

2013 Evaluation of Herbicide Systems in Soybeans at Rochester, MN

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The objective of this trial was to evaluate the performance of herbicide systems for weed control in soybeans in southeastern Minnesota. The research site was a Lawler loam series with a pH of 6.6, O.M. of 2.6%, and soil test P and K levels of 62 ppm and 188 ppm, respectively. The field was fall moldboard plowed, and disked and field cultivated once prior to planting in the spring. The soybean variety Stine 22RC22 was planted on May 24, 2013 at a depth of 1.5 inches in 30 inch rows at a rate of 165,500 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 20 gpa at 32 psi using TeeJet 11002 air induction flat spray tips for PRE treatments, and Turbo TeeJet 11002 wide angle flat spray tip nozzles for POST applications. Evaluations of the plot were taken on June 17 and 26, and July 5, 15, and 24 and September 25. The center two rows of each plot were machine harvested on October 26, 2013. Application dates, environmental conditions, and weed stages are listed in Table 1. Herbicide performance for giant ragweed, common lambsquarters, common waterhemp and giant foxtail control, plus plant injury ratings are found in Tables 2 through 6 respectively. (University of Minnesota Extension Regional Office, Rochester)

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

Date	5/24	6/14	6/27	7/11
Treatment	PRE	POST I	POST II	POST III
Temperature (F)				
Air	64	75	81	75
Soil	65.3	76.8	75.7	76.5
Relative Humidity (%)	48	57	58	53
Wind (mph)	10	18	16	0
Soil Moisture	Adequate	Adequate	Excessive	Adequate
Soybean				
Stage		VC	V3	R1
Height (inch)		3.0	6.0	9.0
Giant Ragweed				
Weed density (ft ²)		16.4	10.8	
Height (inch)		4.8	7.5	16.0
Common Lambsquarters				
Weed density (ft ²)		6.6	10.8	
Height (inch)		0.6	1.6	1.6
Common Waterhemp				
Weed density (ft ²)		1.4	2.3	
Height (inch)		1.4	2.3	1.1
Giant Foxtail				
Weed density (ft ²)		0	1.0	
Height (inch)		0.0	2.1	2.1
Rainfall after each application (inch)				
Week 1	2.40	0.21	0.44	1.07
Week 2	1.63	5.25	0.35	0.25
Week 3	0.56	0.44	1.07	0.47

Table 2. Performance of herbicide systems for giant ragweed control in soybeans on June 17, and 26, July 5, 15, and 24, and September 25 and grain yield at 13% at Rochester, MN in 2013.

Treatment	Rate (rate/A)	Giant Ragweed Control (% Control)						Yield (bu/A)
		6/17	6/26	7/5	7/15	7/24	9/25	
Untreated 1		0	0	0	0	0	0	8.4
Weed Free		100	100	100	100	100	100	43.6
PRE / POST I (2" Weeds)								
Valor SX / Warrant + Roundup WeatherMax + N-Pa-K-AMS	2 oz/a / 3 pt/a + 32 fl oz/a + 3 qt/a	92	91	74	86	83	80	33.7
PRE / POST II (4" Weeds)								
Authority First* / Roundup PowerMax + N-Pa-K-AMS	6.4 oz/a / 32 oz/a + 3 qt/a	72	70	98	97	97	96	38.9
Boundary / FlexStar GT 3.5 + MSO + N-Pa-K-AMS	1.5 pt/a / 3.5 pt/a + 0.5% v/v + 3 qt/a	14	13	98	94	96	96	36.9
Boundary / Touchdown Total + N-Pa-K-AMS	1.5 pt/a / 28 oz/a + 3 qt/a	14	13	97	91	92	91	40.9
Gangster V / Ganster FR / Roundup PowerMax + N-Pa-K-AMS	2 fl oz/a + 0.4 oz/a / 32 fl oz/a + 3 qt/a	80	81	99	97	98	96	40.1
Fierce / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	39	41	97	95	95	94	39.5
Valor SX / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	48	50	97	95	95	95	41.2
Fierce + Classic / Roundup PowerMax + N-Pa-K-AMS	3 oz/a + 0.33 oz/a / 32 fl oz/a + 3 qt/a	59	65	97	96	94	93	41.0
Optil PRO (Optil + Outlook) / Roundup PowerMax + NIS + N-Pa-K-AMS	12 oz/a (2 oz/a + 10 fl oz/a) / 32 fl oz/a + 0.25% v/v + 3 qt/a	59	63	97	97	97	96	36.7
Verdict +Outlook / Roundup PowerMax + NIS + N-Pa-K-AMS	5 fl oz/a + 10 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	50	52	98	95	94	93	39.0
Zidua + Verdict / Roundup PowerMax + NIS + N-Pa-K-AMS	2 oz/a + 5 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	51	55	98	96	97	95	40.5
Sonic* / Durango DMA + N-Pa-K-AMS	3 oz/a / 24 fl oz/a + 3 qt/a	64	63	97	94	94	94	44.8
Sonic* / Durango DMA + N-Pa-K-AMS	4.5 oz/a / 24 fl oz/a + 3 qt/a	61	62	97	96	96	96	41.2
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 3 qt/a	55	60	97	94	94	91	40.8
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + Harmony SG +N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 0.125 oz/a + 3 qt/a	56	60	98	95	95	94	40.2
Warrant / Roundup WeatherMax + N-Pa-K-AMS	3 pt/a / 32 fl oz/a + 3 qt/a	0	0	97	94	93	92	42.0
POST I (2" Weeds)								
Marvel + Roundup PowerMax + NIS + N-Pa-K-AMS	6 fl oz/a + 32 fl oz/a + 0.25% v/v + 3 qt/a	95	89	70	88	84	78	29.6
POST I (2" Weeds) / POST III (2-4" regrowth)								
Roundup WeatherMax + N-Pa-K-AMS / Roundup WeatherMax + N-Pa-K-AMS	32 oz/a + 3 qt/a / 32 fl oz/a + 3 qt/a	86	86	70	95	99	99	38.7
Durango DMA + FirstRate + N-Pa-K-AMS / Durango DMA + N-Pa-K-AMS	24 fl oz/a + 0.3 oz/a + 3 qt/a / 24 oz/a + 3 qt/a	86	88	84	97	98	99	43.7
Flexstar GT 3.5 + MSO + N-Pa-K-AMS / Touchdown Total + N-Pa-K-AMS	3.5 pt/a + 0.5% v/v + 3 qt/a / 28 oz/a + 3 qt/a	95	90	82	97	99	99	42.3
Synchrony (chlorimuron + thifensulfuron) + Abundit S + N-Pa-K-AMS / Abundit Extra + N-Pa-K-AMS	0.375 oz/a (0.33 oz/a + 0.05 oz/a) + 32 fl oz/a + 3 qt/a / 32 oz/a + 3 qt/a	79	80	68	95	97	98	42.8
Roundup PowerMax + Cobra + COC + N-Pa-K-AMS / Roundup PowerMax + N-Pa-K-AMS	32 fl oz/a + 12.5 fl oz/a + 1 pt/a + 3 qt/a / 32 oz/a + 3 qt/a	97	90	73	97	98	98	39.1
	LSD (P=0.10)	6	6	6	2	3	4	6.2

*AuthorityFirst and Sonic are both sulfentrazone + cloransulam package mixes marketed by FMC and Dow, respectively.

Table 3. Performance of herbicide systems for common lambsquarters control in soybeans on June 17, and 26, July 5, 15, and 24, and September 25 and grain yield at 13% at Rochester, MN, in 2013.

Treatment	Rate (rate/A)	Common Lambsquarters Control						Yield (bu/A)
		6/17	6/26	7/5	7/15	7/24	9/25	
Untreated 1		0	0	0	0	0	0	8.4
Weed Free		100	100	100	100	100	100	43.6
PRE / POST I (2" Weeds)								
Valor SX / Warrant + Roundup WeatherMax + N-Pa-K-AMS	2 oz/a / 3 pt/a + 32 fl oz/a + 3 qt/a	99	99	97	96	94	96	33.7
PRE / POST II (4" Weeds)								
Authority First */ Roundup PowerMax + N-Pa-K-AMS	6.4 oz/a / 32 oz/a + 3 qt/a	99	99	99	99	99	99	38.9
Boundary / FlexStar GT 3.5 + MSO + N-Pa-K-AMS	1.5 pt/a / 3.5 pt/a + 0.5% v/v + 3 qt/a	99	99	99	98	97	97	36.9
Boundary / Touchdown Total + N-Pa-K-AMS	1.5 pt/a / 28 oz/a + 3 qt/a	99	99	99	97	94	92	40.9
Gangster V / Ganster FR / Roundup PowerMax + N-Pa-K-AMS	2 fl oz/a + 0.4 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	98	98	40.1
Fierce / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	98	98	97	39.5
Valor SX / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	98	98	41.2
Fierce + Classic / Roundup PowerMax + N-Pa-K-AMS	3 oz/a + 0.33 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	98	41.0
Optil PRO (Optil + Outlook) / Roundup PowerMax + NIS + N-Pa-K-AMS	12 oz/a (2 oz/a + 10 fl oz/a) / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	99	99	36.7
Verdict +Outlook / Roundup PowerMax + NIS + N-Pa-K-AMS	5 fl oz/a + 10 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	91	99	94	90	87	39.0
Zidua + Verdict / Roundup PowerMax + NIS + N-Pa-K-AMS	2 oz/a + 5 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	97	99	97	96	95	40.5
Sonic* / Durango DMA + N-Pa-K-AMS	3 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	99	99	99	44.8
Sonic* / Durango DMA + N-Pa-K-AMS	4.5 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	99	99	99	41.2
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 3 qt/a	99	99	99	99	98	99	40.8
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + Harmony SG +N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 0.125 oz/a + 3 qt/a	99	99	99	99	99	99	40.2
Warrant / Roundup WeatherMax + N-Pa-K-AMS	3 pt/a / 32 fl oz/a + 3 qt/a	63	31	99	98	98	98	42.0
POST I (2" Weeds)								
Marvel + Roundup PowerMax + NIS + N-Pa-K-AMS	6 fl oz/a + 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	87	80	80	29.6
POST I (2" Weeds) / POST III (2-4" regrowth)								
Roundup WeatherMax + N-Pa-K-AMS / Roundup WeatherMax + N-Pa-K-AMS	32 oz/a + 3 qt/a / 32 fl oz/a + 3 qt/a	99	98	80	98	98	98	38.7
Durango DMA + FirstRate + N-Pa-K-AMS / Durango DMA + N-Pa-K-AMS	24 fl oz/a + 0.3 oz/a + 3 qt/a / 24 oz/a + 3 qt/a	99	99	98	99	98	98	43.7
Flexstar GT 3.5 + MSO + N-Pa-K-AMS / Touchdown Total + N-Pa-K-AMS	3.5 pt/a + 0.5% v/v + 3 qt/a / 28 oz/a + 3 qt/a	99	99	98	99	98	98	42.3
Synchrony (chlorimuron + thifensulfuron) + Abundit S + N-Pa-K-AMS / Abundit Extra + N-Pa-K-AMS	0.375 oz/a (0.33 oz/a + 0.05 oz/a) + 32 fl oz/a + 3 qt/a / 32 oz/a + 3 qt/a	99	98	97	99	95	94	42.8
Roundup PowerMax + Cobra + COC + N-Pa-K-AMS / Roundup PowerMax + N-Pa-K-AMS	32 fl oz/a + 12.5 fl oz/a + 1 pt/a + 3 qt/a / 32 oz/a + 3 qt/a	99	98	93	99	96	95	39.1
	LSD (P=0.10)	2	2	3	2	3	3	6.2

*AuthorityFirst and Sonic are both sulfentrazone + cloransulam package mixes marketed by FMC and Dow, respectively.

Table 4. Performance of herbicide systems for common waterhemp control in soybeans on June 17, and 26, July 5, 15, and 24, and September 25 and grain yield at 13% at Rochester, MN, in 2013.

Treatment	Rate (rate/A)	Common Waterhemp Control (% Control)					Yield (bu/A)	
		6/17	6/26	7/5	7/15	7/24		9/25
Untreated 1		0	0	0	0	0	8.4	
Weed Free		100	100	100	100	100	43.6	
PRE / POST I (2" Weeds)								
Valor SX / Warrant + Roundup WeatherMax + N-Pa-K-AMS	2 oz/a / 3 pt/a + 32 fl oz/a + 3 qt/a	99	99	99	99	99	33.7	
PRE / POST II (4" Weeds)								
Authority First* / Roundup PowerMax + N-Pa-K-AMS	6.4 oz/a / 32 oz/a + 3 qt/a	99	99	99	99	99	38.9	
Boundary / FlexStar GT 3.5 + MSO + N-Pa-K-AMS	1.5 pt/a / 3.5 pt/a + 0.5% v/v + 3 qt/a	99	99	99	99	99	36.9	
Boundary / Touchdown Total + N-Pa-K-AMS	1.5 pt/a / 28 oz/a + 3 qt/a	99	99	99	99	97	40.9	
Gangster V / Ganster FR / Roundup PowerMax + N-Pa-K-AMS	2 fl oz/a + 0.4 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	40.1	
Fierce / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	39.5	
Valor SX / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	41.2	
Fierce + Classic / Roundup PowerMax + N-Pa-K-AMS	3 oz/a + 0.33 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	41.0	
Optil PRO (Optil + Outlook) / Roundup PowerMax + NIS + N-Pa-K-AMS	12 oz/a (2 oz/a + 10 fl oz/a) / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	97	95	36.7	
Verdict +Outlook / Roundup PowerMax + NIS + N-Pa-K-AMS	5 fl oz/a + 10 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	96	39.0	
Zidua + Verdict / Roundup PowerMax + NIS + N-Pa-K-AMS	2 oz/a + 5 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	99	40.5	
Sonic* / Durango DMA + N-Pa-K-AMS	3 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	99	99	44.8	
Sonic* / Durango DMA + N-Pa-K-AMS	4.5 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	98	98	41.2	
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 3 qt/a	99	99	99	99	98	40.8	
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + Harmony SG +N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 0.125 oz/a + 3 qt/a	99	99	99	99	99	40.2	
Warrant / Roundup WeatherMax + N-Pa-K-AMS	3 pt/a / 32 fl oz/a + 3 qt/a	97	96	99	99	99	42.0	
POST I (2" Weeds)								
Marvel + Roundup PowerMax + NIS + N-Pa-K-AMS	6 fl oz/a + 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	96	29.6	
POST I (2" Weeds) / POST III (2-4" regrowth)								
Roundup WeatherMax + N-Pa-K-AMS / Roundup WeatherMax + N-Pa-K-AMS	32 oz/a + 3 qt/a / 32 fl oz/a + 3 qt/a	99	98	82	99	99	38.7	
Durango DMA + FirstRate + N-Pa-K-AMS / Durango DMA + N-Pa-K-AMS	24 fl oz/a + 0.3 oz/a + 3 qt/a / 24 oz/a + 3 qt/a	99	98	87	99	99	43.7	
Flexstar GT 3.5 + MSO + N-Pa-K-AMS / Touchdown Total + N-Pa-K-AMS	3.5 pt/a + 0.5% v/v + 3 qt/a / 28 oz/a + 3 qt/a	99	99	99	99	99	42.3	
Synchrony (chlorimuron + thifensulfuron) + Abundit S + N-Pa-K-AMS / Abundit Extra + N-Pa-K-AMS	0.375 oz/a (0.33 oz/a + 0.05 oz/a) + 32 fl oz/a + 3 qt/a / 32 oz/a + 3 qt/a	99	98	99	99	99	42.8	
Roundup PowerMax + Cobra + COC + N-Pa-K-AMS / Roundup PowerMax + N-Pa-K-AMS	32 fl oz/a + 12.5 fl oz/a + 1 pt/a + 3 qt/a / 32 oz/a + 3 qt/a	99	99	98	99	99	39.1	
LSD (P=0.10)		1	2	4	1	2	1	6.2

*AuthorityFirst and Sonic are both sulfentrazone + cloransulam package mixes marketed by FMC and Dow, respectively.

Table 5. Performance of herbicide systems for grass control in soybeans on June 17, and 26, July 5, 15, and 24, and September 25, and grain yield at 13% at Rochester, MN, in 2013.

Treatment	Rate (rate/A)	Grass Control (% Control)						Yield (bu/A)
		6/17	6/26	7/5	7/15	7/24	9/25	
Untreated 1		0	0	0	0	0	0	8.4
Weed Free		100	100	100	100	100	100	43.6
PRE / POST I (2" Weeds)								
Valor SX / Warrant + Roundup WeatherMax + N-Pa-K-AMS	2 oz/a / 3 pt/a + 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	33.7
PRE / POST II (4" Weeds)								
Authority First* / Roundup PowerMax + N-Pa-K-AMS	6.4 oz/a / 32 oz/a + 3 qt/a	99	99	99	99	99	99	38.9
Boundary / FlexStar GT 3.5 + MSO + N-Pa-K-AMS	1.5 pt/a / 3.5 pt/a + 0.5% v/v + 3 qt/a	99	99	99	99	99	99	36.9
Boundary / Touchdown Total + N-Pa-K-AMS	1.5 pt/a / 28 oz/a + 3 qt/a	99	99	99	99	99	99	40.9
Gangster V / Ganster FR / Roundup PowerMax + N-Pa-K-AMS	2 fl oz/a + 0.4 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	40.1
Fierce / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	39.5
Valor SX / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	98	99	41.2
Fierce + Classic / Roundup PowerMax + N-Pa-K-AMS	3 oz/a + 0.33 oz/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	41.0
Optil PRO (Optil + Outlook) / Roundup PowerMax + NIS + N-Pa-K-AMS	12 oz/a (2 oz/a + 10 fl oz/a) / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	98	99	36.7
Verdict +Outlook / Roundup PowerMax + NIS + N-Pa-K-AMS	5 fl oz/a + 10 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	97	99	39.0
Zidua + Verdict / Roundup PowerMax + NIS + N-Pa-K-AMS	2 oz/a + 5 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	99	99	99	40.5
Sonic* / Durango DMA + N-Pa-K-AMS	3 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	99	99	99	44.8
Sonic* / Durango DMA + N-Pa-K-AMS	4.5 oz/a / 24 fl oz/a + 3 qt/a	99	99	99	99	99	99	41.2
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	40.8
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + Harmony SG +N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 0.125 oz/a + 3 qt/a	99	99	99	99	98	99	40.2
Warrant / Roundup WeatherMax + N-Pa-K-AMS	3 pt/a / 32 fl oz/a + 3 qt/a	99	99	99	99	99	99	42.0
POST I (2" Weeds)								
Marvel + Roundup PowerMax + NIS + N-Pa-K-AMS	6 fl oz/a + 32 fl oz/a + 0.25% v/v + 3 qt/a	99	99	99	98	96	98	29.6
POST I (2" Weeds) / POST III (2-4" regrowth)								
Roundup WeatherMax + N-Pa-K-AMS / Roundup WeatherMax + N-Pa-K-AMS	32 oz/a + 3 qt/a / 32 fl oz/a + 3 qt/a	99	99	97	99	99	99	38.7
Durango DMA + FirstRate + N-Pa-K-AMS / Durango DMA + N-Pa-K-AMS	24 fl oz/a + 0.3 oz/a + 3 qt/a / 24 oz/a + 3 qt/a	99	99	99	99	99	99	43.7
Flexstar GT 3.5 + MSO + N-Pa-K-AMS / Touchdown Total + N-Pa-K-AMS	3.5 pt/a + 0.5% v/v + 3 qt/a / 28 oz/a + 3 qt/a	99	99	99	99	99	99	42.3
Synchrony (chlorimuron + thifensulfuron) + Abundit S + N-Pa-K-AMS / Abundit Extra + N-Pa-K-AMS	0.375 oz/a (0.33 oz/a + 0.05 oz/a) + 32 fl oz/a + 3 qt/a / 32 oz/a + 3 qt/a	99	98	93	99	97	98	42.8
Roundup PowerMax + Cobra + COC + N-Pa-K-AMS / Roundup PowerMax + N-Pa-K-AMS	32 fl oz/a + 12.5 fl oz/a + 1 pt/a + 3 qt/a / 32 oz/a + 3 qt/a	99	99	99	99	99	99	39.1
	LSD (P=0.10)	0	1	2	1	2	1	6.2

*AuthorityFirst and Sonic are both sulfentrazone + cloransulam package mixes marketed by FMC and Dow, respectively.

Table 6. Crop response to herbicide systems on June 19, 26, and July 5, 15 and 24 and grain yield at 13% at Rochester, MN, in 2013.

Treatment	Rate (rate/A)	Injury					Yield / (bu/A)
		6/19	6/26	7/5	7/15	7/24	
Untreated 1							8.4
Weed Free							43.6
PRE / POST I (2" Weeds)							
Valor SX / Warrant + Roundup WeatherMax + N-Pa-K-AMS	2 oz/a / 3 pt/a + 32 fl oz/a + 3 qt/a	0	0	20	0	0	33.7
PRE / POST II (4" Weeds)							
Authority First */ Roundup PowerMax + N-Pa-K-AMS	6.4 oz/a / 32 oz/a + 3 qt/a	0	0	3	0	0	38.9
Boundary / FlexStar GT 3.5 + MSO + N-Pa-K-AMS	1.5 pt/a / 3.5 pt/a + 0.5% v/v + 3 qt/a	0	0	68	9	0	36.9
Boundary / Touchdown Total + N-Pa-K-AMS	1.5 pt/a / 28 oz/a + 3 qt/a	0	0	0	0	0	40.9
Gangster V / Ganster FR / Roundup PowerMax + N-Pa-K-AMS	2 fl oz/a + 0.4 oz/a / 32 fl oz/a + 3 qt/a	0	0	14	0	0	40.1
Fierce / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	0	0	0	0	0	39.5
Valor SX / Roundup PowerMax + N-Pa-K-AMS	3 oz/a / 32 fl oz/a + 3 qt/a	0	0	0	0	0	41.2
Fierce + Classic / Roundup PowerMax + N-Pa-K-AMS	3 oz/a + 0.33 oz/a / 32 fl oz/a + 3 qt/a	0	0	3	1	0	41.0
Optil PRO (Optil + Outlook) / Roundup PowerMax + NIS + N-Pa-K-AMS	12 oz/a (2 oz/a + 10 fl oz/a) / 32 fl oz/a + 0.25% v/v + 3 qt/a	3	0	8	5	0	36.7
Verdict +Outlook / Roundup PowerMax + NIS + N-Pa-K-AMS	5 fl oz/a + 10 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	11	0	15	4	0	39.0
Zidua + Verdict / Roundup PowerMax + NIS + N-Pa-K-AMS	2 oz/a + 5 fl oz/a / 32 fl oz/a + 0.25% v/v + 3 qt/a	11	0	13	5	0	40.5
Sonic* / Durango DMA + N-Pa-K-AMS	3 oz/a / 24 fl oz/a + 3 qt/a	0	0	0	0	0	44.8
Sonic* / Durango DMA + N-Pa-K-AMS	4.5 oz/a / 24 fl oz/a + 3 qt/a	0	0	0	0	0	41.2
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 3 qt/a	0	0	0	0	0	40.8
Enlite (chlorimuron + thifensulfuron + flumioxazin) / Abundit Extra + Harmony SG +N-Pa-K-AMS	2.8 oz/a (0.33 oz/a + 0.5 oz/a + 2 oz/a) / 32 fl oz/a + 0.125 oz/a + 3 qt/a	0	0	58	13	0	40.2
Warrant / Roundup WeatherMax + N-Pa-K-AMS	3 pt/a / 32 fl oz/a + 3 qt/a	0	0	0	0	0	42.0
POST I (2" Weeds)							
Marvel + Roundup PowerMax + NIS + N-Pa-K-AMS	6 fl oz/a + 32 fl oz/a + 0.25% v/v + 3 qt/a	76	41	26	9	0	29.6
POST I (2" Weeds) / POST III (2-4" regrowth)							
Roundup WeatherMax + N-Pa-K-AMS / Roundup WeatherMax + N-Pa-K-AMS	32 oz/a + 3 qt/a / 32 fl oz/a + 3 qt/a	0	0	0	0	0	38.7
Durango DMA + FirstRate + N-Pa-K-AMS / Durango DMA + N-Pa-K-AMS	24 fl oz/a + 0.3 oz/a + 3 qt/a / 24 oz/a + 3 qt/a	5	0	0	0	0	43.7
Flexstar GT 3.5 + MSO + N-Pa-K-AMS / Touchdown Total + N-Pa-K-AMS	3.5 pt/a + 0.5% v/v + 3 qt/a / 28 oz/a + 3 qt/a	66	41	16	4	0	42.3
Synchrony (chlorimuron + thifensulfuron) + Abundit S + N-Pa-K-AMS / Abundit Extra + N-Pa-K-AMS	0.375 oz/a (0.33 oz/a + 0.05 oz/a) + 32 fl oz/a + 3 qt/a / 32 oz/a + 3 qt/a	20	8	13	2	0	42.8
Roundup PowerMax + Cobra + COC + N-Pa-K-AMS / Roundup PowerMax + N-Pa-K-AMS	32 fl oz/a + 12.5 fl oz/a + 1 pt/a + 3 qt/a / 32 oz/a + 3 qt/a	84	58	31	12	0	39.1
	LSD (P=0.10)	3	2	5	2	0	6.2

*AuthorityFirst and Sonic are both sulfentrazone + cloransulam package mixes marketed by FMC and Dow, respectively.