Corn Weed Management Studies

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Introduction

Several studies were conducted in corn to evaluate commercially available herbicides for weed control, crop phytotoxicity, and crop yield. Various herbicide treatment combinations and application methods were evaluated.

Materials and Methods

The studies were established using a randomized complete block design with three or four replications. Herbicide evaluation plot size was 10×25 feet. For studies that included yield evaluation, the plot size was 15×25 feet. Herbicides were applied in 20 gallons of water/acre. Visual estimates of percentage weed control and crop injury data were made throughout June and July 2001. Weed control observations were compared with an untreated control and made on a 0–100 rating scale, with 0% equaling no weed control. Crop injury ratings are on a 0–100 rating scale, with 0 representing no crop injury. Weed species and populations evaluated included 5–10 foxtail/ft^2, 170 waterhemp/ft^2, 100 lambsquarters/ft^2, and 5–10 velvetleaf/ft^2.

The soil was a Canisteo Nicollet clay loam with a pH 6.95 and 6.4% organic matter. The 2000 crop was soybeans. Tillage included two cultivation passes in the spring. Fertilization included 250 lbs/acre 18–46–0 and 249 lbs/acre of 82–0–0. On May 14, Golden Harvest 8562 corn was planted 1.75 inches deep at 29,900 seeds/acre, in 30-inch rows. Herbicide application dates and crops stages are presented in Table 1. Precipitation data is presented in Table 2.

Results and Discussion

KC-systems (Table 3). This experiment compared numerous herbicide systems appropriate for north-central Iowa. Timely rainfall shortly after planting and herbicide application provided good activity with pre-emergence programs. The first evaluations were made on the same day as the post-emergence treatments were applied, so these ratings do not reflect the activity of the post treatment. No significant injury was seen with any treatment (data not shown). Favorable conditions resulted in excellent control with most treatments. The total post treatments (13–15) provided a lower level of waterhemp control than treatments that included a pre-emergence herbicide.

KC-tillage (Table 4). The objective of this experiment was to evaluate the benefit of cultivation in weed management. Several herbicide programs were applied at either full or half the recommended rate, with or without cultivation. In most herbicide treatments, there was no benefit to cultivation when herbicide was applied at the full rate. For example, Dual II Magnum followed by Northstar provided greater than 88% control of foxtail when applied at full rate, regardless of cultivation treatment. At half-rate, this treatment provided only 81% control of foxtail without cultivation, but control increased to 92% with the addition of cultivation. The study confirms that inclusion of cultivation in weed management reduces the amount of herbicide required.

KC–Callisto (Table 5). The objective of this experiment was to evaluate the new herbicide Callisto (mesotrione). No significant corn injury was observed with any treatment. All Callisto treatments provided excellent control of velvetleaf, lambsquarter, and waterhemp. No benefit was seen by addition of atrazine, but the field did not contain weeds tolerant of Callisto.

Callisto provided better control of broadleaf weeds than several standard treatments.

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Table 1. 2001 treatment dates and crop stages in Kanawha, Iowa.

	Corn	
Treatment	Date	Crop stage
Preemergence (PRE)	May 14	--
Postemergence (KC-systems and KC-Callisto)	June 11	6 in.
Postemergence (KC-tillage)	June 20	16 in.
Cultivation (KC-tillage)	June 27	26 in.

Table 2. Weekly rainfall totals and largest single rainfall following planting.

Weeks after planting	Total rainfall	Largest single rainfall event
	(inches)	(inches)
1	2.19	2.05
2	1.71	0.86
3	0.35	0.16
4	1.56	1.06
5	1.93	1.53
6	0.00	0.00

Table 3. Evaluation of herbicide systems in corn (KC-systems).

	Treatment	Rate	Unit	Timing	Foxtail 6/11	Velvetleaf 6/11	Lambsqt. 6/11	Waterhemp 6/11	Foxtail 7/10	Velvetleaf 7/10	Lambsqt. 7/10	Waterhemp 7/10
					----- % weed control -----							
1	Dual II Magnum	2	PT/A	pre	94.0 a	97.7 a	99.0 a	99.0 a	93.3 a	99.0 a	99.0 a	97.7 a
	Callisto	6	FL OZ/A	pre								
2	Dual II Magnum	2	PT/A	pre	96.0 a	97.7 a	99.0 a	99.0 a	97.7 a	99.0 a	99.0 a	99.0 a
	Callisto	6	FL OZ/A	pre								
	Atrazine	1	LB A/A	pre								
3	Balance Pro	2.25	FL OZ/A	pre	97.7 a	96.0 ab	97.7 ab	99.0 a	97.7 a	94.7 a	99.0 a	97.7 a
	Surpass	1.25	PT/A	pre								
	Atrazine	1	LB A/A	pre								
4	Dual II Magnum	2	PT/A	pre	93.3 a	76.7 c	70.0 c	91.3 ab	94.6 a	90.5 a	98.7 a	99.1 a
	Callisto	3	FL OZ/A	post								
	Crop Oil Conc	1	% V/V	post								
	Fertilizer – 28% UAN	2.5	% V/V	post								
5	Outlook	16	FL OZ/A	pre	95.0 a	83.3 abc	71.7 c	88.3 b	94.3 a	91.3 a	86.7 b	86.7 ab
	Distinct	3	OZ/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
	Fertilizer – AMS	3	LB/A	post								
6	Harness Xtra	1	QT/A	pre	99.0 a	86.7 abc	95.0 ab	97.7 a	96.0 a	88.3 a	97.7 a	85.0 ab
	Distinct	3	OZ/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
	Fertilizer – AMS	3	LB/A	post								
7	Bicep Lite II Magnum	2.6	PT/A	pre	97.7 a	93.0 ab	94.7 ab	97.7 a	90.0 a	88.0 a	93.0 ab	86.7 ab
	Hornet WDG	2.4	OZ/A	pre								
8	Dual II Magnum	1.7	PT/A	pre	97.3 a	88.3 abc	86.7 ab	93.6 ab	90.4 a	97.9 a	96.9 a	88.3 ab
	Northstar	5	OZ/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
	Fertilizer – AMS	3	LB/A	post								
9	Degree	4	PT/A	pre	99.0 a	94.7 ab	94.7 ab	99.0 a	94.3 a	93.3 a	96.0 a	93.3 ab
	Aim	0.33	OZ/A	post								
	Atrazine	1	LB A/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
10	Axiom	20	OZ/A	pre	99.0 a	93.0 ab	97.7 ab	99.0 a	96.0 a	86.7 a	97.7 a	90.0 ab
	Buctril + Atrazine	2	PT/A	post								
11	Outlook	16	FL OZ/A	pre	94.7 a	88.3 abc	94.7 ab	97.7 a	96.3 a	89.7 a	99.0 a	93.3 ab
	Marksman	3.5	PT/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
	Fertilizer – AMS	2.5	LB/A	post								
12	Dual II Magnum	1	PT/A	pre	99.0 a	81.7 bc	85.0 b	91.3 ab	97.7 a	91.7 a	97.7 a	88.3 ab
	Basis Gold	14	OZ/A	post								
	Crop Oil Conc	1	% V/V	post								
	Fertilizer – 28% UAN	2	QT/A	post								
13	Basis Gold	14	OZ/A	post	0.0 b	0.0 d	0.0 d	0.0 c	97.7 a	86.7 a	97.7 a	85.0 ab
	Crop Oil Conc	1	% V/V	post								
	Fertilizer – 28% UAN	2	QT/A	post								
14	Accent Gold	2.9	OZ/A	post	0.0 b	0.0 d	0.0 d	0.0 c	96.0 a	94.7 a	97.7 a	66.7 c
	Crop Oil Conc	1	% V/V	post								
	Fertilizer – 28% UAN	2	QT/A	post								
15	Celebrity Plus	4.75	OZ/A	post	0.0 b	0.0 d	0.0 d	0.0 c	99.0 a	89.7 a	92.7 ab	80.0 b
	Non-ionic surfactant	0.25	% V/V	post								
	Fertilizer – 28% UAN	2	QT/A	post								
16	Leadoff	1.9	PT/A	pre	92.7 a	88.3 abc	95.0 ab	95.0 ab	93.0 a	94.7 a	99.0 a	90.0 ab
	Accent Gold	1.5	OZ/A	post								
	Atrazine	0.5	LB A/A	post								
	Crop Oil Conc	1	% V/V	post								
	Fertilizer – 28% UAN	2	QT/A	post								
17	Leadoff	1.9	PT/A	pre	94.7 a	91.7 ab	93.0 ab	96.3 a	94.7 a	91.3 a	97.7 a	96.3 a
	Accent Gold	1.5	OZ/A	post								
	Atrazine	0.5	LB A/A	post								
	Crop Oil Conc	1.25	QT/A	post								
	Fertilizer – 28% UAN	2	QT/A	post								
18	Guardsman	1.9	PT/A	pre	91.0 a	86.7 abc	91.3 ab	96.3 a	91.3 a	90.0 a	96.0 a	86.7 ab
	Celebrity Plus	2.5	OZ/A	post								
	Fertilizer –- 28% UAN	2	QT/A	post								
	Non-ionic surfactant	0.25	% V/V	post								
19	Leadoff	1.9	PT/A	pre	96.6 a	88.9 abc	94.8 ab	97.3 a	92.4 a	90.8 a	94.7 Ab	85.1 ab
	Steadfast	0.5	OZ/A	post								
	Clarity	4	FL OZ/A	post								
	Crop Oil Conc	1	QT/A	post								
	Fertilizer – 28% UAN	2	QT/A	post								
20	Untreated											
	LSD (P = .05)				7.8	8.5	7.7	4.9	7.6	9.7	6.4	8.4

Means followed by same letter do not significantly differ (P = .05, Student–Newman–Keuls).

Table 4. Evaluation of various herbicide programs in combination with cultivation (KC-tillage).

	Treatment	Rate	Unit	Timing	Foxtail 6/20		Lambsqt. 6/20		Velvetleaf 6/20		Foxtail 7/10		Lambsqt. 7/10		Velvetleaf 7/10		Crop Yield 10/27	
					----- % weed control -----												--- bu/acre -	
1	Balance Pro	2.25	FL OZ/A	pre	99.0	a	99.0	a	99.0	a	90.8	ab	99.0	a	98.0	a	145.7	cd
	Surpass	40	FL OZ/A	pre														
	Atrazine	1	LB A/A	pre														
	No cultivation																	
2	Balance Pro	2.25	FL OZ/A	pre	97.0	a	99.0	a	99.0	a	93.5	a	98.0	a	99.0	a	151.2	bcd
	Surpass	40	FL OZ/A	pre														
	Atrazine	1	LB A/A	pre														
	Cultivation																	
3	Balance Pro	1.13	FL OZ/A	pre	92.3	ab	98.0	a	98.0	a	89.8	ab	94.3	a	94.5	a	159.7	a-d
	Surpass	20	FL OZ/A	pre														
	Atrazine	0.5	LB A/A	pre														
	No cultivation																	
4	Balance Pro	1.13	FL OZ/A	pre	98.0	a	98.0	a	96.8	a	98.5	a	99.0	a	99.0	a	164.1	abc
	Surpass	20	FL OZ/A	pre														
	Atrazine	0.5	LB A/A	pre														
	Cultivation																	
5	Leadoff	30	FL OZ/A	pre	83.8	b	96.0	a	87.5	ab	94.5	a	98.0	a	94.5	a	182.5	a
	Steadfast	0.5	OZ/A	post														
	Clarity	4	FL OZ/A	post														
	COC	1	QT/A	post														
	28% UAN	2	QT/A	post														
	No cultivation																	
6	Leadoff	30	FL OZ/A	pre	90.0	ab	91.3	a	82.5	bc	99.0	a	99.0	a	98.0	a	175.6	a
	Steadfast	0.5	OZ/A	post														
	Clarity	4	FL OZ/A	post														
	COC	1	QT/A	post														
	28% UAN	2	QT/A	post														
	Cultivation																	
7	Leadoff	15	FL OZ/A	pre	75.0	c	81.3	b	73.8	c	92.3	a	97.0	a	89.8	a	183.8	a
	Steadfast	0.25	OZ/A	post														
	Clarity	2	FL OZ/A	post														
	COC	1	QT/A	post														
	28% UAN	2	QT/A	post														
	No cultivation																	
8	Leadoff	15	FL OZ/A	pre	73.8	c	77.5	bc	75.0	bc	99.0	a	98.0	a	96.8	a	178.2	a
	Steadfast	0.25	OZ/A	post														
	Clarity	2	FL OZ/A	post														
	COC	1	QT/A	post														
	28% UAN	2	QT/A	post														
	Cultivation																	
9	Dual II	2	PT/A	pre	93.5	ab	83.8	b	83.8	bc	88.5	ab	98.0	a	99.0	a	172.1	ab
	Northstar	5	OZ/A	post														
	NIS	0.25	% V/V	post														
	AMS	3	LB/A	post														
	No cultivation																	
10	Dual II	2	PT/A	pre	92.3	ab	77.5	bc	86.3	bc	93.3	a	99.0	a	99.0	a	169.9	ab
	Northstar	5	OZ/A	post														
	NIS	0.25	% V/V	post														
	AMS	3	LB/A	post														
	Cultivation																	
11	Dual II	1	PT/A	pre	91.3	ab	63.8	d	75.0	bc	81.3	b	88.8	b	92.3	a	174.4	a
	Northstar	2.5	OZ/A	post														
	NIS	0.25	% V/V	post														
	AMS	3	LB/A	post														
	No cultivation																	
12	Dual II	1	PT/A	pre	87.5	ab	70.0	cd	76.3	bc	92.5	a	99.0	a	99.0	a	183.8	a
	Northstar	2.5	OZ/A	post														
	NIS	0.25	% V/V	post														
	AMS	3	LB/A	post														
	Cultivation																	
13	Weedy check																141.2	
	LSD (P = .05)				7.2		6.9		8.3		7.2		5.0		5.5		14.6	

Means followed by same letter do not significantly differ (P = .05, Student–Newman–Keuls).