646	7.2	4.2
LSD (0.05)		10	5	ns	6	ns	ns	ns	ns	4520	0.5	ns

[1] Nec. = necrosis.
[2] G.R. = Growth reduction.
[3] Treatments and rates in parenthesis represent a separate application.
[4] Dia. = Diameter.
[5] COC = Class Crop Oil Concentrate.
[6] 28%N = 28% UAN fertilizer solution.
[7] NIS = Class Preference nonionic surfactant.
[8] MSO = Methylated soy oil.
[9] Dual II Magnum.
[10] Premix = Laddok S-12.
[11] Premix = Distinct.
[12] Premix = Camix
[13] Premix = Lumax

Table 3. Sweet corn herbicide weed management trial at Waseca, MN - 2002. Empire sweet corn injury and yield. (Becker et al.).

		Empire										
		Chlorosis	Nec.[1]	G.R.[2]		Total	Husked	Kernel	Total	Usable	Ear	Ear
Treatment[3]	Rate[3]	6/19	6/19	6/19	7/10	Yield	Yield	Yield	Ears	Ears	Length	Dia[4]
	(lb ai/A)	---------- (%) ----------				-------- (ton/A) --------			----- (#/A) -----		(inch)	(cm)
Postemergence												
Nicosulfuron + COC[5] + 28%N[6]	0.031 + 1.0% + 2.5%	10	3	0	0	6.5	5.2	3.4	23813	8712	7.8	4.4
Nicosulfuron + atrazine + COC + 28%N	0.031 + 1.0 + 1.0% + 2.5%	3	0	1	0	8.7	7.1	4.7	25846	16553	8.5	4.6
Nicosulfuron + carfentrazone-ethyl + NIS[7] + 28%N	0.031 + 0.008 + 0.25% + 0.625%	6	17	0	0	8.4	6.9	4.9	27007	16262	8.4	4.5
Nicosulfuron + carfentrazone-ethyl + atrazine + NIS + 28%N	0.031 + 0.008 + 0.5 + 0.25% + 0.625%	15	19	0	0	8.3	6.7	4.8	23813	18005	8.6	4.7
AE F130360 + MSO[8] +28%N	0.032 + 1.0% + 2.5%	5	3	0	0	8.6	6.9	5.0	27007	15391	8.5	4.6
AE F130360 + MSO+28%N	0.038 + 1.0% + 2.5%	3	2	0	0	8.2	6.5	4.5	23813	16262	8.67	4.6
AE F130360 + atrazine +MSO + 28%N	0.032 + 1.0 + 1.0% + 2.5%	5	3	0	0	8.6	6.9	4.9	24684	16553	8.5	4.7
(Preemergence) and Postemergence												
(s-metolachlor & CGA-154281)[9] + halosulfuron + NIS	(1.9) + 0.016 + 0.25%	19	3	0	8	8.0	6.5	4.5	26717	15101	8.3	4.6
(s-metolachlor & CGA-154281) + halosulfuron + NIS	(1.9) + 0.032 + 0.25%	21	1	2	32	6.5	5.1	3.4	22361	11616	8.1	4.5
(s-metolachlor & CGA-154281) + halosulfuron + carfentrazone-ethyl + NIS	(1.9) + 0.032 + 0.008 + 0.25%	16	18	1	38	7.1	5.7	3.9	23232	14810	8.2	4.5
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + NIS	(1.9) + 0.008 + 0.25%	1	10	0	1	8.2	6.7	4.6	26717	14230	8.2	4.5
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.5 + 0.25%	5	11	0	0	8.9	7.3	5.1	27298	18005	8.4	4.6
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine + NIS	(1.9) + 0.008 + 0.75 + 0.25%	2	14	0	0	8.3	6.8	4.8	26426	15682	8.5	4.6
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + mesotrione + COC	(1.9) + 0.008 + 0.063 + 1.0%	5	10	0	0	8.4	6.7	4.6	27298	15101	8.4	4.7
(s-metolachlor & CGA-154281) + carfentrazone-ethyl + atrazine & bentazon[10] + NIS	(1.9) + 0.004 + 0.625 & 0.625 + 0.25%	4	8	0	0	8.1	6.5	4.5	25555	15101	8.3	4.6
(s-metolachlor & CGA-154281) + atrazine & bentazon + COC + 28%N	(1.9) + 0.625 & 0.625 + 1.25% + 0.625%	2	3	2	5	8.8	7.2	5.2	25555	18876	8.4	4.7
s-metolachlor & CGA-154281) + dicamba & San 1269H[11] + NIS	(1.9) + 0.031 & 0.012 + 0.25%	0	1	0	0	7.6	6.1	4.3	23232	13649	8.5	4.6
s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.0625 & 0.025 + 0.25%	0	0	0	0	8.0	6.5	4.1	25265	14810	8.5	4.6
s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.094 & 0.037 + 0.25%	0	0	0	0	7.7	6.4	4.6	24394	16262	8.4	4.5
s-metolachlor & CGA-154281) + dicamba & San 1269H + NIS	(1.9) + 0.125 & 0.05 + 0.25%	0	0	0	0	8.0	6.6	4.8	24974	16262	8.4	4.5
(s-metolachlor & CGA-154281) + mesotrione + COC	(1.9) + 0.094 + 1.0%	1	1	0	0	7.8	6.4	4.5	24684	15972	8.4	4.5
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.25 + 1.0%	0	0	0	0	8.0	6.6	4.7	24394	17424	8.6	4.6
(s-metolachlor & CGA-154281) + mesotrione + atrazine + COC	(1.9) + 0.094 + 0.5 + 1.0%	2	0	0	0	8.5	6.9	4.8	28169	15682	8.3	4.5
Premergence												
s-metolachlor & mesotrione & CGA-154281[12]	1.16 & 0.11 & --	9	3	0	0	8.1	6.5	4.6	24974	14230	8.5	4.5
s-metolachlor + mesotrione + atrazine	1.9 + 0.2 + 0.5	0	0	0	0	7.9	6.4	4.6	25265	13068	8.3	4.6
s-metolachlor & atrazine & mesotrione & CGA-154281[13]	1.46 & 0.15 & 0.54 & --	0	0	0	0	8.5	6.9	5.0	26136	15972	8.4	4.7
Hand weeded check		2	0	0	0	8.1	6.6	4.7	26136	15972	8.2	4.6
Weedy check		0	0	0	0	5.3	4.2	3.1	21490	5227	7.4	4.4
LSD (0.05)		8	6	ns	5	1.4	1.3	1.1	ns	5738	0.5	0.2

[1] Nec. = necrosis.
[2] G.R. = Growth reduction.
[3] Treatments and rates in parenthesis represent a separate application.
[4] Dia. = Diameter.
[5] COC = Class Crop Oil Concentrate.
[6] 28%N = 28% UAN fertilizer solution.
[7] NIS = Class Preference nonionic surfactant.
[8] MSO = Methylated soy oil.
[9] Dual II Magnum.
[10] Premix = Laddok S-12.
[11] Premix = Distinct.
[12] Premix = Camix
[13] Premix = Lumax