



Investigating Potential Antagonism of Select Max[®] Herbicide When Mixed with Warrant[®] Herbicide and Dicamba

2017 Trial Objective

- Warrant[®] Herbicide is often used postemergence (POST) in soybean to provide additional residual control of small-seeded broadleaves and grasses.
- Clethodim products (ACCCase inhibitors), such as Select Max[®] Herbicide with Inside Technology[™], are often tank-mixed with Warrant[®] Herbicide to provide volunteer corn control in soybean.
- With the widespread adoption of Roundup Ready 2 Xtend[®] soybeans, new dicamba products have also been tank-mixed with clethodim products.
- In the past few years, there have been instances regarding decreased volunteer corn control with these tank-mixes.
- The objective in 2017 was to evaluate volunteer corn control in soybean from tank mixes of Warrant[®] Herbicide and ACCCase inhibitors.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Seeding Rate (seeds/acre)
Mapleton, MN	Silty loam	Corn	Conventional	05/07/17	140K
Janesville, WI	Silty loam	Corn	Conventional	05/30/17	120K

- Commercial glyphosate-resistant corn from the prior season (bin-run) was planted in the middle of the 30-inch soybean rows to establish a consistent volunteer corn stand.
- Plot size was 10 ft x 30 ft with three replications per location.
- Warrant[®] Herbicide was applied preemergence (PRE) to all treatments for control of other weeds.
- A factorial treatment design was utilized with two factors:
 - POST herbicide treatment
 - Application timing
- The seven POST herbicide treatments are listed in Table 1.
- Two application timings were chosen targeting 12- and 24-inch-tall volunteer corn, resulting in a total of 14 treatments.



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Table 1. POST Herbicide Treatments in 2017.*

Treatment #	Product	Rate (fl oz/acre)	
		12"	24"
1	Select Max [®] Herbicide	6	6
2	Select Max [®] Herbicide	6	6
2	Warrant [®] Herbicide	48	48
3	Select Max [®] Herbicide	6	6
3	Warrant [®] Herbicide	48	48
3	Crop Oil Concentrate**	1**	1**
4	Select Max [®] Herbicide	12	12
4	Warrant [®] Herbicide	48	48
5	Select Max [®] Herbicide	12	12
5	Warrant [®] Herbicide	48	48
5	Crop Oil Concentrate**	1**	1**
6	Fusilade [®] DX Herbicide	6	6
6	Warrant [®] Herbicide	48	48
7	Fusilade [®] DX Herbicide	6	6
7	Warrant [®] Herbicide	48	48
7	Crop Oil Concentrate**	1**	1**

*All herbicide treatments included Roundup PowerMAX[®] Herbicide at 32 fl oz/acre and N-Pak[®] AMS Liquid Adjuvant at 2.5% v/v

**Crop Oil Concentrate application rate % v/v instead of fl oz/acre



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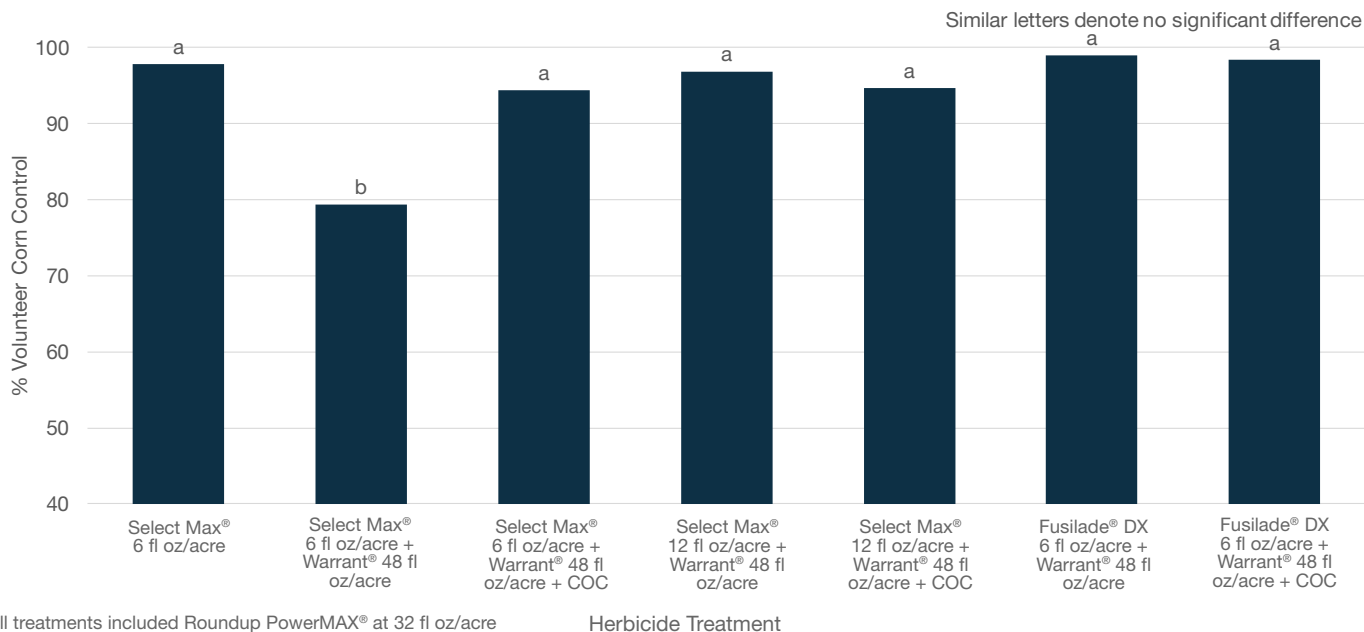


Figure 1. Percent volunteer corn control 28 days after the 12-inch-height application timing at Mapleton, MN and Janesville, WI (2017).

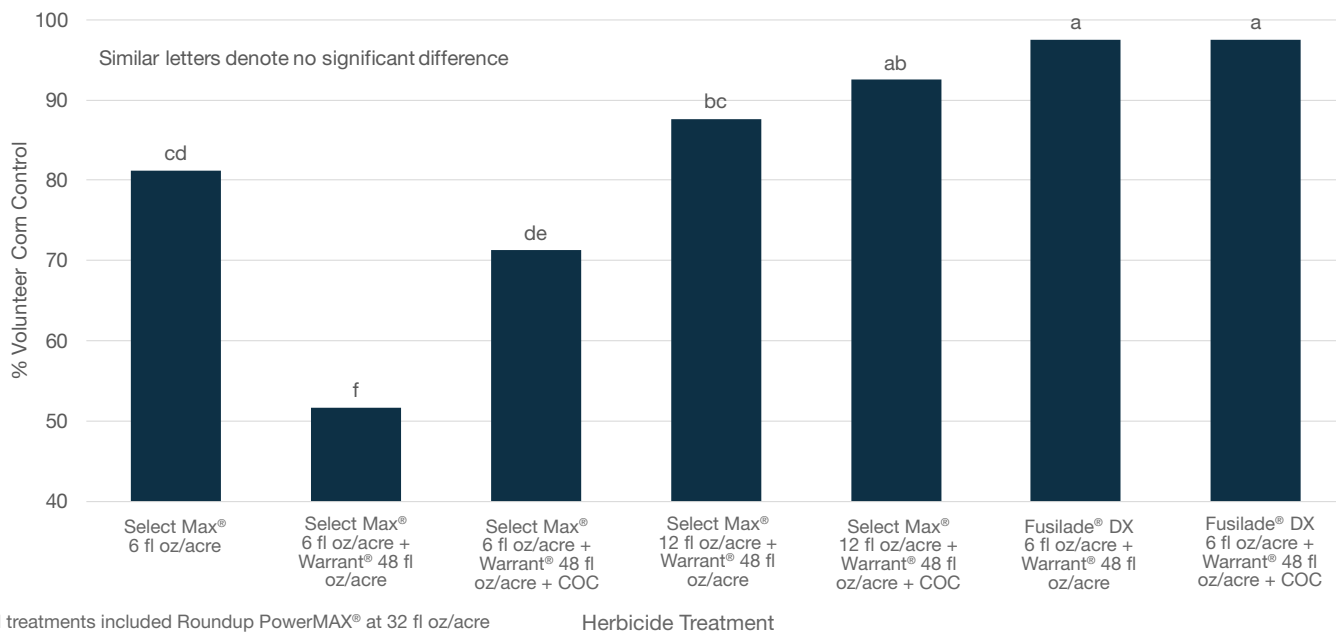


Figure 2. Percent volunteer corn control 28 days after the 24-inch-height application timing at Mapleton, MN and Janesville, WI (2017).



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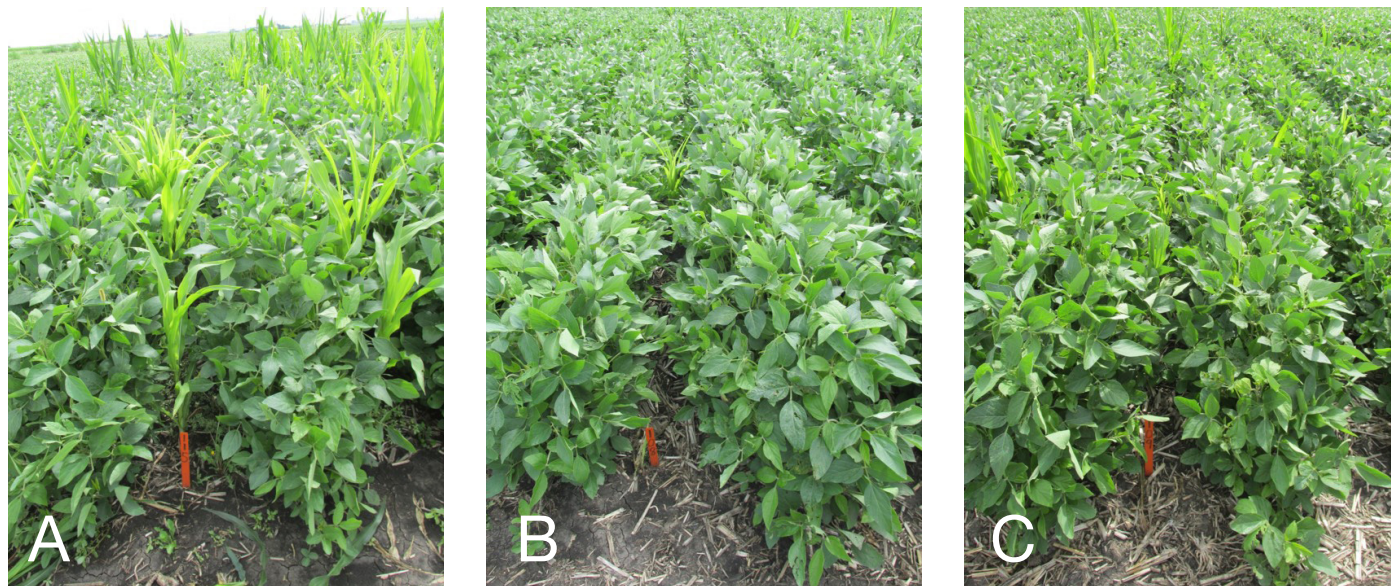


Figure 3. Varying levels of volunteer corn control depending on herbicide treatment in Mapleton, MN (2017). Pictures were taken 28 days after the 24-inch application. A) Untreated check; B) Treatment 1 (Select Max[®] Herbicide); C) Treatment 2 (Select Max[®] Herbicide + Warrant[®] Herbicide).

Understanding the Results

- Overall, the control of volunteer corn increased when herbicide treatments were applied to 12-inch-tall volunteer corn compared to 24-inch-tall volunteer corn.
- Control of volunteer corn decreased when Warrant[®] Herbicide was tank-mixed with Select Max[®] Herbicide (Treatment 2) compared to Select Max[®] Herbicide alone (Treatment 1).
- The addition of crop oil concentrate (COC) to Warrant[®] Herbicide and Select Max[®] Herbicide (Treatment 3) overcame the reduced efficacy seen in Treatment 2 at both application timings, but was still not sufficient in achieving a standard of 90% control of volunteer corn at the later timing.
- Increasing the rate of Select Max[®] Herbicide (Treatment 4) overcame the decreased control from adding Warrant[®] Herbicide to the tank.
- Fusilade[®] DX Herbicide consistently provided among the highest level of volunteer corn control when tank-mixed with Warrant[®] Herbicide at both application timings with and without COC.



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2018 Trial Objective

- To determine whether adding dicamba to Select Max[®] Herbicide affects volunteer corn control with and without Warrant[®] Herbicide.
- To test a 33% increase of the recommended rate of Select Max[®] Herbicide to maintain the desired level of volunteer corn control.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Seeding Rate (seeds/acre)
Collinsville, IL	Silty loam	Corn	Conventional	05/07/18	140K
Janesville, WI	Silty loam	Corn	Conventional	05/17/18	140K

- Similar to the 2017 study, commercial glyphosate-resistant corn from the prior season (bin-run) was planted to establish a consistent stand of volunteer corn at both locations.
- Warrant[®] Herbicide was applied as a blanket PRE to all treatments for control of other weeds.
- Eight combinations of a graminicide herbicide at varying rates (Select Max[®] Herbicide or Fusilade[®] DX Herbicide), Warrant[®] Herbicide (48 fl oz/acre), and XtendiMax[®] herbicide with VaporGrip[®] Technology (22 fl oz/acre) were utilized at two different application timings.
- The POST herbicide treatments are listed in Table 2.
- Two application timings were chosen targeting 12- and 24-inch-tall volunteer corn, resulting in a total of 16 treatments.



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Table 2. POST herbicide treatments in 2018.*

Treatment #	Product	Rate (fl oz/acre)	
		12"	24"
1	Select Max [®] Herbicide	6	9
2	Select Max [®] Herbicide (33% increase)	8	12
2	Warrant [®] Herbicide	48	48
3	Select Max [®] Herbicide (33% increase)	8	12
3	XtendiMax [®] herbicide with VaporGrip [®] Technology	22	22
4	Select Max [®] Herbicide (33% increase)	8	12
4	XtendiMax [®] herbicide with VaporGrip [®] Technology	22	22
4	Warrant [®] Herbicide	48	48
5	Select Max [®] Herbicide	12	16
5	Warrant [®] Herbicide	48	48
6	Select Max [®] Herbicide	12	16
6	XtendiMax [®] herbicide with VaporGrip [®] Technology	22	22
7	Select Max [®] Herbicide	12	16
7	XtendiMax [®] herbicide with VaporGrip [®] Technology	22	22
7	Warrant [®] Herbicide	48	48
8	Fusilade [®] DX Herbicide	6	6
8	XtendiMax [®] herbicide with VaporGrip [®] Technology	22	22
8	Warrant [®] Herbicide	48	48

* All herbicide treatments included Roundup PowerMax[®] at 32 fl oz/acre and non-ionic surfactant (NIS) at 0.25% v/v. All treatments except 1, 2, and 5 contained an approved drift reduction adjuvant (DRA) at 0.5% v/v.



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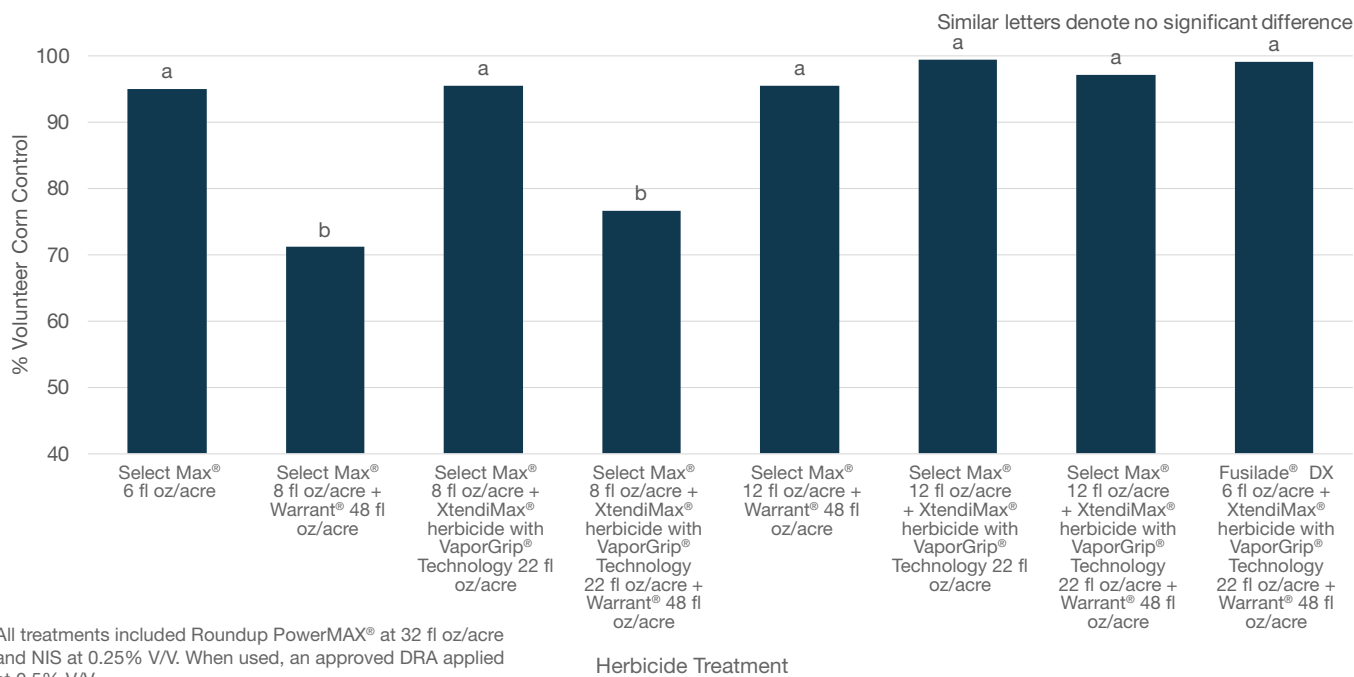


Figure 4. Percent volunteer corn control 28 days after the 12-inch-height application timing at Collinsville, IL and Janesville, WI (2018).

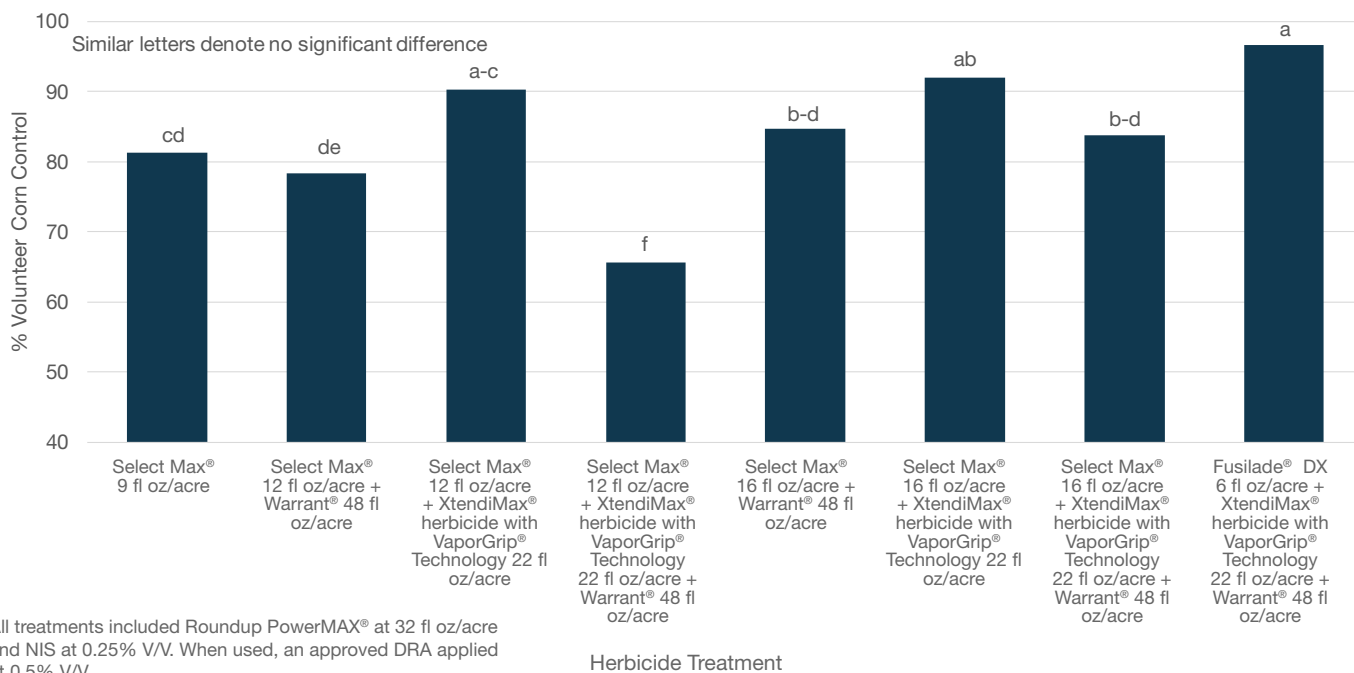


Figure 5. Percent volunteer corn control 28 days after 24-inch-height application timing at Collinsville, IL (2018). Wisconsin data were left out of the analysis due to a tank-mixing error.



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Figure 6. Varying levels of volunteer corn control depending on herbicide treatment at Collinsville, IL (2018). Pictures were taken 28 days after the 24-inch application. A) Untreated; B) Treatment 1 (Select Max[®] Herbicide at 9 fl oz/acre); C) Treatment 2 (Select Max[®] Herbicide at 12 fl oz/acre + Warrant[®] Herbicide at 48 fl oz/acre); D) Treatment 3 (Select Max[®] Herbicide at 12 fl oz/acre + XtendiMax[®] herbicide with VaporGrip[®] Technology at 22 fl oz/acre); E) Treatment 4 (Select Max[®] Herbicide at 12 fl oz/acre + XtendiMax[®] herbicide with VaporGrip[®] Technology at 22 fl oz/acre + Warrant[®] Herbicide at 48 fl oz/acre).

Understanding the Results

- The 24-inch-tall volunteer corn was more difficult to control than the 12-inch-tall volunteer corn.
- A 33% increase in the Select Max[®] Herbicide rate (Treatment 2) was not sufficient to overcome antagonism with Warrant[®] Herbicide when spraying volunteer corn at a 12-inch height.
- Using Select Max[®] Herbicide rates of 8 or 12 fl oz/acre at 12- and 24-inch-tall volunteer corn, respectively, when XtendiMax[®] herbicide with VaporGrip[®] Technology was a tank-mix partner (Treatment 3) provided equal control of volunteer corn compared to the suggested label rate of Select Max[®] Herbicide alone (Treatment 1) at both application timings.
- Volunteer corn control with Fusilade[®] DX Herbicide was among the highest at both application timings.

What Does This Mean for Your Farm?

- Using Warrant[®] Herbicide PRE and/or POST in soybeans can provide additional residual control of small-seeded broadleaves and grasses.
- XtendiMax[®] herbicide with VaporGrip[®] Technology is an excellent PRE and/or POST option in dicamba-tolerant soybeans for control of broadleaf weeds, particularly those that are resistant to glyphosate.
- Controlling small volunteer corn (12 inches or less) can provide more consistent performance from your POST herbicide application.
- Visit www.roundupreadyplus.com to learn more about potential incentives when utilizing Warrant[®] Herbicide or Select Max[®] Herbicide in a crop management solution.



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Select Max[®] Herbicide

- A tank-mix combination of XtendiMax[®] herbicide with VaporGrip[®] Technology + Select Max[®] Herbicide (8 fl oz/acre) + a Roundup[®] brand glyphosate-only agricultural herbicide + labeled DRA can provide control of small volunteer corn. This is consistent with Valent's recommendation to increase the rate of Select Max[®] Herbicide by 33% when tank-mixing with products other than a Roundup[®] brand glyphosate-only agricultural herbicide, Cobra[®] Herbicide, or Phoenix[™] Herbicide.
- Warrant[®] Herbicide + Select Max[®] Herbicide (12 fl oz/acre) can provide consistent control of small volunteer corn when used with a Roundup[®] brand glyphosate-only agricultural herbicide.

Fusilade[®] DX Herbicide

- A tank-mixture of Warrant[®] Herbicide or Warrant[®] Herbicide + XtendiMax[®] herbicide with VaporGrip[®] Technology with Fusilade[®] DX Herbicide (6 fl oz/acre) can provide control of 12- and 24-inch volunteer corn when used with a Roundup[®] brand glyphosate-only agricultural herbicide and a labeled DRA where required.

Legal Statements

The information discussed in this report is from a three-site demonstration trial. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

XtendiMax[®] herbicide with VaporGrip[®] Technology is part of the Roundup Ready[®] Xtend Crop System and is a restricted use pesticide. ALWAYS READ AND FOLLOW DIRECTIONS FOR USE ON PESTICIDE LABELING. It is a violation of federal and state law to use any pesticide product other than in accordance with its labeling. XtendiMax[®] herbicide with VaporGrip[®] Technology and products with XtendFlex[®] Technology may not be approved in all states and may be subject to use restrictions in some states. Check with your local product dealer or representative or U.S. EPA and your state pesticide regulatory agency for the product registration status and additional restrictions in your state. For approved tank-mix products and nozzles visit XtendiMaxApplicationRequirements.com.

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ALWAYS READ AND FOLLOW DIRECTIONS FOR USE ON PESTICIDE LABELING. IT IS A VIOLATION OF FEDERAL AND STATE LAW to use any pesticide product other than in accordance with its labeling. NOT ALL formulations of dicamba or glyphosate are approved for in-crop use with Roundup Ready 2 Xtend[®] soybeans. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USES AND APPROVED FOR SUCH USE IN THE STATE OF APPLICATION. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with Roundup Ready 2 Xtend[®] soybeans.

Roundup Ready 2 Xtend[®] soybeans contains genes that confer tolerance to glyphosate and dicamba. Glyphosate will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. Glufosinate will kill crops that are not tolerant to glufosinate. Contact your seed brand dealer or refer to Monsanto's Technology Use Guide for recommended weed control programs.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Warrant[®] Herbicide is not registered in all states and may be subject to use restrictions. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local dealer or representative for the product registration status in your state. Bayer, Bayer Cross Design, Roundup Ready 2 Xtend[®], VaporGrip[®], Warrant[®] and XtendiMax[®] are registered trademarks of Bayer Group. Select Max[®] is a registered trademark of Valent U.S.A. Corporation. All other trademarks are the property of their respective owners. © 2019 Bayer Group, All Rights Reserved. 181009091605 101518LGM

