Giant Ragweed Control Research Summary

Cropping Systems Weed Science

UNIVERSITY OF WISCONSIN–MADISON

Giant Ragweed Research Summary: What we have learned from 6 years of chemical giant ragweed control in corn and soybean.

The Wisconsin Herbicide Evaluation Program has conducted several chemical manufacturers and commodity board sponsored corn and soybean trials assessing giant ragweed control every year since 2018. The results of this work have been summarized and presented in the Wisconsin Weed Science Research Report, distributed annually in December, as well as several extension presentations and publications. Research reports can be accessed and downloaded from our website **wiscweeds.info**.

All of the data presented in this summary was collected from trials established at the Rock County Farm located on US Highway 14 just west of Janesville, WI. The giant ragweed on the farm is a naturally occurring biotype with a prolonged emergence period, meaning emergence typically starts in mid- to late-April and continues well into June. This creates management challenges as giant ragweed seedlings will continue to emerge for 1-3 weeks after the typical POST herbicide application is made within the first two weeks of June. Giant ragweed density (pressure) is also much higher than what would be typically found on a farm in Wisconsin and is representative of a worst-case scenario. Recommended herbicide rates were based on a medium textured soil with 3% organic matter. Be aware that herbicide performance may vary depending on your soil type and environmental conditions.

**Disclaimer – Results presented in this report do not constitute an endorsement of any product and do not replace any information presented on the pesticide label.*

Corn Research

/// Preemergence Herbicides

Giant ragweed can be difficult to control with PRE herbicides due to its large seed size and ability to emerge from greater soil depths than most other species. Several herbicide premixes are labeled for residual control of giant ragweed; however, these premixes are all comprised of only a handful of effective active ingredients. When deciding on a PRE herbicide, it is important to select premixes that contain at least one but preferably two effective active ingredients listed in the chart. Consideration should also be given to the equivalent product rates of each active ingredient of a given premix. A summary of giant ragweed residual control 3-4 weeks after PRE application is presented in Table 1. Results represent all the herbicides we have evaluated in test plots since 2018 with a minimum of 12 observations and at least 3 years of testing.

/// Effective Active Ingredients

Active Ingredient	SOA[a]	Effectiveness Rating
mesotrione	27	good
isoxaflutole	27	fair
saflufenacil	14	fair-good
atrazine	5	fair
dicamba	4	fair
clopyralid	4	suppression only
flumetsulam	2	suppression only

[a]SOA = site of action

/// Take Home Points

- Mesotrione (Callisto) was a component of most of the top performing herbicide programs (**Table 1**).
  - Equivalent rates of at least 5 fl oz (0.06 lb ai) PRE are needed for greater control
- The addition of 2-3 pts (1-1.5 lb ai) of atrazine 4L to another premix can improve giant ragweed control.
- Half or cut rates of herbicide premixes were not as effective (<65% control).

Table 1. Giant ragweed residual control (%) 3 to 4 weeks after PRE application of corn herbicides evaluated by the Wisconsin Herbicide Evaluation Program from 2018-2023[d]

Herbicide	Rate(s)	Active Ingredient(s)	Rate Equivalents (rate acre^{-1})	Control[a]	n[b]
acetochlor + atrazine				71 (18)	52
Harness Xtra 5.6L/ Keystone NXT	1.5-2.4 qt	acetochlor + atrazine	1.3-2.1 pt Harness + 1.9-3 pt atrazine 4L		
Harness Xtra 6.0L	1.8-2.6 qt		2.2-3.2 pt Harness + 1.5-2.2 pt atrazine 4L		
Acuron	2.5-3 qt	*S*-meto + meso + atz + bicylopyrone	1.4-1.7 pt Dual II Magnum +4.8-5.8 oz Callisto +1.25-1.5 pt atrazine 4L	84 (15)	76
	1.25-1.75 qt		0.7-1 pt Dual II Magnum +2.4-3.4 oz Callisto +0.6-0.9 pt atrazine 4L	63 (26)	56
Acuron Flexi	2-2.25 qt	*S*-meto + meso + bicylopyrone	1.5-1.7 pt Dual II Magnum + 5.1-5.8 fl oz Callisto	70 (21)	12
	1.1-1.5 qt		0.8-1.1 pt Dual II Magnum + 2.8-3.8 fl oz Callisto	64 (25)	14
Balance Flexx + atrazine[c]	4-4.5 fl oz	(isoxaflutole) + atrazine		76 (13)	16
Corvus + atrazine[c]	3.3-5.6 oz	(isoxaflutole + thiencarbazone) + ATZ	3.1-5.3 fl oz Balance Flexx + 0.3-0.5 oz ai thiencarbazone + ATZ	78 (23)	32
Dual II Magnum	0.84-1.67 pt	*S*-metolachlor		11 (18)	12
Harness/Surpass NXT	1.5-2 pt	acetochlor		42 (20)	40
Harness Max	55-75 fl oz	acetochlor + mesotrione	1.7-2.4 pt Harness + 4.5-6.2 fl oz Callisto	76 (18)	43
	37.5-40 fl oz		1.2-1.3 pt Harness + 3.1-3.3 fl oz Callisto	36 (21)	12
Harness Max + atrazine[c]	55-75 fl oz	(acetochlor + mesotrione) + ATZ	1.7-2.4 pt Harness + 4.5-6.2 fl oz Callisto + ATZ	91 (7)	56
Resicore	2.25-3 qt	acetochlor + meso + clopyralid	1.8-2.4 pt Harness + 5.4-7.2 oz Callisto + 4.6-6.1 oz Stinger	87 (14)	48
Resicore + atrazine[c]	2.4-3 qt	(acetochlor + meso + clopyralid) + ATZ	1.9-2.4 pt Harness + 5.8-7.2 oz Callisto + 4.9-6.1 oz Stinger + ATZ	87 (13)	31
S-metolachlor + atrazine				45 (32)	28
Bicep II Magnum	1.75-1.9 qt	*S*-metolachlor + atrazine	1.1-1.2 pt Dual II Magnum + 2.7-2.9 pt atrazine 4L		
Bicep Lite II Magnum	1-1.75 qt		0.9-1.5 pt Dual II Magnum + 1.3-2.3 pt atrazine 4L		
SureStart II/TripleFlex II	1.75-2.5 pt	acetochlor + clopyralid + flumetsulam	0.9-1.3 pt Harness + 3.5-5.1 fl oz Stinger + 0.53-0.75 oz Python	70 (17)	70
Verdict	10-16 fl oz	saflufenacil + dimethenamid-P	2-3.2 fl oz Sharpen + 8.3-13.3 fl oz Outlook	64 (26)	33

[a]Average residual giant ragweed control (%) 3 to 4 weeks after application. Numbers in parentheses represent the standard deviation.
[b]n values are the number of recorded observations (plots) included in the average.
[c]Tank mixes with atrazine 4L were applied at 1.5-3 pt acre^{-1}
[d]Abbreviations: ATZ = atrazine

Corn Research

/// Postemergence/Burndown Herbicides

The options for postemergence (POST) control of giant ragweed are far greater as several herbicide active ingredients provide excellent burndown control. Furthermore, several of these active ingredients can also be tank mixed with each other to enhance control. For example, group 27 (HPPD) and atrazine tank mixes have been documented to have a synergistic relationship. A bareground trial was conducted in 2021 and 2022 to evaluate the giant ragweed control of several single active ingredient corn and soybean herbicides (**Table 2**)

/// Effective Active Ingredients

Active Ingredient	SOA	Effectiveness Rating
2,4-D	4	excellent
clopyralid	4	good
dicamba	4	excellent
atrazine	5	good
bentazon	6	fair
bromoxynil	6	good-excellent
glyphosate[a]	9	excellent
glufosinate	10	excellent
isoxaflutole[b]	27	good
mesotrione	27	good-excellent
tembotrione	27	good-excellent
topramezone	27	good-excellent
tolpyralate	27	good-excellent

[a]giant ragweed population is glyphosate susceptible
[b]only provides control when applied to very small weeds

Table 2. Giant ragweed burndown control ratings of corn herbicides 14 days after the POST application from a bareground trial conducted at Janesville, WI in 2020 and 2021.

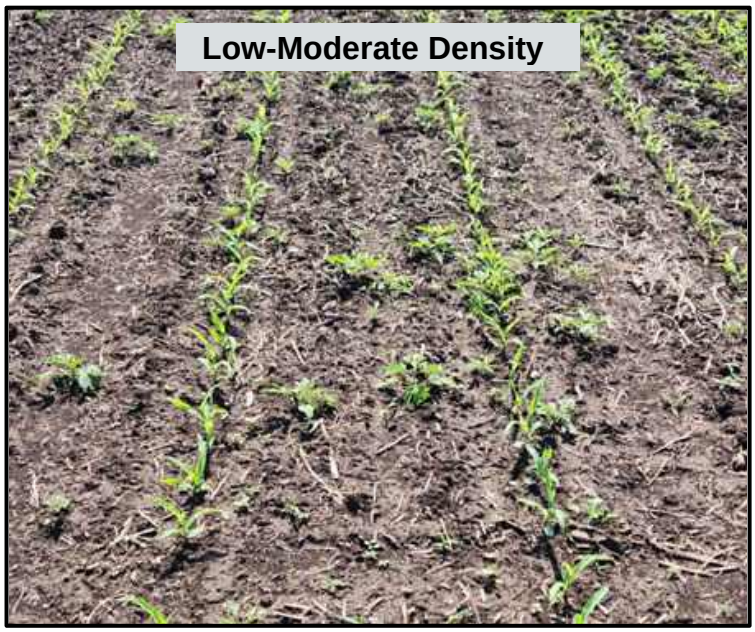
Herbicide (rate acre^{-1})	Active Ingredient	Group (SOA)	Control[a] (%)
Python (1 oz) + COC 1% v/v + AMS (2 lb)	flumetsulam	2 (ALS)	38 (20)
Enlist One (32 fl oz) + AMS (2 lb)	2,4-D choline	4 (Auxin)	96 (2)
XtendiMax (22 fl oz) + Class Act Ridion 1% v/v	dicamba	4 (Auxin)	97 (2)
Stinger (6 fl oz)	clopyralid	4 (Auxin)	82 (5)
AAtrex (2 pt) + COC (1 qt)	atrazine	5 (PSII)	84 (3)
Basagran 5L (1.6 pt) + COC 1% v/v + AMS (2 lb)	bentazon	6 (PSII)	88 (8)
Buctril (1.5 pt)	bromoxynil	6 (PSII)	97 (4)
Roundup PowerMAX II (32 fl oz) + AMS (2 lb)	glyphosate	9 (EPSPS)	97 (2)
Liberty (32 fl oz) + AMS (2 lb)	glufosinate	10 (GS)	99 (0)
Cadet (0.9 fl oz) + COC 1% v/v + AMS (2 lb)	fluthiacet	14 (PPO)	58 (17)
Callisto (3 fl oz) + COC 1% v/v + AMS (2 lb)	mesotrione	27 (HPPD)	89 (7)
Laudis (3 fl oz) + MSO 1% v/v + AMS (2 lb)	tembotrione	27 (HPPD)	98 (2)
Armezon (0.75 fl oz) + MSO 1% v/v + AMS (2 lb)	topramezone	27 (HPPD)	98 (2)
Balance Flexx (5 fl oz) + MSO 1% v/v + AMS (2 lb)	isoxaflutole	27 (HPPD)	94 (3)

[a]Numbers in parentheses represent the standard deviation. n-value for all treatments was 8.

Corn Research

/// Corn Herbicide Systems

Herbicide programs we have evaluated over the past six years were also grouped into three herbicide systems: 1-pass preemergence (PRE), 1 pass early-postemergence (EPOST), and 2-pass preemergence followed by postemergence (PRE fb POST) to better understand general trends in giant ragweed management in a conventional tillage corn cropping system. Additionally, notes were taken every year about the general giant ragweed density in each unique trial area which was broken down in two main categories: low to moderate density and high to very high density. A low or moderate density is what would typically be expected in a grower's field. Data from trials with very low or inconsistent giant ragweed density were discarded. End-of-season giant ragweed control (%) was assessed at or near time of corn harvest.



/// Take Home Points

- The PRE herbicide system was not effective at achieving season long giant ragweed control regardless of density (**Figure 1**).
- The EPOST herbicide system was effective at both controlling giant ragweed and maximizing corn yield under low-moderate densities; however, this was not true in high-very high scenarios (**Figures 1, 2**).
- Performance of the 1-pass EPOST system was more variable than the 2-pass PRE fb POST system.
- Overall, the 2-pass system provided more consistent giant ragweed control and corn yields.
- End-of-season giant ragweed control and corn yield are highly corelated (**Figure 3**) indicating the importance of achieving season long giant ragweed control.

Figure 1. End-of-season giant ragweed control of three herbicide systems grouped by giant ragweed density in the trial area across six years of research trials. Bars indicate the average control ± the standard deviation. N-values at the base of each bar represent the number of observations (plots) included in the average.

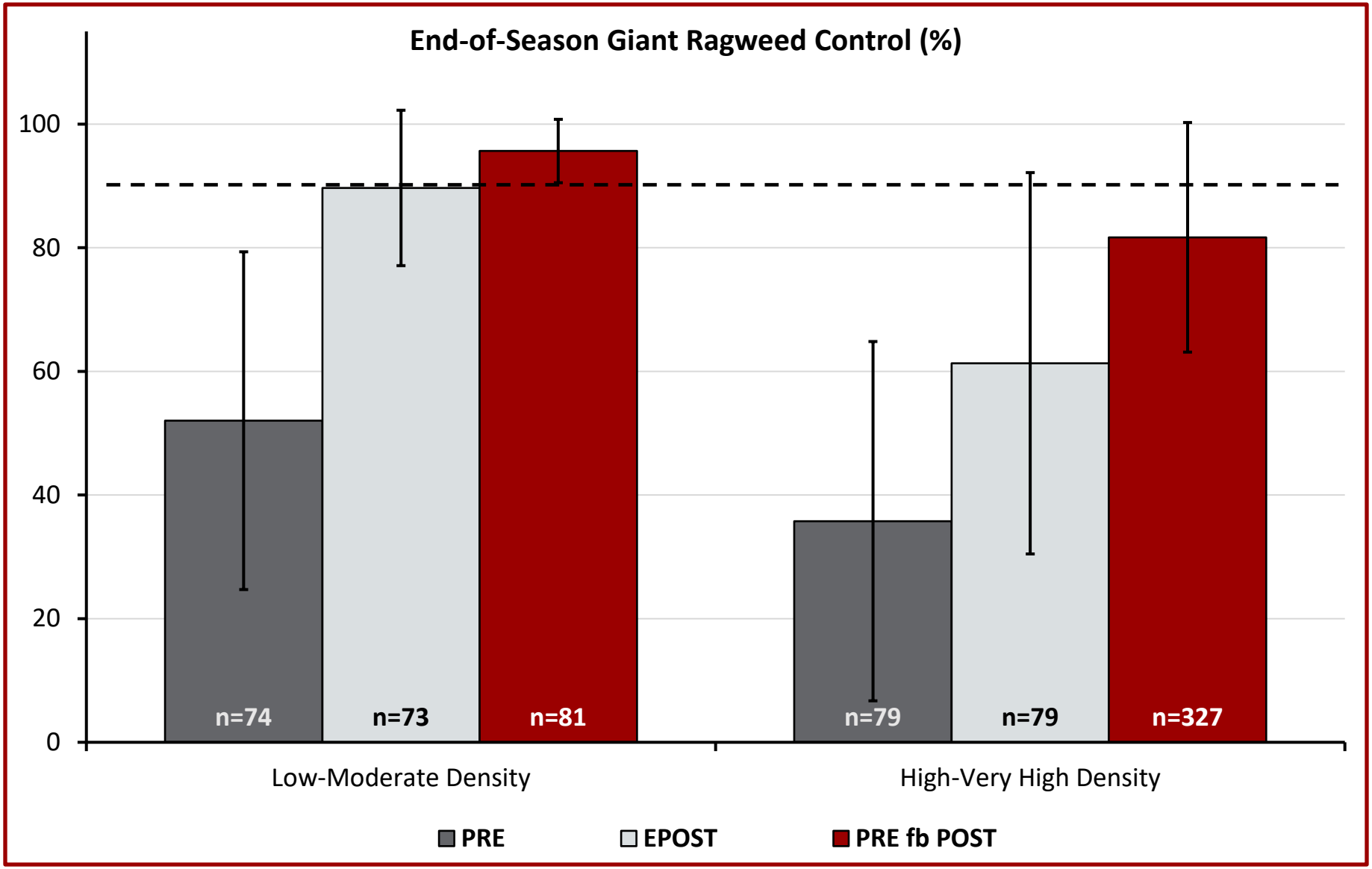


Figure 2. Corn grain yield of three herbicide systems grouped by giant ragweed density in the trial area across six years of research trials. Bars indicate the average corn yield ± the standard deviation. N-values at the base of each bar represent the number of observations (plots) included in the average.

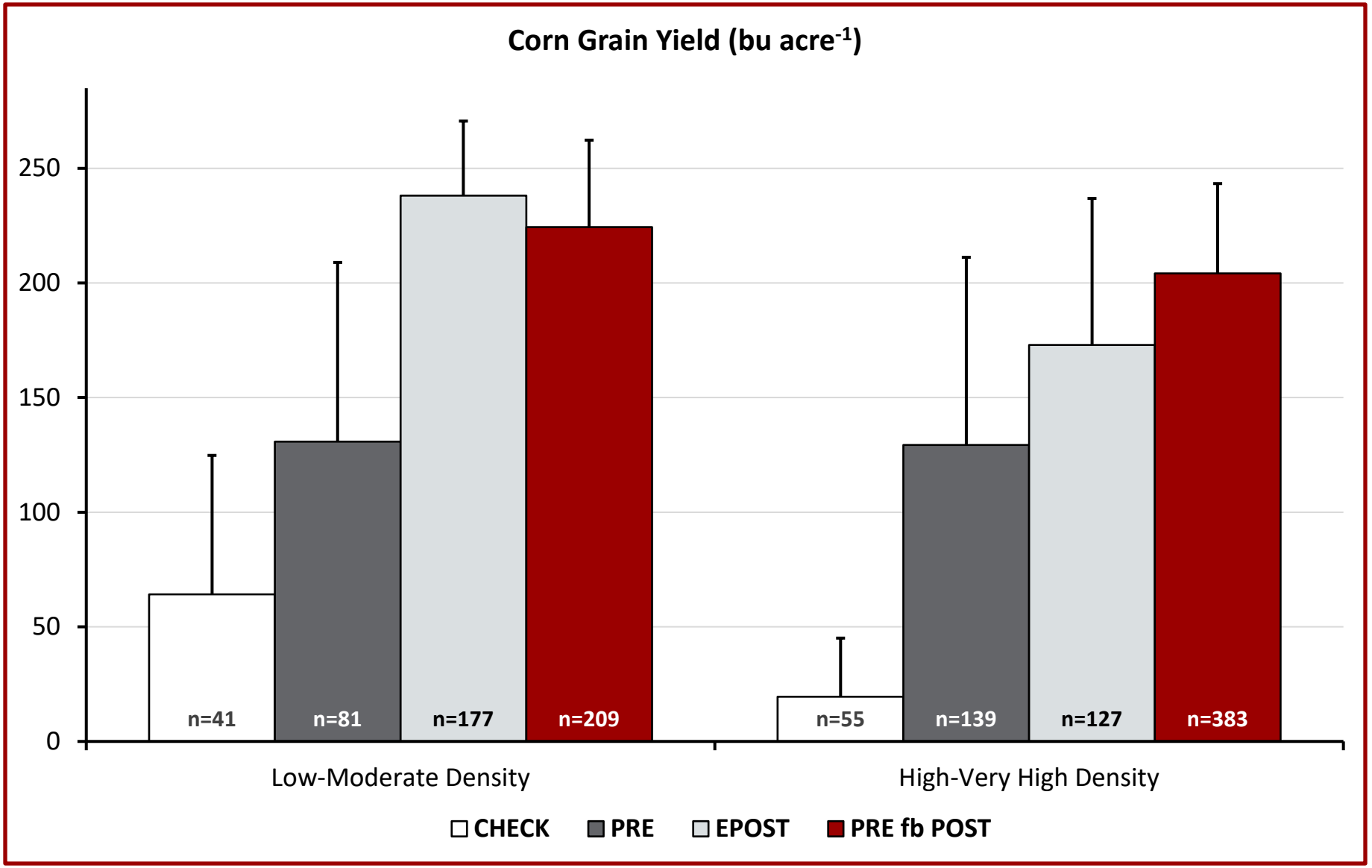
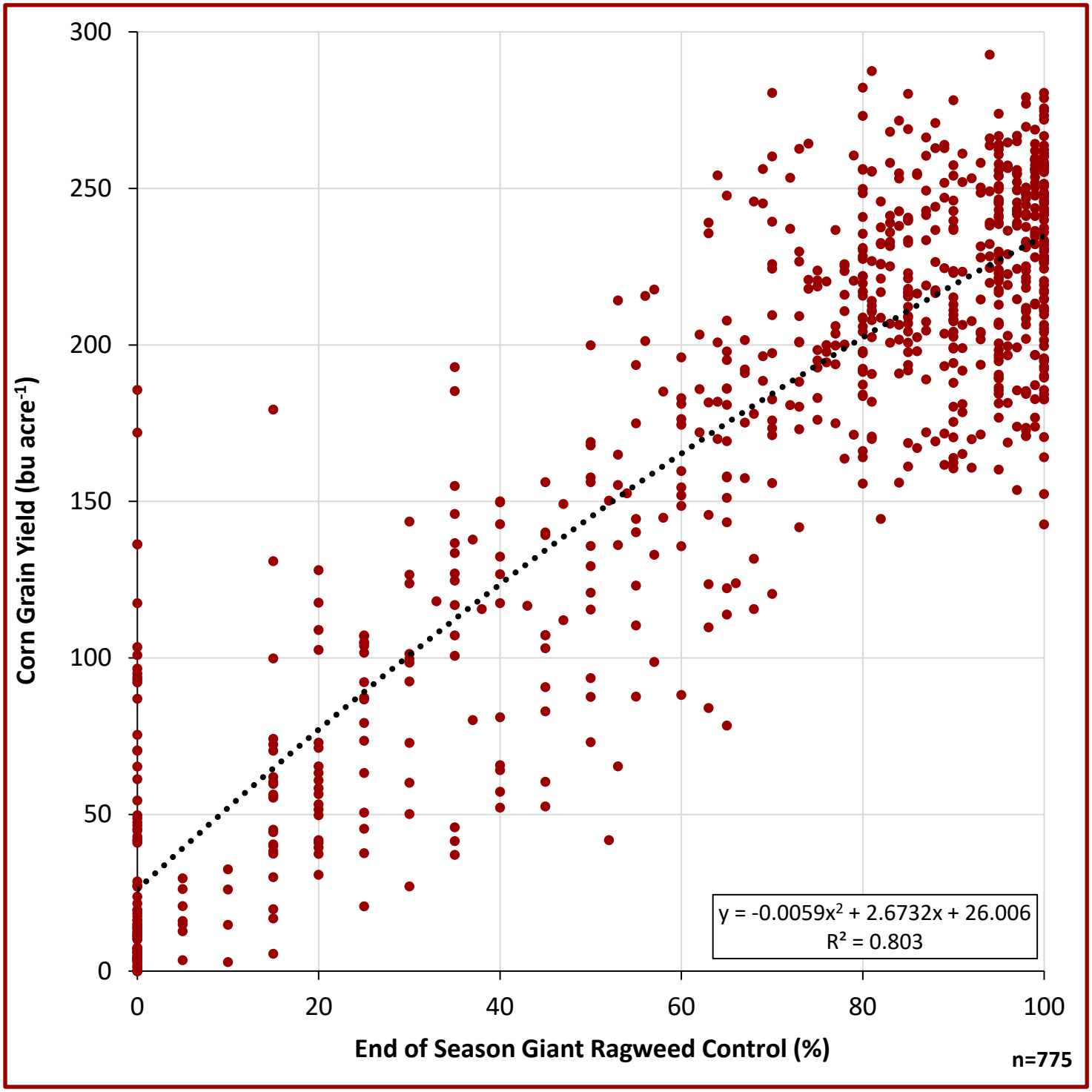


Figure 3. Corn grain yield regressed over end-of-season giant ragweed control from several corn herbicide evaluation trials at Janesville, WI over a six-year period (2018-2023). The formula and corresponding R^2 value is overlayed on the figure.



Soybean Research

/// Preemergence Herbicides

Residual control of giant ragweed in soybean is more challenging in comparison to corn. Very few soybean herbicide premixes are labeled for residual control of giant ragweed. These premixes are comprised of only a handful of effective active ingredients from three different site of action (SOA) groups: group 2 (ALS), 4 (Auxin) and 14 (PPO). Most of the active ingredients will only suppress, not control, giant ragweed when applied alone. Therefore, when deciding on a PRE herbicide it is important to select premixes that contain at least two effective active ingredients listed in the chart. Consideration should also be given to the equivalent product rates of each active ingredient of a given premix. A summary of giant ragweed residual control 3-4 weeks after PRE application is presented in **Table 3**. Results represent all the herbicides we have evaluated in test plots from2018 to 2023 with a minimum of 12 observations and at least 3 years of testing.

/// Take Home Points

- Most of the top performing herbicides included either cloransulam (FirstRate), chlorimuron (Classic), or flumioxazin (Valor) (**Table 3**).
- Tank-mixes with active ingredients from both ALS and PPO herbicide sites of action provided greater and more consistent residual control than either SOA applied alone (**Figure 4**).

/// Effective Active Ingredients

Active Ingredient	SOA[a]	Effectiveness Rating
chlorimuron	2	fair
cloransulam	2	fair-good
flumetsulam	2	suppression
imazethapyr	2	suppression
dicamba	4	fair
flumioxazin	14	suppression-fair
fomesafen	14	suppression
saflufenacil	14	suppression
sulfentrazone	14	suppression

[a]SOA = site of action

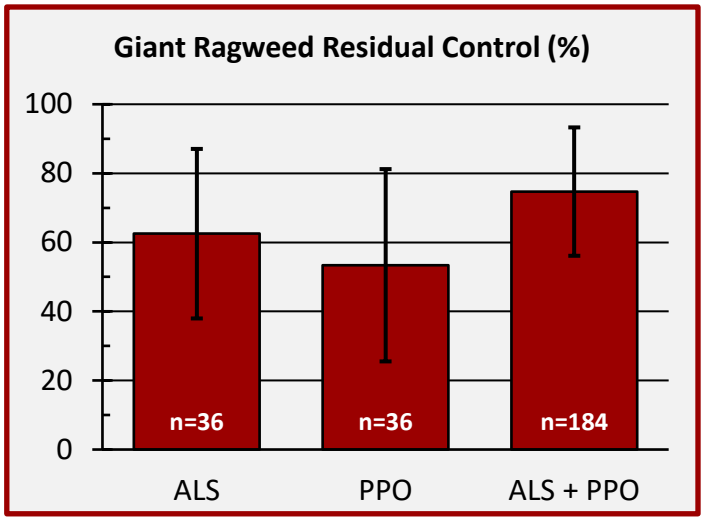


Figure 4. Giant ragweed residual control 3-4 weeks after PRE application grouped by three herbicide sites of action across six years. Bars indicate the average control ± the standard deviation. N-values at the base of each bar represent the number of observations (plots) included in the average.

Table 3. Giant ragweed residual control (%) 3 to 4 weeks after PRE application of soybean herbicides evaluated by the Wisconsin Herbicide Evaluation Program from 2018-2023.

Herbicide	Rate(s)	Active Ingredient(s)	Rate Equivalents (rate acre^{-1})	Control[a]	n[b]
Afforia	2.5 oz	flumioxazin + thifensulfuron + tribenuron	2 fl oz Valor EZ + 0.25 oz Express SG + 0.25 oz Harmony SG	60 (33)	12
Authority Assist	10 fl oz	sulfentrazone + imazethapyr	8.3 fl oz Spartan + 3.4 fl oz Pursuit	73 (19)	12
Authority MTZ	16 oz	sulfentrazone + metribuzin	5.8 fl oz Spartan + 5.8 oz metribuzin 75DF	53 (33)	12
Authority Supreme	8-9 fl oz	sulfentrazone + pyroxasulfone	4.2-4.7 fl oz Spartan + 4-4.5 fl oz Zidua SC	27 (29)	24
Boundary	1.8 pt	*S*-metolachlor + metribuzin	1.24 pt Dual II Magnum + 6 oz metribuzin 75DF	26 (31)	24
Broadaxe XC	25 fl oz	sulfentrazone + *S*-metolachlor	4.4 fl oz Spartan + 1.3 pt Dual II Magnum	27 (30)	24
Canopy DF	2.25 oz	chlorimuron + metribuzin	1 oz Classic + 2 ox metribuzin 75DF	59 (30)	12
Classic	3 oz	chlorimuron		68 (22)	12
Dual II Magnum	1.67 pt	*S*-metolachlor		42 (25)	12
Enlite	2.8 oz	flumioxazin + chlorimuron + thifensulfuron	2 fl oz Valor EZ + 0.3 oz Classic + 0.5 oz Harmony SG	64 (22)	12
Fierce EZ	6 fl oz	flumioxazin + pyroxasulfone	2 fl oz Valor EZ + 2.4 fl oz Zidua SC	65 (27)	12
Fierce MTZ/Kyber	1 pt	flumioxazin + pyroxasulfone + metribuzin	2 fl oz Valor EZ + 2.4 fl oz Zidua SC + 4 oz metribuzin 75DF	59 (28)	16
Fierce XLT	3.75-4.5 oz	flumioxazin + pyroxasulfone + chlorimuron	1.8-2.2 fl oz Valor EZ + 2.2-2.7 fl oz Zidua SC + 1-1.2 oz Classic	75 (16)	24
FirstRate	0.6 oz	cloransulam		67 (25)	12
metribuzin 75DF	10.7 oz	metribuzin		47 (31)	12
Outlook	18 fl oz	dimethenamid		54 (21)	12
Prefix	2 pt	*S*-metolachlor + fomesafen	1.1 pt Dual II Magnum + 1 pt Flexstar	78 (14)	12
Pursuit	4 fl oz	imazethapyr		52 (25)	12
Sharpen	1 fl oz	saflufenacil		41 (26)	12
Sonic/Authority First	5-6.45 oz	sulfentrazone + cloransulam	6.2-8 fl oz Spartan + 0.5-0.6 oz FirstRate	77 (14)	32
Spartan	8 fl oz	sulfentrazone		44 (26)	12
Surveil	3.5 oz	flumioxazin + cloransulam	2.5 fl oz Valor EZ + 0.5 oz FirstRate	82 (17)	12
Trivence	6 oz	flumioxazin + chlorimuron + metribuzin	1.5 fl oz Valor EZ + 0.94 oz Classic + 3.6 oz metribuzin 75DF	79 (18)	12
Valor EZ	3 fl oz	flumioxazin		74 (19)	12
Valor XLT	3 oz	flumioxazin + chlorimuron	1.8 fl oz Valor EZ + 1.2 oz Classic	80 (21)	12
Verdict	5 fl oz	saflufenacil + dimethenamid	1 fl oz Sharpen + 4.2 fl oz Outlook	55 (33)	12
Warrant	48 fl oz	acetochlor		31 (27)	16
Zidua SC	4-4.9 fl oz	pyroxasulfone		48 (28)	16
Zidua PRO	4.5-6 fl oz	saflufenacil + imazethapyr + pyroxasulfone	2.5-3.3 fl oz Zidua SC + 0.75-1 fl oz Sharpen + 3-4 fl oz Pursuit	76 (16)	52

[a]Average residual giant ragweed control (%) 3 to 4 weeks after application. Numbers in parenthesis represent the standard deviation.
[b]n values are the number of recorded observations (plots) included in the average.

Soybean Research

/// Postemergence/Burndown Herbicides

The options for postemergence (POST) control of giant ragweed are far greater as several herbicide active ingredients provide excellent burndown control. However, several require soybean with a herbicide-tolerant trait to be used post-emergence. Additionally, none of the group 2 (ALS) herbicides will control ALS resistant giant ragweed. A bareground trial was conducted in 2021 and 2022 to evaluate the giant ragweed control of several single active ingredient corn and soybean herbicides (**Table 4**).

/// Effective Active Ingredients

Active Ingredient	SOA	Effectiveness Rating
chlorimuron[a]	2	good
cloransulam[a]	2	good-excellent
imazethapyr[a]	2	fair-good
imazamox[a]	2	fair-good
2,4-D[b]	4	excellent
dicamba[b]	4	excellent
bentazon	6	fair-good
glyphosate[bc]	9	excellent
glufosinate[b]	10	excellent
acifluorfen	14	fair-good
fomesafen	14	good
lactofen	14	good-excellent
flumiclorac	14	fair

[a]will only control ALS susceptible giant ragweed
[b]can only be applied POST to soybean with the appropriate herbicide resistance trait
[c]giant ragweed population is glyphosate-susceptible

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Table 4. Giant ragweed burndown control ratings of soybean herbicides 14 days after the POST application from a bareground trial conducted at Janesville, WI in 2020 and 2021.

Herbicide (rate acre^{-1})	Active Ingredient	Group (SOA)	Control[a] (%)
Pursuit (4 fl oz) + COC 1.25% v/v + AMS (2 lb)	imazethapyr	2 (ALS)	41 (15)
Classic (0.75 oz) + COC 1% v/v + AMS (2 lb)	chlorimuron	2 (ALS)	40 (18)
FirstRate (0.3 oz) + COC 1.2% v/v + AMS (2 lb)	cloransulam	2 (ALS)	48 (6)
Enlist One (32 fl oz) + AMS (2 lb)	2,4-D choline	4 (Auxin)	96 (2)
XtendiMax (22 fl oz) + Class Act Ridion 1% v/v	dicamba	4 (Auxin)	97 (2)
Basagran 5L (1.6 pt) + COC 1% v/v + AMS (2 lb)	bentazon	6 (PSII)	88 (8)
Roundup PowerMAX II (32 fl oz) + AMS (2 lb)	glyphosate	9 (EPSPS)	97 (2)
Liberty (32 fl oz) + AMS (2 lb)	glufosinate	10 (GS)	99 (0)
Cobra (12.5 fl oz) + COC (1.5 pt) + AMS (2 lb)	lactofen	14 (PPO)	99 (0)
Flexstar (1 pt) + MSO 1% v/v + AMS (2 lb)	fomesafen	14 (PPO)	93 (9)
Cadet (0.9 fl oz) + COC 1% v/v + AMS (2 lb)	fluthiacet	14 (PPO)	58 (17)
Resource (8 fl oz) + COC (1 qt) + AMS (2 lb)	flumiclorac	14 (PPO)	76 (22)

[a]Numbers in parentheses represent the standard deviation. n-value for all treatments was 8.

Figure 5. Soybean yield regressed over late season giant ragweed control from several soybean herbicide evaluation trials at Janesville, WI over a six-year period (2018-2023). The formula and corresponding R^2 value are overlayed on the figure. Late season efficacy ratings were taken at a single point between soybean canopy closure and harvest.