Soybean Herbicide Management with Preemergence and Postemergence applications of Anthem at Rosemount, MN - 2011. Gunsolus, Jeffrey L. and Douglas W. Miller. The objective of this experiment was to evaluate crop safety and weed control with Anthem and several other herbicides applied preemergence and/or postemergence in a Roundup Ready weed control system. The experiment was conducted at Rosemount, MN on a Waukegon silt loam soil. Following corn, the experimental area was fall plowed. In the spring, the field was field cultivated on April 15 and April 25. Pioneer 91Y92 soybeans were planted on May 27 with 30 inch row spacing. The experimental design was a randomized complete block with four replications and plot size was 15 by 25 ft. All herbicide treatments were applied to a center 10 ft strip with a CO_2 powered backpack sprayer utilizing a six nozzle boom with 20 inch nozzle spacing, 11002VS XR Teejet flat-fan nozzles, 30 psi pressure, and a spray volume of 20 gpa. Sequential Roundup treatments were not applied to the fourth replication so that residual effects of the preemergence and early post treatments could be noted. Application dates, environmental conditions, and weed data are presented below. Crop injury and weed control ratings are presented in Tables 1 and 2.

Treatment Date	**May 27**	**June 16**	**July 13**	**July 21**
Application	**preemergence**	**early post**	**sequential to preemergence**	**sequential to early post**
Application Time	1:30 - 1:50pm	3:00 - 3:30pm	2:45 – 3:00pm	11:45am
Actual Soybean Stage	--	VC-V1	(not recorded)	14-20” flowering
Air Temperature (°F)	63	74	76	78
Relative humidity (%)	45	59	44	46
Dewpoint (°F)	41	59	53	56
Soil Moisture	dry	moist	moist at 0.25”	moist at 0.5”
Soil Temperature (°F)	56	72	81	79
Sky	cloudy	40 % clouds	75 % clouds	25 % clouds
Wind (mph)	SE 5-12	W 5	E 8	calm
Rainfall before Application				
Week 1 (inch)	2.18	1.93	1.46	2.70
Rainfall after Application				
Week 1 (inch)	0.97	2.46	2.74	0.58
Week 2 (inch)	0.12	0.02	0.57	0.89
Weed Stages				
Common Lambsquarters - Colq	--	0.5-3” / 2-9 lf	3-15”	2-6”
Common Ragweed - Corw	--	0.5-2.5” / 2-10 lf	2-15”	2-10”
Pigweed species	--	0.5-1.5” / 2-3 lf	2-8”	8-12”
Pennsylvania Smartweed - Pesw	--	0.25-3” / 5-6 lf	15” diameter	2-6”
Wild Mustard - Wimu	--	0.5” / 2 lf	2-6”	1-4”
Grass species	--	1-2” / 2-4 lf	NA	6-12”

Weed Density	Early (June 13) plants/ft^2	Late (July 26) plants/ft^2
Common Lambsquarters - Colq	1.0	2.0
Common Ragweed - Corw	0.8	0.9
Pigweed species	0.2	0.6
- primarily Powell amaranth		
Pennsylvania Smartweed - Pesw	0.1	0.8
Wild Mustard - Wimu	scattered	0.3
Grass species	0.2 (mixed species)	--
- Barnyardgrass	--	0.2
- Giant Foxtail	--	0.1
- Large Crabgrass	--	0.4
- Woolly Cupgrass	--	0.3
- Yellow Foxtail	--	scattered

Heavy rainfall occurred on May 28 followed by a hot, dry period that resulted in severe soil crusting and poor soybean and weed emergence. The experimental area was rotary hoed at a speed of 1.2 mph on June 13 to break up the soil surface, but that did not result in a significant increase in soybean emergence. Soybean plants that emerged were chlorotic and had shredded leaves, therefore any possible preemergence herbicide injury symptoms could not be discerned. Soybean injury was observed 8 days after the early postemergence treatments were applied and the data are presented in Table 1. The greatest injury was observed on the Prefix treatment followed by the Anthem treatment. In both treatments, leaf yellowing was observed on the tips of the first trifoliate leaf. In addition, those leaf tips in the Prefix treated plots exhibited a v-shaped notch. Flexstar GT and Extreme treated soybeans exhibited some leaf speckling and slight chlorosis, respectively.

Common lambsquarters and common ragweed populations were the most consistent of the weeds present. Pigweed species, Pennsylvania smartweed, and grass species populations were generally light and variable throughout the experimental area. Wild mustard populations were high and consistent prior to cultivation, but light and variable after planting, likely due to the warmer conditions. A second flush of weed growth occurred around the July 21 rating date. This was noted in the weed count data and also in range of weed heights recorded at the sequential application dates presented above. The second flush also included eastern black nightshade and velvetleaf, but the populations were too variable to rate. The sequential Roundup applications (in particular, the July 13 preemergence sequential) were applied later than would normally be recommended. As a result, larger ragweed and smartweed were not adequately controlled.

Preemergence Treatment Weed Control

Nearly six inches of rain was received between the time of the preemergence applications and the end of June. At the July 12 rating date, large treatment differences were observed in weed control among the preemergence treatments (Table 1).

Authority First, Authority Assist, Anthem + Authority First, and Authority MTZ provided good to excellent control of common lambsquarters. Lambsquarters control was fair to poor with Anthem and Fierce. Prefix appeared to provide little or no lambsquarters control. The sequential Roundup application controlled the existing lambsquarters. The August 11 ratings reflect late emerging lambsquarters in the Anthem, Fierce, and Prefix treatments.

Initial control of common ragweed was good to excellent with Authority First, Anthem + Authority First, and Prefix. Control was fair with Anthem alone and Authority Assist. Fierce provided fair to poor control and control with Authority MTZ was poor. As noted earlier, some of the common ragweed not controlled by the preemergence herbicides were large (up to 15 inches) and were not completely controlled by the sequential Roundup application. The August 11 control ratings represent those poorly controlled ragweed as there were little or no late emerging ragweed noted at that date.

Initial populations of pigweed were very low and variable. More pigweed uniformly emerged later in the season. The total numbers may not have been adequately represented in the late season weed counts as those counts were taken in the weedy check plots which were densely covered with common lambsquarters and common ragweed. Pigweed control was generally excellent for all treatments at both the July 12 and August 11 rating dates. The lower rating with Authority MTZ on July was due to a low rating assigned to one of the four replications. Like common lambsquarters, the Roundup sequential controlled all preemergence escapes and the final rating represented only late emerging pigweeds, which were very few.

Pennsylvania smartweed control was generally good to excellent with some lower ratings for Anthem, Authotity MTZ, and Fierce. Populations were highly variable however, and ratings for these three treatments varied greatly between replications. There were few later emerging smartweed. Larger smartweed was hard to control with the Roundup sequential, similar to the common ragweed. The August ratings represent those older surviving plants.

As already noted, the wild mustard populations were also very light and variable. Control was excellent for all preemergence treatments except Anthem and Authority MTZ. The August rating represents some late emerging mustard as the Roundup sequential controlled existing mustard at that application time.

Grasses were not rated on July 12 due to low populations. Late emerging grass populations were also light but more consistent throughout the plots. On August 11, the Anthem treatment was the only treatment that had no grass species present.

Early Postemergence Treatment Weed Control
Overall weed control was excellent on July 12 as the early postemergence glyphosate controlled emerged weeds. Ratings on July 12 and 21 represent newly emerged weeds. The early post Anthem treatment had new populations of all broadleaf weeds except pigweed on July 21. The Prefix treatment had lambsquarters, ragweed, and smartweed. The Flexstar GT treatment was notable for grasses present (mostly barnyardgrass) with some lambsquarters, pigweed, and smartweed. The Extreme was also notable for grasses (mostly large crabgrass) and also common ragweed. The Roundup sequential controlled most of these weeds except for the larger common ragweed and Pennsylvania smartweed (these weeds were greatly suppressed however).

Replication 4
Sequential Roundup treatments were not applied to rep 4 so that soil residual herbicide activity could be observed. These results are shown in Table 2. The results shown for the early post treatments follow the observations noted above with the exception that no pigweed was present in rep 4 of the Flexstar GT treatment.

As would be expected, the initial rating of the preemergence treatments generally follows the results outlined above for the broadleaf species. For the treatments that initially had good to excellent control of broadleaf weeds, control of those weeds was generally maintained throughout the rating period with a few exceptions. Among those exceptions: The Anthem treatment had late emerging pigweed. Authority First had lambsquarters, ragweed and pigweed. Authority Assist had common ragweed. The Anthem + Authority First treatment had lambsquarters, ragweed and pigweed. For the other treatments here broadleaf weed control was initially fair to poor, control ratings went down generally as a result of weeds growing larger and with the addition of late emerging weeds. Some degree of grass control or suppression was maintained by all preemergence treatments. Authority First and Authority MTZ were the least effective on grass species.

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Table 1. Visual soybean injury and weed control ratings

		Soybean	Weed Control																
		Injury	Colq			Corw			pigweed species			Pesw			Wimu			grass species	
Herbicide Treatment[1]	Rate	6/24	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/21	8/11
	(product/A)	(%)	(%)																
(Preemergence May 27) and (Postemergence June 13)																			
(Anthem[2]) + (Roundup[3] + AMS[4])	(8 oz) + (22 oz+ 8 pt)	--	45	--	94	65	--	88	99	--	100	68	--	83	53	--	97	--	100
(Authority First[5]) + (Roundup + AMS)	(6.4 oz) + (22 oz+ 8 pt)	--	96	--	100	97	--	98	99	--	100	98	--	98	99	--	99	--	98
(Authority Assist[6]) + (Roundup + AMS)	(9 oz) + (22 oz+ 8 pt)	--	100	--	100	74	--	92	100	--	100	100	--	100	95	--	100	--	98
(Anthem + Authority First) + (Roundup + AMS)	(7 oz + 3.2 oz) + (22 oz+ 8 pt)	--	97	--	100	97	--	97	100	--	100	100	--	97	100	--	100	--	99
(Authority MTZ[7]) + (Roundup + AMS)	(16 oz) + (22 oz+ 8 pt)	--	85	--	100	29	--	83	86	--	99	74	--	83	68	--	98	--	99
(Fierce[8]) + (Roundup + AMS)	(3 oz) + (22 oz+ 8 pt)	--	58	--	99	48	--	90	100	--	100	80	--	85	100	--	99	--	99
(Prefix[9]) + (Roundup + AMS)	(2 pt) + (22 oz+ 8 pt)	--	5	--	93	86	--	92	98	--	99	91	--	83	100	--	99	--	99
(Postemergence June 16) and (Postemergence July 21)																			
(Anthem + Roundup + AMS) + (Roundup + AMS)	(8 oz + 22 oz + 8 pt) + (22 oz + 8 pt)	11	99	95	100	95	88	97	100	100	100	100	96	100	96	91	99	99	100
(Prefix + Roundup + AMS) + (Roundup + AMS)	(2 pt + 22 oz + 8 pt) + (22 oz + 8 pt)	20	99	97	100	100	97	100	100	100	100	99	96	98	100	100	100	99	100
(Flexstar GT[10]) + (Roundup + AMS)	(3 pt) + (22 oz + 8 pt)	6	99	95	99	99	99	100	99	96	100	100	95	97	100	100	100	83	100
(Extreme[11]) + (Roundup + AMS)	(3 pt) + (22 oz + 8 pt)	6	100	100	100	96	86	96	100	100	100	99	100	100	100	100	100	79	99
LSD (P=.05)		2.0	12.9	2.0	2.7	14.3	8.5	4.7	ns	ns	ns	19.6	ns	8.2	15.9	2.1	1.4	ns	1.0

[1] Treatments and rates in parenthesis represent a single application.

[2] Anthem 2.15SE = fluthiacet-methyl & pyroxasulfone.

[3] Roundup PowerMax 4.5L = glyphosate.

[4] AMS = N-Pak ammonium sulfate solution (3.4 lbs/gal).

[5] Authority First 70DF = 62% sulfentrazone & 8% chloransulam-methyl .

[6] Authority Assist 4SC = 3.33 lbs ai/gal sulfentrazone & 0.67 lbs ai/gal imazethapyr.

[7] Authority MTZ 45WG = 18% sulfentrazone & 27% metribuzin.

[8] Fierce 76WDG = 33.5% flumioxazin & 42.5% pyroxasulfone.

[9] Prefix 5.29EC = 4.34 lbs ai/gal s-metolachlor & 0.95 lbs ai/gal fomesafen.

[10] Flexstar GT 2.82L = 0.56 lb ai/gal fomesamen & 2.26 lb ae/gal glyphosate.

[11] Extreme 2.17L = 0.17 lb ae/gal imazethapyr & 2 lb ai/gal glyphosate salt.

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Table 2. Visual weed control ratings for rep 4 with no residual Roundup applied

		Weed Control																	
		Colq			Corw			pigweed species			Pesw			Wimu			grass species	
Herbicide Treatment	Rate	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/12	7/21	8/11	7/21	8/11
	(product/A)	(%)																
Preemergence May 27																		
Anthem[1]	8 oz	50	80	80	60	45	10	100	90	85	60	25	25	50	30	30	85	85
Authority First[2]	6.4 oz	99	99	95	99	95	90	100	100	95	100	100	100	100	100	100	90	50
Authority Assist[3]	9 oz	99	100	100	85	55	15	100	100	100	100	100	100	100	100	100	95	95
Anthem + Authority First	7 oz + 3.2 oz	99	95	85	99	95	80	100	95	95	100	100	100	100	100	100	95	95
Authority MTZ[4]	16 oz	95	100	100	65	45	10	100	100	100	30	30	30	50	20	20	50	50
Fierce[5]	3 oz	80	80	75	40	40	10	100	100	100	90	50	50	100	100	100	95	95
Prefix[6]	2 pt	10	15	0	90	95	90	100	100	100	90	50	50	100	99	99	95	90
Postemergence June 16																		
Anthem + Roundup[7] + AMS[8]	8 oz + 22 oz + 8 pt	99	95	85	95	90	70	100	100	100	100	90	90	95	90	90	99	99
Prefix + Roundup + AMS	2 pt + 22 oz + 8 pt	99	95	85	98	90	80	100	100	100	99	90	80	100	100	99	95	95
Flexstar GT[9]	3 pt	99	95	85	99	98	90	100	100	100	100	90	85	100	100	100	50	30
Extreme[10]	3 pt	100	100	98	95	95	85	100	100	100	100	100	100	100	100	100	85	40

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