

Corn Weed Management Studies

Brent A. Pringnitz, extension program specialist
Robert G. Hartzler, professor
Department of Agronomy

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/ft², 170 waterhemp/ft², 100 lambsquarters/ft², and 5–10 velvetleaf/ft².

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.

Acknowledgments

BASF and Syngenta provided support for these studies. Bryan Kinneer, Golden Harvest, provided seed for these studies. The authors also acknowledge Dave Rueber, farm superintendent, for his assistance.

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

Treatment	Corn	
	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 (inches)	Largest single rainfall event (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	Velvetleaf	Lambsqt.	Waterhemp	Foxtail	Velvetleaf	Lambsqt.	Waterhemp	
				6/11	6/11	6/11	6/11	7/10	7/10	7/10	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	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	Lambsqt.	Velvetleaf	Foxtail	Lambsqt.	Velvetleaf	Crop Yield 10/27								
				6/20	6/20	6/20	7/10	7/10	7/10									
1	Balance Pro Surpass Atrazine No cultivation	2.25 40 1	FL OZ/A FL OZ/A LB A/A	pre pre pre	99.0	a	99.0	a	99.0	a	98.0	a	145.7	cd				
2	Balance Pro Surpass Atrazine Cultivation	2.25 40 1	FL OZ/A FL OZ/A LB A/A	pre pre pre	97.0	a	99.0	a	99.0	a	93.5	a	98.0	a	151.2	bcd		
3	Balance Pro Surpass Atrazine No cultivation	1.13 20 0.5	FL OZ/A FL OZ/A LB A/A	pre pre pre	92.3	ab	98.0	a	98.0	a	89.8	ab	94.3	a	94.5	a	159.7	a-d
4	Balance Pro Surpass Atrazine Cultivation	1.13 20 0.5	FL OZ/A FL OZ/A LB A/A	pre pre pre	98.0	a	98.0	a	96.8	a	98.5	a	99.0	a	99.0	a	164.1	abc
5	Leadoff Steadfast Clarity COC 28% UAN No cultivation	30 0.5 4 1 2	FL OZ/A OZ/A FL OZ/A QT/A QT/A	pre post post post post	83.8	b	96.0	a	87.5	ab	94.5	a	98.0	a	94.5	a	182.5	a
6	Leadoff Steadfast Clarity COC 28% UAN Cultivation	30 0.5 4 1 2	FL OZ/A OZ/A FL OZ/A QT/A QT/A	pre post post post post	90.0	ab	91.3	a	82.5	bc	99.0	a	99.0	a	98.0	a	175.6	a
7	Leadoff Steadfast Clarity COC 28% UAN No cultivation	15 0.25 2 1 2	FL OZ/A OZ/A FL OZ/A QT/A QT/A	pre post post post post	75.0	c	81.3	b	73.8	c	92.3	a	97.0	a	89.8	a	183.8	a
8	Leadoff Steadfast Clarity COC 28% UAN Cultivation	15 0.25 2 1 2	FL OZ/A OZ/A FL OZ/A QT/A QT/A	pre post post post post	73.8	c	77.5	bc	75.0	bc	99.0	a	98.0	a	96.8	a	178.2	a
9	Dual II Northstar NIS AMS No cultivation	2 5 0.25 3	PT/A OZ/A % V/V LB/A	pre post post post	93.5	ab	83.8	b	83.8	bc	88.5	ab	98.0	a	99.0	a	172.1	ab
10	Dual II Northstar NIS AMS Cultivation	2 5 0.25 3	PT/A OZ/A % V/V LB/A	pre post post post	92.3	ab	77.5	bc	86.3	bc	93.3	a	99.0	a	99.0	a	169.9	ab
11	Dual II Northstar NIS AMS No cultivation	1 2.5 0.25 3	PT/A OZ/A % V/V LB/A	pre post post post	91.3	ab	63.8	d	75.0	bc	81.3	b	88.8	b	92.3	a	174.4	a
12	Dual II Northstar NIS AMS Cultivation	1 2.5 0.25 3	PT/A OZ/A % V/V LB/A	pre post post post	87.5	ab	70.0	cd	76.3	bc	92.5	a	99.0	a	99.0	a	183.8	a
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).