

EVALUATION OF THE UTILITY AND ECONOMICS OF HIGH-INPUT VS. LOW-INPUT CORN PRODUCTION SYSTEMS IN MISSOURI

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2007 and 2008 Results

Impact of Herbicide Programs on Weed Control and Corn Yield:

The results from the first two years of these experiments are presented in Tables 1-8. As illustrated in Table 1, the preemergence only (PRE-only) program of Lexar and the early postemergence (E-POST) application of Aatrex plus Callisto plus Steadfast (conventional 1-pass POST program) generally resulted in the highest weed densities by the time of corn tasseling at both sites in 2007 and 2008. Very few differences in weed density at tasseling have been observed with the other herbicide programs evaluated in these trials. As shown in Table 2, these weed densities caused corn yield reductions at the 2007 Novelty and 2008 St. Elizabeth research sites, but not at the 2007 St. Elizabeth site.

The results in Table 1 also show the inconsistency that can occur with a conventional 1-pass POST program compared to a Roundup Ready 1-pass POST program. Weed density in response to the Roundup Ready 1-pass POST program was significantly less at every site except the 2008 Novelty research location. Throughout our research, we have seen more inconsistency with the conventional POST-only programs in comparison to the POST-only programs containing glyphosate for use in Roundup Ready corn.

Other than the exceptions described above, the results from the first two years of this research illustrate that good weed control and optimum corn yields can be achieved with a variety of herbicide program approaches. The PRE followed by POST conventional and glyphosate programs performed similarly from the standpoint of weed control and yield, which confirms that producers can still grow conventional corn and achieve excellent weed control and high corn yields.

Impact of Stacked Corn Hybrids on Insect Injury and Yield:

As illustrated in Table 3, corn hybrids stacked with protection against European Corn Borer (ECB) and both ECB and corn rootworm (RW) increased corn yields at the St. Elizabeth site in 2007 and 2008 but not Novelty in 2007 where no rootworm pressure was present. Corn rootworm damage was significantly lower to the RR/ECB/RW hybrid than all other hybrids at the 2007 St. Elizabeth site, but only minor root damage was observed at the 2008 St. Elizabeth site (Table 4). In 2008, both stacked hybrids resulted in significant reductions in ECB tunneling and average tunnel length compared to the RR hybrid without insect protection (Table 5). This may help to explain the 4- to 5-bushel per acre reduction in corn yield observed with the RR compared to the stacked hybrids at the 2008 St. Elizabeth site (Table 3).

Impact of Fungicide Application on Disease Incidence and Corn Yield:

The application of Headline fungicide at tasseling caused significant yield increases compared to untreated corn at the 2007 Novelty and the 2008 St. Elizabeth research sites (Table 6). Corn yields were increased by 6 bu/A at both sites in 2007 and by 14 bu/A at the St. Elizabeth site in 2008. Approximately 6 weeks after Headline treatment, common rust severity was greater in untreated corn compared to corn treated with Headline at both locations in 2008 (Table 7). Similarly, grey leaf spot severity was higher in untreated corn compared to corn treated with Headline at the 2008 Novelty site (Table 7). It is unlikely that the observed yield increases can be attributed to these relatively low levels of grey leaf spot and common rust severity, therefore additional measurements were taken in each plot to measure the relative chlorophyll content in untreated corn compared to corn treated with Headline. As illustrated in Table 8, chlorophyll content was higher in the ear leaf and the ear leaf -2 in corn treated with Headline versus untreated corn.

Table 1. Influence of herbicide programs on weed density at tasseling at St. Elizabeth and Novelty, Missouri in 2007 and 2008.

Treatments ^b	Rate	Application Timing	Research Site			
			St. Elizabeth		Novelty	
			2007	2008	2007	2008
	--- product/A ---		----- Total Weed Density (#/m ²) ^a -----			
Lexar	3 qts	PRE	46 b	10 c	17 b	30 b
Lexar Roundup Omax	3qts 22 fl ozs	PRE POST	11 d	6 c	3 c	20 bc
Lexar Aatrex Callisto	3 qts 1 pt 3 fl ozs	PRE POST POST	10 d	3 c	4 c	14 bc
Lexar Roundup Omax	1.5 qts 22 fl ozs	PRE POST	14 d	5 c	4 c	13 bc
Lexar Aatrex Callisto	1.5 qts 1 pt 3 fl ozs	PRE POST POST	12 d	8 c	9 c	10 c
Halex Aatrex	3.6 pts 1 pt	E-POST E-POST	11 d	5 c	3 c	13 bc
Aatrex Callisto Steadfast	1 qt 2 fl ozs ¾ oz	E-POST E-POST E-POST	26 c	27 b	10 c	25 bc
Untreated	-----	-----	64 a	71 a	52 a	148 a

^aMeans followed by the same letter are not different, P < 0.05.

^bAll postemergence treatments applied with recommended adjuvants.

Table 2. Influence of herbicide programs on corn yield at St. Elizabeth and Novelty, Missouri in 2007 and 2008.

Treatments ^b	Rate	Application Timing	Research Site		
			St. Elizabeth		Novelty
			2007	2008	2007
	--- product/A ---		----- Yield (Bu/Acre) ^a -----		
Lexar	3 qts	PRE	87 a	181 ab	145 b
Lexar Roundup Omax	3qts 22 fl ozs	PRE POST	91 a	181 ab	154 a
Lexar Aatrex Callisto	3 qts 1 pt 3 fl ozs	PRE POST POST	91 a	184 ab	155 a
Lexar Roundup Omax	1.5 qts 22 fl ozs	PRE POST	94 a	189 a	154 a
Lexar Aatrex Callisto	1.5 qts 1 pt 3 fl ozs	PRE POST POST	88 a	176 b	155 a
Halex Aatrex	3.6 pts 1 pt	E-POST E-POST	88 a	184 ab	155 a
Aatrex Callisto Steadfast	1 qt 2 fl ozs ¾ oz	E-POST E-POST E-POST	95 a	146 d	146 b
Untreated	-----	-----	61 b	156 c	119 c

^aMeans followed by the same letter are not different, P < 0.05.

^bAll postemergence treatments applied with recommended adjuvants.

Table 3. Influence of insect resistance traits in near-isogenic corn hybrids on corn yield at St. Elizabeth and Novelty, Missouri in 2007 and 2008.

Near-Isogenic Corn Hybrid	Research Site		
	St. Elizabeth		Novelty
	2007	2008	2007
	----- Yield (Bu/Acre) ^b -----		
RR	76 b	172 b	147 a
RR/ECB ^b	88 a	177 a	150 a
RR/ECB/RW ^c	96 a	176 ab	147 a

^aMeans followed by the same letter are not different, $P < 0.05$.

^bContains the Cry 1A protein for European corn borer control.

^cContains both the Cry 1A protein for European corn borer control and Cry 3Bb1 protein for rootworm control.

Table 4. Influence of insect resistance traits in near-isogenic stacked corn hybrids on root damage caused by corn rootworm at St. Elizabeth, Missouri in 2007 and 2008.

Near-isogenic Corn Hybrids	Rootworm Damage ^a	
	2007	2008
	----- Average/Plant ^b -----	
RR	0.44 b	0.035 a
RR/ECB ^c	0.55 a	0.028 ab
RR/ECB/RW ^d	0.10 c	0.019 b

^aRoot damage assessed using a linear 0-3 root damage scale (Oleson et al. 2005).

^bMeans followed by the same letter are not different, $P < 0.05$.

^cContains the Cry 1A protein for European corn borer control.

^dContains both the Cry 1A protein for European corn borer control and Cry 3Bb1 protein for rootworm control.

Table 5. Influence of insect resistance traits in near-isogenic stacked corn hybrids on tunneling and tunnel length caused by European corn borer at St. Elizabeth and Novelty, Missouri in 2008^a.

Near-isogenic Corn Hybrids	St. Elizabeth		Novelty	
	Tunneling	Tunnel Length	Tunneling	Tunnel Length
	-- #/Plant --	---- mm ----	-- #/Plant --	---- mm ----
RR	0.43 a	15.3 a	0.26 a	5.80 a
RR/ECB ^b	0.03 b	0.6 b	0.02 b	0.17 b
RR/ECB/RW ^c	0.03 b	0.4 b	0.02 b	0.13 b

^aMeans followed by the same letter are not different, $P < 0.05$.

^bContains the Cry 1A protein for European corn borer control.

^cContains both the Cry 1A protein for European corn borer control and Cry 3Bb1 protein for rootworm control.

Table 6. Influence of HeadlineTM fungicide application on corn yield at St. Elizabeth and Novelty, Missouri in 2007 and 2008.

Treatments	Research Site		
	St. Elizabeth		Novelty
	2007	2008	2007
	----- Yield (Bu/Acre) ^a -----		
Headline @ Tasseling	90 a	182 a	151 a
No Fungicide	84 a	168 b	145 b

^aMeans followed by the same letter are not different, $P < 0.05$.

Table 7. Influence of Headline™ fungicide application on gray leaf spot and common rust severity 6 weeks after application at St. Elizabeth and Novelty, Missouri in 2008.

Treatments	Research Site			
	St. Elizabeth		Novelty	
	Gray Leaf Spot	Common Rust	Gray Leaf Spot	Common Rust
	----- Severity (%) ^{a,b} -----			
Headline @ Tasseling	0.006 a	0.047 b	0.076 b	0.004 b
No Fungicide	0.013 a	0.214 a	1.009 a	0.394 a

^aMeans followed by the same letter are not different, $P < 0.05$.

^bSeverity was determined by estimating percent of ear leaves showing gray leaf spot or rust symptoms for 10 ear leaves per plot.

Table 8. Influence of Headline™ fungicide application on relative chlorophyll content of corn leaves at St. Elizabeth, Missouri in 2008.

Treatments	Corn Leaf Position	
	Ear Leaf	Ear Leaf -2
	-- Chlorophyll Content (%) ^{ab} --	
Headline @ Tasseling	53.3 a	52.7 a
No Fungicide	51.8 b	50.6 b

^aMeans followed by the same letter are not different, $P < 0.05$.

^bChlorophyll content determined with a Minolta 502 SPAD meter.