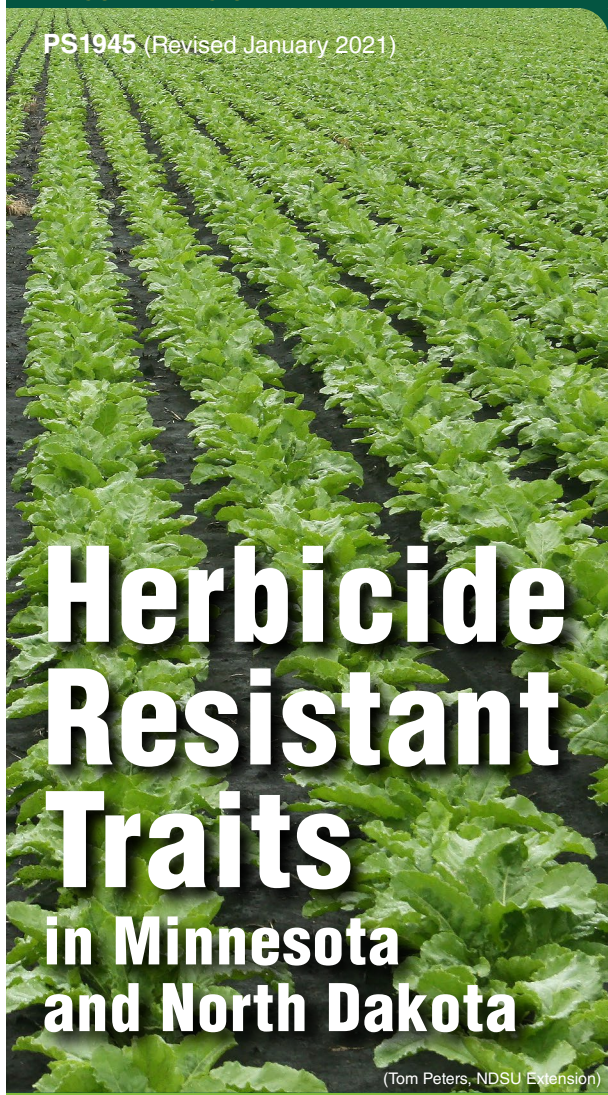


PS1945 (Revised January 2021)



# Herbicide Resistant Traits in Minnesota and North Dakota

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**H**erbicide-resistance traits have created additional weed control options in alfalfa, canola, corn, soybeans, sugarbeets, sunflowers and wheat. However, traits may create confusion surrounding which herbicides can be applied safely and legally to the various crop trait packages. Misapplication due to confusion can be very costly and embarrassing for the producer and collaborating partners.

Weed management to prevent herbicide-resistant weeds requires a well-developed strategy. A durable weed management strategy considers the crops planned for the field and chemical, cultural and mechanical control strategies to achieve excellent control of the primary weeds in the field. Your weed management strategy should consider herbicide applied in sequence and mixtures, along with nonchemical control options, to preserve the value of herbicides and herbicide-resistant traits on your farm.

Reading and following label guidelines when applying herbicides to any crop is important. The label of some glyphosate products indicates they can be applied to Roundup Ready® and glyphosate-tolerant crops. Most glyphosate labels state the products are for use in Roundup Ready® crops or in crops that have the Roundup Ready® gene. Other glyphosate labels have language stating the glyphosate product can be applied to glyphosate-tolerant crops.

This reference guide is designed to help clarify which herbicide products can be applied to various trait packages. You always should verify seed tags and herbicide labels to ensure misapplication does not occur.

**Table 1. Alfalfa herbicide-resistant traits and herbicides that can be used in combination with resistant traits. A checkmark indicates that alfalfa herbicide trait packages have resistance to various herbicide products.<sup>a</sup>**

Alfalfa Herbicide Trait	Glyphosate	Glufosinate	Growth Regulators
Conventional			
Roundup Ready Alfalfa <sup>b</sup>	✓		

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Always consult herbicide label to determine if glyphosate formulation is approved for RR alfalfa.

**Table 2. Canola herbicide-resistant traits and herbicides that can be used in combination with resistant traits. A checkmark indicates that canola herbicide trait packages have resistance to various herbicide products.<sup>a</sup>**

Canola Herbicide Trait	Glyphosate	Glufosinate	ALS Inhibitors
Conventional			
Roundup Ready	✓		
Roundup Ready TruFlex	✓		
LibertyLink		✓	
Clearfield Canola <sup>b</sup>			✓
SU Canola <sup>c</sup>			✓

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Apply Beyond (imazamox) to Clearfield canola varieties.

<sup>c</sup>Apply Draft (thifensulfuron and tribenuron) to SU Canola varieties.

**Table 3. Corn herbicide-resistant traits and herbicides that can be used in combination with resistant traits.**<sup>a</sup> A checkmark indicates that corn herbicide trait packages have resistance to various herbicide products.<sup>b</sup>

Corn Herbicide Trait	Glyphosate	Glufosinate	2,4-D Choline <sup>c</sup>	FOP ACCase Inhibitors <sup>d</sup>
Conventional				
Glyphosate Tolerant (GT)	✓			
LibertyLink (LL)		✓		
GT LL	✓	✓		
RR2	✓			
RR2Y LL <sup>e</sup>	✓	✓		
Enlist	✓		✓	✓

<sup>a</sup>Trait names often refer to insect resistance traits (Agrisure, Optimum, Yieldgard, etc.). Be sure to consult seed tags and product information to ensure herbicide trait packages.

<sup>b</sup>Always consult herbicide labels for application requirements.

<sup>c</sup>2,4-D is labeled for corn. Only approved 2,4-D choline formulations are permitted for applications to Enlist corn (Enlist Duo, Enlist One) at higher rates or later stages of corn growth.

<sup>d</sup>Assure II only and not other FOP or ACCase inhibitors.

<sup>e</sup>Always consult herbicide label to determine if glyphosate formulation is approved for RR corn.

**Table 4. Soybean herbicide-resistance traits and herbicides that can be used in combination with resistant traits.** A checkmark indicates that soybean herbicide trait packages have resistance to various herbicide products.<sup>a</sup>

Soybean Herbicide Trait	Glyphosate	Glufosinate	2,4-D Choline <sup>b</sup>	Dicamba <sup>c</sup>	HPPD Inhibitors <sup>d</sup>
Conventional					
Glyphosate Tolerant (GT)	✓				
Roundup Ready <sup>e</sup>	✓				
Roundup Ready 2 Yield <sup>e</sup>	✓				
Roundup Ready 2 Yield Xtend <sup>e</sup>	✓			✓	
Roundup Ready 2 Yield Xtendflex	✓	✓		✓	
LibertyLink (LL)		✓			
LLGT27 <sup>d</sup>	✓	✓			✓
Enlist E3	✓	✓	✓		
GT27 <sup>d</sup>	✓				✓

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Only approved 2,4-D choline formulations (Enlist Duo, Enlist One) are permitted for over-the top applications to Enlist and Enlist E3 soybeans.

<sup>c</sup>Only approved dicamba formulations (Engenia, FeXapan, Tavium, XtendiMax) are permitted for over-the-top application to Xtend and XtendFlex soybeans.

<sup>d</sup>GT27 and LLGT27 are resistant to isoxaflutole pre-emergence. Alite 27 herbicide is the only herbicide currently approved for use in soybeans in select counties of the U.S. as of January 2021.

<sup>e</sup>Always consult herbicide label to determine if glyphosate formulation is approved for RR soybeans.

**Table 5. Sugarbeet herbicide-resistant traits and herbicides that can be used in combination with resistant traits.** A checkmark indicates that sugarbeet herbicide trait packages have resistance to various herbicide products.<sup>a</sup>

Sugarbeet Herbicide Trait	Glyphosate	Glufosinate	Growth Regulators
Conventional			
Roundup Ready <sup>b</sup>	✓		

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Always consult herbicide label to determine if glyphosate formulation is approved for RR sugarbeets.

**Table 6. Sunflower herbicide-resistant traits and herbicides that can be used in combination with resistant traits.** A checkmark indicates that wheat herbicide trait packages have resistance to various herbicide products.<sup>a</sup>

Sunflower Herbicide Trait	Glyphosate	Glufosinate	ALS Inhibitors
Conventional			
Clearfield Sunflower <sup>b</sup>			✓
Clearfield Plus Sunflower <sup>b</sup>			✓
Express Sun Sunflower <sup>b</sup>			✓

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Apply Beyond (imazamox) to Clearfield sunflower varieties.

<sup>c</sup>Apply Express SG (tribenuron) to Express Sun sunflower varieties.

**Table 7. Wheat herbicide-resistant traits and herbicides that can be used in combination with resistant traits.** A checkmark indicates that wheat herbicide trait packages have resistance to various herbicide products.<sup>a</sup>

Wheat Herbicide Trait	Glyphosate	Glufosinate	ALS Inhibitors
Conventional			
Clearfield Wheat <sup>b</sup>			✓
Clearfield Plus Wheat <sup>b</sup>			✓

<sup>a</sup>Always consult herbicide labels for application requirements.

<sup>b</sup>Apply Beyond (imazamox) to Clearfield wheat varieties.

\*This publication is adapted from Butts et al. 2019. Herbicide resistance traits: quick reference guide. MP544. Available at [www.uaex.edu/publications/PDF/MP544.pdf](http://www.uaex.edu/publications/PDF/MP544.pdf)

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