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 (ACCase 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 ACCase 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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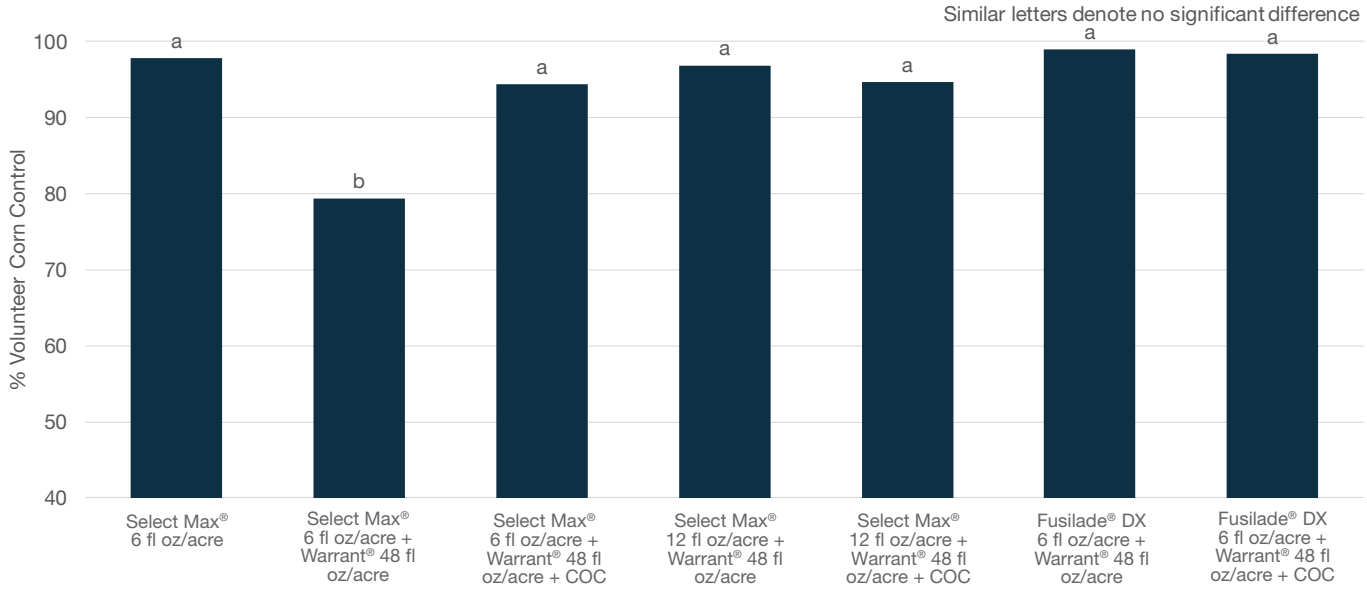
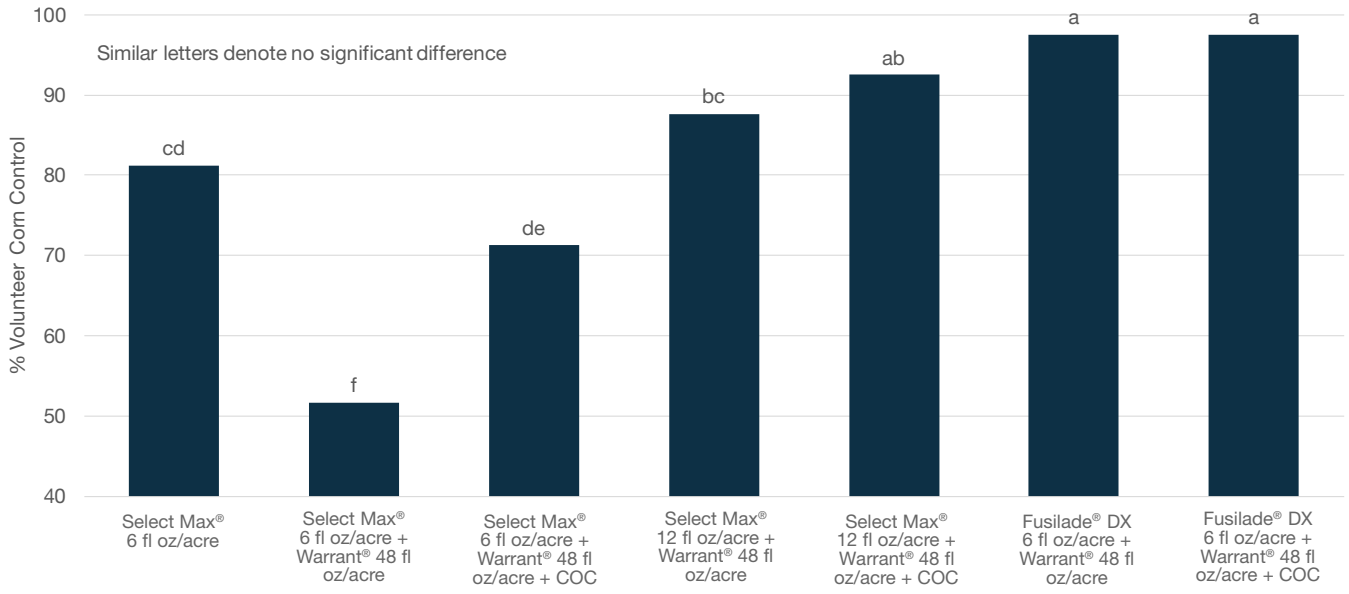


All treatments included Roundup PowerMAX® at 32 fl oz/acre and N-Pak® AMS Liquid Adjuvant at 2.5% V/V. COC rate was 1% V/V for the treatments for which COC was used.

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



All treatments included Roundup PowerMAX® at 32 fl oz/acre and N-Pak® AMS Liquid Adjuvant at 2.5% V/V. COC rate was 1% V/V for the treatments for which COC was used.

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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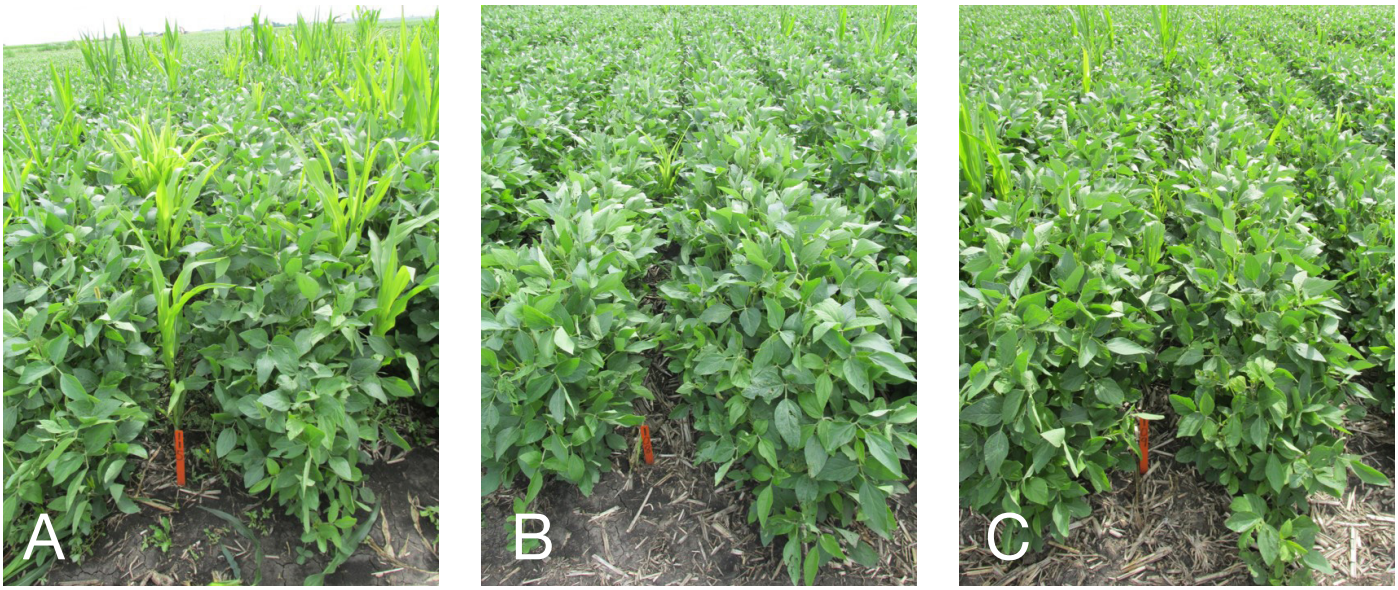

Figure 3. Varying levels of volunteer corn control depending on herbicide treatment in Mapleton, MN (2017). Pictures were taken 28 days after the 24-inch application. A) Untreated check; B) Treatment 1 (Select Max® Herbicide); C) Treatment 2 (Select Max® Herbicide + Warrant® Herbicide).

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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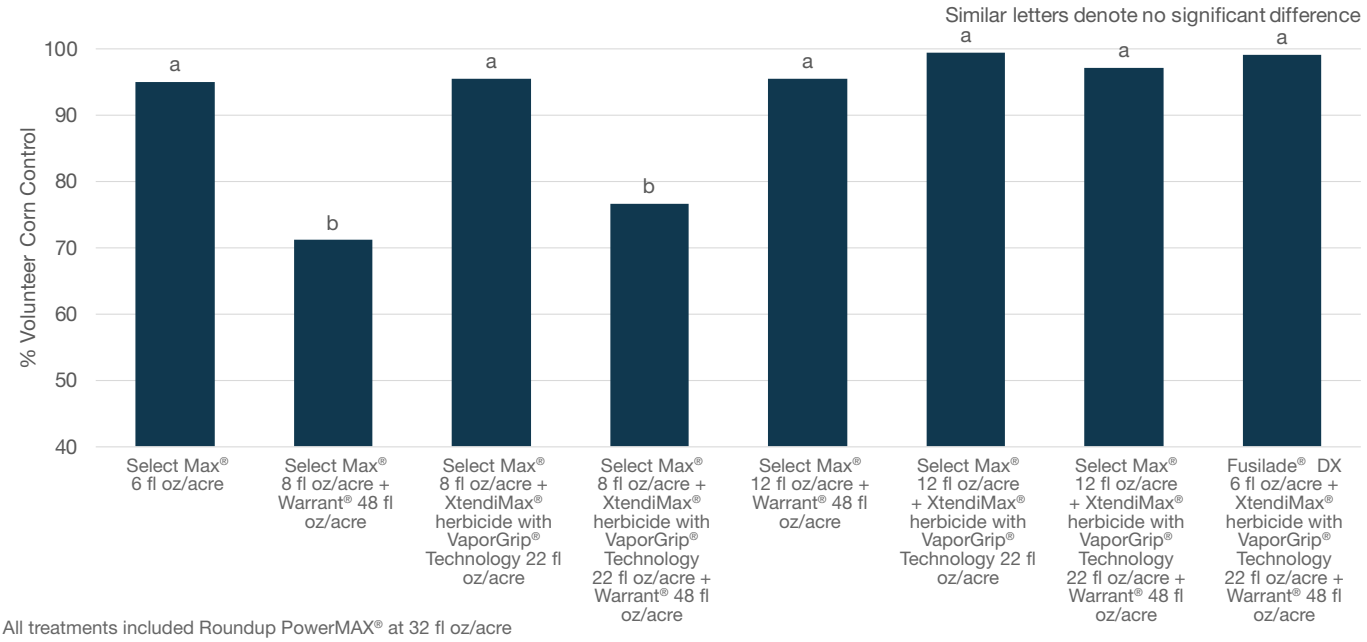
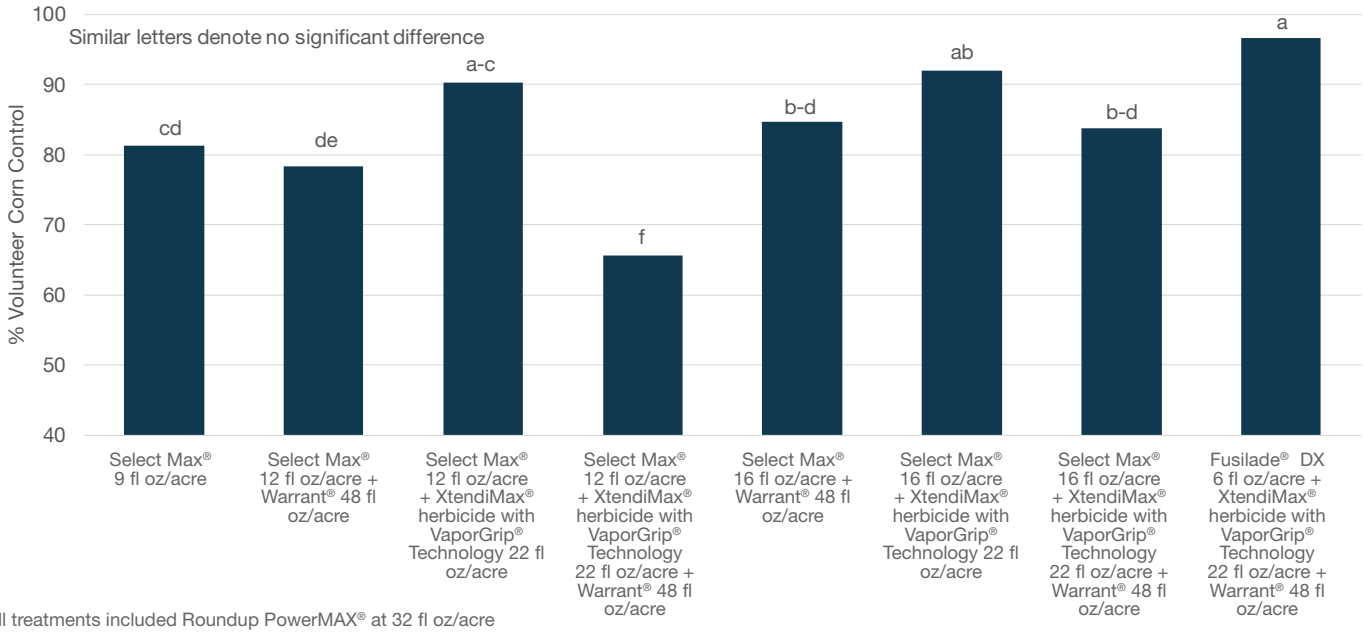


All treatments included Roundup PowerMAX® at 32 fl oz/acre and NIS at 0.25% V/V. When used, an approved DRA applied at 0.5% V/V.

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



All treatments included Roundup PowerMAX® at 32 fl oz/acre and NIS at 0.25% V/V. When used, an approved DRA applied at 0.5% V/V.

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