

**Economics of Weed Control Programs in Corn, 2017**  
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A field trial in corn was conducted in 2017 at the MSU Agronomy Research Farm in East Lansing, MI to compare weed control, corn injury, corn yield, and economic returns of dominant weed control programs marketed to Michigan growers. Each major herbicide company was asked to submit up to four weed control programs for the study based on soil type and weed infestation history. Site characteristics and herbicide application timings are described in Table 1. Table 2 describes the herbicide programs selected by each company for 2017. Herbicide programs are sorted by application timing and the need for glufosinate- (LibertyLink) or glyphosate- (Roundup Ready) resistant corn seed. Corn was planted and PRE herbicide applications were made on May 15. Precipitation at this location is presented in Table 4. Within 14 days after planting and application of the preemergence herbicides the site received 1.19 inches of rain. Twenty-four of the 26 herbicide programs examined resulted in greater than 90% control of all weeds prior to harvest. Twenty-four of the 26 herbicide programs resulted in statistically similar yield. The maximum yield in this trial was 203 bu/A, and yield was 117 bu/A in the untreated (weedy control) treatment. Weed competition in this trial resulted in a yield loss of 86 bu/A (58%). Twenty-four out of 26 herbicide programs resulted in statistically similar gross margins. The maximum gross margin in this trial was \$575.40/A, and the gross margin in the untreated weedy treatment was \$363.48/A. Weed competition in this trial resulting in an economic loss of \$211.92/A (63%). Table 3 contains the data for corn injury, weed control, herbicide program costs, corn yield, and economic returns.

Table 1. Site description and application details

Crop	Corn
Variety	P9807 AM
Row Spacing	30 inches
Soil Texture	Sandy loam
Soil pH	6.1
Soil Organic Matter	2.5%
Dominant Weeds	ANGR, CHEAL, AMAPO, AMBEL, ABUTH
Planting Date	May 15
Application Timing:	
PRE	May 15
EPOS	June 7
POST	June 13
Evaluation Times	Corn injury- 31 d after planting Weed control prior to harvest (31 d after POST)

Abbreviations: ANGR = annual grasses, mainly foxtail species, CHEAL = common lambsquarters, AMAPO = Powell amaranth, AMBEL = common ragweed, ABUTH = velvetleaf

Table 2. Commercial corn herbicide programs evaluated in 2017.

Conventional	Treatments (Rate/A)	Abbreviated Form
PRE	Balance Flexx (4 oz) + Harness Xtra (1.8 qt)	Bal Flexx + HarnXtra
	Keystone NXT (2.4 qt) + Hornet (3 oz)	Keystone NXT + Hornet
	Resicore (2 qt) + Keystone NXT (1 qt)	Resicore + Keystone NXT
	Acuron (3 qt)	Acuron
	Acuron Flexi (2.25 qt)	Acuron Flexi
	Resicore (2.75 qt) + Atrazine (1.1 lb)	Resicore + Atra
PRE/EPOS	Cinch ATZ (1 qt) fb. Revulin Q (3.4 oz) + NIS (0.25%) + AMS (2.5%)	Cinch ATZ fb. Revulin Q
	Cinch ATZ (1 qt) fb. Resolve Q (1.25 oz) + FeXapan (22 oz) + NIS (0.25%) + AMS (2.5%)	Cinch ATZ fb. Resolve Q + FeXapan
Liberty Link		
EPOS	Liberty (32 oz) + Degree Xtra (2 qt) + AMS (2.5%)	Liberty + DegXtra
Roundup Ready		
EPOS	Capreno (3 oz) + Roundup PowerMax (22 oz) + AMS (2.5%)	Capreno + RupPM
	Anthem MAXX (2 oz) + Solstice (2.5 oz) + Atrazine (1.1 lb) + Roundup PowerMax (22 oz) + COC (1%) + AMS (2.5%)	AnthM + Sols + Atra + RupPM
	Armezon PRO (16 oz) + Roundup PowerMax (16 oz) + Atrazine (1.1 lb) + NIS (0.25%) + AMS (2.5%)	Armezon PRO + RupPM + Atra
	Resicore (1.25 qt) + Atrazine (0.56 lb) + Durango DMA (1 qt) + AMS (2.5%)	Resicore + Atra + Durango DMA
	Harness Max (64 oz) + Atrazine (1.1 lb) + Roundup PowerMax (22 oz) + AMS (2.5%)	HarnMax + Atra + RupPM
PRE/POST	Warrant (3 pt) + Atrazine (0.56 lb) + Roundup PowerMax (22 oz) + AMS (2.5%)	Warrant + Atra + RupPM
	Verdict (14 oz) + Atrazine (1.1 lb) fb. Roundup PowerMax (32 oz) + AMS (2.5%)	Verdict + Atra fb. RupPM
	Zidua SC (3.3 oz) + Sharpen (2 oz) + Atrazine (1.1 lb) fb. Roundup PowerMax (32 oz) + AMS (2.5%)	Zidua SC + Sharp + Atra fb. RupPM
	Zidua SC (3.3 oz) + Atrazine (1.1 lb) fb. Roundup PowerMax (32 oz) + AMS (2.5%)	Zidua SC + Atra fb. RupPM
	TripleFLEX II (1 qt) + Degree Xtra (1.5 qt) fb. Roundup PowerMax (22 oz) + AMS (2.5%)	TripleFLEX II + DegXtra fb. RupPM
	Cinch ATZ (2 qt) + Instigate (5.25 oz) fb. Abundit Edge (22 oz) + AMS (2.5%)	Cinch ATZ + Instig fb. AbunditE
	Instigate (5.25 oz) + Atrazine (1.1 lb) fb. Abundit Edge (22 oz) + AMS (2.5%)	Instig + Atra fb. AbunditE
	Balance Flexx (4 oz) fb. Roundup PowerMax (22 oz) + Diflexx Duo (24 oz) + AMS (2.5%)	Bal Flexx fb. RupPM + Diflexx Duo
	Degree Xtra (2 qt) fb. Status (2 oz) + Roundup PowerMax (22 oz) + AMS (2.5%)	DegXtra fb. Status + RupPM
	Acuron (1.5 qt) fb. Acuron (1.5 qt) + Roundup PowerMax (26 oz) + AMS (2.5%)	Acuron fb. Acuron + RupPM
Anthem MAXX (4 oz) + Atrazine (1.1 lb) fb. Solstice (2.5 oz) + Atrazine (0.56 lb) + Roundup PowerMax (22 oz) + COC (1%) + AMS (2.5%)	AnthM + Atra fb. Sols + Atra + RupPM	

Table 3. Corn injury, weed control, program costs, corn yield, and economic returns of 26 herbicide programs in 2017.

Programs	Herbicide Treatments <sup>5</sup>	Injury 28 DAP	ANGR	CHEAL	AMAPO	AMBEL	ABUTH	All Weeds	Cost <sup>1</sup>	Yield	Economic Return <sup>2</sup>
			Prior to harvest (31 d after POST)								
Conventional		(%)	% Control					(≥ 90%)	(\$/A)	(bu/A)	(\$/A)
PRE	Bal Flexx + HarnXtra	0	100	100	100	100	100	YES	49.36	188* <sup>3</sup>	534.22** <sup>4</sup>
	Keystone NXT + Hornet	0	100	100	100	99	100	YES	52.39	188*	531.19**
	Resicore + Keystone NXT	0	100	100	100	100	100	YES	53.24	184*	517.94**
	Acuron	0	100	100	100	100	100	YES	57.98	190*	529.47**
	Acuron Flexi	0	98	100	100	100	100	YES	54.72	188*	528.86**
	Resicore + Atra	0	100	100	100	100	100	YES	69.83	182*	494.37
PRE/EPOS	Cinch ATZ fb. Revulin Q	0	97	100	100	100	100	YES	50.03	202*	575.4**
	Cinch ATZ fb. Resolve Q + FeXapan	0	95	100	100	100	100	YES	52.96	201*	570.14**
Liberty Link											
EPOS	Liberty + DegXtra	0	98	99	99	99	88	NO	52.08	202*	573.34**
Roundup Ready											
EPOS	Capreno + RupPM	0	96	96	98	99	98	YES	35.70	179	518.42**
	AnthM + Sols + Atra + RupPM	5	96	100	100	100	100	YES	57.93	195*	544.25**
	Armezon PRO + RupPM + Atra	0	99	100	100	100	99	YES	51.84	186*	523.21**
	Resicore + Atra + Durango DMA	3	99	100	100	100	100	YES	45.92	184*	525.26**
	HarnMax + Atra + RupPM	5	98	100	100	100	100	YES	67.18	199*	549.72**
	Warrant + Atra + RupPM	0	100	100	100	100	100	YES	53.57	200*	567.21**
PRE/POST	Verdict + Atra fb. RupPM	0	100	100	100	100	100	YES	66.32	201*	556.78**
	Zidua SC + Sharp + Atra fb. RupPM	0	100	100	100	100	100	YES	71.34	188*	510.69**
	Zidua SC + Atra fb. RupPM	0	99	97	98	100	100	YES	59.29	203*	569.23**
	TripleFLEX II + DegXtra fb. RupPM	0	100	100	100	100	100	YES	61.09	184*	509.31**
	Cinch ATZ + Instig fb. AbunditE	0	100	100	100	100	100	YES	61.98	194*	538.65**
	Instig + Atra fb. AbunditE	0	99	100	100	100	100	YES	57.14	188*	525.66**
	Bal Flexx fb. RupPM + Diflexx Duo	0	100	100	100	100	100	YES	59.47	187*	519.45**
	DegXtra fb. Status + RupPM	0	100	100	100	100	100	YES	53.26	189*	532.64**
	Acuron fb. Acuron + RupPM	0	100	100	100	100	100	YES	74.49	188*	507.54**
	AnthM + Atra fb. Sols + Atra + RupPM	0	100	100	100	100	100	YES	85.66	199*	532.79**
	Untreated	0	0	0	0	0	0	NO	0.00	117	363.48

Abbreviations: ANGR = annual grasses, mainly foxtail species, CHEAL = common lambsquarters, AMAPO = Powell amaranth, AMBEL = common ragweed, ABUTH = velvetleaf, fb. = followed by

<sup>1</sup>Herbicide costs = avg. of price lists; App. cost = \$7.50/A; seeding rate = 33,500 seeds/A. Weed control costs = Herbicide \$ + Additive \$ + Application \$

<sup>2</sup>Crop selling price = \$3.10/bu (December 2017). Economic return = (Yield x Price) – Weed Control Costs

<sup>3</sup>\*Not statistically different from the highest yielding

<sup>4</sup>\*\*Not statistically different from the highest gross margins

<sup>5</sup>Many herbicide programs have long rotation restrictions to more sensitive crops, i.e., sugarbeet, alfalfa, potatoes, etc. Consult the Table 12 in the MSU Weed Control Guide for Field Crops (E-434) or the herbicide label for crop rotation restriction

Table 4. 2017 Precipitation at the MSU Hancock Turfgrass Research Center, East Lansing, MI near study location.

Date	April	May	June	July	August	September
	Inches					
1	-	0.21	-	-	-	-
2	-	0.13	-	-	-	-
3	0.43	-	-	-	0.03	-
4	0.48	0.31	0.04	-	0.28	-
5	0.41	-	0.01	-	0.12	0.06
6	0.98	-	-	-	-	-
7	0.01	-	-	0.65	0.03	0.22
8	-	-	-	-	-	-
9	-	-	0.01	-	-	-
10	0.01	0.02	-	0.54	-	-
11	-	0.13	-	-	0.22	-
12	-	-	-	0.22	0.02	-
13	0.01	-	-	0.27	0.01	-
14	-	-	-	-	-	-
15	0.15	-	-	-	0.54	-
16	-	0.03	-	-	-	-
17	-	-	0.63	-	0.19	0.07
18	-	-	0.07	-	0.03	-
19	0.07	-	0.02	-	-	0.08
20	0.94	0.12	0.01	-	-	-
21	-	0.66	-	-	0.03	0.3
22	-	-	0.35	0.15	0.08	-
23	-	0.01	0.67	-	-	-
24	-	0.48	-	-	-	-
25	-	0.07	-	-	-	-
26	0.03	-	-	-	-	-
27	-	-	-	-	-	0.11
28	-	-	-	-	0.06	-
29	0.02	-	0.06	-	0.01	0.03
30	1.00	-	0.1	-	-	-
31	-	-	-	-	-	-
Total	4.54	2.17	1.97	1.83	1.65	0.87