Evaluation of two-pass versus single-pass corn herbicide programs for crop phytotoxicity and weed control, Ames, IA, 2003. Owen, Micheal D.K., James F. Lux, and Damian D. Franzenburg. The purpose of this study was to evaluate the effectiveness of two-pass and single-pass corn herbicide programs for crop phytotoxicity, weed control and yield. The soil was a Canisteo, Nicollet, Clarion and Webster clay loam with a pH 6.8 and 5.3% organic matter. The experimental design was a randomized complete block with three replications and plots were 10 by 25 ft. The 2002 crop was soybean. Tillage included a fall chisel plowing and a spring field cultivation. Fertilization included 127 lb/A actual N applied as urea. Crop residue on the soil surface was 35% at planting. "Dekalb hybrid DKC 58-24" corn was planted 1.5 inches deep on May 18, at 27,700 seeds/A in 30-inch rows. Preemergence (PRE) treatments were applied on May 21 at 20 gpa and 25 psi using flat fan nozzles. Postemergence (POST) and directed postemergence (DPOST) treatments were applied on June 11, and June 27, respectively, at 20 gpa and 25 psi using flat fan nozzles. Conditions on May 21 were: air temperature 15 C, soil temperature at the 4-inch depth 13 C, calm conditions, clear sky, 53% relative humidity. Conditions on June 11 were: air temperature 22 C, soil temperature at the 4-inch depth 21 C, 2 mph wind, 50% cloud cover, 31% relative humidity. Corn growth was V4 and 5 inches tall. Weed species, average size and number per ft^2 in the untreated control included: giant foxtail one to four leaves, 0.5 to 4 inches tall, five to thirty-five plants; velvetleaf cotyledon to three leaves, 1 to 3 inches tall, zero to three plants; common waterhemp numerous leaves, 0.5 to 4 inches tall, zero to fifteen plants; common lambsquarters numerous leaves, 0.5 to 2 inches tall, zero to fifteen plants. Conditions on June 27 were: air temperature 28 C, soil temperature at the 4-inch depth 21 C, 1 mph wind, 10% cloud cover, 61% relative humidity. Corn growth was V7 and 24 inches tall. Weed species, average size and number per ft^2 in the untreated control included: giant foxtail two to four leaves, 0.5 to 4 inches tall, zero to five plants; velvetleaf one to two leaves, 0.5 to 1 inch tall, zero to one plant; common waterhemp numerous leaves, 0.5 to 4 inches tall, zero to two plants; common lambsquarters two to eight leaves, 0.5 to 3 inches tall, zero to one plant. May rainfall included: 1.67, 0.37, 0.99, 0.15, 0.39, and 0.18 inches on May 4, 6, 8, 10, 13, and 14, respectively. Total rainfall for May was 3.75 inches. June rainfall included: 0.36, 0.53, 0.32, 0.23, 0.10, 0.28, and 0.55 inches on June 2, 6, 7, 8, 9, 24, and 25, respectively. Total rainfall for June was 2.37 inches. July rainfall included: 2.38 inches and 1.12 inches from July 1 through 15 and 16 through 31, respectively. Total rainfall for July was 3.5 inches. Rainfall total for August was 0.86 inches.

Significant differences between treatments in corn stand were not a result of the herbicides, but due to inherent variability in planter seeding rates. Observations for corn injury on June 11, prior to POST applications, demonstrated excellent crop safety with the PRE treatments. POST applications of halosulfuron & dicamba and foramsulfuron plus flumetsulam & clopyralid demonstrated 20% injury when observed on June 16. POST flumetsulam & clopyralid, nicosulfuron & rimsulfuron plus atrazine, rimsulfuron & nicosulfuron & atrazine plus dicamba, and nicosulfuron & rimsulfuron plus atrazine plus mesotrione caused 10 to 13% crop injury, while injury by other POST treatments was less significant. Crop injury by POST treatments on subsequent observation dates remained at 10% or less.

Giant foxtail control ranged from 78 to 88% for PRE acetochlor & atrazine treatments on June 11. S-metolachlor & atrazine & mesotrione & CGA154281 alone or with atrazine, provided 80% control. Dimethenamid-P treatments provided 80 to 83% giant foxtail control. Atrazine & s-metolachlor provided only 60% control. Velvetleaf control observed on June 11 by PRE treatments was excellent with s-metolachlor & atrazine & mesotrione & CGA-154281 with and without atrazine. No other PRE treatments provided adequate velvetleaf control. Common waterhemp control was generally excellent, with all PRE treatments, providing at least 85% control. PRE dimethenamid-P and atrazine & s-metolachlor provided only 33 and 57% control of common lambsquarters, respectively, while the remaining treatments provided control of at least 83%.

On July 11, treatments with only PRE applications, POST halosulfuron & dicamba, and POST dicamba & diflufenzopyr & nicosulfuron following PRE acetochlor & atrazine, provided 80% or less giant foxtail control. Common lambsquarters control was improved from 81 to 99% when atrazine was added to s-metolachlor & atrazine & mesotrione & CGA-154281. Foramsulfuron plus flumetsulam & clopyralid provided only 42% control of common waterhemp. However, common waterhemp and common lambsquarters control was otherwise excellent for all treatments.

Corn yield in the untreated control was 87 bu/A. Otherwise treatment yields ranged between 176 to 213 bu/A. Differences in yield between treatments were not statistically different. (Dept. of Agronomy, Iowa State University, Ames).

Table 1. Evaluation of two-pass versus single-pass corn herbicide programs for crop phytotoxicity and weed control, Ames, IA, 2003 (Owen, Lux, and Franzenburg).

Treatment	Rate	Appl. time	Corn[a] Stand	Corn injury 6/11/03	SETFA 6/11/03	ABUTH 6/11/03	AMATA 6/11/03	CHEAL 6/11/03
	(lb/A)			---- (%) ----	---------- (%) ----------			
Untreated	-	-	27	0	0	0	0	0
S-metolachlor&atrazine&mesotrione& CGA-154281	2.0&0.75&0.2	PRE	27	0	80	96	99	83
S-metolachlor&atrazine&mesotrione& CGA-154281+atrazine	2.0&0.75&0.2+ 1.0	PRE	29	0	80	96	99	99
S-metolachlor&atrazine&CGA-154281/ mesotrione+atrazine+ COC[b]+28%UAN[c]	1.56&2.02/ 0.094+0.5+ 1.0+2.5	PRE/ POST	26	0	75	62	99	96
Acetochlor&atrazine/ halosulfuron&dicamba+ COC+28% UAN	2.5&1.24/ 0.031&0.138+ 1.0+2.5	PRE/ POST	28	0	80	60	99	99
Dimethenamid-P/ dicamba&atrazine+NIS[d]	0.98/ 0.48&0.92+0.125	PRE/ POST	28	0	80	43	92	33
Dimethenamid-P&atrazine/ dicamba&diflufenzopyr+ NIS+28% UAN	0.98&1.89/ 0.125&0.05+ 0.25+2.5	PRE/ POST	28	0	83	68	99	96
Acetochlor&atrazine/ flumetsulam&clopyralid[e]+ NIS+28% UAN	2.4&1.8/ 0.035&0.093+ 0.25+2.5	PRE/ POST	27	0	88	72	99	99
Atrazine&s-metolachlor/ nicosulfuron&rimsulfuron+ atrazine+COC+28%UAN	0.58&0.45/ 0.023&0.012+ 1.0+1.0+2.5	PRE/ POST	27	0	60	53	85	57
Acetochlor&atrazine&MON 4660/ glyphosate[f]+ammonium sulfate[g]	0.78&0.62/ 0.75+17.0	PRE/ POST	29	0	78	60	99	90
Glyphosate+ammonium sulfate/ glyphosate+ammonium sulfate	0.75+17.0/ 0.56+17.0	POST/ DPOST	28	0	0	0	0	0
Rimsulfuron&nicosulfuron&atrazine+ dicamba+NIS+28%UAN	0.012&0.012&0.76+ 0.125+0.25+2.5	POST	28	0	0	0	0	0
Dicamba&diflufenzopyr& nicosulfuron+NIS+28%UAN	0.128&0.049& 0.029+0.25+2.5	POST	27	0	0	0	0	0
Nicosulfuron&rimsulfuron+atrazine+ mesotrione+COC+28%UAN	0.023&0.012+0.5+ 0.094+1.0+2.5	POST	28	0	0	0	0	0
Nicosulfuron&rimsulfuron+atrazine+ dicamba+NIS+28%UAN	0.023&0.012+1.0+ 0.0625+0.25+2.5	POST	29	0	0	0	0	0
Foramsulfuron+flumetsulam& clopyralid+MSO[h]+28%UAN	0.0328+0.035& 0.093+1.0+2.5	POST	28	0	0	0	0	0
LSD (P=0.05)			2	0	4	14	6	11

[a] Corn stand per 17.5 row feet on July 30.
[b] COC = Herbimax, an oil-surfactant adjuvant from Loveland Industries, Inc. Rate in % v/v.
[c] 28%UAN = Mixtures of urea and ammonium nitrate. Rate in % v/v.
[d] NIS=Activator 90, a non-ionic surfactant from Loveland Industries, Inc. Rate in % v/v.
[e] Flumetsulam&clopyralid rate in lb ae/A.
[f] Glyphosate rate in lb ae/A.
[g] Ammonium sulfate rate in lbs/100gal.
[h] MSO=methylated seed oil plus surfactant from Loveland Industries, Inc. Rate in % v/v.

Table 2. Evaluation of two-pass versus single-pass corn herbicide programs for crop phytotoxicity and weed control, Ames, IA, 2003 (Owen, Lux, and Franzenburg).

Treatment	Rate	Appl. time	Corn Injury 6/16/03	Corn Injury 6/27/03	Corn Injury 7/11/03	SETFA 7/11/03	ABUTH 7/11/03	AMATA 7/11/03	CHEAL 7/11/03
	(lb/A)		(%)	(%)	(%)	(%)	(%)	(%)	(%)
Untreated	-	-	0	0	0	0	0	0	0
S-metolachlor&atrazine&mesotrione& CGA-154281	2.0&0.75&0.2	PRE	0	0	0	75	96	99	81
S-metolachlor&atrazine&mesotrione& CGA-154281+atrazine	2.0&0.75&0.2+ 1.0	PRE	0	0	0	75	98	99	99
S-metolachlor&atrazine&CGA-154281/ mesotrione+atrazine+ COC[a]+28%UAN[b]	1.56&2.02/ 0.094+0.5+ 1.0+2.5	PRE/ POST	0	0	0	87	98	99	99
Acetochlor&atrazine/ halosulfuron&dicamba+ COC+28% UAN	2.5&1.24/ 0.031&0.138+ 1.0+2.5	PRE/ POST	20	10	3	80	96	99	98
Dimethenamid-P/ dicamba&atrazine+NIS[c]	0.98/ 0.48&0.92+0.125	PRE/ POST	5	10	3	88	96	99	99
Dimethenamid-P&atrazine/ dicamba&diflufenzopyr+ NIS+28% UAN	0.98&1.89/ 0.125&0.05+ 0.25+2.5	PRE/ POST	5	5	0	95	92	99	99
Acetochlor&atrazine/ flumetsulam&clopyralid[d]+ NIS+28% UAN	2.4&1.8/ 0.035&0.093+ 0.25+2.5	PRE/ POST	13	7	0	87	87	99	99
Atrazine&s-metolachlor/ nicosulfuron&rimsulfuron+ atrazine+COC+28%UAN	0.58&0.45/ 0.023&0.012+ 1.0+1.0+2.5	PRE/ POST	12	5	0	93	95	98	99
Acetochlor&atrazine&MON 4660/ glyphosate[e]+ammonium sulfate[f]	0.78&0.62/ 0.75+17.0	PRE/ POST	0	0	0	99	96	99	99
Glyphosate+ammonium sulfate/ glyphosate+ammonium sulfate	0.75+17.0/ 0.56+17.0	POST/ DPOST	0	0	0	99	99	99	99
Rimsulfuron&nicosulfuron&atrazine+ dicamba+NIS+28%UAN	0.012&0.012&0.76+ 0.125+0.25+2.5	POST	12	5	3	80	96	96	99
Dicamba&diflufenzopyr& nicosulfuron+NIS+28%UAN	0.128&0.049& 0.029+0.25+2.5	POST	7	5	3	78	95	93	99
Nicosulfuron&rimsulfuron+atrazine+ mesotrione+COC+28%UAN	0.023&0.012+0.5+ 0.094+1.0+2.5	POST	10	3	0	87	98	99	99
Nicosulfuron&rimsulfuron+atrazine+ dicamba+NIS+28%UAN	0.023&0.012+1.0+ 0.0625+0.25+2.5	POST	7	3	0	88	96	98	99
Foramsulfuron+flumetsulam& clopyralid+MSO[g]+28%UAN	0.0328+0.035& 0.093+1.0+2.5	POST	20	7	5	85	83	42	96
LSD (P=0.05)			3	3	3	7	7	3	7

[a] COC = Herbimax, an oil-surfactant adjuvant from Loveland Industries, Inc. Rate in % v/v.

[b] 28%UAN = Mixtures of urea and ammonium nitrate. Rate in % v/v.

[c] NIS=Activator 90, a non-ionic surfactant from Loveland Industries, Inc. Rate in % v/v.

[d] Flumetsulam&clopyralid rate in lb ae/A.

[e] Glyphosate rate in lb ae/A.

[f] Ammonium sulfate rate in lbs/100gal.

[g] MSO=methylated seed oil plus surfactant from Loveland Industries, Inc. Rate in % v/v.

Table 3. Evaluation of two-pass versus single-pass corn herbicide programs for crop phytotoxicity and weed control, Ames, IA, 2003 (Owen, Lux, and Franzenburg).

Treatment	Rate	Appl. time	Corn injury 7/30/03	SETFA 7/30/03	ABUTH 7/30/03	AMATA 7/30/03	CHEAL 7/30/03	Corn yield
	(lb/A)		---- (%) ----	---------- (%) ----------				-- (bu/A) --
Untreated	-	-	0	0	0	0	0	87
S-metolachlor&atrazine&mesotrione& CGA-154281	2.0&0.75&0.2	PRE	0	73	95	99	77	176
S-metolachlor&atrazine&mesotrione& CGA-154281+atrazine	2.0&0.75&0.2+ 1.0	PRE	0	73	98	99	99	186
S-metolachlor&atrazine&CGA-154281/ mesotrione+atrazine+ COC[a]+28%UAN[b]	1.56&2.02/ 0.094+0.5+ 1.0+2.5	PRE/ POST	0	87	94	99	99	183
Acetochlor&atrazine/ halosulfuron&dicamba+ COC+28% UAN	2.5&1.24/ 0.031&0.138+ 1.0+2.5	PRE/ POST	0	82	85	99	98	179
Dimethenamid-P/ dicamba&atrazine+NIS[c]	0.98/ 0.48&0.92+0.125	PRE/ POST	0	88	95	99	99	200
Dimethenamid-P&atrazine/ dicamba&diflufenzopyr+ NIS+28% UAN	0.98&1.89/ 0.125&0.05+ 0.25+2.5	PRE/ POST	0	95	73	99	99	199
Acetochlor&atrazine/ flumetsulam&clopyralid[d]+ NIS+28% UAN	2.4&1.8/ 0.035&0.093+ 0.25+2.5	PRE/ POST	0	88	68	99	99	179
Atrazine&s-metolachlor/ nicosulfuron&rimsulfuron+ atrazine+COC+28%UAN	0.58&0.45/ 0.023&0.012+ 1.0+1.0+2.5	PRE/ POST	0	92	77	98	99	183
Acetochlor&atrazine&MON 4660/ glyphosate[e]+ammonium sulfate[f]	0.78&0.62/ 0.75+17.0	PRE/ POST	0	88	67	98	99	205
Glyphosate+ammonium sulfate/ glyphosate+ammonium sulfate	0.75+17.0/ 0.56+17.0	POST/ DPOST	0	92	91	99	99	209
Rimsulfuron&nicosulfuron&atrazine+ dicamba+NIS+28%UAN	0.012&0.012&0.76+ 0.125+0.25+2.5	POST	0	77	88	96	99	190
Dicamba&diflufenzopyr& nicosulfuron+NIS+28%UAN	0.128&0.049& 0.029+0.25+2.5	POST	0	73	83	92	98	193
Nicosulfuron&rimsulfuron+atrazine+ mesotrione+COC+28%UAN	0.023&0.012+0.5+ 0.094+1.0+2.5	POST	0	80	93	99	99	200
Nicosulfuron&rimsulfuron+atrazine+ dicamba+NIS+28%UAN	0.023&0.012+1.0+ 0.0625+0.25+2.5	POST	0	82	80	98	99	213
Foramsulfuron+flumetsulam& clopyralid+MSO[g]+28%UAN	0.0328+0.035& 0.093+1.0+2.5	POST	0	83	82	42	96	198
LSD (P=0.05)			0	9	13	3	7	38

[a] COC = Herbimax, an oil-surfactant adjuvant from Loveland Industries, Inc. Rate in % v/v.

[b] 28%UAN = Mixtures of urea and ammonium nitrate. Rate in % v/v.

[c] NIS=Activator 90, a non-ionic surfactant from Loveland Industries, Inc. Rate in % v/v.

[d] Flumetsulam&clopyralid rate in lb ae/A.

[e] Glyphosate rate in lb ae/A.

[f] Ammonium sulfate rate in lbs/100gal.

[g] MSO=methylated seed oil plus surfactant from Loveland Industries, Inc. Rate in % v/v.