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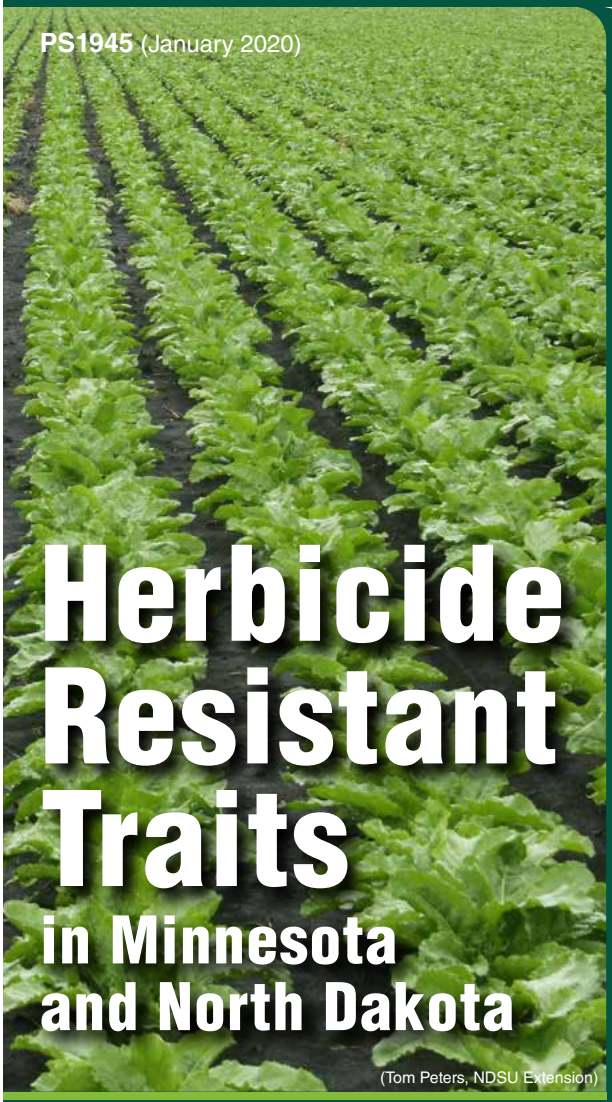

Herbicide Resistant Traits

in Minnesota and North Dakota

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Herbicide-resistance traits have created additional weed control options in alfalfa, canola, corn, soybeans, sugarbeets and wheat. However, traits may create confusion surrounding which herbicides can be applied safely and legally to the various crop trait packages. Misapplications 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-thought-out strategy. Best management practices should consider control of weeds present in the field as well as control during the cropping sequence. A weed management strategy including an assortment of herbicide mixtures along with nonchemical options is necessary to preserve the value of herbicides and herbicide-resistant traits.

It is important to read and follow label guidelines when applying herbicides to any crop. 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 check seed tags and herbicide labels to ensure missapplications do 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.[a]

Alfalfa Herbicide Trait	Glyphosate	Glufosinate	Growth Regulators
Conventional			
Roundup Ready Alfalfa[b]	✔		

[a]Always consult herbicide labels for application requirements.
[b]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.[a]

Canola Herbicide Trait	Glyphosate	Glufosinate	ALS Inhibitors
Conventional			
Roundup Ready	✔		
Roundup Ready TruFlex	✔		
LibertyLink		✔	
Clearfield Canola[b]			✔
SU Canola[c]			✔

[a]Always consult herbicide labels for application requirements.
[b]Apply Beyond (imazamox) to Clearfield canola varieties.
[c]Apply Draft (thifensulfuron and triberuron) to SU Canola varieties.

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

Corn Herbicide Trait	Glyphosate	Glufosinate	2,4-D Choline[c]	FOP ACCase Inhibitors[d]
Conventional				
Glyphosate Tolerant (GT)	✔			
LibertyLink (LL)		✔		
GT LL	✔	✔		
Roundup Ready 2 Yield (RR2Y)	✔			
RR2Y LL[e]	✔	✔		
Enlist	✔		✔	✔

[a]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.
[b]Always consult herbicide labels for application requirements.
[c]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.
[d]Assure II only and not other FOP or ACCase inhibitors.
[e]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.[a]

Soybean Herbicide Trait	Glyphosate	Glufosinate	2,4-D Choline[b]	Dicamba[c]	HPPD Inhibitors[d]
Conventional					
Glyphosate Tolerant (GT)	✔				
Roundup Ready[e]	✔				
Roundup Ready 2 Yield[e]	✔				
Roundup Ready 2 Yield Xtend[e]	✔			✔	
Roundup Ready 2 Yield Xtendflex[f]	✔	✔		✔	
LibertyLink (LL)		✔			
LLGT27[d]	✔	✔			✔
Enlist	✔		✔		
Enlist E3	✔	✔	✔		
GT27	✔				✔

[a]Always consult herbicide labels for application requirements.
[b]Only approved 2,4-D choline formulations (Enlist Duo, Enlist One) are permitted for over-the top applications to Enlist and Enlist E3 soybeans.
[c]Only approved dicamba formulations (Engenia, FeXapan, Tavium, XtendiMax) are permitted for over-the-top application to Xtend and XtendFlex soybeans.
[d]GT27 and LLGT27 are resistant to isoxaflutole preemergence. No HPPD-inhibiting herbicide is approved for use in soybeans in the U.S. as of January 2020.
[e]Always consult herbicide label to determine if glyphosate formulation is approved for RR soybeans.
[f]Not approved for commercial production in the U.S. as of January 2020.

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.[a]

Sugarbeet Herbicide Trait	Glyphosate	Glufosinate	Growth Regulators
Conventional			
Roundup Ready Sugarbeets[b]	✔		

[a]Always consult herbicide labels for application requirements.
[b]Always consult herbicide label to determine if glyphosate formulation is approved for RR sugarbeets.

Table 6. 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.[a]

Wheat Herbicide Trait	Glyphosate	Glufosinate	ALS Inhibitors
Conventional			
Clearfield Wheat[b]			✔

[a]Always consult herbicide labels for application requirements.
[b]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

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