

# SOYBEAN

Herbicide	Product/A (ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<p>Refer to page 6 for Fall or Spring Early Preplant Herbicides. Refer to page 38-39 for additional herbicides to use in conventional or herbicide-resistant soybean.</p>				
<p><b>Soil-Applied Herbicides</b></p>				
<b>Prowl</b> <b>Prowl H2O</b> (pendimethalin <sup>3</sup> )	<b>2.4 to 3.6 pt EC</b> <b>2.1 to 3 pt ACS</b> (1 to 1.5 lb)	Annual grass and some broadleaf weeds.	PPI. Fall or Spring.	Adjust rate for soil type. Do not apply PRE. Poor control of weeds with large seeds, including wild oat and wild mustard. A1-2 B1 B7 E1 E11
<b>Sonalan</b> <b>Sonalan 10G</b> (ethalfluralin <sup>3</sup> )	<b>1.5 to 3 pt EC</b> <b>5.5 to 11.5 10G</b> (0.55 to 1.15 lb)			
<b>Treflan / generic</b> trifluralin <sup>3</sup>	<b>1 to 2 pt EC</b> (0.5 to 1 lb)			
<b>Valor SX</b> <b>Valor EZ</b> (flumioxazin <sup>14</sup> )	<b>2 to 3 oz WDG</b> <b>2 to 3 fl oz EZ/SC</b> (1.02 to 1.53 oz)	Small-seeded broadleaf weeds.	EPP, Shallow PPI, or PRE.	PRE requires precipitation for herbicide activation. Refer to label for tank-mix options, application information, and restriction. Commercial mixtures available (See page 30): <b>Afforia</b> = flumioxazin + thifensulfuron + tribenuron <b>Authority Assist</b> = sulfentrazone + imazethapyr <b>Authority Edge</b> = sulfentrazone + pyroxasulfone <b>Authority Elite</b> = sulfentrazone + S-metolachlor <b>Authority First</b> = sulfentrazone + cloransulam <b>Authority MTZ</b> = sulfentrazone + metribuzin <b>Authority Supreme</b> = sulfentrazone + pyroxasulfone <b>BroadAxe XC</b> = sulfentrazone + S-metolachlor <b>Fierce</b> = flumioxazin + pyroxasulfone <b>Fierce MTZ</b> = flumioxazin+pyroxasulfone+metribuzin <b>Sonic</b> = sulfentrazone + cloransulam <b>Surveil</b> = flumioxazin + cloransulam A1-2 B1-2 E1 E12-13
<b>Spartan</b> (sulfentrazone <sup>14</sup> )	<b>4.5 to 12 fl oz F</b> (2.25 to 6 oz)			
Metribuzin <sup>5</sup>	Soil pH >7.5 = <b>0.33 lb DF</b> Soil pH <7.5 = <b>0.33 to 0.5 lb DF</b>			
<b>Sharpen</b> (saflufenacil <sup>14</sup> )	<b>1 to 1.5 fl oz SC</b> (0.36 to 0.54 oz)	Broadleaf weeds including winter annuals.		PRE requires precipitation for herbicide activation. Apply with MSO adjuvant at 1 to 1.5 pt/A for burndown control of emerged broadleaf weeds. Planting interval is dependent on soil texture and OM. Sharpen at 1.5 fl oz and Verdict at 7.5 fl oz require a 14 day plantback interval. Refer to label for tank-mix options. A1-2 B1-2 B12
<b>Verdict</b> (saflufenacil <sup>14</sup> & dimethenamid <sup>15</sup> )	<b>5 to 7.5 fl oz EC</b> (1.3 to 0.53 oz & 0.9 to 1.34 lb)			
<b>Dual/II/Magnum</b> (S/metolachlor <sup>15</sup> )	<b>1 to 2 pt EC</b> (0.95 to 1.9 lb)	Annual grasses and some broadleaf weeds.	EPP, Shallow PPI, PRE and EPOST.	Requires precipitation for soil activation. Multiple rain events increase activation of pyroxasulfone. Provides 3 to 4 weeks residual weed control after activation. Adjust rate for soil type. Shallow PPI gives more consistent weed control than PRE. Use highest rates for greater and more consistent weed control. Warrant: Do not PPI. Application with other PRE or EPOST herbicides and stressful environment after application may increase risk of soybean injury. Refer to labels for tank-mix options. Commercial mixtures available (See page 30): <b>Authority Elite</b> = S-metolachlor + sulfentrazone <b>Boundary</b> = S-metolachlor + metribuzin <b>BroadAxe XC</b> = S-metolachlor + sulfentrazone <b>Fierce</b> = pyroxasulfone + flumioxazin <b>Zidua Pro</b> = pyroxasulfone + saflufenacil + imazethapyr A1-2 B1-2 D5 E1
<b>Outlook / generic</b> dimethenamid <sup>15</sup>	<b>10 to 24 fl oz EC</b> (0.47 to 1.125 lb)			
<b>Warrant</b> (acetochlor <sup>15</sup> - microencapsulated)	<b>1.25 to 2 qt ME</b> (0.94 to 1.5 lb)		POST PHI: Dual = 90 days.	
<b>Anthem Maxx</b> (pyroxasulfone <sup>15</sup> & fluthiacet <sup>14</sup> )	<b>2 to 5.5 fl oz SC</b> (1 to 2.87 oz & 0.03 to 0.087 oz)			
<b>Zidua SC</b> (pyroxasulfone <sup>15</sup> )	<b>2.5 to 5.75 oz SC</b> (1.3 to 3 oz)			

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<b>Refer to page 38-39 for additional herbicides to use in conventional or herbicide-resistant soybean.</b>				
<b>POST-Applied Herbicides</b>				
<b>Warrant</b> (acetochlor <sup>15</sup> - microencapsulated)	<b>1.25 to 2 qt ME</b> (0.94 to 1.5 lb)	PRE control of grass and broadleaf weeds.	POST. Soybean: After emergence until R2.	Rainfall required for PRE activation. Does not control emerged weeds. Provides residual weed control after activation. No adjuvant required. A1-2 E1 D5
<b>Basagran 5L /</b> generic bentazon <sup>6</sup> + MSO adjuvant	<b>0.4 to 1.6 pt SL /</b> <b>0.5 to 2 pt applied</b> <b>1 to 4 times.</b> (0.25 to 1 lb)	Some broadleaf weeds.	POST. Soybean: After emergence. Broadleaf weeds: <b>Small.</b>	Non-residual, contact herbicide requiring >15 gpa and full sunlight. Add MSO adjuvant at 1 to 1.5 pt/A. Maximum bentazon amount per season is 2 lb/A. Refer to E3 for additional information. A3 A5-6 E1 E3
<b>Cadet</b> (fluthiacet <sup>14</sup> )	<b>0.4 to 0.9 fl oz EC</b> (0.045 to 0.1 oz)	Some small broadleaf weeds including pigweed species.	POST. Soybean: 1 to 2 trifoliates.	Contact herbicides requiring small weed size, >15 gpa, NIS or oil adjuvant at 1 to 2 pt/A, and full sunlight. May cause speckling on soybean leaves. Cadet may improve lambsquarters control. Apply Cobra with oil adjuvant at 1 to 2 pt/A. Refer to label for crop response, adjuvant type and rate, and tank-mix options. A3 E1
<b>Cobra</b> (lactofen <sup>14</sup> )	<b>8 to 12.5 fl oz EC</b> (2 to 3.2 oz)		Weeds: Small.	
<b>Resource</b> (flumiclorac <sup>14</sup> )	<b>2 to 8 fl oz EC</b> (0.215 to 1.72 oz)			
<b>Ultra Blazer</b> (acifluorfen <sup>14</sup> )	<b>0.5 to 1.5 pt EC</b> (0.125 to 0.375 lb)			
<b>Flexstar / generic</b> fomesafen <sup>14</sup> + oil adjuvant	<b>0.75 pt EC</b> (0.176 lb)	Many small broadleaf weeds.  Poor buckwheat, lambsquarters and hairy nightshade control.	POST Soybean: Prior to flowering. Weeds: Small.  Do not use as a rescue treatment. Contact herbicide requiring small weed size.	Apply at >15 gpa, oil adjuvant at 1 to 2 pt/A, and full sunlight. MSO at 1 to 2 pt/A + AMS at 8.5 lbs/100 gal water will increase weed control and risk of crop injury. Apply at 1 pt/A in ND east of I-29 and south of I-94. Apply at 0.75 pt/A in ND east of Hwy 281 and in the following counties west of Hwy 281: Benson, Bottineau, Burleigh, Dickey, Eddy, Emmons, Foster, Grant, Kidder, LaMoure, Logan, McHenry, McIntosh, McLean, Mercer, Morton, Oliver, Pierce, Renville, Rolette, Sheridan, Sioux, Stutsman, Towner, Ward, and Wells. West of Hwy 281: - Do not apply to soil with OM >4%. - Do not apply after June 20. Refer to product label and ND SLN label for crop rotation restrictions and other restrictions. Refer to E4 for improved broadleaf weed control. A3 E1 E5
<b>FirstRate</b> (cloransulam <sup>2</sup> )	<b>0.3 oz WDG or</b> <b>10 A/pack</b> (0.25 oz)	Large-seeded broadleaf weeds.	POST. Soybean: Up to full flower stage (R2). Weeds: Small.	Add oil adjuvant at 1 to 2 pt/A + 28% UAN at 2.5% v/v. Refer to label for weed size, and tank-mix options. A3 E1
<b>Harmony / generic</b> thifensulfuron <sup>2</sup>	<b>0.083 (1/12) oz DF</b> <b>0.125 (1/8) oz SG</b> (0.062 oz)	Mustard, pigweed, and lambsquarters.	POST. Soybean: 1 <sup>st</sup> trifoliolate until 60 days PHI.	Add oil additive at 1 to 2 pt/A + 28% UAN or AMS. Refer to label for tank-mix options. A3 A5-8 E1 E6
<b>Pursuit</b> (imazethapyr <sup>2</sup> )	<b>2 to 3 fl oz SL</b> (0.5 to 0.75 oz)	Annual broadleaf weeds. Poor lambsquarters, ragweed, buckwheat and b. wormwood control.	POST. Soybean: <b>Prior to flowering.</b>	Add oil adjuvant at 1 to 2 pt/A + 28% UAN at 2.5% v/v. MSO adjuvants enhance weed control more than petroleum oil or NIS adjuvants. Refer to label for weed size and application information. Raptor has less soil residual carryover than Pursuit. A3 A5-8 E1 E8 E10
<b>Raptor</b> (imazamox <sup>2</sup> )	<b>4 to 5 fl oz SL</b> (0.5 to 0.625 oz)		Weeds: Small and actively growing.	
<b>Varisto</b> (bentazon <sup>6</sup> & imazamox <sup>2</sup> )	<b>11 to 27 fl oz SL</b> (0.34 to 0.84 lb + 0.26 to 0.64 oz)	Small annual grass and broadleaf weeds and suppression of Canada thistle.	Allow a 30 day PHI.	Add MSO adjuvants at 1.25 to 1.5 pt/A. Apply 11 fl oz to pre-bolt canola. Refer to E3 for additional information. A3 A5-8 E1 E3 E10

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<b>Refer to page 38-39 for additional herbicides to use in conventional or herbicide-resistant soybean.</b>				
<b>Assure II Targa</b> (quizalofop <sup>1</sup> )	<b>4 to 12 fl oz EC</b> (0.44 to 1.32 oz)	Annual grasses and quackgrass.	Soybean: Prior to pod set. Grass weeds: Refer to table below.	Add oil adjuvant at 1 gal/100 gal water but not less than 1.25 pt/A. Use highest rate of Assure II for yellow foxtail control. Grass control is reduced by tank mixtures or close interval application of POST broadleaf control herbicides. Antagonism generally can be avoided by applying a higher rate of grass herbicide or apply the grass control herbicide 1 or more days before or 7 days after the broadleaf control herbicide. Do not cultivate prior to 5 days before or 7 days after application. Refer to label for tank-mix options. A3 A5-7 E1-2
<b>Fusilade DX</b> (fluazifop <sup>1</sup> )	<b>5 to 12 fl oz EC</b> (1.25 to 3 oz)			
<b>Poast</b> (sethoxydim <sup>1</sup> )	<b>0.5 to 1.5 pt EC</b> (0.1 to 0.3 lb)	Annual grasses.	Soybean: All stages. Grass weeds: Refer to table below.	
<b>Select Max 1EC</b> <b>Select 2EC</b> <b>Shadow 3EC</b> (clethodim <sup>1</sup> )	<b>9 to 16 fl oz EC</b> <b>4 to 8 fl oz EC</b> <b>2.66 to 5.33 EC</b> (1 to 2 oz)	Annual grasses and quackgrass.		

## Grass Control with POST Herbicides

	Foxtail, green and yellow		Corn, volunteer (See page 113)		Quackgrass		Wheat, barley, oat, and sandbur		Proso millet, wild	
	inches	fl oz/A	inches	fl oz/A	inches	fl oz/A	inches	fl oz/A	inches	fl oz/A
Assure II/Targa <sup>1</sup>	2 to 4	7 to 8	6 to 30	5 to 8	6 to 10	12	2 to 6	7 to 8	2 to 6	5 to 8
Fusilade DX <sup>1</sup>	2 to 4	10 to 12	12 to 24	4 to 6	6 to 10	12	2 to 6	8	4 to 8	6
Poast <sup>1</sup>	2 to 8	1 pt	1 to 20	1 pt	6 to 8	2 pt	1 to 4	1 pt	4 to 10	0.5 pt
Select Max 1EC <sup>1</sup>	2 to 8	9 to 12	4 to 24	9 to 12	4 to 12	12	2 to 6	9	2 to 10	9
Select 2EC <sup>1</sup>	2 to 8	4 to 6	4 to 24	6	4 to 12	8	2 to 6	6	2 to 10	4 to 6
Shadow 3EC <sup>1</sup>	2 to 8	2.66-5.33	4 to 24	2.66-5.33	4 to 12	5.3-10.6	2 to 6	4 to 5.33	2 to 10	4 to 5.33

## Preharvest Application

Herbicide	Product/A (ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Glyphosate <sup>9</sup>	Up to 1.5 lb ae <b>See Remarks.</b>	Preharvest weed control - broadcast or spot application.	Prior to harvest. Apply when soybean seed pods are a mature brown color, >75% leaf drop, and <30% seed moisture.	Add NIS plus AMS fertilizer at 8.5 lb/100 gal. <b>Do not apply on soybean grown for seed because reduced germination/vigor may occur.</b> A3-6 B8
Banvel / generic dicamba <sup>4</sup> + MSO adjuvant	<b>Up to 32 floz 4SL + 1 qt/A</b> (1 lb)			<b>Do not apply on soybean grown for seed because reduced germination/vigor may occur.</b> Add oil adjuvant at 1 to 2 pt/A. A3 A5-8 B6 E4
<b>Aim + MSO adjuvant</b> (carfentrazone <sup>14</sup> )	<b>1 to 6 oz SL + 1 qt/A</b> (0.256 to 1.5 oz)	Desiccant.	PHI: RU = 7 days Dicamba = 7 days. Paraquat = 15 days Aim = 3 days Sharpen = 3 days	Contact herbicides require >15 gpa and full sunlight. Apply at >10/>5 gpa for ground/aerial application. Apply paraquat with NIS at 2 qt/100 gal water. Sharpen requires up to 10 days for optimum desiccation. Apply dicamba, Aim, and Sharpen with AMS at 8.5 lb/100 gal water or UAN at 2.5 gal/100 gal water.
Paraquat <sup>22</sup> + NIS	<b>8 to 16 fl oz 2SL</b> <b>5.4 to 10.7 floz 3SL</b> (0.13 to 0.25 lb)			<b>Do not apply Sharpen on soybean grown for seed because reduced germination/vigor may occur.</b> B11-12
<b>Sharpen + MSO adjuvant</b> (saflufenacil <sup>14</sup> )	<b>1 to 2 fl oz SC + 1 to 2 pt/A</b> (0.36 to 0.72 oz)			

## HERBICIDE-RESISTANT SOYBEAN

Refer to Herbicide Resistant Weeds section (X1) for weed management strategies to delay herbicide resistant weeds.

Rule #1 - Control weeds BEFORE 2 to 4 inches tall to avoid yield loss.  
Remove weeds early especially when grass weed populations are high.

### ND soybean yield loss from weeds removed at different intervals.

Weed height when weeds were removed.	Soybean stage	Soybean yield* (bu/A)
Weed free	-	44.3
2 to 4 inches	VC (cotyledon) to V1	42.1
6 to 8 inches	V2 to V4	40.8
>10 inches	V3 to R2	36.4
Weedy check	-	22.7

Soybean yield loss from weeds may be greater in dry North Dakota environments than other areas of the Midwest that receive greater precipitation.

\*Source: Greg Endres, Carrington R&E Center. 8-site years (2011-2014). Carrington, Doyon, Langdon, and Minot.

## LibertyLink Soybean

Herbicide	Product/A (ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Liberty 280, Interline</b> (glufosinate <sup>10</sup> )	<b>32 to 43 fl oz SL</b> (0.58 to 0.72 lb)  <b>Maximum total = 87 fl oz</b>	Annual grass and broadleaf weeds including ALS and glyphosate resistant weeds.	POST. Soybean: Emergence to pre-bloom.	<b>Apply only to LibertyLink soybean varieties.</b> Non-selective, contact, non-residual herbicide requiring thorough coverage. Apply a PRE foundation treatment prior to Liberty POST. Add AMS at 3 lb/A - do not use AMS replacement or water conditioner adjuvants. Can be applied with a registered grass herbicide. Refer to label for tank-mix options and restrictions. Most active in hot and sunny conditions. Controls weeds resistant to other herbicides. A3 A6 B9 D7
<b>Cheetah, Scout</b> (glufosinate <sup>10</sup> )	<b>29 to 43 fl oz SL</b> (0.53 to 0.72 lb)  <b>Maximum total = 87 fl oz</b>		Weeds: Up to 3 inches tall.	

## STS (sulfonylurea-tolerant) Soybean

Herbicide	Product/A (ae/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Harmony/generic</b> thifensulfuron <sup>2</sup>	<b>0.33 oz DF</b> <b>0.5 oz SG</b> (0.25 oz)	Annual broadleaf weeds including wild buckwheat, lambsquarters, mustard species, and vol. RR canola.	POST. RR/STS soybean: 1 <sup>st</sup> fully expanded trifoliolate to 60 days PHI.	<b>Apply only to RR/STS soybean varieties.</b> Apply with glyphosate at 0.38 to 1.125 lb ae/A. Add NIS at 1 qt/100 gal water. Apply with AMS fertilizer at 8.5 lb/100 gal. Refer to label for weeds controlled and application information. A4-7 B8 D8 E6

## Roundup Ready and Roundup Ready 2 Yield Soybean

Herbicide	Product/A (ae/A)	Weeds	When to Apply	Remarks and Paragraphs
Glyphosate <sup>9</sup>	<b>Maximum single application = 1.5 lb ae</b>  <b>Maximum in-crop = 2.25 lb ae</b> <b>See Remarks.</b>	Annual and perennial grass and broadleaf weeds.	POST. Soybean: Emergence through R2 or full flowering. Allow a 14 day PHI.	<b>Apply only to RR / RR 2 Yield soybean varieties. Cannot plant harvested patented soybean seed.</b> Add AMS fertilizer at 8.5 lb/100 gal. Multiple applications may be necessary for weed flushes. Refer to label for weeds controlled, application information, and tank-mix options with residual herbicides and restrictions. A4-7 B8 D8

## Roundup Xtend Soybean

Herbicide	Product/A (ae/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Engenia 5 SL</b> <b>FeXapan 2.9SL</b> <b>XtendiMax 2.9SL</b> (dicamba <sup>4</sup> )  <b>RUP</b> Only certified applicators may purchase and apply.	<b>Single application rate in-crop: 12.8 5SL 22 fl oz 2.9SL</b> (0.5 lb ae) <b>Maximum total in-crop: 1 lb ae</b>  <b>Maximum total/yr: 2 lb ae</b>  <b>Do not apply less than 0.5 lb ae/A for any application.</b>	Annual and perennial broadleaf weeds.	EPP, At Planting, PRE and POST. Soybean: Emergence to pre-bloom or no more than 45 days after planting, whichever comes first.  Weeds: Less than 4 inches tall.	<b>Apply only to RU Xtend soybean varieties.</b> Drift and off-site movement may cause injury or death to susceptible plants and crops. For all application information and restrictions refer to: <a href="http://www.xtendimaxapplicationrequirements.com">www.xtendimaxapplicationrequirements.com</a> <a href="http://www.engeniatankmix.com">www.engeniatankmix.com</a> / <a href="http://www.fexapan.com">www.fexapan.com</a> web site <ul style="list-style-type: none"> <li>Do not deviate in use from label or web sites (above).</li> <li>Dicamba or auxin-specific training is required.</li> <li>Apply with approved nozzles and adjuvants.</li> <li>Do not add any product containing ammonium.</li> <li>Do not apply before/during temperature inversion.</li> <li>Do not apply when wind speed is &lt;3 or &gt;10 mph.</li> <li>Maintain a 110 or 220 foot buffer depending on rate.</li> </ul> A3-8 B6 B8 D1 D3 D8 E1 E4
<b>Tavium 3.38 SL</b> (dicamba <sup>4</sup> & S-metolachlor <sup>15</sup> )	<b>56.5 fl oz CS (0.5 lb &amp; 1 lb)</b>	Annual and perennial broadleaf weeds.  Residual control of grass and small-seeded broadleaf weeds	EPP, At Planting, PRE and POST. Soybean: Emergence to V4 or no more than 45 days after planting, whichever comes first.  Weeds: Less than 4 inches tall.	

### Dicamba Applications to DT Soybeans in 2020

ND implemented a State and Local Need (SLN), 24c label with restrictions beyond the Federal Section 3 Label in 2019. At the time of this writing, ND Department of Agriculture is CONSIDERING implementing similar restrictions for 2020. However, this is a multistep process requiring support of registrants and EPA. NDSU has established the following link to apprise applicators of developments. A link to the ND Department of Agriculture website will be provided if a SLN is implemented. Use the following link for the latest information: <https://tinyurl.com/ND-Dicamba2019SLN>

#### Some reasons why off-site movement of dicamba can occur:

1. Soybean can show phytotoxic symptoms from dicamba at rates as low as 0.0004 oz ae/A (0.028 g/ha). Very small amounts of dicamba from contaminated sprayers, particle drift, and volatility can cause injury symptoms on soybean. Extremely high soybean sensitivity to dicamba influences all other discussion points.
2. Dicamba rate used in DT soybean is 8 oz ae/A compared to 0.5 to 2 oz ae/A used in wheat and corn. The higher dicamba rate applied in DT soybean applied during late June and early July can result in very high release of dicamba into the environment, which could be a source for particle drift and volatility.
3. Higher temperatures occur in late June and early July. The vapor pressure of dicamba significantly increases as temperature increases.
4. Dicamba is normally applied in May and early June in wheat and corn. Dicamba in DT soybean allows application prior to R1 stage. Later applications are more prone to dicamba drift because temperatures are higher, which allows greater dicamba volatility while soybeans are more advanced in growth to intercept dicamba, express injury symptoms, and possibly reduce yield.
5. Dicamba drift is more likely to cause yield loss the closer to and including reproductive stage. Summer solstice (June 21) is the reproductive trigger in soybean.
6. Precipitation normally decreases after late June. Dicamba is highly water soluble and rain events after application can “wash” dicamba off plant leaves into the soil to trap dicamba and reduce off-target movement.

NDSU Weed Science recommends no dicamba applications after June 20 - See #3-6 above.

- This allows for PRE and Early POST applications.
- This supports the residual PRE concept for effective weed management and encourages timely applications.
- Soybeans are photoperiod sensitive: the reproductive phase begins after the longest day of the year (June 21). Off-target drift of dicamba is more likely to injure non-tolerant soybean yield when it enters the reproductive phase.
- Most off-target dicamba drift complaints result from postemergence applications. Postemergence applications have the greatest potential to contact and injure susceptible vegetation. Spraying conditions may be favorable after June 20 but average temperatures are higher, which exponentially increase the potential for dicamba volatilization. Soybean plants will be larger to intercept more herbicide.

## Enlist Soybean

Herbicide	Product/A (ae/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Enlist One 3.8 SL</b> (2,4-D choline <sup>4</sup> )	<b>1.5 to 2.0 pt SL</b> (0.7 to 0.95 lb ae)	Annual and perennial broadleaf weeds	EPP, At Planting, PRE and POST. Soybean:	<b>Apply only to Enlist Soybean Varieties</b> Drift and off-site movement may cause injury or death to susceptible plants and crops.
<b>Ensit Duo 3.3 SL</b> (2,4-D choline <sup>4</sup> & glyphosate <sup>9</sup> )	<b>3.5 to 4.75 pt SL</b> (0.7 to 0.95 lb ae & 0.75 to 1 lb ae)	Annual and perennial grass and broadleaf weeds.	Emergence to no later than R2 (full bloom)	For all application information and restrictions refer to: <a href="https://www.enlist.com/en/approved-tank-mixes.html">https://www.enlist.com/en/approved-tank-mixes.html</a> <ul style="list-style-type: none"> <li>• Do not deviate in use from label or web sites (above).</li> <li>• Apply with approved nozzles and adjuvants.</li> <li>• Do not apply before/during temperature inversion.</li> <li>• Do not apply when wind speed is &lt;3 or &gt;15 mph.</li> <li>• Maintain a 30 foot buffer.</li> </ul>

Only glyphosate formulations that have been approved for use over the top of “Enlist” or “glyphosate-tolerant” soybeans can be used on Enlist soybeans.

Enlist “E3” soybean varieties are also tolerant to glufosinate. Apply only glufosinate formulations that have been approved for use over the top of “Enlist” or “glufosinate-tolerant” soybeans.

# Roundup Ready Soybean - Herbicides to apply in tank-mix or sequentially with glyphosate for control of weeds not controlled by glyphosate.

Herbicide <sup>a</sup>	Site of action-pg 108-109	Rate/A	Buckwheat, Wild	Canola, Vol. RR <sup>b</sup>	Horseweed (Marestail)	Kochia	Lambsquarters	Nightshade species	Pigweed, Redroot	Prickly lettuce	Ragweed, Common	Smartweed, Annual	Waterhemp / Palmer
Glyphosate <sup>9</sup> (4.5 lb ae)+ AMS + HSOC		32-105 fl oz	F-E	N	P-E	P-E	E	E	E	E	P-E	E	P-E
+ 2,4-D <sup>4e</sup>		+ 1 pt	F-E	P-E	G-E	P-E	E	E	E	E	E	E	P-E
+ 2,4-D <sup>4e</sup> + Express		+ 1 pt + 0.3 oz	F-E	G-E	P-E	P-E	E	E	E	E	P-E	E	P-E
+ 2,4-D <sup>4e</sup> + Metribuzin <sup>5</sup>		+ 1 pt + 0.33 lb	G-E	G-E	G-E	F-E	E	G-E	E	E	E	E	F-E
+ Afforia <sup>2,14</sup>		2.5-3.75 oz WDG	G-E	G-E	F-G	P-G	G-E	G-E	G-E	F-E	P	F	G
+ Verdict <sup>14,15</sup>		+ 5 fl oz	G-E	P-G	G-E	G-E	E	G-E	E	G-E	G-E	E	E
+ Verdict <sup>14,15</sup> + Metribuzin <sup>5</sup>		+ 5 fl oz + 0.33 lb	E	G-E	E	E	E	E	E	E	E	E	E
+ Verdict <sup>14,15</sup> + Zidua SC <sup>15</sup>		+ 5 fl oz + 3.25 fl oz	E	G-E	G-E	G-E	E	E	E	E	G-E	E	G-E
Paraquat <sup>22</sup> + NIS adjuvant		3 pt 2SL + 1-2 pt	F	-	F-G	G-E	P-E	G-E	E	F-G	G-E	E	G-E
+ Verdict <sup>14,15</sup> + Metribuzin <sup>5</sup> + oil adj.		+ 5 fl oz + 0.33	G-E	E	G-E	G-E	E	G-E	E	G-E	E	E	G-E
+ 2,4-D <sup>4e</sup> +Verdict <sup>14,15</sup> +Metrib <sup>5</sup> + oil adj.		+ 5 oz + 0.33 lb	E	E	E	E	E	E	E	E	E	E	E
Weed Control Ratings <sup>c,d</sup> - <i>without glyphosate</i>													
Afforia <sup>2,14</sup>		2.5-3.75 oz WDG	G-E	G-E	F-G	P-G	G-E	G-E	G-E	F-E	P	F	G
Anthem Maxx <sup>14,15</sup>		2-5.5 oz WDG	F-E	P-F	-	F-E	F-E	F-E	G-E	-	P	F-E	G-E
Authority Assist <sup>2,14</sup>		6-9 fl oz	P-G	G-E	F	F-E	G-E	F-E	F-E	E	N	G-E	F-E
Authority Elite <sup>14,15</sup>		20-32 fl oz	P-G	P	F	G-E	G-E	G-E	G-E	P	N	G-E	G-E
Authority First <sup>2,14</sup>		4-8 oz WDG	P-G	E	P-G	F-E	G-E	F-E	E	P	N	G-E	F-E
Authority MTZ <sup>5,14</sup>		12-15* oz	F-G	E	F	F-E	G-E	G-E	G-E	G-E	P-F	G-E	F-E
Authority Supreme <sup>14,15</sup>		6-11.5 fl oz	P-F	P	P-F	F-E	G-E	F-E	G-E	P	N	G-E	G-E
Boundary <sup>5,15</sup>		1.6*-2.4** pt	F-G	E	F	F-G	G	P	G-E	G-E	P-F	G	G-E
BroadAxe XC <sup>14,15</sup>		20-32 fl oz	P-G	P-F	F	G-E	G-E	G-E	G-E	P	N	G-E	G-E
Fierce <sup>14,15</sup>		3 oz WDG	P-F	G-E	F-G	F-E	F-G	F-E	G-E	F-G	F-G	F-G	G-E
FirstRate <sup>2</sup>		0.3-0.75 WDG	N	E	P-E	N	P-F	N	P-F	-	P	G-E	N
Metribuzin <sup>5</sup>		0.33-0.5 lb DF	F-G	E	F	F-G	P-G	P	G-E	G-E	P-F	G	F-G
Prowl <sup>3</sup> (PPI)		See label	N	N	N	P	F-G	N	E	N	N	N-P	F-G
Panther Pro <sup>2,5,14</sup>		12* fl oz	F-G	E	F-G	F-G	F-E	G-E	E	G-E	P-F	G	G
Pursuit <sup>2</sup>		2 fl oz	F-G	G-E	N	N	P	P-E	E	-	N	G	N
Sharpen <sup>14</sup>		1 fl oz	P-F	G-E	P-F	P	F	P	F-P	P	P	P	P-F
Sonalan <sup>3</sup> (PPI)		See label	P	N	N	P	F-G	N	E	N	N	N-P	F-G
Sonic <sup>2,14</sup>		4-8 oz WDG	F-G	E	P-G	F-E	G-E	F-E	E	P	N	G-E	F-E
Spartan <sup>14</sup>		4.5-9 fl oz	F-G	P	F	F-E	G-E	F-E	F-E	P	N	G-E	F-E
Surveil <sup>2,14</sup>		2.1-4.2 oz WDG	P	E	-	P-G	G-E	E	E	-	F-E	G-E	F-E
Treflan <sup>3</sup> (PPI)		See label	N	N	N	P	F-G	N	E	N	N	N-P	F-G
Valor EZ <sup>14</sup>		2-3 oz SC/WDG	P-F	F-E	F-G	F-G	F-E	G-E	G-E	F-E	P-F	F	G
Verdict <sup>14,15</sup>		5 fl oz	P-F	G-E	P-F	P	F-G	F	G	G-E	P-F	F	F-G
Zidua SC <sup>15</sup>		2.5 - 5.75 fl oz	F-E	P-F	-	F	F-E	F-E	G-E	-	P-F	F-E	G-E
Zidua Pro <sup>2,14,15</sup>		4.5 fl oz	F-E	P-F	-	F-E	F-E	F-E	G-E	-	F-G	F-E	G-E

<sup>a</sup>May carry over more than one cropping season. Follow labeled crop rotation restrictions - see Y15.

<sup>b</sup>See page 128 for control of volunteer canola and corn, and herbicide rates.

<sup>c</sup>E = Excellent (90-99%), G = Good (80-90%), F = Fair (65-80%), P = Poor (40-65%), N = None.

<sup>d</sup>Includes resistant populations.

\*Metribuzin at 0.33 lb/A DF, \*\*Metribuzin at 0.5 lb/A DF.

## Roundup Ready Soybean - Herbicides to apply in tank-mix or sequentially with glyphosate for control of weeds not controlled by glyphosate.

Herbicide <sup>a</sup> Site of action-pg 108-109	Rate/A	Buckwheat, Wild	Canola, Vol. RR <sup>b</sup>	Horseweed (Marestail)	Kochia	Lambsquarters	Nightshade species	Pigweed, Redroot	Prickly lettuce	Ragweed, Common	Smartweed, Annual	Waterhemp / Palmer
		PE	P-E	P-E	P-E	E	P-E	E	P-E	P-E	P-E	P-E

PRE fb POST Weed Management Programs - add AMS at 1.5 lb/A and see label for adjuvant requirements.

Weed Control Ratings<sup>c,d</sup>

RP = Residual PRE listed on page 30, such as, Boundary, Fierce, Sharpen, Spartan, or Zidua, or combinations above.

Herbicide	Rate/A	PE	P-E	P-E	P-E	E	P-E	E	P-E	P-E	P-E	P-E
RP fb RU <sup>9</sup> (4.5 lb ae) + AMS + HSOC	32-105 fl oz	PE	P-E	P-E	P-E	E	P-E	E	P-E	P-E	P-E	P-E
RP fb RU <sup>9</sup> + Flexstar <sup>GT</sup> <sup>9,14</sup> + HSMOC	32floz+2.68pt+1pt	G-E	E	P-G	G-E	E	E	E	G	E	E	P-E
RP fb RU <sup>9</sup> + Marvel <sup>14,14</sup> + NIS fb RU <sup>9</sup> + Cobra <sup>14</sup> + NIS	32 fl oz + 7.25 fl oz fb 32floz+8-12 floz	G-E	E	P-G	F-E	E	E	E	G	E	E	P-E
RP fb RU fb Storm + NIS fb RU if need	32 fl oz fb 1.5 pt	G	F-G	P-E	F-E	G-E	G-E	E	G-E	F-E	E	F-E

POST herbicides<sup>a</sup> - add AMS at 1.5 lb/A - see label for adjuvant requirements.

Weed Control Ratings<sup>c,d</sup> - *without glyphosate*

Herbicide	Rate/A	P-G	P-G	P-F	P-E	F-E	N-G	F-E	G	P-F	E	F-E
Basagran <sup>6</sup> + MSO	1.5-2 pt + 1.5 pt	P-G	P-G	P-F	P-E	F-E	N-G	F-E	G	P-F	E	F-E
Cadet <sup>14</sup> + NIS	0.65-0.9 fl oz	N-P	-	N	P-F	F-G	-	F-G	-	N	-	P-G
Cobra <sup>14</sup> + PO	8-12.5 fl oz	P	P	N	P-F	N	G	G-E	-	P-E	P	P-G
Extreme <sup>2,9</sup> + HSMOC	1.5-2.25 pt	G	P-E	P-G	P-E	G	E	E	G-E	P-E	G-E	P-E
FirstRate <sup>2</sup> + PO	0.3-0.6 oz WDG	P-F	P-G	G-E	P	P	N	N-P	-	N	E	N
Flexstar <sup>14</sup> + MSO	0.75 pt + 1-1.5 pt	P	E	N-P	G-E	P-F	F-E	E	-	P-E	G-E	P-E
Flexstar <sup>GT</sup> <sup>9,14</sup> + HSMOC	2.68 pt + 1 pt	P-G	E	P-G	G-E	G-E	G-E	E	F-G	F-E	E	P-E
Glyphosate <sup>9</sup> (4.5 lb ae) + AMS	32 fb 32 fl oz	G	N	P-E	P-E	E	E	E	E	P-E	E	P-E
Harmony DG/SG <sup>2</sup> + NIS + AMS	1/12 oz / 1/8 oz	N	P	N	N	F-G	N	G	P	N	F-G	N
Marvel <sup>14</sup> + NIS	5 to 7 fl oz	P	E	N-P	G-E	F-G	F-E	E	-	P-E	G-E	P-E
Pursuit <sup>2</sup> + MSO	2-3 fl oz + 1.5 pt	P	P-E	N	N	P	P-E	E	P-E	N	G	N
Raptor <sup>2</sup> + MSO	4-5 fl oz + 1.5 pt	P	P-E	N	N	P-F	E	E	G	N	G-E	N
Resource <sup>14</sup> + NIS or MSO	3 fl oz	-	-	N	-	F-G	-	F-G	-	N-P	-	N-P
Storm <sup>6,14</sup> + NIS or MSO	1.5 pt	P-F	P-E	N	P-E	F-E	F-G	E	G	P-F	E	F-E
Ultra Blazer <sup>14</sup> + NIS or MSO	1.5-2 pt	P	F-G	N	P-G	N	F-G	E	-	N-F	E	P-E
Varisto <sup>2,6</sup> + MSO	16-27 fl oz + 1.5 pt	P-G	P-E	P-F	P-E	F-E	E	E	G	P-F	E	F-E

Herbicides for Liberty Link soybean ONLY - add AMS at 3 lb/A.

Weed Control Ratings<sup>c,d</sup> - *without glyphosate*

Herbicide	Rate/A	F-G	F-E	G-E	F-E	F-E	F-E	F-E	F-E	F-E	F-E	F-E
Liberty 280 <sup>10</sup> + AMS	32 - 43 fl oz	F-G	F-E	G-E	F-E	F-E	F-E	F-E	F-E	F-E	F-E	F-E
fb Liberty <sup>10</sup> + AMS	fb 32 - 43 fl oz	G-E	F-E	E	E	E	E	E	G-E	E	E	G-E
+ Flexstar <sup>14</sup> + adjuvant + AMS	+ 0.75 pt	G	E	G-E	E	G-E	E	E	F-E	E	E	G-E
Residual PRE fb Liberty <sup>10</sup> + AMS	X rate fb 36 fl oz	E	E	E	E	E	E	E	E	E	E	E

<sup>a</sup>May carry over more than one cropping season. Follow labeled crop rotation restrictions - see Y15. <sup>b</sup>See page 128 for control of volunteer canola and corn, and herbicide rates.

<sup>c</sup>E = Excellent (90-99%), G = Good (80-90%), F = Fair (65-80%), P = Poor (40-65%), N = None.

<sup>d</sup>Includes resistant populations.

\*Metribuzin at 0.33 lb/A DF, \*\*Metribuzin at 0.5 lb/A DF.



# SOYBEAN

**E1. Soybean** is a poor competitor with weeds when cool soil temperatures cause slow germination and growth but does compete effectively in warm soils when germination and growth are rapid. Soybean production requires good cultural practices. Prepare the seedbed prior to planting to kill germinating weeds. Management practices such as thorough seedbed preparation, adequate soil fertility, choice of a well-adapted variety, and use of good quality seed all contribute to conditions of good competition with weeds. A rotary hoe or harrow may be used to control weeds after planting but before the soybean emerge or after emergence when soybean are in the 1 to 2 trifoliate leaf stage. Rotary hoe or harrow help activate PRE herbicides under dry conditions and increase weed control. The rotary hoe can effectively control weeds when ground is not trashy, lumpy or wet, and when weeds are emerging. Cultivation is most effective when soybean are slightly wilted during the warm part of the day, because the crop is less susceptible to breakage and weeds will desiccate quickly.

**E2. Poast** (sethoxydim), **Assure II/Targa** (quizalofop), **Fusilade DX** (fluazifop-P), **Select/Max\*** (clethodim) applied POST with oil adjuvant controls annual grasses and quackgrass. MSO oils have performed equal to petroleum-based oil additives. See tables in the soybean section for rates according to weed and weed size. Retreat quackgrass when regrowth is 4 to 8 inches tall. Poast suppresses quackgrass. Most broadleaf herbicides tank mixed with POST grass herbicides will often reduce grass control compared to the grass herbicide applied alone. Addition of fertilizer may partially overcome antagonism from broadleaf herbicides. Reduced grass control can be avoided by applying the grass herbicide at least 1 day before or 7 days after application of a broadleaf herbicide. 'Dim' herbicides (Select\* and Poast) may leave a residue in the soil and injure corn and other grass crops if planted before 6 days after application. Grass crops may be planted 30 days after Poast\* or Select\* application. Select Max allows a 6 days interval only if applied at low rates - see label.

Select\* is an ACCase inhibitor mode of action herbicide but has controlled ACCase resistant grasses. Do not overuse clethodim.

**E3. Basagran 5L** contains 5 lbs ai/gal and generic bentazon contains 4 lb ai/gal and applied POST at 0.5 to 1 qt/A controls many annual broadleaf weeds and suppresses Canada thistle. For greater broadleaf weed control, especially kochia, lambsquarters, redroot pigweed and wild buckwheat, apply bentazon as split treatments either twice each at 1 pt/A, 3 times each at 0.67 pt/A, or 4 times each at 0.5 pt/A as compared to one application at 2 pt/A. Make applications 7 to 10 days apart depending on weed growth rate, growing conditions, size of weeds at application, degree of weed control from first application, and sequential flushes. The first application must be made to small weeds (1 inch).

Apply bentazon at 1 qt/A to Canada thistle before bud stage and make a second application at 1 qt/A 7 to 10 days later.

Sequential applications will provide greater broadleaf weed control than from a single application at full rates and can be used in all labeled crops. Apply with oil adjuvant at 1 to 2 pt/A (1 pt/A by air). MSO adjuvant has shown greater enhancement of bentazon than petroleum oil (COC) adjuvants but the cost of MSO is higher. Bentazon is safe to soybean at all stages. The total maximum seasonal use rate is 4 pt/A so the micro-rate can be increased if weeds are large at application or if sequential applications are delayed due to rain or wind. Refer to paragraph F6 in the dry bean section for more information.

Weed control from Basagran applied 1 to 4 times. NDSU data.

Basagran			Oil adjuvant	Colq	Koch	Rrpw
(pt/A x no. of app.)			Rate/A	----- % control -----		
2 pt	x 1	+	PO at 2 pt/A	8	38	51
1 pt	x 2	+	"	31	64	90
0.67 pt	x 3	+	"	34	79	95
0.5 pt	x 4	+	"	76	98	99
2 pt	x 1	+	MSO at 1.5 pt/A	35	86	92
1 pt	x 2	+	"	76	98	95
0.67 pt	x 3	+	"	79	98	98
0.5 pt	x 4	+	"	99	99	99

Colq = lambsquarters, Koch = kochia, Rrpw = redroot pigweed

Bentazon is commonly combined with fertilizer micronutrients that may cause incompatibility problems resulting in zinc precipitation. Chelated zinc materials (black in color) have greater incompatibility problems than unchelated material (clear). Recommendations to prevent precipitation are to fill sprayer with water, add bentazon and thoroughly agitate, then add zinc fertilizer material.

**E4. Dicamba** controls most annual and perennial broadleaf weeds in glyphosate tolerant soybean. Weed control will vary based on rate, size of weeds, and adjuvants used. Refer to specific manufacturer web sites no more than 7 days before application for approved tank-mixes and application information.

Dicamba will injure or kill many broadleaf plants/crops from either particle or vapor drift. Avoiding spray drift is the responsibility of the applicator. Do not apply when wind is blowing toward or when drift may occur to susceptible crops. Apply only labeled formulations of dicamba and follow best management practices to reduce drift. Unabsorbed dicamba on plant tissue and soil may release vapors after dew and small rain events several days after application and injure susceptible crops. Applicators are required to be aware of proximity to susceptible crops. The applicator must survey areas surrounding application site and must consult susceptible crop registries for susceptible crops near the application site. Minute quantities of dicamba trapped in sprayers or bound to sprayer tank and components will cause injury to non-dicamba resistant soybean and many other susceptible crops. Closely follow label instructions for spray tank clean-out procedures.

Relative susceptibility of crops from dicamba drift:

- Low susceptibility: all small grains, canola, corn, flax, millet, triticale.
- Moderately susceptibility: alfalfa, buckwheat, potato, safflower, and tomato.
- Very high susceptibility: chickpea, dry bean, field pea, grape, lentil, sunflower, and sugarbeet.
- Extremely high susceptibility: non-DT soybean

Dicamba resistant kochia biotypes have been documented in many states including North Dakota. Use herbicides with effective modes of action other than Group 4 in soybean and in rotational crops to delay resistance to dicamba. High dicamba rates and multiple soil and in-crop applications of dicamba (alone) will greatly increase the development of dicamba resistant kochia and other broadleaf weeds similar to the development of glyphosate resistant weeds.

Growers should consider the risks of dicamba particle and or vapor drift, susceptibility of neighboring crops to dicamba, stage of neighboring crops at dicamba application, and drift of dicamba vapors possibly released from soil after application when considering using dicamba on dicamba resistant soybean. Consult label for these and other new label requirements.

## E5-13 - SOYBEAN

**E5. Flexstar** (fomesafen + adjuvants) controls many small broadleaf weeds. Apply with NIS at 1 to 2 qt/100 gal water or oil adjuvant at 1 to 2 pt/A. Oil adjuvant increases weed control but also increases risk of soybean injury. NDSU research has shown good to excellent kochia and other broadleaf weed control when Flexstar is applied at high spray volumes (>17 gpa), with oil adjuvants (especially MSO type), at labeled rates, and to kochia less than 2 inches tall.

Flexstar may cause excessive soybean injury if tank-mixed with EC formulated herbicides which emulsifiers act as additional oil adjuvant. Activity of Flexstar increases and risk of crop injury increases as temperature and humidity increases. Optimum soil degradation occurs in moist and warm soils. Dry periods during summer months may cause Flexstar residue to carryover and injure corn.

Flexstar is labeled on soybean and Reflex is labeled on dry bean. Flexstar contains adjuvants lacking in the Reflex formulation. Reflex may give less consistent weed control than Flexstar and will require better management strategies to achieve equivalent weed control. See label or crop rotation restriction section for additional information.

**E6. Harmony\*** (thifensulfuron) has activity on wild mustard, lambsquarters, pigweed species, annual smartweed, and wild buckwheat. Apply with NIS at 1 qt/100 gal water or oil adjuvants at 1 to 2 pt/A plus liquid fertilizer at 2 to 4 gal/100 gal water. Do not apply with oil adjuvants when tank-mixing with any other herbicide or severe crop injury may occur. See label or Pursuit paragraph for precautions when tank-mixing with Pursuit and other herbicides.

Harmony\* as spray drift or sprayer contamination may cause severe injury to susceptible crops such as sugarbeet and sunflower. Thoroughly clean sprayer to prevent contamination of subsequent spray mixtures and injury to susceptible crops.

**E7. Metribuzin\*** controls some annual broadleaf weeds, including wild mustard. Adjust rate according to soil type, pH, and organic matter. Some soybean varieties are susceptible to metribuzin\*; consult label for list of susceptible varieties. Soybean injury can be reduced by using herbicide combinations with lower rates of metribuzin\*.

**E8. Pursuit** (imazethapyr) may not control Venice mallow, horseweed, wild buckwheat, lambsquarters and common ragweed. POST application may not provide adequate soil residual to control subsequent nightshade flushes due to plant foliage intercepting most of the spray. However, even a small amount of Pursuit may give a reduction in number and intensity of weed flushes. Pursuit is enhanced greatest by MSO at 1.5 pt/A or basic pH blend adjuvants at 1 gal/100 gal water. Addition of UAN fertilizer improves weed control, especially lambsquarters.

Crop injury may result if either Pursuit or thifensulfuron is applied sequentially or tank-mixed together. In sequential application, the first herbicide reduces the ability of soybean to metabolize the second herbicide. Uncontrolled weeds from the first herbicide may be too large at the time of the second herbicide application. This is particularly important for lambsquarters.

**E9. Python** (flumetsulam) does not control large-seeded broadleaf weeds like common and giant ragweed and common cocklebur. Python activity is strongly affected by soil pH. High soil pH increases herbicide activity and increases speed of herbicide degradation, but also increases risk of crop injury. Some stunting may occur under poor growing conditions on soils with pH greater than 8.0. See label or Y15 for crop rotation restrictions.

**E10. Raptor** (imazamox) does not control wild buckwheat, lambsquarters, common and giant ragweed, Venice mallow, horseweed, biennial wormwood, and ALS-resistant weeds. Raptor may control marginally susceptible weeds if less than 1 inch tall. Soil residue of Raptor will not control late germinating weeds or weed flushes later in the growing season after rain events. Raptor as compared to Pursuit has greater grass and broadleaf weed control, provides improved lambsquarters control, and has less carryover and crop rotation restrictions.

Apply **Raptor** with basic pH blend adjuvant at 1 gal/100 gal water or MSO type adjuvants at 1 to 1.5 pt/A. Under high temperatures and humidity apply with NIS at 1 qt/100 gal water or PO at 1 to 2 qt/A v/v plus 28% UAN liquid fertilizer at 2 to 4 gal/100 gal water. 28% UAN improves control of many weeds. Activity of Raptor activity is greatest applied with MSO + UAN but may result in crop injury at >88F and >80% RH.

Refer to label and paragraph on Pursuit and Raptor for information and restrictions when applying Raptor before or after Harmony\* or tank-mixing with Harmony\* or other POST grass herbicides. Crop rotation restrictions are less with Raptor than Pursuit. However, like Pursuit, Raptor carryover is affected by soil pH. As soil pH increases, rate of Raptor degradation increases. At soil pH less than 6.5, rate of breakdown is slow and injury to sugarbeet and other sensitive crops may occur if planted before allowed time interval. See label or Y15 for crop rotation restrictions.

**E11. Sonalan** (ethalfluralin), **Treflan\*** (trifluralin), or **Prowl/H2O** (pendimethalin) applied PPI controls most annual grasses and some small-seeded broadleaf weeds but no large-seeded weeds including wild mustard, common cocklebur and sunflower control. Requirements for proper timing and depth of incorporation differ for each herbicide. Adjust rate according to soil type. Treflan\* must be incorporated in the top 2 to 3 inches of soil within 24 hours of application. Treflan\* incorporation may be delayed up to 2 days if applied to a cool, dry soil. Incorporation of Sonalan 10G can be delayed 3 to 5 days after application. Herbicides can be applied with most soil PPI herbicides labeled in soybean. Sonalan has less soil residue than Treflan\* or Prowl and may be more active at comparable rates.

**E12. Spartan** (sulfentrazone) applied shallow PPI or PRE controls most annual small-seeded broadleaf weeds, may partially control wild buckwheat, marshelder, wild mustard, common ragweed, hairy nightshade, Venice mallow, and foxtail, but provides no perennial weed control. Spartan control several weeds that have become resistant to glyphosate including waterhemp and kochia. Rate must be adjusted for soil texture, soil pH and organic matter content. Apply 4.5 to 12 fl oz/A and adjust rate for soil type. Herbicide solubility, activity, and phytotoxicity increases as soil pH increases. Follow label for rate information. Spartan may be applied up to 30 days prior to planting but use the higher rate in the appropriate rate range. Spartan can be tank-mixed with most PPI/PRE herbicides registered in soybean.

Consistent weed control depends on at least 0.5 to 0.75 inch rainfall shortly after application and before weeds emerge. Spartan will leave a residue in soil for more than one year. Refer to label or Y15 for crop rotation restrictions.

**E13. Valor** (flumioxazin) applied EPP or PRE controls most annual small-seeded broadleaf weeds and may suppress foxtail, common ragweed, annual smartweed, Russian thistle, and wild buckwheat. **Fierce** (flumioxazin + pyroxasulfone) applied EPP or PRE controls most grass and small-seeded broadleaf weeds. Valor can be applied with glyphosate in early burndown programs in soybean. Valor requires a minimum of 0.5 inch of rain for activation. Refer to label or Y15 for crop rotation restrictions.