

Soybean Weed Control

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The weed control suggestions in this production guide are based on the assumption that all herbicides mentioned will have a registered label with the Environmental Protection Agency. Soybeans treated with a nonregistered herbicide may have an illegal residue which, if detected, could cause condemnation of the crop. Federal law makes liable for seizure any raw agricultural commodity that possesses a pesticide residue for which no exemption or tolerance has been established or that exceeds the tolerances established by the Food and Drug Administration. People using herbicides in a manner contrary to label instructions are subject to penalty under federal and state laws. North Dakota State University or its officers or employees makes no claims or representations that the chemicals discussed will or will not result in residues on agricultural commodities and assume no responsibility for results from using herbicides.

Instructions for registered uses of herbicides are given on container labels. Read and follow label instructions carefully. **USE PESTICIDES ONLY AS LABELED.**

Herbicide labels also can be found on the Web at www.cdms.net/Home.aspx.

Soybean fall or spring early pre-plant herbicides.

| | Rate/a | Before planting |
|---|---------------|-----------------|
| 2,4-D amine ¹ | 0.5 lb ai | 15 days |
| | 1 lb ai | 1 month |
| 2,4-D ester ¹ | 0.5 lb ai | 7 days |
| | 1 lb ai | 1 month |
| | E-99 | 15 days |
| | Weedone 650 | 15 days |
| Aim EC | 2 fl oz | 0 |
| Affinity/thifensulfuron & tribenuron ¹ | | |
| All formulations | Label rates | 14 days |
| Banvel/dicamba ¹ | 4 fl oz | 14 days |
| | 1 pt | 1.5 months |
| Express/tribenuron ¹ | | |
| All formulations | Label rates | 1.5 months |
| Harmony/thifensulfuron ¹ | | |
| All formulations | Label rates | 0 |
| Ignite 280 | 29 - 36 fl oz | 0 |
| Paraquat ¹ - RUP | Label rates | 0 |
| Pre-Pare | 0.3 oz | 9 months |
| Rage D-Tech | 9-16 fl oz | 7 days |
| | 17-24 fl oz | 14 days |
| | 25-32 fl oz | 1 month |
| Roundup/generic ¹ | 0.75-3 lb ae | 0 |
| Sequence | 2.5-3.5 pt | 0 |
| Sharpen | 1-2 fl oz | 0-2 months |
| Spartan | 3-8 fl oz | 0 |
| Spartan Advance | 16-36 fl oz | 0 |
| Spartan Charge | 3-8.5 fl oz | 0 |
| Valor ² | + tillage | 2 oz |
| | - tillage | 2 oz |
| | + tillage | 3 oz |
| | - tillage | 3 oz |

¹ or generic brand equivalentd

² Valor = refer to label for rates >3 oz/a.

| Herbicide | Product/a (ai/a) | Weeds | When to apply | Remarks and paragraphs |
|--|---|---|----------------------|--|
| Soil-applied herbicides in soybean | | | | |
| Prowl | 2.4 to 3.6 pt EC | Annual grass and some broadleaf weeds. | PPI. Fall or spring. | Adjust rate for soil type. Do not apply PRE. Poor wild oat and no wild mustard control. Green foxtail has become resistant to dinitroaniline (DNA) herbicides in North Dakota. |
| Prowl H2O (pendimethalin) | 2.1 to 3 pt ACS (1 to 1.5 lb) | | | |
| Sonalan | 1.5 to 3 pt | Broadleaf weeds including wild mustard. | PPI. | Sencor may injure certain soybean varieties. |
| Sonalan 10G (ethalfluralin) | 5.5 to 11.5 10G (0.55 to 1.15 lb) | | | |
| Treflan/generic trifluralin | 1 to 2 pt (0.5 to 1 lb) | Grass and some broadleaf weeds. | PPI or PRE. | Dual may give greater weed control than generic metolachlor at equal product rates. Poor wild oat control and wild mustard control. Shallow PPI gives more consistent control than PRE. PRE requires precipitation for herbicide activation. Adjust rate for soil type and OM. Outlook gives greater nightshade or EPOST. control. |
| Sencor/generic metribuzin | Soil pH >7.5 = 0.25 lb DF Soil pH <7.5 = 0.33 to 0.5 lb DF | | | |
| Dual/generic metolachlor | 1 to 2 pt (0.95 to 1.9 lb) | Grass and some broadleaf weeds. | PPI or PRE. | Dual may give greater weed control than generic metolachlor at equal product rates. Poor wild oat control and wild mustard control. Shallow PPI gives more consistent control than PRE. PRE requires precipitation for herbicide activation. Adjust rate for soil type and OM. Outlook gives greater nightshade or EPOST. control. |
| Intrro/generic alachlor RUP | 2 to 3 qt (2 to 3 lb) | | | |
| Outlook/generic dimethenamid | 16 to 21 fl oz (0.75 to 1 lb) | | PPI, PRE | |

| | | | | |
|--|--|---|-------------------------------|--|
| Valor (flumioxazin) | 2 to 3 oz WDG (1 to 1.5 oz) | Small-seeded broadleaf weeds including pigweed, nightshade, kochia lambsquarters, and B. wormwood. | EPP, Shallow PPI, and PRE. | PRE requires precipitation for herbicide activation. Refer to label for tank-mix options, application information, and rate structure. |
| Spartan (sulfentrazone) | 3 to 8 fl oz F (1.5 to 4 oz) | Python does not control ALS resistant kochia. | | |
| Python (flumetsulam) <i>No aerial application</i> | 0.8 to 1.33 oz DG or 5 to 3 a/pack (0.64 to 1.06 oz) | Broadleaf weeds. | | Sharpen has no grass activity. Provides burndown control of emerged broadleaf weeds. Planting interval is dependent on soil texture and OM. Refer to label for tank-mix options. |
| Sharpen (saflufenacil) | 1 fl oz (0.36 oz) | | | |

POST-applied herbicides in soybean

| | | | | |
|----------------------------------|--|--------------------------|---|--|
| Basagran/ generic bentazon | 0.5 to 2 pt applied 1 to 4 times. (0.25 to 1 lb) | Some broadleaf weeds. | POST. Soybean: After emergence. Broadleaf weeds: Small. | Non-residual, contact herbicide requiring thorough coverage. Most active in hot and sunny conditions. Add oil adjuvant at 1 to 2 pt/a. Allow a 30 day PHI. |
|----------------------------------|--|--------------------------|---|--|

| Herbicide | Product/a (ai/a) | Weeds | When to apply | Remarks and paragraphs |
|--|---|---|--|--|
| Rezult + MSO oil adjuvant (bentazon & sethoxydim) | 1.6 + 1.6 pt or 0.8 + 0.8 pt 2X or 0.56 + 0.56 pt 3X or 0.4 + 0.4 pt 4X + 1.25 pt/a (1 + 1 lb or 0.5 + 0.5 lb or 0.38 + 0.38 lb or 0.25 + 0.25 lb) | Small grass and broadleaf weeds including pigweed, ragweed, kochia, lambsquarters, wild buckwheat, biennial wormwood and Canada thistle. | First application: Weeds: 1 inch or less. Make consecutive applications 7 to 10 days later. | Weeds must be small at application. MSO enhances weed control more than petroleoil adjuvants. Sequential applications at 7 to 10 day intervals improve overall weed control. Tank-mix with Raptor at 2 fl oz/a for improved weed control. Allow 30 day PHI. |
| | Ultra Blazer (acifluorfen) | Small broadleaf weeds including pigweed and common lambsquarters. | POST. Soybean: 1 to 2 trifoliolates. Weeds: Small. | Contact, non-residual herbicides requiring thorough coverage. Most active in hot and sunny conditions. May cause speckling on soybean leaves. Refer to label for crop response, adjuvant type and rate, and tank-mix options. |
| | Cadet (fluthiacet) | | | |
| | Cobra (lactofen) | 6 to 12.5 fl oz (1.5 to 3.2 oz) | | |
| Resource (flumiclorac) | 2 to 3 fl oz EC (0.215 to 0.32 oz) | | | |
| Flexstar (fomesafen + adjuvants) | 0.75 to 1 pt (0.176 to 0.24 lb) | Broadleaf weeds including pigweed, cocklebur, Venice mallow, mustard, ragweed, kochia, smartweed, EB nightshade. Poor hairy nightshade control. | POST. Soybean: Prior to flowering. Weeds: Small. | Contact herbicide requiring thorough coverage. Most active in hot and sunny conditions. Apply at 1 pt/a in N.D. east of I-29 and south of I-94 and in Minn. south of I-94. Use 0.75 pt/a in N.D. east of Hwy 281 and in Minn. south of US Hwy 2. Add MSO at 1% v/v + AMS at 10 lb/100 gal water. Refer to label for crop rotation restrictions and |

| | | | | |
|-----------------------------------|--|--|---|---|
| FirstRate (cloransulam) | 0.3 oz WDG or 10 a/pack (0.25 oz) | Venice mallow, cocklebur, horseweed, ragweed, sunflower, and wild mustard. | POST. Soybean: Up to 50% of plants flowering. Weeds: Up to 10 inches tall. | restrictions for each geographic region. Refer to narrative for improved broadleaf weed control. |
| | Harmony/ generic thifensulfuron | 0.083 (1/12) oz DF0.125 (1/8) oz SG (0.062 oz) | Wild mustard, pigweed and lambsquarters. No ALS-resistant weed control. | |
| Pursuit (imazethapyr) | 3 fl oz (0.75 oz ae) | Annual broadleaf weeds. Poor common lambsquarters, ragweed, wild buckwheat and biennial wormwood control. No control of ALS-resistant weeds. | POST. Soybean: Fully expanded first trifoliolate leaf until 60 days PHI. | Add NIS at 0.25% v/v or 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. Refer to label for weed size and application information. Raptor has less soil residual carryover than Pursuit. |
| | Raptor (imazamox) | | | |

| Herbicide | Product/a (ai/a) | Weeds | When to apply | Remarks and paragraphs |
|--|--|---|---|--|
| Assure II Targa (quizalofop) | 4 to 10 fl oz (0.44 to 1.1 oz) | Annual grasses and quackgrass. | Soybean: Prior to pod set. Grass weeds: Refer to table below. | Add oil adjuvant at 1% v/v but not less than 1.25 pt/a. Oil adjuvant at more than 1 qt/a is not needed. See Select Max label for detailed adjuvant recommendations. Use highest rate of Assure II for yellow foxtail control. |
| Fusilade DX (fluzifop) | 5 to 12 fl oz (1.25 to 3 oz) | | | Grass control is reduced by tank mixtures or close interval application of POST broadleaf control herbicides. |
| Fusion (fluzifop & fenoxaprop) | 4 to 12 fl oz (1 to 3 oz & 0.32 to 0.96 oz) | | | Antagonism generally can be avoided by applying a higher rate of grass herbicide or applying 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. |
| Poast (sethoxydim) | 0.5 to 1.5 pt (0.1 to 0.3 lb) | Annual grasses. | Soybean: All stages. | |
| Select/generic clethodim | 4 to 16 fl oz (1 to 4 oz) | Annual grasses and quackgrass. | Grass weeds: Refer to table below. | |
| Select Max (clethodim) | 9 to 32 fl oz (1.125 to 4 oz) | | | |
| NDSU soybean micro-rate | | | | |
| Rezult B & Rezult G + Raptor + Flexstar + Select/clethodim + MSO adjuvant | 0.5 to 0.6 pt & 0.5 to 0.6 pt + 1 fl oz + 2 to 4 fl oz + 2 fl oz (optional) + 1.25 pt/a | Grass and broadleaf weeds, including kochia, pigweed and nightshade. May not control wild buckwheat. | POST. Weeds. Small. Must be less than 1 to 2 inches tall. | User assumes all risk of inadequate weed control when using this reduced-rate treatment. Must be applied with MSO or MSO and basic pH blend adjuvants. Select/clethodim can be excluded if grass infestation is low. Refer to narrative and Rezult section above. |

Grass control with post serbicides in soybean.

| Herbicide | Grass size (inches) | Rate (fl oz/a) |
|---|--|------------------------|
| Green and yellow foxtail | | |
| Assure II/Targa | 2 to 4 | 7 to 8 |
| Fusilade DX | 2 to 4 | 10 to 12 |
| Fusion | 2 to 4 | 8 |
| Poast | 1 to 8 | 1 pt |
| Select/ Select Max | 2 to 8 2 to 6 6 to 8 | 4 to 6 9 12 |
| Wild-proso millet | | |
| Assure II/Targa | 2 to 6 | 5 to 8 |
| Fusilade DX | 4 to 8 | 6 |
| Fusion | 4 to 8 | 6 |
| Poast | 4 to 10 | 0.5 pt |
| Select Select Max | 1 to 10 2 to 6 6 to 8 | 4 to 6 9 12 |
| Volunteer corn | | |
| Assure II/Targa | 6 to 30 | 5 to 8 |
| Fusilade DX | 12 to 24 | 4 to 8 |
| Fusion | 12 to 24 | 6 |
| Poast | 1 to 20 | 1 pt |
| Select Select Max | 4 to 12 12 to 24 1 to 12 12 to 24 24 to 36 | 4 6 6 9 12 |
| Wild oat, vol. small grains, sandbur | | |
| Assure II/Targa | 2 to 6 | 7 to 8 |
| Fusilade DX | 2 to 6 | 8 |
| Fusion | 2 to 6 | 8 |
| Poast | 1 to 4 | 1 pt |
| Select Select Max | 2 to 6 2 to 6 6 to 8 | 6 9 12 |
| Quackgrass | | |
| Assure II/Targa | 6 to 10 | 12 |
| Fusilade DX | 6 to 10 | 12 |
| Fusion | 6 to 10 | 12 |
| Poast | 6 to 8 | 2 pt |
| Select Select Max | 4 to 12 4 to 12 | 8 12 |

| Herbicide | Product/a (ai/a) | Weeds | When to apply | Remarks and paragraphs |
|--|---|--|---|---|
| Preharvest application in soybean | | | | |
| Roundup/ generic glyphosate | Up to 1.5 lb ae See Remarks. | Preharvest weed control. | Prior to harvest. Apply after pods have set and lost all green color. Allow a 7 day PHI. | Add AMS fertilizer at 4 lb/100 gal, or more for hard water. Refer to label adjutant use. Do not apply on soybean grown for seed because reduced germination/vigor may occur. |
| Paraquat | RUP 8 to 12 fl oz 2SL 5.6 to 8.4 fl oz 3SL (0.13 to 0.188 lb) | Desiccant. | Prior to harvest. Paraquat – Allow a 15 day PHI. | Add NIS at 0.125% v/v. Most active in hot and sunny conditions. Apply when at least 65% of seed pods are a mature brown color or when seed moisture is 30% or less. |
| Aim | 1 to 1.5 oz (0.256 to 0.384) | | Aim – Allow a 3 day PHI. | |
| LibertyLink soybean | | | | |
| Ignite 280 (glufosinate) | 22 fl oz (0.4 lb) | Annual grass and broadleaf weeds including ALS and glyphosate resistant weeds. | POST. Soybean: Emergence up to bloom. Weeds: Up to 3 inches tall. | Apply only to LibertyLink soybean varieties. Non-selective, contact, non-residual herbicide requiring thorough coverage. Add AMS at 3 lb/a. Apply 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. |

| Herbicide | Product/a(ae/a) | Weeds | When to apply | Remarks and paragraphs | | | | | | | | | | | | | | | | | | | | |
|--|--|---|--|--|-----------|-----------|----------------------|-----------------|---|---|------------|----------|--------|---------|------------|----------|-----|-----|------------|----------|---|-----|------------|----------|
| Roundup Ready and Roundup Ready 2 Yield soybean | | | | | | | | | | | | | | | | | | | | | | | | |
| Roundup/ generic glyphosate | <p>Maximum single application = 1.5 lb ae</p> <p>Maximum in-crop = 2.25 lb ae</p> <p>See Remarks.</p> | Annual and perennial grass and broadleaf weeds. | <p>POST. Soybean: Emergence through R2 of full flowering. The R2 stage when a pod 3/16 inch long at one of the four uppermost nodes appears on the main stem along with a fully developed leaf (R3 stage). Allow a 14 day PHI.</p> | <p>Apply only to Roundup Ready/RR 2 Yield soybean varieties.</p> <table border="1"> <thead> <tr> <th>lb ae/gal</th> <th>lb ai/gal</th> <th>Maximum single appl.</th> <th>Maximum in-crop</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>4</td> <td>= 64 fl oz</td> <td>96 fl oz</td> </tr> <tr> <td>4/4.17</td> <td>5.4/5.1</td> <td>= 48 fl oz</td> <td>72 fl oz</td> </tr> <tr> <td>4.5</td> <td>5.5</td> <td>= 44 fl oz</td> <td>66 fl oz</td> </tr> <tr> <td>5</td> <td>6.1</td> <td>= 40 fl oz</td> <td>60 fl oz</td> </tr> </tbody> </table> <p>Add AMS fertilizer at 4 lb/100 gal, or more for hard water. Multiple applications may be necessary for weed flushes. Drift and off-site movement may cause injury or death to other plants and crops. Refer to label for weeds controlled, application information, adjuvant use, tank-mix options with residual herbicides and restrictions. Cannot plant harvested patented soybean seed.</p> | lb ae/gal | lb ai/gal | Maximum single appl. | Maximum in-crop | 3 | 4 | = 64 fl oz | 96 fl oz | 4/4.17 | 5.4/5.1 | = 48 fl oz | 72 fl oz | 4.5 | 5.5 | = 44 fl oz | 66 fl oz | 5 | 6.1 | = 40 fl oz | 60 fl oz |
| lb ae/gal | lb ai/gal | Maximum single appl. | Maximum in-crop | | | | | | | | | | | | | | | | | | | | | |
| 3 | 4 | = 64 fl oz | 96 fl oz | | | | | | | | | | | | | | | | | | | | | |
| 4/4.17 | 5.4/5.1 | = 48 fl oz | 72 fl oz | | | | | | | | | | | | | | | | | | | | | |
| 4.5 | 5.5 | = 44 fl oz | 66 fl oz | | | | | | | | | | | | | | | | | | | | | |
| 5 | 6.1 | = 40 fl oz | 60 fl oz | | | | | | | | | | | | | | | | | | | | | |

| Herbicide | Product/a(ae/a) | Weeds | When to apply | Remarks and paragraphs |
|---|--|--|--|---|
| Roundup Ready/STS (sulfonyleurea-tolerant) soybean | | | | |
| Harmony/ generic thifensulfuron | 0.33 oz DF 0.5 oz SG (0.25 oz) | Annual broadleaf weeds including, wild buckwheat, lambsquarters, mustard species, and volunteer RR canola. | POST. RR/STS soybean: First fully expanded trifoliolate to 60 days PHI. | Apply only to RUR/STS soybean varieties. Apply with glyphosate at 0.38 to 1.125 lb ae/a. Add NIS at 0.125 to 0.25% v/v to non-loaded glyphosate. Refer to label for adjuvant use. Apply with AMS at 4 lb/100 gal water, or more for hard water. Refer to label for weeds controlled and application information. |

Refer to Roundup Ready soybean above for use of glyphosate in RR/STS soybean.

Weed Management in Roundup Ready Soybean

NDSU recommends using herbicides with different modes of action and different weed control management practices in Roundup Ready soybean production to delay development of glyphosate-resistant weeds.

COMMANDMENT 1 – Control weeds BEFORE 2 to 4 inches tall to avoid yield loss.

Remove weeds early, especially when grass weed populations are high. Some data from the Midwest indicate that soybean yield may not be reduced by delaying Roundup/generic glyphosate application until weeds are up to 6 inches tall. However, data from the northern Plains show that, especially under dry conditions, soybean yield loss will occur if weeds become greater than 4 inches tall prior to Roundup/glyphosate application.

Roundup/glyphosate – at 1.5 oz ae/a controls foxtail, 2.25 oz ae/a controls volunteer small grain and 3 oz ae/a controls wild oat and downy brome. Use higher rates on broadleaf weeds, larger weeds and tolerant weeds, or if weeds are under environmental stress.

Three Systems of Weed Control in RR Soybean

1. PRE followed by glyphosate POST: **All PRE herbicides require rain for activation.**

Tables list many registered PRE soybean herbicides that can be used in herbicide-resistant soybean. PRE herbicides at 2/3 to the full labeled rate may give 60 to 99 percent control of some grass and broadleaf weeds, will reduce weed infestations emerging with soybean, will allow more flexibility in application of POST herbicides and will help protect yield from early season weed competition.

2. Roundup/generic glyphosate + POST broadleaf herbicide (different mode of action):

Several herbicides listed in the following table will improve control of weeds not controlled by Roundup/glyphosate. Roundup/glyphosate has no soil residual and will not control weeds emerging after application. Roundup/glyphosate may not control some weed species or biotypes. Many POST herbicides listed will give residual weed control. Follow label directions for tank-mix and application information.

3. Roundup/generic glyphosate (EPOST = 2- to 4-inch-tall weeds) followed by Roundup/glyphosate (POST = 14 to 21 days later):

This program will increase the risk of weed resistance unless other strategies are used in rotational crops.

The following table shows herbicides to apply in tank-mix or sequentially with Roundup/glyphosate in RR soybean for control of weeds not controlled by Roundup/glyphosate. Weed ratings are control without Roundup/glyphosate. Refer to label for tank-mix and specific application information. Residual weed control listed in the table refers to control of subsequent flushes of weeds after herbicide application.

Herbicides to apply in tank-mix or sequentially with Roundup/generic glyphosate in RR soybean for control of weeds not controlled by Roundup/glyphosate. Refer to previous tables for additional herbicides.

| Rate/a | | Weed Control/Ratings ³ | | | | | | | | | | | | | | | | | | | |
|---|--------------|-----------------------------------|------------------------------|----------------------|----------------|---------------|----------------|--------------------|-----------------|-----------------|-------------------|-----------|--|--|--|--|--|--|--|--|--|
| | | Buckwheat, Wild | Canola, Vol. RR ¹ | Horseweed (Marshall) | Kochia | Lambsquarters | Mallow, Common | Nightshade species | Prickly lettuce | Ragweed, Common | Smartweed, Annual | Waterhemp | | | | | | | | | |
| Preplant or PRE herbicides – no residual weed control | | | | | | | | | | | | | | | | | | | | | |
| 2,4-D ester | Plant > 7 d | P | P-G | E | P | E | | | | | | | | | | | | | | | |
| Airm | 0.5-1 fl oz | P | N-P | N | F-E | F-G | | | | | | | | | | | | | | | |
| Harmony/thifen. | See label | E | G-E | F | E ⁴ | E | | | | | | | | | | | | | | | |
| Sharpen | 1 fl oz | G-E | G-E | G-E | G-E | G-E | | | | | | | | | | | | | | | |
| Preplant or PRE herbicides – with residual weed control. See Combination herbicides for soybean. | | | | | | | | | | | | | | | | | | | | | |
| Prowl, Sonalan, Treflan ² - PPI | See label | N | N | N | P | F-E | | | | | | | | | | | | | | | |
| Python ² | 0.8-1 oz DG | F-G | E | E | E ⁴ | E | | | | | | | | | | | | | | | |
| Spartan ² | 3-4.5 fl oz | P-F | P | E | E | E | | | | | | | | | | | | | | | |
| Valor | 2-2.5 oz WDG | P-F | G-E | E | E | E | | | | | | | | | | | | | | | |
| POST herbicides – See Combination herbicides for soybean. | | | | | | | | | | | | | | | | | | | | | |
| FirstRate ² | <50% flower | P-F | P-G | E ⁴ | P ⁴ | P | | | | | | | | | | | | | | | |
| Flexstar ² | < Flowering | P | E | N | G-E | P-F | | | | | | | | | | | | | | | |
| Harmony SG | 60 day PHI | P | P-F | P | N | G | | | | | | | | | | | | | | | |
| Harmony DF | 60 day PHI | P | P-F | P | N | G | | | | | | | | | | | | | | | |
| Pursuit ² | < Flowering | P | E | N | E ⁴ | P-F | | | | | | | | | | | | | | | |
| Raptor ² | < Flowering | P | E | N | E ⁴ | F | | | | | | | | | | | | | | | |

¹ See table: Control of volunteer Roundup Ready crops (page 52).

² May carry over more than one cropping season. Follow labeled crop rotation restrictions.

³ E = Excellent (90-99%), G = Good (80-90%), F = Fair (65-80%), P = Poor (40-65%), N = None.

⁴ Except where resistant populations have developed.

Combination herbicides (partial list) for conventional and herbicide-resistant soybean.

| Trade Name | Manu- facturer | Applied at (Prod/a)... | Gives the equivalent product rates of: |
|-----------------------------|-------------------|---------------------------|--|
| Authority Assist | FMC | 4 fl oz 6 fl oz | 3.33 fl oz Spartan + 1.33 fl oz Pursuit 5 fl oz Spartan + 2 fl oz Pursuit |
| Authority First/Sonic | FMC | 2.4 oz 3.2 oz | 3 fl oz Spartan + 0.2 oz FirstRate 4 fl oz Spartan + 0.3 oz FirstRate |
| Authority MTZ | FMC | 8 oz 12 oz | 3.6 fl oz Spartan + 3.6 oz Sencor 4.33 fl oz Spartan + 4.33 oz Sencor |
| Boundary | Syngenta | 1.2 pt | 0.83 pt Dual Magnum + 4 oz Sencor |
| Domain | Bayer | 9 oz | 4.33 fl oz Define + 4.33 oz Sencor |
| Extreme | BASF | 1.5 pt 2.25 pt | 2 fl oz Pursuit + 12 fl oz glyphosate- <i>ipa</i> (3 lb ae/gal) 3 fl oz Pursuit + 18 fl oz glyphosate- <i>ipa</i> (3 lb ae/gal) |
| Gangster (co-pack) | Valent | 1.8 oz | 1.5 oz Valor + 0.3 oz FirstRate |
| Pursuit Plus | BASF | 20 fl oz 1.8 pt | 0.88 pt Prowl H ₂ O + 2 fl oz Pursuit 1.28 pt Prowl H ₂ O + 2.9 fl oz Pursuit |
| Rage D-Tech* | FMC | 8 fl oz 16 fl oz | 0.5 fl oz Aim + 0.5 pt 2,4-D ester – apply at least 14 days prior to planting. 1 fl oz Aim + 1 pt 2,4-D ester – apply at least 14 days prior to planting. |
| Sequence | Syngenta | 1.5 pt | 18 fl oz glyphosate- <i>ipa</i> (3 lb ae/gal) + 0.6 pt Dual II Magnum |
| Spartan Advance | FMC | 24 fl oz | 3.4 fl oz Spartan + 24 fl oz glyphosate- <i>ipa</i> (3 lb ae/gal) |
| Spartan Charge ⁵ | FMC | 5.75 fl oz | 4.5 fl oz Spartan + 1 fl oz Aim |

*Plant no earlier than 14 days after application.

Control of volunteer Roundup Ready crops.

| | Rate | Canola Pre | Canola 3-leaf | Canola 6-leaf | Corn 10-18 inches | Corn 18-24 inches | Corn 24-40 inches | Soy- bean V2-V3 | Soy- bean V4-V6 |
|------------------------------|-------------------------|---------------|------------------|------------------|-------------------------|-------------------------|-------------------------|-----------------------|-----------------------|
| POST Grass Herbicides | | | | | | | | | |
| Assure II | 4-5 fl oz | N | N | N | E | E | G-E | N | N |
| Fusilade DX | 4-6 fl oz | N | N | N | E | E | G-E | N | N |
| Select/generic clethodim | 3-4 fl oz 6 fl oz | N | N | N | G-E E | P-F G | P F | N N | N N |
| Select Max | 4-6 fl oz 8 fl oz | N | N | N | F-G E | P F | N-P P | N N | N N |
| Broadleaf Herbicides | | | | | | | | | |
| Aim | 0.5 fl oz | - | P | N | N | N | N | P | P |
| atrazine | 0.38 lb ai 0.5 lb ai | E | N-P P | N | N | N | N | E E | P F |
| Balance Flexx | 3 fl oz | E | - | - | N | N | N | - | - |
| Basagran/generics | 0.5 pt | - | G-E | F | N | N | N | N | N |
| Bronate/generics | 0.8 pt | - | E | F-G | N | N | N | E | E |
| Callisto | 3 fl oz | E | E | G | N | N | N | P | P |
| Stinger/generic clopyralid | 1.3 fl oz 2.6 fl oz | N | N | N | N | N | N | G | F-G G-E |
| Curtail/generics | 0.25-0.5 pt | - | G-E | F-G | N | N | N | F-G | P-F |
| Banvel/generic dicamba | 2 fl oz 4-5 fl oz | - | P P | N P | N | N | N | G E | G E |

| | | | | | | | | | |
|-------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Extreme | 1.5 pt | E | E | G-E | F-G | F | P | N | N |
| Flexstar | 0.38-0.75 pt | - | E | E | N | N | N | N | N |
| FirstRate | 0.1-0.3 oz | E | E | F-E | - | - | - | N | N |
| Hornet | 1-2 oz | P-F | G-E | F-E | N | N | N | E | F |
| Huskie | 11 fl oz | - | E | G-E | N | N | N | G | G |
| MCPA | 0.5 pt | P | G-E | P | N | N | N | P | P |
| Sencor/generics | 0.25 lb | E | G-E | F | N | N | N | P-F | P-F |
| Laudis | 3 fl oz | - | E | G-E | N | N | N | G | G |
| Option | 1.5 oz | - | E | E | N | N | N | P | P |
| Progress + UpBeet + MSO | 1.5 pt + 0.25 oz | - | P-F | N-P | F | N-P | N-P | F | N-P |
| Pursuit | 2 fl oz | G-E | E | G-E | G | F | P | N | N |
| Raptor | 1-2 fl oz | - | E | G-E | P-F | P | N-P | N | N |
| | 4 fl oz | - | E | E | G-E | F | P | N | N |
| Spartan | 4 oz | P-F | - | - | - | - | - | - | - |
| Status | 1-2 oz | - | F-G | P-F | N | N | N | E | G-E |
| | 4 oz | - | G | F | N | N | N | E | E |
| Steadfast | 0.75 oz | - | E | E | N | N | N | P | P |
| Harmony/generics | 1/12 oz DF / 1/8 oz SG | - | P-F | P | N | N | N | N | N |
| | 0.33 oz DF / 0.5 oz SG | - | E | G-E | N | N | N | N | N |
| Express/generics | 0.167 oz DF/0.25 oz SG | - | E | G-E | P | P | P | P | P |
| Valor | 2.5 oz | E | - | - | - | - | - | - | - |
| WideMatch | 0.13-0.25 pt | - | P | P | N | N | N | F-E | P-G |
| UpBeet + MSO | 0.25 oz | - | P-F | N-P | F | N-P | N-P | F | N-P |
| Wolverine | 1.7 pt | - | E | G-E | E | E | E | G | G |
| 2,4-D | 0.25-0.5 pt | - | G | P | N | P | P | P | P |

Herbicide Comments

Soybean is a poor competitor with weeds when cool soil temperatures cause slow germination and growth, but soybean 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 emerges or after emergence when soybean is in the one- to two-trifoliolate leaf stage. A rotary hoe or harrow helps activate PRE herbicides under dry conditions and increase weed control. The rotary hoe is an effective and economical weed control method when a field is not trashy, lumpy or wet, and when weeds are emerging. Cultivation is most effective when soybean is slightly wilted during the warm part of the day because the crop is less susceptible to breakage and weeds will desiccate quickly.

Poast (sethoxydim) plus petroleum oil adjuvant or applied POST controls annual grasses. **Assure II** (quizalofop), **clethodim**, **Fusilade DX** (fluazifopP), **Fusion** (fluazifop-P & fenoxaprop-P) plus petroleum oil adjuvant or **Select Max** (clethodim) applied POST controls annual grasses and quackgrass. Methylated seed oils (MSO) have performed

equally to petroleum-based oil additives. Refer to Select Max label for adjuvant information. Retreat quackgrass when regrowth is 4 to 8 inches tall. Poast only suppresses quackgrass. Most broadleaf herbicides tank-mixed with POST grass herbicides often will reduce grass control compared with the grass herbicide applied alone. Reduced grass control can be avoided by applying the grass herbicide at least one day before or seven days after application of a broadleaf herbicide.

Assure II may provide excellent green foxtail control but less yellow foxtail control. Lower yellow foxtail control may result from applying Assure II at reduced rates, with broadleaf herbicides or to large or stressed plants. Addition of fertilizer may enhance yellow foxtail control and control of stressed grasses.

Clethodim is an ACCase mode of action herbicide similar to Assure II, Fusilade and Poast. However, in NDSU research, clethodim controls many grasses documented resistant to other ACCase herbicides and is antagonized less by tank-mixes with broadleaf herbicides. We recommend that clethodim be used in rotation with herbicides of different modes of action and in a resistant weed management program.

Several generic brands of clethodim are available, but not all formulations are identical to the original Select formulation. Select, Clethodim, Trigger and Volunteer are the same, but Arrow, Prism, Section and Select Max all have different formulations.

Select Max is a 1 lb/gal formulation, contains activating adjuvants in the formulation, and allows use of NIS, PO or MSO depending on tank-mix partner.

Basagran (bentazon) at 0.5 to 1 qt/a applied POST controls many annual broadleaf weeds and suppresses Canada thistle. NDSU research has shown greater broadleaf weed control, especially in kochia, lambsquarters, redroot pigweed and wild buckwheat, by applying Basagran as split treatments either twice each at 1 pt/a, three times each at 0.67 pt/a or four times each at 0.5 pt/a, compared with one application at 2 pt/a. Make applications seven 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).

For Canada thistle control, apply Basagran at 1 qt/a when plants are 8 inches tall to bud stage, and make a second application at 1 qt/a seven to 10 days later.

The NDSU soybean micro-rate concept is based on the sugarbeet micro-rate and substitutes additional weed management for reduced herbicide rates. Application to small weeds is essential for success. The micro-rate can be applied more than once in dry bean to control emerging weed flushes, but applying a foundation herbicide treatment (DNA or acetanilide) may require only one POST application. MSO adjuvant is required for optimum weed control.

The POST grass herbicide can be excluded if grass populations are low. Preliminary data show weed control can be improved by increasing spray volume. The first application can be made at 10 gallons per acre (gpa) when weeds are small and less than 3 inches tall. Increase spray volume by 10 gpa for every 3 inches in weed height. The addition of AMS at 1 lb/a also increases weed control. Weed control from the micro-rate is best when temperature plus humidity is greater than 140. Increasing spray volume and using AMS may help improve weed control when the value is below 140.

Sequential micro-rate applications will provide greater broadleaf weed control than a single application at full rates and can be used in all crops where Basagran is labeled. Apply with oil additive at 1qt/a (1pt/a by air). Do not reduce the amount of oil adjuvant with the micro-rate. MSO adjuvant has shown greater enhancement of Basagran than petroleum oil (COC) adjuvants, but the cost of MSO is higher. Basagran is safe to soybean at all stages. The total maximum seasonal use rate is 4 pt/a, so the rate of the micro-rate can be increased if weeds are large at application or if sequential applications are delayed due to rain or wind.

Weed control from Basagran applied one to four times, NDSU data.

| Basagran + | Rate | Colq | Koch | Rrpw |
|----------------------------|----------------------|---------------------|------|------|
| | (pt/a) | — percent control — | | |
| Petroleum oil at 1 qt/a | 2 pt x 1 application | 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 |
| MSO at 1.5 pt/a | 2 pt x 1 application | 5 | 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 |

Basagran commonly is combined with fertilizer micronutrients that may cause incompatibility problems resulting in zinc precipitation. Chelated zinc materials (black) have greater incompatibility problems than unchelated material (clear).

Recommendations to prevent precipitation are to fill the sprayer with water, add Basagran and thoroughly agitate, then add zinc fertilizer material.

Rezult B and Rezult G (bentazon and sethoxydim) applied POST at equal product amounts controls some grass and broadleaf weeds. Apply with oil adjuvants at 1 to 2 pt/a. Refer to the label or narrative for tank-mix options. Rezult is priced economically compared with other POST herbicide programs. Rezult may be more economical than Basagran for grass and broadleaf weed control. If so, use the following chart.

| Bentazon | Basagran | Result |
|-----------|-------------|-------------|
| (lb ai/a) | (product/a) | (product/a) |
| 0.25 | 0.5 pt | 0.4 pt |
| 0.33 | 0.67 pt | 0.56 pt |
| 0.5 | 1 pt | 0.8 pt |
| 1 | 2 pt | 1.6 pt |

Flexstar (fomesafen + adjuvants) applied POST controls many small broadleaf weeds. Apply with NIS at 0.25 to 0.5 percent v/v or oil adjuvant at 0.5 to 1 percent v/v. Oil adjuvants increase weed control but also increase risk of soybean injury. NDSU research has shown good to excellent kochia 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.

Soybean injury may result when Flexstar is tank-mixed with EC formulation herbicides that act as an additional oil adjuvant. Activity of fomesafen and risk of crop injury increase as temperature and humidity increase. A maximum of 0.75 pt/a is allowed in most of North Dakota, while 1 pt/a is allowed through the Midwest. The reduced fomesafen rate reduces carryover and crop rotation restrictions.

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 adequate weed control. See label or crop rotation restriction section for additional information.

Alachlor,- dimethenamid, metolachlor or S-metolachlor applied PPI or PRE controls annual grass and some broad-leaf weeds and does not control wild oat. Apply the higher rate on clay soils high in organic matter. Soybean has good tolerance and incorporation improves consistency of weed control. Dual products may be surface applied or incorporated in the fall after Oct. 15 but before the ground freezes or applied in the spring.

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

Pursuit (imazethapyr) applied POST controls or suppress many broadleaf weeds, except ALS-resistant weeds. Pursuit has controlled marshelder, Russian thistle, common cocklebur, sunflower, smartweed and lanceleaf sage in NDSU field trials. Pursuit may not control Venice mallow, horseweed, wild buckwheat, lambsquarters and common ragweed. POST application may not provide adequate soil residual to control subsequent flushes of nightshade 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 flushes of other weeds. Pursuit is enhanced greatest by MSO (1.5 pt/a) and basic pH blend (1 percent v/v) adjuvants. UAN fertilizer

(a solution of urea and ammonium nitrate in water) 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. Weeds not controlled by the first herbicide may not be controlled after the second herbicide is applied. This is particularly important for lambsquarters. Weeds that escape control from the first herbicide may be larger than labeled size by the time soybean can be treated safely with the second herbicide. Delay cultivation for 14 days after application to avoid reduction in weed control.

Tank-mixtures of Pursuit with Assure II, clethodim or Fusilade DX may result in reduced grass control. Reduced grass control can be avoided by applying the POST grass herbicide either one or more days prior to or seven days after Pursuit.

Pursuit Plus (imazethapyr and pendimethalin) at 1.8 pt/a applied PPI controls most annual grass and broadleaf weeds, including wild buckwheat. North Dakota state labeling allows use in the state only south of U.S. Highway 2 at a reduced rate of 1.8 pt/a, which is 75 percent of the full labeled rate. Pursuit Plus at 1.8 pt/a contains the equivalent of Pursuit at 3 fl oz/a plus 1.75 pt/a of Prowl EC. Add additional pendimethalin at 1.75 pt/a for more consistent weed control. Thoroughly incorporate it into the top 1 to 2 inches of soil. Refer to paragraphs on Pursuit

and Prowl for additional information on use and restrictions.

Python (flumetsulam) applied PPI or PRE will control many annual small-seeded broadleaf weeds in soybean. Python does not control large-seeded broadleaf weeds such as common and giant ragweed and common cocklebur. Python requires soil water for optimum weed control. Python also is strongly affected by soil pH. High soil pH increases herbicide activity and the speed of herbicide degradation, but it also increases risk of crop injury.

Excellent broad-spectrum weed control may occur when applied on soils with above 7.5 pH when significant precipitation occurs after application, when rates are based on soil texture and organic matter content, and under light to moderate weed infestations. Some stunting may occur under poor growing conditions on soils with pH greater than 8.0.

Raptor (imazamox) applied POST controls nearly all annual grass and broadleaf weeds in soybean except wild buckwheat, lambsquarters, common and giant ragweed, Venice mallow, horseweed, biennial wormwood and ALS-resistant weeds. In NDSU field trials, Raptor has controlled marshelder, Russian thistle and lanceleaf sage 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 with Pursuit, has greater grass and broadleaf weed control,

provides improved lambsquarters control and has less carryover and crop rotation restrictions.

Apply **Raptor** with a basic pH blend adjuvant at 1 percent v/v or MSO-type adjuvants at 1.25 pt/a. Alternatively, apply with NIS at 0.125 to 0.25 percent v/v or oil concentrate at 0.5 percent v/v plus 28 percent UAN liquid fertilizer at 4 percent v/v. Use of 28 percent UAN improves control of some weeds such as lambsquarters. MSO-type oil additives should be used when weeds are large and/or stressed. MSO or basic pH blend adjuvants enhance weed control more than NIS or some petroleum oil additives with or without 28 percent UAN. However, Raptor applied with MSO + UAN may result in crop injury at temperatures greater than 88 F and greater than 80 percent relative humidity.

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

Sonalan (ethalfluralin), **trifluralin** or **Prowl/H20** (pendimethalin) applied PPI controls most annual

grasses and some small-seeded broad-leaf weeds but provides no wild mustard, common cocklebur and sunflower control. Requirements for proper timing and depth of incorporation differ for each herbicide. Adjust the rate according to soil type. Trifluralin must be incorporated in the top 2 to 3 inches of soil within 24 hours of application. Trifluralin incorporation may be delayed up to two days if applied to a cool, dry soil. Incorporation of Sonalan 10G can be delayed three to five days after application. Herbicides can be applied with most soil PPI herbicides labeled in soybean. Sonalan has less soil residue than trifluralin or Prowl and may be more active at comparable rates.

Spartan (sulfentrazone) applied shallowly PPI or PRE controls most annual small-seeded broadleaf weeds and partially may control wild buckwheat, marshelder, wild mustard, common ragweed, hairy nightshade, Venice mallow and foxtail but provides no perennial weed control. The rate must be adjusted for soil texture, soil pH and organic matter content. Apply 3 to 6 fl oz/a for coarse- and medium-textured soils and 4 to 8 fl oz/a for fine-textured soils. Herbicide solubility, activity and phytotoxicity increase as soil pH increases. The user must read and follow the label for rate information to ensure adequate weed control. Spartan provides excellent burndown weed control and 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.

NDSU research has shown that consistent control of susceptible broadleaf weeds and suppression of foxtail and marginally susceptible broadleaf weeds depends on at least 0.5 to 0.75 inch of rainfall shortly after application and before weeds emerge. Spartan will leave a residue in the soil for more than one year. Refer to the label for crop rotation restrictions.

Harmony GT (thifensulfuron) has activity on wild mustard, lambsquarters, pigweed species, annual smartweed and wild buckwheat. Apply with NIS at 0.125 to 0.25 percent v/v or oil adjuvants at 0.5 percent v/v plus liquid fertilizer at 4 percent v/v. DO NOT apply with oil adjuvants when tank-mixing with any other herbicide or severe crop injury may occur. See the label or Pursuit paragraph for precautions when tank-mixing with Pursuit and other herbicides. Thifensulfuron 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. Follow the label for improved cleanout procedure.

Valor (flumioxazin) applied EPP or PRE controls most small-seeded broadleaf weeds and may suppress foxtail, common and giant ragweed, annual smartweed, Russian thistle and wild buckwheat. **Gangster** (flumioxazin and cloransulam), a co-pack of Valor and FirstRate applied EPP or PRE, controls most broadleaf weeds. Valor and Gangster does not control perennial

weeds. Apply from 14 days prior to seeding to just before soybean emergence. Valor can be applied with glyphosate in early burndown programs in soybean. Valor requires a minimum of 0.25 inch of rain for activation and requires a bioassay prior to planting sensitive crops. Refer to the label for weeds controlled, rates and crop rotation restrictions.

Soybean Herbicide Injury/Symptomology

Acetanilide (Lasso, Dual, etc)

Leaf stunting, puckering and the “drawstring” effect on the central vein or leaf midrib.

DNA (Trifluralin, Sonalan, Prowl)

Excessive rates with stress conditions may cause pruned roots and swollen or cracked hypocotyls.

Plant Growth Regulators

Leaf puckering along with stem and branch twisting and epinasty.

ALS Inhibitors

Misapplication, drift or carryover of some ALS herbicides not registered on soybean may stunt soybean plants and cause yellow or chlorotic blotches on leaves. Labeled herbicides such as Raptor and Pursuit may intensify the symptoms of iron chlorosis. Tank-mixes of Harmony GT with Pursuit or Raptor are not recommended due to severe soybean stunting and leaf burn.

Contact – Soil applied(Authority and Valor)

Authority: Some soybean varieties are susceptible to injury. See your seed dealer for a list. Symptoms

are stunting and yellowing of soybean leaves. Valor may cause localized speckling from a “splash effect” after a rainstorm. Speckling may occur only on bare soil where no crop residue exists.

Contact – POST (Aim, Blazer, Cobra, Flexstar)

Aim, Blazer and Flexstar may show localized speckling of soybean leaves. More serious injury may result if Aim is applied in wet or dewy conditions. Injury from Cobra may vary from speckling to severe leaf burn. New soybean growth after contact herbicide application is unaffected.

Contact – POST (Basagran)

Yellow chlorotic mottling in small patches on leaves. Areas of leaf burn may occur under stress conditions or hot temperatures. Injury is cosmetic and new growth is unaffected.

Triazine

Symptoms of atrazine carryover from high rates and high soil pH may be visible as leaf burn and desiccation from the bottom leaves progressing up the plant and from leaf tips inward. Symptoms from metribuzin may be similar to atrazine where high rates are used.

Glyphosate (Conventional soybean)

Symptoms from drift are expressed early on new growth as stunting and leaf yellowing. Symptoms will progress to older plant tissue. Plants may remain stunted, and affected plant tissue may die within seven to 14 days after exposure depending on herbicide concentration and growing conditions.