

**Soybean weed management at Rosemount, MN - 2014.** Gunsolus, Jeffrey L., Douglas W. Miller, and Bradley Kinkaid. The objective of this experiment was to evaluate weed control and crop response with preemergence and postemergence applied herbicides in a Roundup Ready soybean system. The experiment was conducted at Rosemount, MN on a Waukegon silt loam soil with pH 6.5 and 4.1% organic matter. Soil test P and K were 14 and 172 lbs/A respectively. Following weedy fallow, the experimental area was fall chisel plowed. In the spring, 60 lbs/A P and 60 lbs/A K were applied and the area was field cultivated on May 5. The area was field cultivated again on May 22 and planted with Asgrow AG 1733 (RR) soybeans at a rate of 150,000 seeds/A with 30 inch row spacing. The experimental design was a randomized complete block with four replications and plot size was 10 by 30 ft. Herbicide treatments were applied with a tractor mounted, compressed air sprayer with an eight nozzle boom, 15 inch nozzle spacing, 110015VS XR Teejet flat-fan nozzles at 35 psi pressure producing a spray volume of 15 gpa. Plots were visually rated throughout the growing season. On October 6, giant ragweed plants with seed were counted in each plot (center 7.5 feet x 30 feet length). Soybean yields were determined by harvesting the two center rows of each plot. Application dates, environmental conditions, and weed data are presented below. Weed control data are presented in Tables 1 and 2. Soybean injury and yield data are presented in Table 2.

<b>Treatment Date</b>	<b>May 23</b>	<b>June 13</b>	<b>June 21</b>	<b>July 10</b>
Application Target	Preemergence	Early-Post 2" weeds & 2" weeds following Preemergence	Mid-Post 4" weeds & 4" weeds following Preemergence	Late-Post 2-4" weeds following Early-Post
Air Temperature (°F)	73	74	77	79
Relative humidity (%)	35	32	50	53
Dewpoint (°F)	44	43	57	61
Soil Moisture	dry to 1.0"	moist at 0.75-1"	moist at 0.1"	not recorded
Soil Temperature (°F)	69	81	85	not recorded
Sky	clear	40% clouds	5% clouds	10% clouds
Wind (mph)	calm	W 3-5	NE 2-3	SE 10
Rainfall before Application				
Week 1 (inch)	1.61	1.27	5.88	0.65
Rainfall after Application				
Week 1 (inch)	0.54	5.88	0.20	1.58
Week 2 (inch)	2.44	0.20	0.88	0.02
Soybean				
Stage	--	V1 (10%) –V2 (90%)	V3 (10%)-V4 (90%)	R1
Height (inch)	--	4-5	6-10	19-20
<b><u>Average weed density (plants/ft<sup>2</sup>) in untreated check</u></b>				
Common Lambsquarters – Colq	--	1.8	--	--
Common Ragweed - Corw	--	1.5	--	--
Giant Ragweed - Girw	--	0.8	--	--
Nightshade - Ebns	--	3.3	--	--
Amaranth species	--	1.6	--	--
Grass species	--	150-700 (most 300-400)	--	--
<b><u>Weed height (inches) / leaf stage</u></b>				
Common Lambsquarters - Colq	--	0.25-0.75 / cot-4lf	0.5-1"	0.25-2
Common Ragweed - Corw	--	0.25-3" / cot to 6lf	1-8" most 4"	up to 3"
Giant Ragweed - Girw	--	2-4" / 4-6lf	3-8" most 4-6"	8-11"
Nightshade - Ebns	--	0.25-1" / cot to 3lf	0.5-1.25"	0.5-1
Amaranth species	--	0.25-2" / cot to 6lf	0.5-4"	1- 2.5"
Grasses	--	0.25-5" / 1-4lf	0.5-7"	2-5"

## Results

### General observations

Broadleaf weed densities were generally low. Amaranth species included mainly redroot pigweed and Powell amaranth with low and variable populations of tall waterhemp. Common ragweed was the most evenly distributed broadleaf species. Giant ragweed was present throughout the experimental area but densities were variable. Ragweed species generally germinated early, a few late germinating ragweeds were noted at the July 9 rating date. Common lambsquarters, nightshade and in particular the amaranth species had mid-season germination flushes. Grass species densities were very high and heavy growth flushes occurred into July. Early populations consisted of giant and yellow foxtail and woolly cupgrass. Late germinating flushes consisted mainly of wild proso millet. Foxtails and proso millet were the most evenly distributed while woolly cupgrass populations were more variable.

Rainfall (0.54 inches) occurred 5 days after planting to activate the preemergence treatments. Total rainfall for the month of June was 10.57 inches. Spray drift of Status herbicide from an adjacent corn production field occurred on June 26. This resulted in soybean injury to the entire experiment. Leaf cupping occurred on the upper 3 to 4 leaves with greatest injury on the youngest leaves. Subsequent leaf growth was normal and the crop appeared to have recovered well.

### Weed Control

Preemergence control of lambsquarters, nightshade, and amaranth species was excellent for all species (Table 1). With the exception of some lambsquarters in the Warrant treatment, preemergence control remained at 100% for these broadleaf species when the postemergence sequential treatments were applied on June 21. On July 10, control of these species remained excellent overall. There was some late germination noted in a few treatments on July 10, mainly lambsquarters and amaranth species. Canopy closure in late July resulted in little to no competition from these broadleaf species for the remainder of the growing season. The Verdict + Outlook and the Warrant treatments had the lowest overall residual control of these broadleaf species. The Zidua + Verdict treatment had the lowest residual control of common lambsquarters. The single application of Dual + Flexstar GT on June 21 provided excellent season long control of these species. The early postemergence treatments (no preemergence application) initially controlled these broadleaf species but late flushes (especially amaranths) were present on July 10. The late postemergence application on July 10 controlled these weeds for the remainder of the season.

Initial grass control varied greatly among the preemergence treatments (Table 1). The Sonic treatments (in particular the 3 oz/A rate) had the poorest grass control, followed by Authority First + Anthem and the Warrant treatment. Woolly cupgrass was the predominate grass present in the Sonic treatments when rated on June 20. Foxtail control with Sonic was fair to good. It was not clear why the Authority First + Anthem treatment had lower control than the Authority First alone. All other treatments provided good to excellent grass control with the Fierce treatments being the best. The mid-postemergence sequential treatments controlled all grass species present at application time. The greatest residual grass control was maintained by the Dual II Magnum / Flexstar GT, Authority First + Anthem, and Boundary / Flexstar GT treatments. Authority First and the Sonic treatments had fair to good residual grass control. The mid-post tank-mix of Dual II Magnum + Flexstar GT resulted in excellent season long grass control. The three early-post / late-post treatments controlled all grass species present at application. Most grass germination was complete by July 10 and the late postemergence treatments applied on that date combine with subsequent canopy closure resulted in excellent grass control the remainder of the season.

Control of common ragweed was good to excellent for the majority of the preemergence treatments (Table 2). Boundary, Dual II Magnum, and Warrant treatments had poor control of common ragweed. The postemergence sequential treatments on June 21 controlled the common ragweed that was present. Preemergence residual control was excellent for most treatments. The Verdict + Outlook, Zidua + Verdict, and Warrant treatments had some late emerging common ragweed. In the Boundary and Dual treatments, Flexstar GT provided residual control of common ragweed. The single postemergence application of Dual + Flexstar GT on June 21 also controlled common ragweed season long. The late postemergence application of the three early-post / late-post treatments also resulted in season long control as little or no common ragweed emerged after July 10.

Preemergence control of giant ragweed was good to excellent with Authority First, Gangster, Fierce, Fierce + Classic, Valor SX, Valor SX + Warrant, and Optill + Outlook. Boundary, Dual II Magnum, and Warrant provided little to no control of giant ragweed (Table 2). The mid-postemergence sequential glyphosate treatments on June 21 provided a high degree of giant ragweed control and/or suppression. The giant ragweed population was suspected as having some level of glyphosate resistance which most likely contributed to lack of complete giant ragweed control with these sequential

treatments. In addition, giant ragweed size exceeded the target size (see application data above) at each of the postemergence application times. Nonetheless, subsequent soybean canopy competition resulted in excellent late season control of surviving giant ragweed in these treatments. While the Valor SX + Warrant (preemergence) treatment provided excellent early season control, the early-postemergence application of Roundup on June 13 did not completely control all giant ragweed. The additional time to soybean canopy closure (8 days) compared to the sequential treatments applied on June 21, allowed surviving giant ragweed to compete better with the soybean crop and this is reflected in the slightly lower control ratings at the July 10 and October 6 rating dates.

The single mid-postemergence application of Dual II Magnum + Flexstar GT on June 21 resulted in excellent giant ragweed control similar to the other mid-postemergence treatments that were applied on June 21. Of the three two-pass postemergence treatments, giant ragweed control with the early-postemergence application was lowest with the Roundup WeatherMax treatment. Synchrony + Abundit Extra had better control and Roundup PowerMax + Cobra provided excellent control. The sequential late-postemergence treatment plus soybean canopy competition resulted in good to excellent late season control, with the Roundup + Cobra / Roundup treatment providing the greatest control.

All herbicide treatments resulted in some giant ragweed plants remaining with seed prior to harvest. While there was some treatment differences in the number of giant ragweed plants producing seed between these treatments, the only significant difference was between the herbicide treated (plus the weedfree check) and the untreated check. Seed viability was not determined.

#### Soybean Injury and Yields

Of the preemergence treatments, Fierce and Valor SX caused moderate soybean injury. Injury was a “draw string” effect on the first trifoliolate leaf (Table 2). In the Fierce + Classic treatment, some stunting was noted in addition to the “draw string” effect. Gangster, Dual II Magnum, and Boundary also cause a “draw string” effect with the Dual II Magnum also causing a leaf “crinkling” effect. Enlite caused leaf “draw string” and slight chlorosis. The early postemergence treatment of Roundup PowerMax + Cobra caused a high degree of injury due to Cobra-induced leaf necrosis. Soybean stunting was also observed as a result of the Roundup + Cobra application. Applications of Flexstar GT on June 21 caused moderate injury with injury exhibited as a necrotic leaf speckling and chlorosis. These symptoms were more severe when Dual II Magnum was applied with Flexstar GT postemergence.

There were some significant yield differences noted. The mid-postemergence Dual II Magnum + Flexstar GT and two-pass Roundup + Cobra / Roundup treatments yielded significantly lower than the weedfree check. Since overall weed control was excellent for these treatments, herbicide injury could have contributed to the lower yields. Poor grass control and herbicide injury may have factored in the lower yields of some treatments compared to the weedfree check.

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Table 1. Weed control (part 1).

Treatment <sup>1</sup>	Rate <sup>1</sup> (product/A)	Weed Control												
		Colq			Ebns			Amaranths			Grass			
		6/20	7/10	10/6	6/20	7/10	10/6	6/20	7/10	10/6	6/20	7/10	10/6	
(%)														
<b>(Preemergence May 23) / (Mid-Postemergence June 21)</b>														
(Authority First <sup>2</sup> ) / (Roundup PowerMax <sup>3</sup> + AMS <sup>4</sup> )	(6.4 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	100	100	100	90	97	91
(Authority First + Anthem <sup>5</sup> ) / (Roundup PowerMax + AMS)	(6.4 oz + 8 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	100	100	100	69	99	99
(Boundary <sup>6</sup> ) / (Flexstar GT 3.5 <sup>7</sup> + MSO <sup>8</sup> + AMS)	(1.5 pt) / (3.5 pt + 9.6 oz + 3 qt)	100	100	100	100	100	100	100	100	100	100	96	99	98
(Dual II Magnum <sup>9</sup> ) / (Flexstar GT 3.5 + MSO + AMS)	(1.5 pt) / (3.5 pt + 9.6 oz + 3 qt)	100	99	100	100	100	100	100	100	100	100	98	99	99
(Gangster V <sup>10</sup> + Gangster FR <sup>11</sup> ) / (Roundup PowerMax + AMS)	(2 oz + 0.4 oz) / (32 oz + 3 qt)	100	99	100	100	100	100	100	100	100	100	95	92	69
(Fierce <sup>12</sup> ) / (Roundup PowerMax + AMS)	(3 oz) / (32 oz + 3 qt)	100	99	99	100	100	100	100	100	100	100	99	92	74
(Valor SX <sup>13</sup> ) / (Roundup PowerMax + AMS)	(3 oz) / (32 oz + 3 qt)	100	99	99	100	100	100	100	100	100	99	92	94	70
(Fierce + Classic <sup>14</sup> ) / (Roundup PowerMax + AMS)	(3 oz + 0.33 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	100	100	100	99	92	73
(Optill <sup>15</sup> + Outlook <sup>16</sup> ) / (Roundup PowerMax + NIS <sup>17</sup> + AMS)	(2 oz + 10 oz) / (32 oz + 4.8 oz + 3 qt)	100	100	100	100	99	99	100	99	100	100	97	88	75
(Verdict <sup>18</sup> + Outlook) / (Roundup PowerMax + NIS + AMS)	(5 oz + 10 oz) / (32 oz + 4.8 oz + 3 qt)	100	99	98	100	99	99	100	98	96	97	97	88	54
(Zidua <sup>19</sup> + Verdict) / (Roundup PowerMax + NIS + AMS)	(2 oz + 5 oz) / (32 oz + 4.8 oz + 3 qt)	100	97	95	100	100	100	100	99	99	97	97	95	86
(Sonic <sup>20</sup> ) / (Durango DMA <sup>21</sup> + AMS)	(3 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	98	99	36	94	83	
(Sonic) / (Durango DMA + AMS)	(4.5 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	100	100	68	96	87	
(Sonic) / (Durango DMA + FirstRate <sup>22</sup> + AMS)	(3 oz) / (32 oz + 0.3 oz + 3 qt)	100	100	99	100	100	100	100	100	99	36	97	90	
(Enlite <sup>23</sup> ) / (Abundit Extra <sup>24</sup> + AMS)	(2.8 oz) / (32 oz + 3 qt)	100	100	100	100	100	100	100	100	100	93	93	68	
(Enlite) / (Abundit Extra + Harmony SG <sup>25</sup> + AMS)	(2.8 oz) / (32 oz + 0.125 oz + 3 qt)	100	100	100	100	100	100	100	100	100	90	91	76	
(Warrant <sup>26</sup> ) / (Roundup WeatherMax <sup>27</sup> + AMS)	(3 pt) / (32 oz + 3 qt)	99	98	99	100	100	100	100	98	98	77	96	87	
<b>(Preemergence May 23) / (Early-Postemergence June 13)</b>														
(Valor SX + Warrant) / (Roundup WeatherMax + AMS)	(2 oz + 3 pt) / (32 oz + 3 qt)	100	98	100	100	100	100	100	99	100	99	95	84	
<b>(Mid-Postemergence June 21)</b>														
Dual II Magnum + Flexstar GT 3.5 + NIS + AMS	10 oz + 3.5 pt + 4.8 oz + 3 qt	--	100	99	--	100	100	--	100	100	--	99	98	
<b>(Early-Postemergence June 13) / (Late-Postemergence July 10)</b>														
(Roundup WeatherMax + AMS) / (Roundup WeatherMax + AMS)	(32 oz + 3 qt) / (32 oz + 3 qt)	--	97	100	--	99	100	--	91	100	--	55	99	
(Synchrony <sup>28</sup> + Abundit Extra + AMS) / (Abundit Extra + AMS)	(0.375 oz + 32 oz + 3 qt) / (32 oz + 3 qt)	--	99	100	--	99	100	--	97	100	--	70	99	
(Roundup Powermax + Cobra <sup>29</sup> + COC + AMS) / (Roundup PowerMax + AMS)	(32 oz + 12.5 oz + 1 pt + 3 qt) / (32 oz + 3 qt)	--	98	99	--	99	100	--	94	100	--	70	98	
Untreated Check	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Weed Free Check	--	100	100	100	100	100	100	100	100	100	100	100	100	100
LSD (0.05)		ns	2	ns	ns	ns	ns	ns	3	2	13	7	10	

<sup>1</sup> Treatments and rates in parenthesis represent a separate application timing.

<sup>2</sup> Authority First 70DF = 62% sulfentrazone & 8% chloransulam-methyl.

<sup>3</sup> Roundup PowerMax 4.5L = glyphosate.

<sup>4</sup> AMS = N-Pak ammonium sulfate solution (3.4 lbs/gal).

<sup>5</sup> Anthem 2.15SE = fluthiacet-methyl & pyroxasulfone.

<sup>6</sup> Boundary 6.5L = S-metolachlor (5.25 lb ai/gal) & metribuzin (1.25 lb ai/gal).

<sup>7</sup> Flexstar GT 3.5 2.82L = fomesafen (0.56 lb ai/gal) & glyphosate (2.26 lb ae/gal).

<sup>8</sup> MSO = methylated soybean oil.

<sup>9</sup> Dual II Magnum 7.64E = s-metolachlor.

<sup>10</sup> Gangster V 51DF = flumioxazin (part of Gangster package mix).

<sup>11</sup> Gangster FR 84DF = chloransulam-methyl (part of Gangster package mix).

<sup>12</sup> Fierce 76WDG = 33.5% flumioxazin & 42.5% pyroxasulfone.

<sup>13</sup> Valor SX 51WDG = flumioxazin.

<sup>14</sup> Classic 25WG = chlorimuron-ethyl.

<sup>15</sup> Optill 68WG = 17.8% saflufenacil & 50.2% imazethapyr.

<sup>16</sup> Outlook 6EC = 6.0 lbs ai/gal dimethenamid-P.

<sup>17</sup> NIS = Preference nonionic surfactant.

<sup>18</sup> Verdict 5.57EC = saflufenacil (0.57 lbs ai/gal) & dimethenamid-P (5.0 lbs ai/gal).

<sup>19</sup> Zidua 85WG = pyroxasulfone.

<sup>20</sup> Sonic 70DF = 62.1% sulfentrazone & 7.9% chloransulam-methyl.

<sup>21</sup> Durango DMA 4L = glyphosate.

<sup>22</sup> FirstRate 84DF = chloransulam-methyl.

<sup>23</sup> Enlite 47.86DG = chlorimuron ethyl (2.85%) & flumioxazin (36.21 %) & thifensulfuron methyl (8.80 %).

<sup>24</sup> Abundit Extra 3L = glyphosate.

<sup>25</sup> Harmony SG 50DF = thifensulfuron-methyl.

<sup>26</sup> Warrant 3CS = acetochlor.

<sup>27</sup> Roundup WeatherMax 4.5L = glyphosate.

<sup>28</sup> Synchrony 28.4WDG = 21.5% chlorimuron-ethyl & 6.9% thifensulfuron-methyl.

<sup>29</sup> Cobra 2EC = lactofen.

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**Table 2. Weed control (part 2), soybean injury, and soybean yields.**

Treatment <sup>2</sup>	Rate <sup>2</sup> (product/A)	Weed Control						Girw			Soybean Yield (bu/A)	
		Corw			Girw			Counts <sup>1</sup>	Soybean Injury			
		6/20	7/10	10/6	6/20	7/10	10/6	10/6	6/16	6/20		6/26
----- (%) -----												
<b>(Preemergence May 23) / (Mid-Postemergence June 21)</b>												
(Authority First <sup>3</sup> ) / (Roundup PowerMax <sup>4</sup> + AMS <sup>5</sup> )	(6.4 oz) / (32 oz + 3 qt)	99	100	100	96	99	99	58	0	0	0	58
(Authority First + Anthem <sup>6</sup> ) / (Roundup PowerMax + AMS)	(6.4 oz + 8 oz) / (32 oz + 3 qt)	100	100	100	50	98	95	736	0	0	10	61
(Boundary <sup>7</sup> ) / (Flexstar GT 3.5 <sup>8</sup> + MSO <sup>9</sup> + AMS)	(1.5 pt) / (3.5 pt + 9.6 oz + 3 qt)	28	100	100	0	99	99	97	5	0	11	63
(Dual II Magnum <sup>10</sup> ) / (Flexstar GT 3.5 + MSO + AMS)	(1.5 pt) / (3.5 pt + 9.6 oz + 3 qt)	8	100	100	5	99	99	97	8	0	11	62
(Gangster V <sup>11</sup> + Gangster FR <sup>12</sup> ) / (Roundup PowerMax + AMS)	(2 oz + 0.4 oz) / (32 oz + 3 qt)	100	99	100	93	99	99	58	9	5	1	59
(Fierce <sup>13</sup> ) / (Roundup PowerMax + AMS)	(3 oz) / (32 oz + 3 qt)	99	99	99	93	99	99	252	14	3	1	55
(Valor SX <sup>14</sup> ) / (Roundup PowerMax + AMS)	(3 oz) / (32 oz + 3 qt)	98	100	100	91	98	98	252	14	5	3	53
(Fierce + Classic <sup>15</sup> ) / (Roundup PowerMax + AMS)	(3 oz + 0.33 oz) / (32 oz + 3 qt)	100	100	100	88	97	97	542	18	6	0	60
(Optill <sup>16</sup> + Outlook <sup>17</sup> ) / (Roundup PowerMax + NIS <sup>18</sup> + AMS)	(2 oz + 10 oz) / (32 oz + 4.8 oz + 3 qt)	99	98	99	95	99	99	155	4	0	0	59
(Verdict <sup>19</sup> + Outlook) / (Roundup PowerMax + NIS + AMS)	(5 oz + 10 oz) / (32 oz + 4.8 oz + 3 qt)	91	97	98	83	99	99	155	3	0	0	59
(Zidua <sup>20</sup> + Verdict) / (Roundup PowerMax + NIS + AMS)	(2 oz + 5 oz) / (32 oz + 4.8 oz + 3 qt)	94	96	96	70	98	98	348	3	1	1	60
(Sonic <sup>21</sup> ) / (Durango DMA <sup>22</sup> + AMS)	(3 oz) / (32 oz + 3 qt)	94	99	99	71	99	98	290	0	0	0	62
(Sonic) / (Durango DMA + AMS)	(4.5 oz) / (32 oz + 3 qt)	100	99	99	41	97	97	445	0	0	0	62
(Sonic) / (Durango DMA + FirstRate <sup>23</sup> + AMS)	(3 oz) / (32 oz + 0.3 oz + 3 qt)	96	100	100	45	98	97	484	0	0	4	62
(Enlite <sup>24</sup> ) / (Abundit Extra <sup>25</sup> + AMS)	(2.8 oz) / (32 oz + 3 qt)	99	100	100	66	97	97	736	8	2	1	55
(Enlite) / (Abundit Extra + Harmony SG <sup>26</sup> + AMS)	(2.8 oz) / (32 oz + 0.125 oz + 3 qt)	99	99	100	73	98	98	387	9	1	8	56
(Warrant <sup>27</sup> ) / (Roundup WeatherMax <sup>28</sup> + AMS)	(3 pt) / (32 oz + 3 qt)	35	99	97	3	96	95	871	4	0	0	58
<b>(Preemergence May 23) / (Early-Postemergence June 13)</b>												
(Valor SX + Warrant) / (Roundup WeatherMax + AMS)	(2 oz + 3 pt) / (32 oz + 3 qt)	100	97	99	97	91	87	1936	11	5	1	58
<b>(Mid-Postemergence June 21)</b>												
Dual II Magnum + Flexstar GT 3.5 + NIS + AMS	10 oz + 3.5 pt + 4.8 oz + 3 qt	--	100	99	--	99	95	832	--	--	19	52
<b>(Early-Postemergence June 13) / (Late-Postemergence July 10)</b>												
(Roundup WeatherMax + AMS) / (Roundup WeatherMax + AMS)	(32 oz + 3 qt) / (32 oz + 3 qt)	--	96	100	--	84	96	1220	--	0	0	63
(Synchrony <sup>29</sup> + Abundit Extra + AMS) / (Abundit Extra + AMS)	(0.375 oz + 32 oz + 3 qt) / (32 oz + 3 qt)	--	99	100	--	92	93	1510	--	0	0	61
(Roundup Powermax + Cobra <sup>30</sup> + COC + AMS) / (Roundup PowerMax + AMS)	(32 oz + 12.5 oz + 1 pt + 3 qt) / (32 oz + 3 qt)	--	96	99	--	98	98	252	--	31	13	54
Untreated Check	--	--	--	--	--	--	--	16804	0	0	0	16
Weed Free Check	--	100	100	100	100	100	100	0	0	0	0	63
LSD (0.05)		17	3	2	20	4	4	2089	3	3	2	7

<sup>1</sup> Giant ragweed plants with seed.

<sup>2</sup> Treatments and rates in parenthesis represent a separate application timing.

<sup>3</sup> Authority First 70DF = 62% sulfentrazone & 8% chloransulam-methyl .

<sup>4</sup> Roundup PowerMax 4.5L = glyphosate.

<sup>5</sup> AMS = N-Pak ammonium sulfate solution (3.4 lbs/gal).

<sup>6</sup> Anthem 2.15SE = fluthiacet-methyl & pyroxasulfone.

<sup>7</sup> Boundary 6.5L = S-metolachlor (5.25 lb ai/gal) & metribuzin (1.25 lb ai/gal).

<sup>8</sup> Flexstar GT 3.5 2.82L = fomesafen (0.56 lb ai/gal) & glyphosate (2.26 lb ae/gal).

<sup>9</sup> MSO = methylated soybean oil.

<sup>10</sup> Dual II Magnum 7.64E = s-metolachlor.

<sup>11</sup> Gangster V 51DF = flumioxazin (part of Gangster package mix).

<sup>12</sup> Gangster FR 84DF = chloransulam-methyl (part of Gangster package mix).

<sup>13</sup> Fierce 76WDG = 33.5% flumioxazin & 42.5% pyroxasulfone.

<sup>14</sup> Valor SX 51WDG = flumioxazin.

<sup>15</sup> Classic 25WG = chlorimuron-ethyl.

<sup>16</sup> Optill 68WG = 17.8% saflufenacil & 50.2% imazethapyr.

<sup>17</sup> Outlook 6EC = 6.0 lbs ai/gal dimethenamid-P.

<sup>18</sup> NIS = Preference nonionic surfactant.

<sup>19</sup> Verdict 5.57EC = saflufenacil (0.57 lbs ai/gal) & dimethenamid-P (5.0 lbs ai/gal).

<sup>20</sup> Zidua 85WG = pyroxasulfone.

<sup>21</sup> Sonic 70DF = 62.1% sulfentrazone & 7.9% chloransulam-methyl.

<sup>22</sup> Durango DMA 4L = glyphosate.

<sup>23</sup> FirstRate 84DF = chloransulam-methyl.

<sup>24</sup> Enlite 47.86DG = chlorimuron ethyl (2.85%) & flumioxazin (36.21 %) & thifensulfuron methyl (8.80 %).

<sup>25</sup> Abundit Extra 3L = glyphosate.

<sup>26</sup> Harmony SG 50DF = thifensulfuron-methyl.

<sup>27</sup> Warrant 3CS = acetochlor.

<sup>28</sup> Roundup WeatherMax 4.5L = glyphosate.

<sup>29</sup> Synchrony 28.4WDG = 21.5% chlorimuron-ethyl & 6.9% thifensulfuron-methyl.

<sup>30</sup> Cobra 2EC = lactofen.