

## 2013 Time of Weed Removal in Corn: A Field Teaching Tool – Seeing is Believing

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Proper time of weed removal in corn is a critical component of successful weed control programs that maximize crop yields. Over-reliance on postemergence glyphosate in corn and soybean has reduced herbicide diversification and the use of preemergence herbicides, and has over-simplified weed management programs. The result, increased early season weed competition, decreased time to effectively control weed populations, increased weed densities to be controlled by postemergence herbicides, increased risk of developing resistant weed populations, and ultimately reduced crop yield potential.

Field demonstrations and hands-on schools can be effective ways of teaching agricultural professionals and farmers the importance of these concepts, **Seeing is Believing**. The goal, to help growers focus on herbicide systems, develop long range plans and ultimately **Take Control** of weed management on their farm to preserve the technologies available.

Field demonstrations with different times of weed removal and systems of preemergence followed by postemergence herbicides were established in 2012 and 2013 at Rochester, Minnesota. Weeds were removed with herbicides at the following crop stages: 1) at planting, 2) V2-V3, 3) V4-V5 and 4) V6-V7. In addition, herbicide systems that compared broad and limited spectrum preemergence weed control (based on control of weed species present) followed by both timely and untimely postemergence herbicides were established. Field tours showed participants the value of robust early-season weed control and how this increased the time period (window of opportunity) for applications of effective postemergence herbicides to control weeds. The opposite demonstrated how poor or no early-season weed control greatly reduces the time period (window of opportunity) for applications of effective postemergence herbicides to control weeds.

The research site was a Lawler loam series with a pH of 6.6, O.M. of 2.1%, and soil test P and K levels of 49 ppm and 137 ppm, respectively. Spring fertilizer was broadcast ahead of planting on April 26, 2013 at a rate of 130-26-120-24(N-P-K-S). An additional 40#/a of nitrogen fertilizer was topdressed on June 20, 2013. The field was spring disked and field cultivated once prior to planting. The corn hybrid, Syngenta N42Z 3011A, was planted on May 15,

2013 at a depth of 1.5 inches in 30 inch rows at a rate of 32,000 seeds per acre. A randomized complete block design was used with four replications. Preemergence (PRE) and postemergence (POST) treatments were applied with a tractor-mounted sprayer delivering 15 GPA at 32 psi using Turbo Tee 11002 nozzles. Evaluations of the plots were taken on June 6, 17, 26, and July 11, 2013. The center two rows of each plot were machine harvested on November 8, 2013. Application dates, environmental conditions, and weed stages are listed below in Table 1. Herbicide performance for giant ragweed, common lambsquarters, common waterhemp and grass are reported in Tables 2 through 5, respectively. (University of Minnesota Extension Regional Office – Rochester)

**Table 1. Application timing, plant stage, environmental conditions.**

Date	5/15	6/10	6/18	6/27
<b>Treatment</b>	PRE	POST I	POST II	POST III
<b>Temperature (F)</b>				
Air	68	73	68	78
Soil	60.4	73	75.7	74.8
<b>Relative Humidity (%)</b>	38	65	68	66
<b>Wind (mph)</b>	3	5	8	12
<b>Soil Moisture</b>	Normal	Normal	Normal	Wet
<b>Corn</b>				
Stage		V2-V3	V4-V5	V6
Height (inch)		3.5	9	18
<b>Giant Ragweed</b>				
Weed density (ft <sup>2</sup> )		9.0		9.0
Height (inch)		3.3		13.3
<b>Common Lambsquarters</b>				
Weed density (ft <sup>2</sup> )		10.3		10.3
Height (inch)		0.2		1.9
<b>Common Waterhemp</b>				
Weed density (ft <sup>2</sup> )		44.1		44.1
Height (inch)		0.2		2.9
<b>Rainfall after each application (inch)</b>				
Week 1	4.77	0.43	5.25	0.44
Week 2	1.0	4.13	1.56	0.35
Week 3	3.4	1.56	0.35	1.07

**Comparisons:**

Four Treatments:

1. Verdict PRE followed by an early (POST II) and late (POST III) application of Roundup PowerMax
2. Harness PRE followed by an early (POST II) and late (POST III) application of Roundup PowerMax

Three Treatments:

1. Roundup PowerMax applied at POST I
2. Roundup PowerMax applied at POST II
3. Roundup PowerMax applied at POST III

Consider a) what weeds were missed with the lack of a residual herbicide and b) what problems were encountered when herbicides were not applied at the most effective or “best” time for controlling weeds.

Evaluate and compare several systems of PRE/POST or POST only

**Table 2. Evaluation of preemergence and postemergence systems for giant ragweed control in field corn on June 6, 17, 26, and July 11 at Rochester, MN, in 2013.**

Treatment	Rate  (rate/A)	Giant Ragweed Control			
		6/6	6/17	6/26	7/11
		Giant Ragweed Control (%)			
<b>PRE / POST II (V4-V5)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	66	56	94	89
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	78	70	98	94
<b>PRE / POST III (V6-V7)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	64	57	59	97
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	69	60	55	96
Zemax / Halex + NIS + AMS	2 pt/a / 3.6 pt/a +0.25 % v/v +8.5 lb/100 gal	61	51	58	98
<b>POST I (V2-V3)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	92	92	82
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	94	96	94
Harness + Roundup PowerMax + AMS	1.75 pt/a + 32 fl oz/a + 8.5lb/100 gal	0	94	93	87
<b>POST II (V4-V5)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	93	94
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	0	86	95
<b>POST III (V6-V7)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	0	95
<b>POST I (V2-V3) / POST III (V6-V7)</b>					
Roundup PowerMax + AMS / Roundup PowerMax + AMS	32 fl oz/a + 8.5lb/100 gal / 32 fl oz/a + 8.5lb/100 gal	0	93	94	97
<b>LSD (P=0.10)</b>		<b>5</b>	<b>10</b>	<b>9</b>	<b>4</b>

**Table 3. Evaluation of preemergence and postemergence systems for common lambsquarters control in field corn on June 6, 17, 26, and July 11 at Rochester, MN, in 2013.**

Treatment	Rate (rate/A)	Common Lambsquarters Control			
		6/6	6/17	6/26	7/11
		(%)			
<b>PRE / POST II (V4-V5)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	87	99	91
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	90	99	89
<b>PRE / POST III (V6-V7)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	86	99	94
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	92	97	96
Zemax / Halex + NIS + AMS	2 pt/a / 3.6 pt/a +0.25 % v/v +8.5 lb/100 gal	99	92	96	99
<b>POST I (V2-V3)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	99	99	90
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	99	99	99
Harness + Roundup PowerMax + AMS	1.75 pt/a + 32 fl oz/a + 8.5lb/100 gal	0	99	99	96
<b>POST II (V4-V5)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	99	89
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	0	99	95
<b>POST III (V6-V7)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	0	90
<b>POST I (V2-V3) / POST III (V6-V7)</b>					
Roundup PowerMax + AMS / Roundup PowerMax + AMS	32 fl oz/a + 8.5lb/100 gal / 32 fl oz/a + 8.5lb/100 gal	0	99	99	97
<b>LSD (P=0.10)</b>		<b>0</b>	<b>4</b>	<b>2</b>	<b>4</b>

**Table 4. Evaluation of preemergence and postemergence systems for common waterhemp control in field corn on June 6, 17, 26, and July 11 at Rochester, MN, in 2013.**

Treatment	Rate (rate/A)	Common Waterhemp Control (%)			
		6/6	6/17	6/26	7/11
<b>PRE / POST II (V4-V5)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	92	99	84
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	98	99	86
<b>PRE / POST III (V6-V7)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	92	88	98
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	99	99	98
Zemax / Halex + NIS + AMS	2 pt/a / 3.6 pt/a +0.25 % v/v +8.5 lb/100 gal	99	94	96	99
<b>POST I (V2-V3)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	97	95	75
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	99	99	99
Harness + Roundup PowerMax + AMS	1.75 pt/a + 32 fl oz/a + 8.5lb/100 gal	0	99	99	98
<b>POST II (V4-V5)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	98	90
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	0	99	92
<b>POST III (V6-V7)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	0	88
<b>POST I (V2-V3) / POST III (V6-V7)</b>					
Roundup PowerMax + AMS / Roundup PowerMax + AMS	32 fl oz/a + 8.5lb/100 gal / 32 fl oz/a + 8.5lb/100 gal	0	96	97	94
<b>LSD (P=0.10)</b>		<b>0</b>	<b>2</b>	<b>3</b>	<b>5</b>

**Table 5. Evaluation of preemergence and postemergence systems for grass control in field corn on June 6, 17, 26, and July 11 at Rochester, MN, in 2013.**

Treatment	Rate (rate/A)	Grass			
		6/6	6/17	6/26	7/11
		Grass (%)			
<b>PRE / POST II (V4-V5)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	99	99	98
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	99	99	98
<b>PRE / POST III (V6-V7)</b>					
Verdict / Roundup PowerMax + AMS	13 fl oz/a / 32 fl oz/a + 8.5lb/100 gal	99	99	99	99
Harness / Roundup PowerMax + AMS	1.75 pt/a / 32 fl oz/a + 8.5lb/100 gal	99	99	99	99
Zemax / Halex + NIS + AMS	2 pt/a / 3.6 pt/a +0.25 % v/v +8.5 lb/100 gal	99	99	99	99
<b>POST I (V2-V3)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	99	99	99
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	98	99	99
Harness + Roundup PowerMax + AMS	1.75 pt/a + 32 fl oz/a + 8.5lb/100 gal	0	99	99	98
<b>POST II (V4-V5)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	99	96
Halex + NIS + AMS	3.6 pt/a + 0.25 % v/v + 8.5lb/100 gal	0	0	99	98
<b>POST III (V6-V7)</b>					
Roundup PowerMax + AMS	32 fl oz/a + 8.5 lb/100 gal	0	0	0	99
<b>POST I (V2-V3) / POST III (V6-V7)</b>					
Roundup PowerMax + AMS / Roundup PowerMax + AMS	32 fl oz/a + 8.5lb/100 gal / 32 fl oz/a + 8.5lb/100 gal	0	99	98	98
<b>LSD (P=0.10)</b>		<b>0</b>	<b>0.6</b>	<b>1</b>	<b>1</b>



**Trt. 1**  
Verdict 13 fl oz/a  
PRE sprayed on 5/15/13  
Roundup PowerMax 32 fl oz/a  
+ AMS 8.5 lb/100 gal  
POST II (V4-V5) sprayed 6/18/13



June 17, 2013

July 12, 2013  
3.7 ft (ab)



191 bu/a

**Trt. 2**  
Verdict 13 fl oz/a  
PRE sprayed on 5/15/13  
Roundup PowerMax 32 fl oz/a +  
AMS 8.5 lb/100 gal  
POST III (V6-V7) sprayed 6/27/13



June 24, 2013

July 12, 2013  
2.6 ft (c)



181 bu/a

**Trt. 3**  
Harness 1.75 pt/a  
PRE sprayed on 5/15/13  
Roundup PowerMax 32 fl oz/a +  
AMS 8.5 lb/100 gal  
POST II (V4-V5) sprayed 6/18/13



June 17, 2013

July 12, 2013  
3.5 ft (b)



163 bu/a

**Trt. 4**  
Harness 1.75 pt/a  
PRE sprayed on 5/15/13  
Roundup PowerMax 32 fl oz/a  
+ AMS 8.5 lb/100 gal  
POST III (V6-V7) sprayed 6/27/13



June 24, 2013

July 12, 2013  
2.9 ft (c)



168 bu/a



**Trt. 5**  
**Roundup PowerMax 32 fl oz/a**  
**+ AMS 8.5 lb/100 gal**  
**POST I (V2-V3) sprayed 6/10/13**



**June 17, 2013**

**July 12, 2013**  
**3.9 ft (ab)**



**170 bu/a**

**Trt. 6**  
**Roundup PowerMax 32 fl oz/a**  
**+ AMS 8.5 lb/100 gal**  
**POST II (V4-V5) sprayed 6/18/13**



**June 17, 2013**

**July 12, 2013**  
**3.5 ft (b)**



**169 bu/a**

**Trt. 7**  
**Roundup PowerMax 32 fl oz/a**  
**+ AMS 8.5 lb/100 gal**  
**POST III (V6-V7) sprayed 6/27/13**



**June 24, 2013**

**July 12, 2013**  
**2.5 ft (c)**



**154 bu/a**