2022 South Dakota Pest Management Guide

Soybeans

A guide to managing weeds, insects and diseases.

South Dakota Department of Agriculture

South Dakota State University Extension

South Dakota Soybean Checkoff

Safety First

Follow the Label. It is a violation of federal pesticide laws to use a pesticide in a manner inconsistent with its labeling. Read the entire label before using.

Applicator Safety. The most serious risk of exposure is during handling and mixing the concentrated product. Use protective equipment specified on the label. Use chemical-resistant gloves, eye shield, long-sleeved clothing, rubber boots and appropriate respirator as required. In case of emergency, contact the Poison Control Center via 24-hour phone line:

Poison Control Center – 1-800-222-1222

Water Protection. Water quality is a public concern. Preventing spills and accidents reduces risk of groundwater and surface water contamination. Mix pesticides away from wells and water sources. Prevent back siphoning. Install anti-backflow devices in irrigation equipment used for pesticides. Triple rinse containers. Store pesticides properly. Identify high-risk areas such as coarse soils or areas where the water table is near the surface. Be aware of pesticide properties that increase the risk of contamination in the critical area. Some treatments have specific restrictions requiring buffer strips and border areas around wells, lakes and streams.

Trade names for pesticides are used in this publication to aid reader recognition. The common name is also listed and is used for pesticides that are available in many labeled products. Examples of other product names are listed where possible based on information available. As patents expire and marketing agreements are formed, additional products may be marketed. Be sure crop use and application directions are followed for the product being used.

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Information in this book is intended to be a guideline for label information and is not a label substitute. Pesticide products include herbicides, insecticides and fungicides. Pesticide product labels can change at any time and applicators must follow all label procedures. It is particularly important to be sure pesticide products are being applied in the correct environments (e.g. right-of-way, pasture, cropland, non-crop, etc.), environmental precautions are being followed (rate restrictions, applications on or near surface water or shallower water tables, applications near trees, etc.), and in accordance with grazing/haying restrictions.

This resource is presented for informational purposes only. SDSU does not endorse the services, methods or products described herein, and makes no representations or warranties of any kind regarding them.

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Herbicide suggestions
Information in this publication is based on South Dakota Agricultural Experiment Station research and other research or observations. Herbicides are included only after the chemical is registered by the Environmental Protection Agency (EPA) as to residue tolerances in crops used for food or feed.

There is no intent to specify product performance guarantees; such agreements involve the labeler and user. Users are responsible for following all label directions and precautions.

Rates
Rates for each treatment are stated as the amount of product per acre. All rates are on a broadcast basis. Labeled rates for the range in soil types and suggested rates based on SDSU tests are stated.

Cost
The cost per acre is based on current price information. The cost for low and high rates is listed. Cost does not include additives. Consult your dealer for actual price.

Tank-Mixes and Combinations
Selected tank-mixes are listed for several herbicides where specific products and rates are given on the label. Most interpretations allow mixing unless prohibited; however, the user assumes responsibility if the specific combination is not shown. Tank-mixes having the most promise for local situations are included with at least one of the products. Check the section for each product alone and each product label for the complete listing of combinations for that specific product.

Resistance Management
Refer to the table on below for a brief description of each herbicide site of action. Repeated use of similar herbicide modes of action over multiple years may result in herbicide resistant weed populations or shifts in populations toward weed species that are difficult or costly to control. Maintaining the efficacy of herbicide chemistries through herbicide rotations may be an effective long-term strategy to reduce weed control costs as herbicide patents expire and weed control technology becomes less expensive. To facilitate proper herbicide rotation, the herbicide site of action number is listed next to the herbicide products in this publication.

Buffers
Many labels now have buffer zone recommendations for applying herbicides. Check individual product labels for specific restrictions.

Group Numbers Associated with Herbicide Sites or Modes of Action

WSSA Group Number	Site or Mode of Action	Examples
1	ACCase inhibitor	fluazifop, sethoxydim, quizalofop
2	ALS inhibitor	imazamox, cloransulam
3	Microtubule inhibitor	pendimethalin, trifluralin
4	Growth regulator	2,4-D, dicamba
5	Photosynthesis inhibitor (triazine)	metribuzin
6	Photosynthesis inhibitor (contact)	bentazon
7	Photosynthesis inhibitor	linuron
9	EPSP inhibitor	glyphosate
10	Glutamine synthetase inhibitor	glufosinate
13	Bleacher (isoxazolidinone)	clomazone
14	Cell membrane disrupter (PPO inhibitor)	acifluorfen, lactofen, fomesafen, flumioxazin, sulfentrazone
15	Seedling shoot inhibitor	acetochlor, metolachlor, dimethenamid, pyroxasulfone
22	Cell membrane disrupter (PSI inhibitor)	paraquat

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ABBREVIATIONS and DEFINITIONS

EPP: Surface application usually 2-6 weeks before planting in no-till systems.
PPI: Before the crop is planted, incorporated.
PPS: Before the crop is planted, surface applied (not incorporated).
PRE: After planting, but before crop or weeds emerge.
EPOST: After initial emergence of crop or weeds.
POST: After crop or weeds emerge.

ae = acid equivalent
ai = active ingredient
and/+ = split application (and) or as a tank-mix (+)
gal = gallon
gpa = gallon per acre
lb = pound
oz = ounce
psi = pounds per square inch pressure
pt = pint
qt = quart
%v/v = percent volume per volume

AMS = ammonium sulfate
COC = crop oil concentrate
DG = dispersable granule
DF = dry flowable
G = granule
L = liquid, flowable, or EC
MSO = metholated seed oil
N = liquid nitrogen fertilizer
NIS = non-ionic surfactant
OM = organic matter
SG = soluble granule
UAN = urea+ammonium nitrate liquid fertilizer
WDG = water dispersible granule

Glyphosate Resistant Weeds

Glyphosate-resistant weeds are becoming more common in South Dakota. The following list includes some important weed species that are known or suspected to be glyphosate resistant. Early detection of resistance will greatly improve your ability to manage the resistant population. The best solution is to minimize selection for resistant weed species, which may be done by using preemergence herbicides or rotating different crops that allow alternative herbicide programs (chemistries), such as Liberty Link, Enlist or dicamba tolerant.

Kochia
Several locations in central SD. One option may be rotating to Liberty Link, dicamba tolerant or using conventional herbicides. In Roundup Ready soybeans, consider using a full rate of a preemergence herbicide containing flumioxazin (Valor, Fierce, Afforia, etc) or sulfentrazone (Authority products, Sonic, etc.). In no-till, burndown options may include Cobra (lactofen), Dicamba tolerant Liberty (glufosinate) or Gramoxone (paraquat). Cobra (lactofen) may be the most effective post-emergence option, but it should not be applied during stressful growing conditions. Plan on scouting fields closely after soybean emergence and making any post-emergence herbicide applications prior to the third soybean trifoliate.

Common waterhemp
Several confirmed sites in eastern SD. The best management option may be to use preemergence herbicides such as flumioxazin products (Valor, Fierce, Surveil) or sulfentrazone products (Authority products or Sonic). Flexstar/Reflex (fomesafen), Avalanche Ultra/Ultra Blazer (acifluorfen) and Cobra (lactofen) may be the most effective postemergence tank-mix partners. Glufosinate (Liberty/Cheetah) will control glyphosate-resistant waterhemp in Liberty Link soybeans, but applications must be made to small (less than 4 inches) waterhemp plants. The Enlist (2,4-D) system works well on waterhemp but again waterhemp should be small, ideally 4 inches. Labeled dicamba products will control glyphosate-resistant waterhemp in Xtendimax soybeans, but applications must be made to small (less than 4 inches) waterhemp plants.

Common ragweed
Some reports in eastern SD. In Roundup Ready soybeans, consider using a preemergence herbicide that contains cloransulam (Authority First/Sonic or Surveil), metribuzin (Authority MTZ), fomesafen (Prefix) or flumioxazin (Valor, Afforia, Surveil) followed by a glyphosate tank-mix partner such as FirstRate (cloransulam) or Flexstar (fomesafen). Do not apply Flexstar postemergence if Prefix was applied preemergence. Consider rotating to Liberty Link, dicamba tolerant or using conventional soybean herbicides.

Horseweed (marestail)
Several reports in southeastern and northcentral South Dakota. In Roundup Ready soybeans, use 2,4-D ester in the burndown application before planting or use a preemergence herbicide that also has foliar activity such as saflufenacil (Sharpen or OpTill) or cloransulam (Authority First/Sonic or Surveil). In Xtendimax soybeans, labeled dicamba products will provide control. For postemergence, consider tank-mixing FirstRate (cloransulam) with glyphosate.

Common lambsquarters
May be tolerant during adverse conditions, but resistance has not been confirmed in SDSU trials. The best management option may be to use preemergence herbicides containing flumioxazin (Valor, Fierce, Afforia, etc.), sulfentrazone (Authority products, Sonic, etc.) or saflufenacil (Sharpen, Optill, etc.). Thifensulfuron (Harmony, etc.) may be the most effective postemergence tank-mix partner, but it may stunt soybeans during periods of rapid growth. Cadet (fluthiacet) or Resource (flumiclorac) may be moderately effective. The Enlist (2,4-D) system works well on lambsquarters but again lambsquarters should be small, ideally 4 inches.

Soybean Herbicides

TRIFLURALIN PRODUCTS *(trifluralin)* Site of Action: 3

Trifluralin is available in several brand name products, including **Treflan**, **Trifluralin**, **Trust**, **Triflurex**, and others. Formulation and use may vary. Follow directions for product used.

1-2 pt trifluralin 4L (0.5-1.0 lb ai) **($3.35-8.60)**
5-10 lb trifluralin 10G **($5.45-13.85)**

Dinitroanaline herbicide. Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Gives partial waterhemp control. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves. Consistent performance. Very good crop tolerance. Rates of 1.5 pt 4L per acre have been satisfactory in most SDSU tests. Minimum carrier is 5 gpa for ground or air. Carryover may damage oats, sorghum, proso millet or annual/ perennial grasses planted the following year. No restriction on use of vines for feed.

FALL. Liquid or granule formulation may be applied in late fall and incorporated with 1 fall tillage and 1 pass in the spring. Spray forms preferred for spring application. Granules perform best in fall. Weed control with fall-applied granules has been equal to that for spring-applied liquid.

PPI. Spring application. Immediate incorporation preferred, but may be delayed up to 24 hours if soil surface is dry and wind is under 10 mph. Incorporate into the top 2-3 inches. A second incorporation improves uniformity, especially under wet, lumpy, or trashy conditions. Follow with a harrow or leveling device.

PENDIMETHALIN PRODUCTS *(pendimethalin)* Site of Action: 3 **($8.25-20.45)**

1.8-3.6 pt pendimethalin 3.3L (0.5-1.5 lb ai)
1.7-3.4 pt Satellite Flex 3.5L (0.74-1.49 lb ai)
1.5-3.0 pt Prowl H2O or Satellite HydroCap 3.8L (0.7-1.5 lb ai)

There are several pendimethalin 3.3L products available including **Prowl 3.3EC**, **Acumen**, **Framework 3.3EC**, **Pendimethalin**, **Pin-Dee**, **Stealth** and others.

Dinitroanaline herbicide. Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Does not control mustard, nightshade, smartweed, or large-seeded annual broadleaves. Consistent performance as a preplant incorporated treatment. Very good crop tolerance; less tolerance if left on the surface. Prowl H2O is a water-based formulation with less odor and staining and has shown improved performance in high residue tests. Rates of 3 pt 3.3L or 2.5-3 pt 3.8L per acre have been satisfactory in most SDSU tests. Minimum carrier is 10 gpa for ground and 5 gpa for air. No label restrictions for crops planted the following year if normal crop was produced. No use restrictions on vines for feed.

FALL. Pendimethalin may be surface applied or incorporated in the fall. Follow-up weed program required. Apply after October 1 and before freeze-up.

EPP. Apply up to 15 days before planting. One-inch rainfall or mechanical incorporation required.

PPI. Apply up to 60 days before planting. Immediate incorporation preferred but may be delayed up to 7 days. Incorporate into the top 1-2 inches. A second incorporation improves uniformity, especially if no rain was received, or under lumpy, trashy conditions. Follow with a harrow or leveling device.

PREMIX

TRIPZIN ZC *(pendimethalin + metribuzin)* Site of Action: 3 + 5 **($14.80-29.55)**

29-58 oz Tripzin ZC 4L (0.66-1.31 + 0.25-0.5 lb ai)

Premix containing 2.9 lb pendimethalin and 1.1 lb metribuzin per gallon. Excellent control of most annual grasses and small seeded broadleaf weeds. Rates vary with soil texture and organic matter. Use lower rate on soils over 7.5 PH. Minimum carrier is 10 gpa for ground or 2 gpa for air.

Do not use on sandy soils. Do not use on loamy sand or sandy loam soils with less than 1% OM. Do not apply more than one application per season at the highest rate allowed for the soil type. Do not graze or feed forage for 40 days or harvest for 85 days after application. Rotation interval is 4 months for alfalfa, corn, or soybeans; 8 months for lentils, and peas; and 18 months for most other crops. Barley and wheat is 4 months following soybeans, peas or lentils or 8 months following any other crop.

PPI. Apply up to 60 days before planting and incorporate into top 1-2 inches within 7 days. Incorporation not required if a rainfall/irrigation of at least 0.25 inches occurs. Immediate incorporation preferred. A second incorporation improves uniformity, especially if no rain was received, or under lumpy, trashy conditions.

SONALAN *(ethalfluralin*) Site of Action: 3 **($10.60-25.90)**

1.5-3.5 pt Sonalan 3L (0.55-1.3 lb ai) 5.5-13 lb Sonalan 10G

Dinitroanaline herbicide. Excellent control of most annual grasses; fair to good control of small-seeded annual broadleaves such as pigweed and lambsquarters. Gives partial waterhemp control. Does not control mustard, smartweed, or large-seeded annual broadleaves. Consistent performance. Good crop tolerance in most situations. Performance has been similar to Treflan when amount of product is adjusted to label rates. Rate of 3-3.5 pt is for eastern black nightshade suppression and

added broadleaf control. Rate of 2.5 pt per acre has been satisfactory in most SDSU tests. Minimum carrier is 5 gpa. Less soil residual than Treflan; no label limitations for common crops the following year. Do not feed vines to livestock.

PPI. Immediate incorporation preferred; however, incorporation may be delayed up to 48 hours. Second incorporation improves uniformity.

METRIBUZIN PRODUCTS *(metribuzin)* Site of Action: 5 **($4.60-15.90)**

0.66-1 pt Dimetric 3L
0.5-0.75 pt Glory 4L, Mauler, Metricor 4F, Metriflex 4SC, Metrixx SC, Me-Try-Buzin 4L, TriCor 4F
0.32-0.54 lb Metrixx 70DF
0.33-0.5 lb BL2, Derive 75DF, Dimetric EXT, Glory, Metribuzin, Metriclude EXT, Metricor DF, Me-Try-Buzin 75DF, TriCor 75DF (0.25-0.38 lb ai)

Triazine herbicide. Metribuzin is usually used with other soil-applied herbicides. It gives good to excellent control of small-seeded annual broadleaves and fair to good control of certain large-seeded broadleaves. Aids in early season waterhemp control. Foxtail control is variable. Mustard is very sensitive; also used for kochia, lambsquarters, Russian thistle, and wild buckwheat. Metribuzin at 0.5 pt 4F or 0.33 lb 75DF per acre is usually satisfactory for light infestations of many small-seeded broadleaves with reduced risk of crop injury. Rates vary depending on soil texture, organic matter, pH and tankmix partner. Higher rates are intended for fine texture soils with pH < 7.5.

Fair crop tolerance. Risk of injury from metribuzin on variable, sandy, high pH (> 7.5), low-organic-matter soils or on clay knolls. Do not use on sandy soil with less than 1% OM. Cold, wet soil conditions that slow crop emergence increase risk of injury. Combined effects of metribuzin with atrazine carryover can produce serious crop injury. Rotation interval is 4 months for alfalfa, corn, and forage grasses; 8 months for peas, and lentils; 12 months for potato; and 18 months for most other crops. Barley and wheat is 4 months following soybeans, peas or lentils or 8 months following any other crop. Fields treated with metribuzin should not be grazed or harvested for 40 days after application.

PRE. Metribuzin provides improved burndown and some residual control. Labeling may include special burndown rates; higher rates may be used for preemergence application. Tank-mixes with glyphosate in SDSU tests improve control of seedling dandelion and kochia.

TANK-MIXES. Several tank-mix options available, including trifluralin, Prowl (pendimethalin), Pursuit (imazethapyr), Dual (s-metolachlor), and others. Check the label for specific instructions regarding the rates and application timings for each tank-mix option.

PREMIX

DIMETRIC CHARGED or PANTHER MTZ *(metribuzin + flumioxazin)* Site of Action 5+14 **($16.65-33.30)**

12-24 oz Dimetric Charged or Panther MTZ (0.28-0.56 + 0.063-0.125 lb ai)

Premixes containing 3.0 lbs metribuzin + 0.67 lb flumioxazin per gallon. Rates will vary with timing, soil texture and organic matter. Use a minimum of 10-15 gpa for ground or 5-7 gpa for aerial applications. The higher carrier volume is recommended for burndown applications.

Barley and wheat (when following soybeans) may be planted in 4 months; corn and soybeans in 4 months; alfalfa (≤18 oz) in 5 months; lentils, peas and barley in 8 months; wheat (when 24 fl oz/A used) in 9 months. Most other crops are 18 months, consult label. Soybean vines or hay treated with this product may be grazed or fed to livestock 40 days after application. Do not tank mix with chloroacetamide herbicides such as flufenacet, metolachlor, dimethenamid, or acetochlor within 14 days of planting, unless soybeans are planted in no-till or minimum till on wheat stubble or no-till corn stubble.

FALL. Apply 12-24 oz/A after October 15. Can be used in the fall to provide residual weed control in fields that will be planted the following spring with soybeans.

PPS/PRE. Apply 12-18 oz/A. Can be used in the spring early preplant through preemergence. Preemergence applications must be made within 3 days after planting and prior to soybean emergence.

S-METOLACHLOR PRODUCTS Site of Action: 15 **($6.65-29.45)**
DUAL II MAGNUM *(s-metolachlor)*

1-2 pt Dual II Magnum 7.64L (0.95-1.95 lb ai)
6-12 lb Dual IIG Magnum 16G

Additional 7.62L s-metolachlor products include **Dual Magnum, Brawl, Charger Basic, EverpreX** and **Medal** and 7.64L s-metolachlor products include **Dual II Magnum, Brawl II, Charger Max, Cinch, Ladem, Medal II, Moccasin II Plus** and **StreliuS II**. Very good to excellent control of several grasses and fair control of pigweed. Useful for special weed problems such as nightshade, nutsedge, or waterhemp. Consistent on annual grasses when rainfall is adequate. Excellent crop tolerance. Rates of 1.7-2 pt per acre have been satisfactory in most SDSU tests. S-metolachlor products contain a resolved form of metolachlor. Labeling includes higher rates for certain grass problems. Minimum carrier is 10 gpa for ground and 2 gpa for air. No carryover. Vines may be used for livestock feed.

FALL. Apply after September 30. For minimum and no-till systems on medium and fine soils having greater than 2.5% OM. Use 1.7-2 pt or 8-10 lb Dual IIG Magnum per acre on medium-textured soil. Use the high rate for fine-textured soil. Apply before ground freezes. Performs best in early, dry spring seasons where grass pressure is moderate to light.

EPP. Intended for early-season annual grasses and residual control into the season. Rain required. Does not control emerged weeds. Weed control has been acceptable except in seasons with heavy, early rain that delays planting.

PPI. Incorporate into top 2 inches within 14 days before planting. Deep incorporation reduces grass control. Use maximum rate for soil type.

PRE. Requires 0.5-0.75 inch rain within 1 week after application.

POST. May be applied alone from emergence up to the third soybean trifoliate at 1-1.33 pt/A (1-2 pt/A for Dual or Medal) Application 21-25 days after soybean emergence is recommended. Most products allow a postemergence application if s-metolachlor product was also applied preemergence as long as total rate does not exceed 2.5 pt/A (3.9 pt/A for Dual or Medal) per cropping season. Consult specific label before postemergence application. Do not graze or feed forage to livestock after a postemergence application. Make postemergence applications at least 90 days (75 days for Dual or Medal) before harvest.

METOLACHLOR PRODUCTS *(metolachlor)* Site of Action: 15

1-2 pt Helmet SPC, Me-Too-Lachlor, Parallel PCS8L or Helmet, Metalica, Parallel, Phenomenon, Stalwart C 7.8L (1-2 lb ai)

Products contain metolachlor. EPA required labeling at the same product rate as for s-metolachlor products. Higher rates are labeled for certain grassy weed problems.

FALL, EPP, PPI, and PRE. Apply as listed above for s-metolachlor.

PREMIX

BOUNDARY, LEDGER, PRESIDUAL, TAILWIND or TYRANT *(s-metolachlor + metribuzin)*
STALWART MTZ, GALVAN, HEADWIN, ME-TOO-LACHLOR MTZ or PRIORITY MTZ **($12.40-38.35)**
(metolachlor + metribuzin) Site of Action: 15 + 5

1.2-3.6 pt Boundary, Galvan, Ledger, Presidual, Tailwind, Tyrant, Me-Too-Lachlor MTZ, Priority MTZ, or Stalwart MTZ 6.5EC (0.79-2.36 + 0.19-0.56 lb ai)
1.2-3.6 pt Headwin 6.68L (0.81-2.43 + 0.19-0.58 lb ai)

Premix containing 5.25 lb s-metolachlor (Dual) +1.25 lb metribuzin per gallon. (Headwin contains 5.4 lb metolachlor + 1.28 lb metribuzin.) Rates vary depending on soil texture, organic matter and tillage. The 1.5 pt rate provides the equivalent of 1 pt Dual II Magnum + 5 oz metribuzin 75 DF or 7.5 fl oz 4F and provides early-season residual for specific weeds including waterhemp. Application rate of 1.5-1.8 pt per acre when used as a foundation in a sequential program. Winter wheat and alfalfa may be planted in 4.5 months; corn in 4 or 8 months (depending on product used); peas, barley, and spring wheat in 8 months; forage grasses and most other crops in 12 months. Treated soybean plants cannot be grazed or fed to livestock for 40 days after application. Do not apply to calcareous soils or soils with pH of 7.5 or higher. Use 1.5 pt/A or less for soils with pH greater than 7.0.

PPS. Apply up to 30 days before planting.

PPI. Incorporate into top 2 inches within 14 days before planting.

PRE. Apply after planting but before soybeans emerge.

PREFIX or QUAKE *(s-metolachlor + fomesafen)* Site of Action: 15 + 14 **($16.00)**
SHARP, UP-FRONT, or VISE *(metolachlor + fomesafen)*

2 pt Prefix, Quake, Sharp, UP-Front, or Vise (1.1 + 0.24 lb ai)

Prefix at 2 pt/A is equivalent to 1.1 pt/A Dual II Magnum + 0.95 pt/A Flexstar. Provides residual control of several common grass weed species such as crabgrass, barnyardgrass, foxtails, and witchgrass. Also controls several broadleaf weed species such as common lambsquarters, pigweed, purslane, common ragweed, and waterhemp. May provide approximately 5 weeks residual control. Maximum application rate is 0.25 lb/ai fomesafen once every 2 years.

Minimum carrier is 10 gpa for ground applications or 5 gpa for aerial applications. Rotation restriction is 4.5 months for wheat, barley, oat, or rye; 10 months for corn; 12 months for peas and sunflowers; 18 months for sorghum and all other crops.

Limited region for application in South Dakota includes land east of I-29 from North Dakota to Watertown, east of Hwy 81 from Watertown to Madison, and all areas east and south of State Road 34 and Hwy 281 down to the Nebraska border. Do not apply fomesafen (Flexstar, Reflex, etc) postemergence if applied preemergence.

EPP. Apply within 15 days prior to planting. Minimize soil movement at planting.

PPI. Incorporate into the top 2 inches of soil within 7 days after application.

PRE. Apply during or after planting but before weeds or soybeans emerge.

EPOST. Apply between cracking and the third trifoliate. Temporary spotting, bronzing, or growth deformity may occur on the soybeans. If tank-mixing with a glyphosate that does not have an adjuvant, NIS may be added at 0.25% v/v. Do not use COC. Make postemergence applications at least 90 days before harvest.

PUMMEL *(metolachlor + imazethapyr)* Site of Action: 15 + 2 **($13.60-17.05)**

1.6-2 pt Pummel 5.25L (1-1.25 + 0.05-0.06 lb ai)

Premix containing 5 lb metolachlor (Dual) and 0.25 lb imazethapyr (Pursuit) per gallon. Rates vary depending on soil texture and organic matter. Rainfall within 7 days is necessary to activate the herbicide. Do not apply products containing chlorimuron, imazaquin, or imazethapyr during the same year. Do not tank-mix herbicides containing clomazone. Pummel can only be applied once per year.

Minimum carrier rate is 10 gpa for ground and 5 gpa for air. Add NIS at 1 qt/100 gal and UAN at 1-2 qt/A or AMS at 4 lb/A for optimum burndown activity on emerged weeds. Do not graze or feed forage, hay or straw from treated areas. Apply at least 90 days before harvest. Rotation interval is 4 months for alfalfa; 4.5 months for wheat; 8.5 months corn: 9.5 months for barley; 18 months for oats, safflower, sorghum and sunflower; 26 months for flax; 40 months for canola; and 18 months for most other crops.

EPP. Apply up to 30 days before planting in minimum till or no-till systems.

PPI. Apply up to 14 days before planting. Incorporate into the top 2 inches of soil within 7 days after application.

PRE. Apply during or after planting but before soybeans emerge.

POST. Apply up to and including the fifth trifolilate. May be tank-mixed with glyphosate.

MATADOR *(metolachlor + metribuzin + imazethapyr)* Site of Action: 15 + 5 + 2

1.6-4 pt Matador 4.7L (0.8-2.0 + 0.11-0.28 + 0.026-0.065 lb ai)
1.9-3 pt Matador-S 4.3L (0.8-1.26 + 0.178-0.28 + 0.04-0.064 lb ai)

Matador is a premix containing 4.01 lb metolachlor, 0.56 lb metribuzin, and 0.13 lb imazethapyr per gallon. Matador-S is a premix containing 3.38 lb s-metolachlor, 0.75 lb metribuzin, and 0.17 lb imazethapyr per gallon. Rates vary with soil texture and organic matter. Controls lambsquarters, kochia, mustard species, pigweed/waterhemp, common ragweed, velvetleaf, and several annual grass weed species.

Minimum carrier rate is 10 gpa for ground applications or 5 gpa for aerial applications. Risk of injury: if soil has a calcareous surface or pH > 7.5, soils with less than 0.5% organic matter, in water-saturated soils, or soybeans planted less than 1.5 inches deep. See label for additional precautions. Rotation restriction is 4.5 months for alfalfa, winter wheat; 8 months for peas or spring wheat; 8.5 months for corn; 12 months for edible beans and rye; 18 months for oats, sunflower, safflower, and sorghum; 26 months for flax, and 40 months for most other crops.

PPS, EPP. May be applied 15-30 days prior to planting. May add glyphosate or 2,4-D if weeds have emerged prior to application.

PPI. Incorporate into the upper 2 inches of soil within 14 days prior to planting.

PRE. Must be applied prior to soybean emergence.

SEQUENCE *(s-metolachlor + glyphosate)* Site of Action: 15 + 9 **($19.10-30.60)**

2.5-4 pt Sequence 5.25L (0.94-1.5 + 0.7-1.13 lb ai)

Sequence is a premix containing 3 lb s-metolachlor plus 2.25 lb ae glyphosate per gallon. It provides preemergence residual control for some annual grasses and certain small-seeded annual broadleaves and non-selective burndown of emerged weeds. The 4 pt rate provides the equivalent of 1.2 pt Dual Magnum plus 48 oz glyphosate 3L ae product. Minimum carrier is 10 gpa for ground or 3 gpa for air.

FALL. Apply as a tank-mix with s-metolachlor after September 30 and when soil temperature at 4 inch depth is below 55 degrees. Do not apply to frozen soil. Apply to medium or fine textured soils with >2.5% O.M.

EPP and PRE. Apply up to 30 days before planting but before crop emergence. Do not feed treated forage or hay for 30 days.

POST. Glyphosate resistant soybeans only. Apply after cracking up to 90 days before harvest. Maximum rate is 3.5 pt/A. Do not feed treated forage or hay to livestock.

TANK-MIXES. Sequence may be tank-mixed with several herbicides labeled for preemergence use in soybeans.

INTERMOC *(s-metolachlor + glufosinate)* Site of Action: 15 + 10

2-2.5 qt Intermoc 3.57L 1.25-1.56 + 0.54-0.67 lb ai)

Intermoc is a premix containing 2.5 lb s-metolachlor plus 1.07 lb ae glufosinate per gallon. It provides preemergence residual control for some annual grasses and certain small-seeded annual broadleaves and non-selective burndown of emerged weeds. The 2 qt rate provides the equivalent of 1.3 pt Dual Magnum plus 30 oz glufosinate product. Minimum carrier is 10 gpa for ground or 5 gpa for air. Do not feed treated forage or hay to livestock. Do not harvest grain for 90 days. Do not make more than two applications per year or more than 122 oz total.

EPP and PRE. Apply 2-2.5qt up to 30 days before planting or 14 days on coarse soils but before crop emergence.

POST. Glufosinate resistant soybeans only. Apply 2 qt after crop emergence up to but not including bloom stage.

OUTLOOK or SLIDER *(dimethenamid-p)* Site of Action: 15 **($10.65-28.00)**

8-21 oz Outlook or Slider, 6L (0.4-1 lb ai)

Chloroacetamide herbicide chemically related to Dual. Very good to excellent control of several annual grasses. Sandbur and wild proso millet are partially controlled. Fair to good control of certain annual broadleaves such as pigweed, waterhemp, or black nightshade.

Rates of 16-21 oz per acre are suggested for most situations. In South Dakota see Sec. 24(c) label for list of vulnerable soil types where application is prohibited when ground water is within 30 feet from the surface. Minimum carrier is 2 gpa for ground or air. There are no crop rotation restrictions for the next season. Corn, dry beans, or sorghum anytime; cereal crops can be planted after 4 months; and all other crops after 11 months. Do not graze or feed forage to livestock for 40 days.

FALL. Apply in fall after October 1 and when soil temperature at 4 inch depth is below 55 degrees and before ground freezes. Apply to medium or fine textured soils with >2.5% O.M.

EPP. Apply up to 45 days before planting. A split application (2/3 early and 1/3 at planting) is preferred if applying more than 30 days before planting.

PPI. Apply within 2 weeks of planting and incorporate shallowly into the top 1-2 inches. Avoid deep incorporation. Incorporated applications not recommended for coarse soils with less than 1.5% OM.

PRE. Requires rain prior to weed emergence.

POST. May be applied early postemergence up to the 5-trifoliate stage. Avoid late application. Emerged weeds are not controlled.

TANK-MIXES. May be applied as a tank-mix or sequentially with other herbicides including but not limited to: pendimethalin (Prowl), trifluralin (Treflan), Sonalan, glyphosate, Liberty and several post emergence grass herbicides.

WARRANT or ARREST CS *(acetochlor)* Site of Action: 15 **($13.90-22.25)**

1.25-2 qt Warrant or Arrest CS 3L (0.94-1.5 lb ai)

Warrant is an encapsulated acetochlor which allows for use on soybeans. May be applied preplant, preemergence, or early postemergence for residual control of annual grasses, such as foxtails, barnyardgrass, crabgrass, and wild oats and broadleaf weed species such as waterhemp, lambsquarters, purslane, and others. Rates vary with soil texture and OM. Do not apply more than a total of 4 qt/A per year. Minimum carrier is 10 gpa for ground applications. Do not apply with aerial equipment. For best performance, 0.5-0.75 inch precipitation is required within 1 week after application.

Rotation restriction is 4 months for wheat, 9 months for alfalfa, or 12 months for sunflower, pulse crops (beans and peas), and most other crops. Do not apply within 100 feet of a well or areas where the ground water is less than 30 feet below the soilsurface. Do not apply on sand soils with less than 3% organic matter (OM), loamy sands with less than 2% OM, or sandy loams with less than 1% OM. Do not mix or load within 50 feet of a well, sinkhole, or surface water (lakes, reservoirs, streams, etc.) unless done on a properly designed impervious pad.

PPS, PRE. Incorporation not recommended. Risk of crop injury if conditions slow plant growth, such as cool temperatures or excessive moisture, occur after application but prior to soybean emergence. Recommeded rates vary with soil texture and OM (1.25- 2 qt/A with average of 1.5 qt/A).

EPOST. Only controls weeds not yet emerged. Apply after soybean emergence but prior to the R2 (full bloom) soybean growth stage. Optimal timing may be V2-V3 soybeans. Early applications are recommended to take advantage of the soil residual activity. Canopy cover may inhibit soil contact at later application dates.

TANK-MIXES. Supplemental label for PPS and PRE tank-mix applications. Several tank mix options available for postemergence application (see label).

PREMIX

WARRANT ULTRA *(acetochlor + fomesafen)* Site of Action: 15 + 14 **($23.75)**

48 oz Warrant Ultra 3.45L (1.06 + 0.24 lb ai)

Rates and use in South Dakota are limited to defined geographical areas (see label for regional maps). The maximum rate of 48 oz per acre may be used east of I-29 from North Dakota to Watertown, east of Hwy 81 from Watertown to Madison, and south of Hwy 34 and east of Hwy 281 to Nebraska. In South Dakota, a maximum of 48 oz/A Warrant Ultra or 0.24 lb ai/A fomesafen from any source is allowed only in alternate years. Maximum of 3 lb/A acetochlor used from all sources on soybeans per year.

Only one application of Warrant Ultra is allowed in a growing season. Soybeans can be replanted anytime. Rotation interval is 4 months for barley, oat, rye and wheat; 10 months for corn and peas; next season for dry beans and lentils; and 18 months for alfalfa, sunflower, sorghum and most other crops. Do not harvest grain for 45 days. Do not graze or feed forage or hay. Ground application only. Minimum of 10 gpa for preplant or preemergence and 15 gpa for postemergence applications.

PPS, PRE. Apply anytime up to soybean emergence. Incorporation not recommended.

POST. Apply before the R2 stage. Optimum application timing is when soybeans are V2-V3. Add NIS at 0.25-0.5% v/v, COC at 0.5-1% v/v or MSO. COC or MSO may reduce crop tolerance.

ZIDUA *(pyroxasulfone)* Site of Action: 15 **($11.40-37.50)**

1-3.5 oz Zidua 85WG (0.053-0.186 lb ai)
1.75-5.75 oz Zidua SC 4.17L (0.057-0.187 lb ai)

Selective herbicide that provides control of annual grasses, sedges and annual broadleaves. Rates vary depending on soil texture. After application, at least 0.5 inches of rain is needed to activate the herbicide. Maximum use rate per season (including fall application) is 2.1 oz/A WG or 3.5 oz/A SC for coarse soils and 3.5 oz/A WG or 5.75 oz/A SC for medium/fine soils. Minimum carrier volume is 3 gpa air or 5 gpa ground.

Corn and soybeans can be planted anytime. Rotation interval for ≤3 oz WG or ≤5 oz SC is 1 month for chickpea and field peas; 2 months for lentil; 3 months for safflower or sunflower; 4 months for wheat; 6 months for flax; 10 months for alfalfa and grain sorghum; 11 months for edible dry beans, edible peas, and small grains other than wheat; 15 months for canola; and 18 months for most other crops.

FALL. 1.5-3.5 oz WG or 2.5-5.75 oz SC Do not apply to frozen or snow-covered soil.

EPP. 2.0-3.5 oz/A WG or 3.5-5.75 oz SC 15 to 45 days before planting on medium or fine soils. Not recommended on coarse soils.

PPS, PPI. 1.5-3.5 oz/A WG or 2.5-5.75 oz SC up to 14 days before planting on all soil types.

PRE. 1.5-3.5 oz/A WG or 2.5-5.75 oz SC applied after planting and before crop emergence.

EPOST. 1-3.5 oz/A WG or 1.75-5.75 oz SC applied from emergence to 6 trifoliate soybeans. May result in temporary leaf burn or stunting of soybeans. Emerged weeds are not controlled.

ZIDUA PRO *(pyroxasulfone + saflufenacil + imazethapyr)* Site of Action: 15 + 14 + 2 **($20.40-27.15)**

4.5-6 oz Zidua Pro 4.09L (0.08-0.107 + 0.017-0.023 + 0.047-0.062 lb ai)

Premix containing 2.28 lb pyroxasulfone (Zidua), 0.48 lb saflufenacil (Sharpen) and 1.33 lb imazethapyr (Pursuit) per gallon. Provides foliar burndown and residual control of several broadleaf and grass species. Apply 4.5 to 6.0 oz in conventional and reduced-till and 6.0 oz in no-till or in fields with resistant weed populations or heavy weed pressure. Crop injury may occur during stressful conditions such as extreme hot or cold conditions, excessive moisture or drought, high soil pH, or disease injury.

Do not tank-mix or apply sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products), or flumioxazin (e.g., Valor), within 30 days of planting. Separate sequential applications of Zidua Pro and Group 14 herbicides by at least 44 days. Do not harvest for 85 days after application. Do not graze or feed soybean forage, hay, or straw.

For foliar activity, add MSO 1% v/v (minimum 1 pt/A) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier volume is 5 gpa for ground or 3 gpa for air. Crop rotation restriction is 4 months for wheat, 8.5 months for corn, 10 months for alfalfa, 11 months for dry beans, rye, and barley, 18 months for oats, sorghum, sunflower, or safflower, 26 months for flax, and 40 months and field bioassay for most other crops.

EPP, PRE. Apply preplant through preemergence for most soils. Allow a minimum 30 day interval between application and planting for coarse soils with less than 2% OM. Do not apply after soybeans are in the cracking stage or after emergence. Make sure seeds are completely covered prior to application.

PERPETUO *(pyroxasulfone + flumiclorac)* Site of Action: 15 + 14 **($18.25-30.45)**

6-10 oz Perpetuo 2.3 SC (0.08-0.134 + 0.027-0.046 lb ai)

Premix containing 1.71 lb pyroxasulfone (Zidua) and 0.59 lb flumiclorac (Resource) per gallon. Provides preemergence and postemergence weed control. Residual activity controls small-seeded broadleaf and grass weeds, including late season germinating weeds.

For postemergence applications, use COC or MSO at 1-2 pt/A. Certain tank mixes may require NIS instead of oil; follow tank mix partner recommendation. AMS or UAN may be added to enhance weed control. Add a tank mix herbicide when weeds are taller than specified on label. Minimum carrier is 15 gpa for ground and 7 gpa for aerial applications. Rainfast one hour after application.

Do not make more than one application per year. Do not apply more than 10 oz/A per year. Do not apply within 60 days of harvest. Do not graze or harvest for forage or hay.

At 6-8 oz/A the rotation interval is 1 month for chickpea, lentil, field peas, safflower and wheat; 2 months for sunflower; 4 months for flax and potato; 6 months for grain sorghum; 8 months for sweet corn; 9 months for succulent peas; 10 months for alfalfa; 11 months for dry beans, succulent beans, and small grains other than wheat; 12 months for canola and sugar beet; and 18 months for most other crops. Field corn and soybean can be planted anytime.

EPP or PRE. Apply 6-10 oz/A. Add a tank mix for emerged weeds. May be tank mixed with dicamba, glyphosate, glufosinate, 2,4-D and others.

POST. Apply 6-10 oz/A from the emergence to V6 stage of soybeans. May be tank mixed with Cobra, Select Max, glyphosate, glufosinate, and other herbicides. Follow tank mix partner adjuvant recommendations.

ANTHEM FLEX *(pyroxasulfone + carfentrazone)* Site of Action: 15 + 14 **($12.95-36.85)**

2.25-6.4 oz Anthem Flex 4L (0.066-0.19 + 0.005-0.013 lb ai)

Premix containing 3.733 lb pyroxasulfone (Zidua) and 0.267 lb carfentrazone (Aim) per gallon. Controls annual grasses and some broadleaves; including waterhemp and pigweed species. Rates vary based on soil texture and organic matter. Use the higher recommended rate for early preplant, reduced tillage, or heavy weed pressure. Plant soybeans at least 1 inch deep to avoid risk of crop response. For burndown applications add NIS (0.25% v/v), or COC/MSO (1-2 pt/A). For control of emerged weeds include a tank-mix such as 2,4-D, or glyphosate. Minimum carrier is 5 gpa for ground or 3 gpa for aerial applications.

Do not apply more than 3.8 oz/A on coarse soils or 6.4 oz/A on medium or fine soils per cropping season. Rotation intervals vary with the rate used. For the 5.46 oz rate rotation interval is anytime for corn, soybeans, lentils, field peas and sunflower; 4 months for wheat; 6 months for flax; 10 months for alfalfa and sorghum; 11 months for dry beans and small grains other than wheat; and 18 months for most other crops.

EPP. Apply 2.75-6.4 oz 15-45 days before planting.

PPS, PPI or PRE. Apply 2.25-6.4 oz.

COMMAND *(clomazone)* Site of Action: 13 **($28.55-57.15)**

1.3-2.6 pt Command 3ME (0.5-1 lb ai)

Command 3ME is a 3 lb/gal encapsulated formulation intended for preemergence or shallow incorporation. Command gives excellent control of velvetleaf and very good to excellent control of annual broadleaves such as lambsquarters and Venice mallow. Smartweed and ragweed require high rates. Pigweed and nightshade control is less consistent; cocklebur is partially controlled. Foxtail control is very good in some tests but has been variable. Excellent crop tolerance. There are no restrictions for high soil pH; however, carryover potential may increase at pH below 6. Velvetleaf control is usually satisfactory with 2 pt in most soils; use 2.6 pt per acre for heavy, high-organic-matter soil or for less susceptible weeds. Combination with other herbicides improves pigweed and grass control. Affected plants show chlorosis or bleaching of leaf tissue. Crop rotation restriction is soybeans anytime, 9 months for corn, sorghum, dry beans and peas; 12 months wheat and sweet corn at 1 lb ai rate, 16 months for most other crops. Treated fields may be rotated to corn or sorghum. Temporary whiteness may be noted, especially in spray overlaps or if it is very dry. Minimum carrier is 10 gpa for ground equipment. Not labeled for air.

Do not spray within 300 feet of downwind crops. Ornamental and fruit trees, shrubs, evergreens, oats, alfalfa, and several garden plants are sensitive and will show whitening. Do not apply within 1200 feet of housing areas and commercial nurseries. Do not apply when wind exceeds 15 mph or when there is a temperature inversion. Do not graze or harvest forage from clomazone treated field.

EPP, PRE. Preemergence or shallow incorporated application allows use in bands, no-till, and other conservation tillage. Experience suggests the 3ME formulation can be applied preemergence if extra precautions are followed to prevent movement.

TANK-MIXES. Command can be tank-mixed with metolachlor products, or Boundary to improve grass control. It can also be tank-mixed with metribuzin, Pursuit or used preplant followed by labeled postemergence herbicides.

PYTHON, ACCOLADE or REPTILE *(flumetsulam)* Site of Action: 2 **($15.25-25.35)**

0.8-1.33 oz Python, Accolade or Reptile 80WDG (0.04-0.07 lb ai)

Python is a soil-applied broadleaf herbicide. Rates vary according to weed species and soil texture. Python and Accolade are packaged in 1-oz packets. Rates of 0.8-1 oz per acre are for the most susceptible weeds including Russian thistle, lambsquarters, Venice mallow, mustard, redroot pigweed, waterhemp, and kochia. Rates of 0.9-1.33 oz per acre are required for sunflower, marestail, nightshade, smartweed, and others. Python does not control ALS-resistant biotypes. Results in SDSU tests with grass control combinations have been good to excellent for velvetleaf, pigweed, waterhemp, mustard, and lambsquarters. Cocklebur and common ragweed are suppressed but require additional herbicide for best results.

Crop tolerance has been good in SDSU tests. Temporary leaf chlorosis and stunting may be noted on calcareous soils. Varieties with tolerance to iron chlorosis should be used in fields with a history of early season chlorosis.

Alfalfa, dry beans, peas, and small grain may be planted after 4 months; forage grasses and cover crops 9 months; grain sorghum 12 months; sunflower 18 months; and canola and all other crops not listed on label after 26 months and successful bioassay.

Minimum carrier is 10 gpa for ground equipment; 20 gpa for reduced till systems. Preharvest interval is 85 days. Do not apply to soils with a pH exceeding 7.8. Do not graze or feed forage, hay, or straw to livestock.

FALL. Intended to reduce need for burndown. Apply late fall after soil temperature drops below 50 degrees F.

PPI, PRE. Apply from 30 days before planting to after planting but before soybeans emerge.

TANK-MIXES/SEQUENTIAL. Mixes with burndown herbicides may be used for no-till. Python may be used with preplant or preemergence grass herbicides. Basagran, Cobra, and other similar herbicides may be used sequentially postemergence for additional broadleaf control.

FIRSTRATE, FRONTRUNNER, PROVONIS or TRAJECT *(cloransulam)* Site of Action: 2 **($14.40-36.00)**

0.3-0.75 oz FirstRate or Frontrunner 84WDG (0.016-0.04 lb ai)
1-2.5 oz Provonis 2L (0.016-0.04 lb ai)
0.5-1.25 oz Traject 4SC (0.016-0.04 lb ai)

Cloransulam is a soil-applied or postemergence ALS-inhibitor herbicide used for broadleaf weed control. There is root and foliar uptake. Soil and postemergence applications provide good to excellent control of cocklebur, sunflower, velvetleaf, marestail, common ragweed, giant ragweed, and Venice mallow. Soil applications also control redroot pigweed and lambsquarters. Nightshade is suppressed. Sunflower and cocklebur control in SDSU tests with postemergence applications has been excellent; velvetleaf control has been satisfactory.

Product is packaged in 0.6 oz soluble packets; 1 packet will treat 1 acre at the preemergence rate or 2 acres at the postemergence rate. Minimum carrier is 10 gpa for ground or 3 gpa for aerial equipment. For postemergence application, add NIS at 1-2 pt/100 gal plus 28% N at 2.5 gal/100 gal or 2 lb AMS per acre. COC plus 28% N may be used under adverse conditions. Do not harvest forage for 25 days; do not harvest soybeans for 70 days after application. Crop tolerance is very good. There are no soil pH restrictions. Iron chlorosis may increase under stress conditions with soil applications. For preemergence or for ≤ 0.3 oz/A WDG postemergence, wheat may be planted after 4 months; alfalfa, corn, dry beans, oats, peas, or sorghum after 9 months; barley after 12 months; sweet corn after 18 months; sunflower after 30 months and successful bioassay; other crops not listed on label after 18 months. Some inbred corn lines grown for seed production may be sensitive and should be thoroughly tested prior to planting the year following an application of FirstRate.

BURNDOWN. FirstRate has foliar activity on several broadleaf weeds species, such as horseweed (marestail), common or giant ragweed, and mustard species. Tankmix with other herbicides to increase the number of weed species controlled. Use an adjuvant, such as NIS at 1-2 pt/100 gal water (0.125-0.25% v/v) or COC or MSO at 1.2 gal/100 gal water (1.2% v/v). AMS (8.5-17 lb/100 gal water or 2 lb/A) or UAN (2.5 gal/100 gal water or 2.5% v/v) may be added with any of these surfactants.

PPI, EPP, PRE. Rate is 0.6 oz/A WDG, 2 oz/A Provonis or 1 oz/A Traject for soils less than 3% OM or 0.75 oz/A WDG, 2.5 oz/A Provonis or 1.25 oz/A Traject for higher OM. For preplant applications, it is best to apply within 2 weeks of planting (do not apply earlier than 4 wks prior to planting). May be incorporated into the top 1-3 inches or apply to soil surface prior to crop emergence.

POST. Rate is 0.3-0.6 oz/A WDG, 1-2 oz/A Provonis or 0.5-1 oz/A Traject, but 0.3 oz/A WDG, 1 oz/A Provonis or 0.5 oz/A Traject is the standard rate for a single application. Do not apply more than 0.6 oz/A WDG, 2 oz/A Provonis or 1 oz/A Traject per year postemergence. Postemergence applications greater than 0.3 oz/A WDG may increase crop rotation intervals as the intervals listed above only apply to the 0.3 oz/A WDG rate. Apply from emergence to flowering. Crop tolerance best after first trifoliate leaf is emerged. Rainfast after 2 hrs.

TANK-MIXES. FirstRate may be tank-mixed with burndown herbicides for no-till or tank-mixed with postemergence broadleaf herbicides (Basagran, Cobra, Flexstar, Raptor, Pursuit, Ultra Blazer, and others) or grass herbicides (Select, Poast Plus, Assure II, Fusion, and others) or with glyphosate (Roundup Ready). Grass antagonism may be noted with tank-mixes with postemergence grass herbicides.

SULFENTRAZONE PRODUCTS *(sulfentrazone)* Site of Action: 14 **($5.70-25.90)**

4.5-12 oz Spartan, Antares, Aquesta, Blanket, HM-1512 AG, Intensa, Sulfentrazone, Sulfen, Sulfin or Zone 4F (0.141-0.375 lb ai)
4.5-11.8 oz Shutdown 4.16L (0.146-0.384 lb ai)

Sulfentrazone is a soil-applied herbicide used primarily for broadleaf weeds. It is root or shoot absorbed, and is translocated, causing cell membrane disruption in susceptible species. It is non-volatile and does not photo-degrade. Pigweed and waterhemp control has been excellent in SDSU trials; kochia control has been very good. Black nightshade is also controlled. Other herbicides are required to control grass and broadleaf weeds such as velvetleaf, sunflower, ragweed, and cocklebur.

Application rates are based on soil organic matter and texture. The 6-oz rate is suggested for most preemergence applications. Applications made near or after crop emergence may cause severe crop injury. Minimum carrier is 10 gpa for ground or 5 gpa for aerial applications. There are no pH restrictions. Do not apply more than 12 oz per acre per 12-month period. Do not use on sands which have less than 1% OM. Do not graze or feed forage or hay.

Crop rotation restrictions are 4 months for wheat, barley, triticale, and rye; 10 months for corn or sorghum; 12 months for alfalfa, oats, and millet; 18 months for sorghum (rates above 7.8-8 oz/A), popcorn, and sweetcorn; and 24 months for canola.

FALL. Spartan 4F may be applied as a fall treatment to the stubble of harvested crops for the burndown of existing vegetation and preemergence control of labeled weeds the following spring in no-till and conservation till systems. Apply after harvest when the sustained soil temperature is 55 degrees F and falling at a 4-inch soil depth. Applications can be made after September 30 in areas north of Interstate 90 and after October 15 in areas south of Interstate 90. If weeds are emerged at time of application, use a suitable tank-mix burndown herbicide partner at labeled rates. Use a minimum of 20 gpa per acre of carrier to ensure adequate weed coverage. COC or MSO is suggested.

PPI. Incorporation must be uniform and no deeper than 2 inches. Improper soil incorporation increases the chance for erratic weed control and/or crop injury.

PRE. Apply up to 3 days after planting but before soybean emergence. Rain (0.5-1 inch) required.

TANK-MIXES. Spartan 4F may be tank-mixed with other herbicides for the control of additional weed species. Conduct appropriate compatibility tests prior to tank-mixing. Follow all precautions and restrictions on the tank-mix partner label.

PREMIXES

SPARTAN CHARGE *(sulfentrazone + carfentrazone)* Site of Action: 14 + 14 **($15.45-22.85)**

5.75-8.5 oz Spartan Charge 3.5L (0.14-0.21 + 0.016-0.023 lb ai)

The mix with carfentrazone improves foliar activity on emerged seedlings at the time of application. Provides preemergence control of pigweed, waterhemp, kochia, lambsquarters, Russian thistle, nightshade, and other weed species. Rate range depends on the soil texture. Do not use on sandy soils with less than 1% organic matter. Temporary soybean stunting or discoloration may occur in soils with a high pH (above 7.5), cool temperatures, excessive soil moisture, and other conditions that inhibit vigorous growth. Do not apply to frozen soils or over snow cover. Thorough coverage is important for foliar activity. Minimum carrier is 10 gpa for ground applications or 5 gpa for aerial applications. When applied alone, add MSO or COC. When applied with glyphosate, add a NIS.

BURNDOWN, PPS, PRE. Do not apply after soybean emergence. If applying prior to soybean planting, minimize soil disturbance when planting. If applying after planting, it is important to have closed furrows to avoid soybean injury.

AUTHORITY FIRST, AQUESTA FR, SONIC or SULFEN FIRST **($14.50-48.60)**
(sulfentrazone + cloransulam) Site of Action: 14 + 2

3-8 oz Authority First, Aquesta FR, Sonic or Sulfen First 70DF (0.12-0.31 + 0.015-0.04 lb ai)

Rate range is 6.45-8 oz/A in all soybeans. Reduced rates of 3-6 oz/A in RR soybean may be used when followed by a preplanned postemergence glyphosate application without resistant biotypes. Premixes that contain 0.62 lb ai sulfentrazone (Spartan) + 0.08 lb ai cloransulam-methyl (FirstRate) per pound of product and is equivalent to 8-10 oz/A Spartan 4F plus 0.61-0.75 oz/A FirstRate. Rates are based on soil organic matter. The higher rate is used on soils with organic matter greater than 3%.

Weeds controlled include marestail, waterhemp, lambsquarters, velvetleaf, common and giant ragweed, cocklebur, smartweed, nightshade, sunflower and kochia. Do not make more than 1 soil application in a single season. Do not apply more than 8 oz per season. Do not feed treated soybean forage or soybean hay to livestock. Do not apply to sandy soils containing less than 1% organic matter. Do not harvest for 65 days after application. Rotational interval is 4 months for wheat; 9-12 months for peas and dry beans; 10 months for corn (< 6.45 oz); 12 months for alfalfa, barley, oats, rye, and sorghum; and 30 months with a bioassay for most other crops.

BURNDOWN, PPS. Apply as a preplant burndown treatment at 6.45-8 oz/A. Use minimum of 10 gpa for ground or 5 GPA for air. Use NIS at 0.125-0.25% v/v or COC at 1-2% v/v plus AMS. May be tank-mixed with other herbicides like Aim, 2,4-D, glyphosate, paraquat, glufosinate or metribuzin to improve weed spectrum.

PRE. Apply within 3 days after planting.

AUTHORITY MTZ *(sulfentrazone + metribuzin)* Site of Action: 14 + 5 **($21.65-54.10)**

8-20 oz Authority MTZ 45DF (0.09-0.23 + 0.14-0.34 lb ai)

Rates in conventional soybeans are 12-20 oz/A and rates for weed suppression in glyphosate-tolerant soybeans are 8-14 oz/A depending on soil texture and OM. Authority MTZ at 10 oz/A is equivalent to 3.6 fl oz/A Spartan 4F + 5.4 oz metribuzin 4F. Standard rates control several common broadleaf weed species, such as common lambsquarters, pigweed, waterhemp, velvetleaf, kochia, cocklebur, marestail, and others and provide grass suppression.

Minimum carrier volume is 10 gpa for ground applications or 5 gpa for aerial applications. Continuous agitation during application is required. May use NIS (0.25% v/v), COC (1 qt/A), or MSO (fall applications only) when applying to emerged weeds prior to crop planting, but it is recommended to tank-mix with a herbicide intended for foliar activity.

Risk of crop injury increases in soils with pH greater than 7.5, soils with less than 0.5% OM., planting seed less than 1.5 inches deep, or applying with an organophosphate insecticide. Cool temperatures or heavy rainfall after application may cause stunting or stand reduction.

Rotation restriction is 4 months for wheat, or barley; 10 months for field corn (>14 oz/A); 12 months for alfalfa, dry beans, sorghum, or sunflower; or 18 months for crops not specified on the label.

EPP. For fall applications, apply in the fall after September 30 north of I-90 or October 15 south of I-90 when soils are less than 55 degrees F. For spring applications, apply within 30-45 days prior to planting. Use higher rates for applications between 30-45 days prior to planting.

PPI. Do not incorporate deeper than 2 inches.

PRE. May be applied up to 3 days after planting. Application to emerged soybeans may cause severe crop injury. Properly closed furrows are necessary prior to application.

AUTHORITY ASSIST, COMPENSA or ZONE ASSIST **($13.95-41.85)**
(sulfentrazone + imazethapyr) Site of Action: 14 + 2

4-12 oz Authority Assist, Compensa or Zone Assist 4L (0.1-0.31 + 0.02-0.06 lb ai)

Rates range from 6-12 fl oz/A in conventional soybeans or 4-6 oz/A in Roundup Ready soybeans. Rates vary depending on soil texture and OM. Do not apply to soils with less than 1% OM. or pH greater than 7.5. Authority Assist at 5 oz/A is equivalent to 4.2 oz/A Spartan 4F and 1.7 oz/A Pursuit 2L. Provides control or suppression of many annual broadleaf weed species such as mustards, pigweeds, kochia, velvetleaf, lambsquarters, wild buckwheat, and several others and some annual grass species, such as foxtails, fall panicum, and shattercane as well as sedges, such as yellow nutsedge.

Use 10-40 gpa carrier for ground applications or 5 gpa for aerial applications. Carrier may be water or liquid fertilizer, but a jar test is recommended to test compatibility if mixing with liquid fertilizer. Rotation restrictions are 4 months for wheat; 10 months for corn, chickpeas or field peas; 12 months for alfalfa; 18 months for sorghum, safflower, sunflower, and oats; and 26 months for flax.

EPP. For use in no-till or conservation tillage systems. For fall applications, the label recommends 15 gpa of carrier. For larger weeds or in adverse growing conditions, COC or MSO may be added. Do not apply to frozen soil. For spring applications, apply up to 45 days prior to planting. If applying earlier than 30 days prior to planting, use the high recommended rates.

PPI. Do not incorporate deeper than 2 inches.

PRE. Apply up to 3 days after planting but before crop emergence. Properly closed seed furrows are necessary prior to application.

SULFENTRAZONE + S-METOLACHLOR/METOLACHLOR PRODUCTS ($16.10-43.45)

(sulfentrazone + s-metolachlor/metolachlor) Site of Action: 14 + 15

19-38.7 oz Authority Elite, Broadaxe XC, Spartan Elite, or Sulfen Elite 7L (0.10- 0.21 + 0.93-1.90 lb ai) (sulfentrazone + s-metolachlor)
19-38.7 oz Zone Elite 7L (sulfentrazone + metolachlor)
18.25-36.25 oz Whistle 7.25L (0.11-0.21 + 0.93-1.84 lb ai) (sulfentrazone + metolachlor)

Controls certain broadleaf, grass, and sedge weeds. Within 7-10 days after application, 0.5-1 inches of rain is needed to activate herbicide. Rates vary depending on soil texture and O.M. Do not use on sand soils with less than 1% O.M. Do not apply after germination of crop. Maximum use rate is 38.7 oz/A per crop year. Do not graze or feed forage, hay or straw from treated areas for 30 days. Sunflowers may be planted anytime. Rotation restrictions are 4.5 months for barley, rye, triticale, and wheat; 4 or 10 months for corn depending on rate and product used; 10 months for sorghum; 12 months for alfalfa, oats, millet, and buckwheat; and 12 months with a bioassay for most other crops.

FALL. Apply after September 30 when the soil temperature is less than 55 degrees F. Do not apply to frozen or snow covered soils.

PPS, PPI, PRE. Apply up to 3 days after planting but before crop emergence. Label suggests preplant surface application on medium to fine soils with minimum till or no-till systems in South Dakota. Incorporate uniformally no deeper than 2 inches.

AUTHORITY EDGE *(sulfentrazone + pyroxasulfone)* Site of Action: 14 + 15 ($25.65-68.30)

5.9–15.7 oz Authority EDGE 4.25L (0.07-0.186 + 0.126-0.335 lb ai)

Controls certain broadleaf, grass, and sedge weeds. Within 7-10 days after application, 0.5-1 inches of rain is needed to activate herbicide. Rates vary depending on soil texture and O.M. Do not use on sand soils with less than 1% O.M. Do not apply after germination of crop. Maximum use rate is 15.7 oz/A per crop year. Do not graze or feed forage, hay or straw from treated areas for 30 days. At <13.4 oz/A sunflowers and soybeans may be planted anytime. Refer to label for other crop rotations as the rotation varies by use rate for each crop.

FALL. Apply after September 30 when the soil temperature is less than 55 degrees F. Do not apply to frozen or snow-covered soils.

PPS, PPI, PRE. Apply up to 3 days after planting but before crop emergence. Label suggests preplant surface application on medium to fine soils with minimum till or no-till systems in South Dakota. May be incorporated uniformally no deeper than 2 inches.

AUTHORITY SUPREME *(sulfentrazone + pyroxasulfone)* Site of Action: 14 + 15 ($26.10-50.05)

6–11.5 oz Authority Supreme 4.16L (0.098- 0.187 + 0.098- 0.187 lb ai)

Controls certain broadleaf, grass, and sedge weeds. Within 7-10 days after application, 0.5-1 inches of rain is needed to activate herbicide. Rates vary depending on soil texture and O.M. Do not use on sand soils with less than 1% O.M. Do not apply after germination of crop. Maximum use rate is 11.5 oz/A per crop year. Do not graze or feed forage, hay or straw from treated areas for 30 days. Sunflowers may be planted anytime. Refer to label for other crop rotations as the rotation varies by use rate for each crop.

FALL. Apply after September 30 when the soil temperature is less than 55 degrees F. Do not apply to frozen or snow covered soils.

PPS, PPI, PRE. Apply up to 3 days after planting but before crop emergence. Label suggests preplant surface application on medium to fine soils with minimum till or no-till systems in South Dakota. May be incorporated uniformly no deeper than 2 inches.

ZONE DEFENSE *(sulfentrazone + flumioxazin)* Site of Action: 14 ($11.10-20.90)

3.5-6.6 oz 77.2 WDG (0.136-0.257 + 0.033-0.062 lb ai)

Zone Defense is a unique premix of sulfentrazone and flumioxazin that when applied together have activity in two zones within the soil profile. Both active ingredients are soil-applied herbicides used primarily to control small-seeded broadleaf weeds. Sulfentrazone and flumioxazin are PPO herbicides that are non-volatile and are primarily absorbed via root and shoot tissue. Testing has shown that across most soil types 5 oz per acre provides control waterhemp, nightshades, pigweeds, and lambsquarters. Provides good control of kochia including ALS-resistant biotypes. Rates depend on soil type, organic matter, and pH. Use lower rates from rate table when pH is greater than 7.0. Do not apply to sand soils with less than 1% O.M.

For burndown, minimum carrier is 15 gpa for ground or 7 gpa for aerial applications. For preemergence, minimum carrier is 10 gpa for ground and 5 gpa for aerial applications. Do not graze, hay or feed forage to livestock. Do not apply more than 9.6 oz/A in a 12 month period.

Soybeans may be planted immediately when tank-mixed with glyphosate, glufosinate, or paraquat for control of emerged weeds. For additional grass control and resistance management, tank-mixes with metolachlor are recommended with Zone Defense up to 5.0 oz/A. With conventional tillage, do not tankmix with flufenacet or dimethenamid within 14 days of planting.

FALL. Apply 5-6.6 oz/A after October 15. Do not apply to frozen or snow-covered soil. Do not perform any tillage operation after application or residual weed control will be reduced. Consult label for specific use instructions.

PRE. Apply at planting time or within 3 days after planting, but before seed emergence. May be applied alone or in tank mix combinations with other registered soybean herbicides. When applied in tank mix combinations, follow applicable use directions, including application rates, precautions and restrictions of each product in the mixture. The seed furrow should be completely closed and seed covered before any applications.

PPI. Uniformly incorporate no deeper than 2" prior to planting soybeans. If tank-mixing with a companion herbicide, follow all label instructions for proper incorporation of the companion herbicide in the top 2" of soil. Improper incorporation can result in erratic weed control or potential crop injury.

ANTARES COMPLETE *(sulfentrazone + metribuzin + metolachlor)* Site of Action: 14 + 5 + 15

2.25-3 pt Antares Complete 6.1L (0.113-0.15 + 0.28-0.375 + 1.32-1.76 lb ai)

Antares Complete at 3 pt/A is equivalent to 4.8 fl oz/A Spartan 4F + 12 oz/A metribuzin 4F + 1.85 pt/A s-metolachlor 7.64L. Controls several common broadleaf weed species, such as common lambsquarters, pigweed, waterhemp, velvetleaf, kochia, cocklebur, other broadleaves and many grasses.

Rates depend on soil type, organic matter, and pH. Use lowest rates from rate table when pH is greater than 7.5. Do not apply to sand soils with less than 1% O.M. Risk of crop injury increases with coarse soils, high pH (> 7.2), planting seed less than 1.5 inches deep, or applying with an organophosphate insecticide. Cool temperatures or heavy rainfall after application may cause stunting or stand reduction.

Minimum carrier volume is 10 gpa for ground applications or 5 gpa for aerial applications. Continuous agitation during application is required. May use COC or MSO when applying to emerged weeds prior to crop planting. For increased burndown label recommends tank-mixing with a herbicide intended for foliar activity.

Rotation restriction is 4 months for field corn (<3 pt/A); 4.5 months for wheat, or barley; 12 months for alfalfa, sorghum, or sunflower; or 18 months for crops not specified on the label.

FALL/EPP. For fall applications, apply in the fall after September 30 north of I-90 or October 15 south of I-90 when soils are less than 55 degrees F. For spring applications, apply within 30-45 days prior to planting. Use higher rates for applications between 30- 45 days prior to planting.

PPI. Do not incorporate deeper than 2 inches.

PRE. May be applied up to 3 days after planting. Application to emerged soybeans may cause severe crop injury. Properly closed furrows are necessary prior to application.

VALOR, BL3, OUTFLANK or PANTHER *(flumioxazin)* Site of Action: 14 **($1.45-21.85)**

1-4 oz Valor SX, BL3, Flumi 51, Flumi SX, Outflank, Panther, or Varsity 51WDG (0.032-0.128 lb ai)
1-4 oz Panther SC, Valor EZ 4L (0.031-0.125 lb ai)

Flumioxazin is a soil-applied herbicide used primarily to control small-seeded broadleaf weeds. Flumioxazin is a PPO herbicide that is non-volatile and is absorbed primarily by shoot and some by root. It does not photo-degrade. Rates of 2-3 oz per acre control waterhemp, nightshades, pigweeds, and lambsquarters. Provides good control of kochia including ALS-resistant biotypes. The 1 oz per acre rate is primarily used to increase speed of spring burndown applications with glyphosate. There are no pH restrictions. For burndown, minimum carrier is 15 gpa for ground or 7 gpa for aerial applications. For preemergence, minimum carrier is 10 gpa for ground and 5 gpa for aerial applications. Do not graze, hay or feed forage to livestock. Do not apply more than 3 oz/A during a single growing season.

Soybeans may be planted immediately. At rates up to 2 oz: corn (minimum or no-till) can be planted after 7 days; corn (conventional tillage), sorghum, sunflower, and wheat after 1 month with 1-inch rainfall; barley, dry bean, flax, peas, rye, and safflower after 3 months; alfalfa, canola, clover, and oats after 4 months if soil is tilled before planting or 8 months for no-till; lentil after 6 months; and most other crops are 4 months (if tilled) or 8 months (no-till) and a successful soil bioassay. Consult label for rates greater than 2 oz/acre.

FALL. Apply 2-4 oz/A (2-3 oz/A for BL3) after October 15. Not all products labeled for fall application. Do not apply to frozen or snow-covered soil. Do not perform any tillage operation after application or residual weed control will be reduced. Consult label for rotation restrictions.

BURNDOWN. Apply 1-3 oz/A. Tank-mixes with glyphosate provide increased control of wild buckwheat, lambsquarters, wild mustard, kochia, and waterhemp. Can also be tank-mixed with 2,4-D or dicamba for control of dandelion, marestail, and other winter annual weeds. Tank-mix with Select if targeting only grasses. Use COC at 2 pt/A or NIS at 0.5%v/v plus AMS at 17 lb/100 gal when using in burndown applications.

EPP, PRE. Apply 1-3 oz/A before planting or within 3 days after soybean planting. Do not apply after cracking or emergence. Rain (0.5 inch) required for activation.

TANK-MIXES/SEQUENTIAL. Valor may be tank-mixed with several other herbicides to control additional weed species. Do not tank mix Valor with acetamide (e.g., Axiom, Dual, Outlook, Warrant) herbicides within 14 days of planting soybeans, unless soybeans are planted under no-till or minimum tillage conditions on wheat stubble or no-till corn stubble. A sequential program of Cobra/Phoenix, FirstRate, and Select is recommended for control of grasses and large-seeded broadleaf weeds like cocklebur and sunflower.

PREMIXES

SURVEIL *(flumioxazin + cloransulam)* Site of Action: 14 + 2 **($19.40-29.10)**

2.8-4.2 oz Surveil (0.063-0.095 + 0.021-0.032 lb ai)

Premix containing 36% flumioxazin (Valor) and 12% cloransulam (FirstRate). The standard rate, which is listed on a supplemental 2ee label, will be 2.8 oz/A, which is equivalent to 2 oz/A Valor and 0.4 oz/A FirstRate. The standard label recommends 3.5 or 4.2 oz/A, depending on the target weed species. Surveil at 4.2 oz/A is equivalent to Valor at 3 oz/A and FirstRate at 0.6 oz/A, which should not affect rotation intervals. Surveil provides control of many broadleaf weeds including waterhemp, kochia, common ragweed, nightshade, lambsquarters, cocklebur, sunflower, Venice mallow, pigweed, and velvetleaf and suppression of some annual grasses. Wheat may be planted after 3 months; dry beans, corn, sorghum, oats, and alfalfa after 9 months; and sunflowers after 30 months. Crops not listed, such as canola and flax, require a bioassay prior to planting. For burndown, minimum carrier is 15 gpa for ground or 7 gpa for aerial applications. For preemergence, minimum carrier is 10 gpa for ground and 5 gpa for air.

Do not apply more than 4.2 oz/A per year. Do not till after application or residual weed control will likely be reduced. Do not tank mix with a Group 15 choloracetamide herbicide such as acetochlor (Warrant), metolachlor (Dual II Magnum), dimethenamid (Outlook), or pyroxasulfone (Zidua) within 14 days prior to planting.

FALL. Apply after October 15, or when the soil temp. is less than 50° F. Do not apply to frozen or snow-covered soil.

BURNDOWN. Tank mix Surveil with a foliar-active herbicide, such as glyphosate or 2,4-D, to ensure adequate control of emerged weeds such as dandelion, marestail, and mustard species. Add NIS at 0.5% v/v (2 qt/100 gal water) or COC/MSO at 1 pt/A and AMS at 17 lb/100 gal water.

EPP. May be applied up to 14 days prior to planting.

PRE. Apply after planting but before soybean emergence or cracking.

FIERCE *(flumioxazin + pyroxasulfone)* Site of Action: 14 + 15 **($27.05-41.55)**

3-4.5 oz Fierce 76WDG (0.063-0.078 + 0.08-0.1 lb ai)
6-9 oz Fierce EZ 3.04SC (0.063-0.094 + 0.08-0.12 lb ai)

Premix containing 33.5% flumioxazin (Valor) and 42.5% pyroxasulfone (Zidua). Liquid formulation is a suspension concentrate containing 1.34 lb flumioxazin and 1.7 lb pyroxasulfone per gallon. Flumioxazin controls broadleaf weeds and suppresses some annual grasses. Addition of pyroxasulfone provides residual control of many grasses and increases broadleaf control.

Controls grass weed species such as foxtails and barnyardgrass and broadleaf species such as lambsquarters, pigweed, waterhemp, common ragweed, velvetleaf, kochia, horseweed (marestail), and others. Rate varies with soil texture, organic matter, and application timing.

Do not apply more than 3.75 oz/A Fierce or 9 oz/A Fierce EZ per year to soybean. Do not graze treated soybean fields or feed treated forage or hay with Fierce WDG (allow 21 days for Fierce EZ). Soybean injury may occur if Fierce is used in the same field that chloroacetamide herbicides such as flufenacet, metolachlor, s-metolachlor, dimethenamid-p, or acetochlor will be used preemergence. At the 6 oz/A rate of Fierce EZ, the rotation interval is 7 days for minimum or no-till corn; 1 month for wheat and conventional till corn; 2 months for field peas; 4 months for sunflower; 6 months for lentil and sorghum; 9 months for edible peas and edible beans; 10 months for alfalfa; 11 months for other small grains; and 18 months for most other crops. Consult label for rates greater than 6 oz/A. Soybeans may be planted immediately.

FALL. Apply 3-4.5 oz/A Fierce or 6-9 oz/A Fierce EZ. Do not apply to frozen or snow-covered soil. Do not perform any tillage operation after application or residual weed control will be reduced. Consult label for rates and rotation restrictions.

EPP or PRE. Apply 3-3.75 oz/A Fierce or 6-9 oz Fierce EZ. May apply up to 3 days after planting but prior to soybean emergence. Do not apply after soybeans reach cracking stage or severe injury will occur. Do not irrigate during cracking stage.

FIERCE MTZ or KYBER *(flumioxazin + pyroxasulfone + metribuzin)* Site of Action: 14 + 15 + 5 **($30.05-48.45)**

1-1.5 pt Fierce MTZ or Kyber 2.64 SC (0.063-0.094 + 0.08-0.12 + 0.188-0.28 lb ai)

Premix containing containing 0.5 lb flumioxazin, 0.64 lb pyroxasulfone and 1.5 lb metribuzin per gallon formulated as a suspension concentrate. Provides residual control of grass weed species such as foxtails and barnyardgrass and broadleaf species such as lambsquarters, pigweed, waterhemp, common ragweed, velvetleaf, kochia, horseweed (marestail), and others. Rates vary depending on soil type, organic matter and application timing. Can be applied as a burndown in fall or early preplant or preemergence in the spring.

Minimum spray volume is 10 gpa for ground and 5-7 gpa for aerial application. Do not apply more than 1.5 pt per acre per year to soybean. Do not graze treated soybean fields or feed treated forage or hay to livestock within 40 days of treatment. Do not irrigate when soybeans are cracking. Soybean injury may occur if Fierce MTZ is used in the same field that chloroacetamide herbicides such as flufenacet, metolachlor, S-metolachlor, dimethenamid-p, or acetochlor will be used preemergence.

At the 1 pt/A use rate, the rotation interval is 7 days for minimum or no-till corn, 1 month for conventional till corn; 2 months for field peas; 4 months for sweet corn; 6 months for lentils; 8 months for wheat (4 months if following peas, lentils, or soybeans);

9 months for edible peas and edible beans; 10 months for alfalfa; 11 months for small grains (other than wheat); 12 months for dry beans and sunflower; and 18 months for most other crops. Consult label for rates greater than 1 pt/A.

FALL. Do not apply to frozen or snow-covered ground. Do not perform any tillage operation after application or residual weed control will be reduced.

EPP or PRE. Apply within 3 days after planting and prior to soybean emergence. Severe injury will occur if Fierce MTZ is applied when soybeans have begun to crack.

ENLITE *(chlorimuron + flumioxazin + thifensulfuron)* Site of Action: 2 + 14 + 2 **($18.75)**

2.8 oz Enlite 47.9DG (0.005 + 0.063 + 0.015 lb ai)

A higher rate up to 4.25 oz/A is allowed if soil pH is 7.0 or less. Provides residual control of several annual broadleaf weed species similar to Valor (flumioxazin) but provides greater control of emerged broadleaf weed species such as mustards, lambsquarters, redroot pigweed, and others.

For burndown applications, add either a COC or NIS (COC recommended). Add COC at 1% v/v under normal conditions or 2% v/v in dry conditions or NIS at 0.25% v/v under normal conditions or 0.5% v/v in dry conditions. Minimum carrier volume is 10 gpa for ground applications in conventional tillage, 15 gpa for ground applications in conservation tillage, or 5 gpa for aerial applications. Follow label restrictions when using Enlite with acetochlor (Warrant), flufenacet (Axiom), metolachlor (Dual, Cinch, Boundary, Prefix), or dimethenamid (Outlook). Do not apply within 14 days of application of an organophosphate insecticide.

Crop rotation restriction is 3 months for wheat; 4 months for barley, and winter rye; 9 months for dry beans, peas, field corn, and sunflower; 10 months for alfalfa, clover, and oats; 15 months for sorghum; 18 months for canola, flax, and lentils; and 30 months for most other crops. Do not graze treated fields or harvest for forage or hay.

FALL. Apply after October 15 or when soil temperature is less than 50 degrees F. Apply when annual broadleaf weeds are less than 3 inches tall or when perennial weeds are less than 6 inches tall. Tank-mix with 2,4-D or glyphosate for greater weed control. Do not till soil after application.

EPP. Tank mix with glyphosate, paraquat, or 2,4-D for difficult species or if weeds are greater than 1-3 inches tall.

PRE. Apply within 3 days after planting and before soybean emergence. Applications after soybeans emerge will result in severe soybean injury.

AFFORIA *(flumioxazin + thifensulfuron + tribenuron)* Site of Action: 14 + 2 + 2 **($15.40-23.10)**

2.5-3.75 oz Afforia 50.8DG (0.063-0.095 + 0.008-0.012 + 0.008-0.012 lb ai)

Used for burndown and residual control of some grasses and broadleaves; such as waterhemp, pigweed, nightshade, and kochia. Apply with COC or MSO at 1-2 % v/v or NIS at 0.25-0.5 % v/v, use higher rates in dry conditions. Follow label recommendations for adjuvants when tank-mixing. Minimum carrier is 5 gpa for air and 10 gpa for ground application in conventional tillage, 15 gpa for ground application in conservation tillage.

Follow label restrictions when using with flufenacet (Axiom), acetochlor (Warrant), metolachlor (Dual, Cinch, Boundary, Prefix), or dimethenamid (Outlook). Do not apply within 14 days of application of an organophosphate insecticide. May graze treated fields or harvest for forage or hay later than 21 days after application. Rotation interval for the 2.5 oz/A rate is 14 days for corn (minimum and no-till); 30 days for corn (conventional till), sorghum and wheat with 1 inch of rainfall; 45 days for sunflowers; 3 months for barley, dry beans, flax, lentils, peas, rye and safflower; 4 months for alfalfa and oats with tillage (8 months without tillage); and 4 months for canola and most other crops with tillage and a soil bioassay (8 months without tillage). For rates above 2.5 oz/A check label for extended rotation intervals.

FALL. Apply 2.5-3.75 oz/A. Do not apply on frozen or snow-covered ground.

EPP. Apply 2.5-3.75 oz/A a minimum of 7 days before planting.

PRE. Apply 2.5 oz/A within 3 days after planting and before soybean emergence. Applications after soybeans emerge will result in severe soybean injury.

LATIR *(flumioxazin + imazethapyr)* Site of Action 14 + 2

3.2-4.25 oz Latir 55WDG (0.063-0.084 + 0.047-0.062 lb ai)

Latir contains 31.5% flumioxazin and 23.5% imazethapyr. Provides control of broadleaves and some grasses. Apply using 15-30 gpa for burndown applications or 10-30 gpa for preemergence applications. Add MSO or COC at 1-2 pt/A or NIS at 0.25-0.5% v/v. AMS (8.5-17 lb/100 gal) may also be added.

Make only one application and do not apply more than 4.25 oz/A per growing season. Do not graze or feed forage to livestock. Do not tank-mix with cloroacetamide products such as; flufenacet, s-metolachlor, dimethenamid, acetochlor, or clomazone products.

EPP, PRE. Apply before planting or within 3 days after planting. Do not apply after cracking or emergence.

PANTHER PRO *(metribuzin + flumioxazin + imazethapyr)* Site of Action: 5 + 14 + 2

12-15 oz Panther Pro 4.23L (0.28-0.35 + 0.06-0.08 + 0.053-0.066)

Panther Pro is a premix containing 3 lb metribuzin, 0.67 lb flumioxazin and 0.56 lb imazethapyr per gallon. Provides burndown and residual control of broadleaves and grasses; such as lambsquarters, waterhemp, velvetleaf, ragweed and foxtail. Add COC or MSO at 0.25% v/v for burndown applications. AMS (2-2.5 lb/A) or UAN (1-2 qt/A) may also be added. Some tank-mixes may not require additional surfactant. Minimum carrier is 10 gpa for ground and 7 gpa for aerial application.

Do not apply to sand soils or sandy loam or loamy sand soils with <2% O.M. Do not incorporate. Make only one application and do not apply more than 15 oz/A per growing season. Do not graze or feed forage to livestock. Do not harvest for 85 days after application. Do not apply within 14 days of planting as a tank-mix with acetochlor, flufenacet, metoachlor or dimethenamid.

FALL. Apply up to 18 oz/A.

EPP, PRE. Apply 12-15 oz/A before planting or within 3 days after planting. Do not apply after cracking or emergence.

REVITON *(tiafenacil)* Site of Action: 14 **($5.75-17.35)**

1-3 fl oz Reviton 2.83L (0.02-0.066 lb ai)

Provides foliar control of broadleaf and grass weed species such as wild buckwheat, common lambsquarters, waterhemp, pigweed, dandelion, mustard species, Russian thistle, volunteer corn, wild oat and several others. Limited preemergence activity. May tank-mix with glyphosate, glufosinate, dicamba, 2,4-D, metribuzin, Pursuit (imazethapyr), Prowl (pendimethalin), or (sulfentrazone) based products for control of additional weed species. Reviton does not have application interval restrictions when tankmixed or applied sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products) or flumioxazin (e.g., Valor products).

For foliar activity, add a high quality MSO (1% v/v). Minimum carrier volume is 10 gpa for ground applications. See label for specific crop rotation restrictions but all crops not listed on label have a minimum of 120 days rotational restriction.

BURNDOWN, EPP. Apply 1-3 fl oz/A for all soil types. Applications must be made a minimum of 14 days prior to planting.

SHARPEN *(saflufenacil)* Site of Action: 14 **($7.20-14.45)**

1-2 oz Sharpen 2.85L (0.02-0.04 lb ai)

Provides foliar and residual control of broadleaf weed species such as wild buckwheat, common lambsquarters, waterhemp, pigweed, mustard species, Russian thistle, horseweed (marestail), and several others. After application, at least 0.5 inches of rain is needed to activate the herbicide. Sharpen may provide 2-3 weeks of residual weed control. May tank-mix with glyphosate, Clarity (dicamba), Pursuit (imazethapyr), or Prowl (pendimethalin) for control of additional weed species. Follow label application interval restrictions when tankmixed or applied sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products) or flumioxazin (e.g., Valor products).

For foliar activity, add either MSO (1% v/v) or COC (1% v/v) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier volume is 5 gpa for ground applications or 3 gpa for aerial applications. Crop rotation restriction is 4 months or less for most crops.

EPP. 1-2 oz/A For most soils, soybeans may be planted at any time after application with the 1 oz rate, but on coarse soils with less than 2% OM, applications must be made 30 days prior to planting. Planting intervals for rates above 1 oz vary from 14-44 days depending on soil type and organic matter.

PRE. 1 oz/A Do not apply after soybeans begin to emerge. Make sure seeds are completely covered prior to application. Do not use on coarse soils with less than 2% organic matter.

HARVEST AID. 1-2 oz/A. Apply to soybeans with greater than 65% brown pods and greater than 70% leaf drop or when seed moisture is 30% or less. Allow up to 10 days for optimum desiccation. Preharvest interval is 3 days for soybean grain. Do not apply to soybean grown for seed production. Do not graze or feed treated hay or straw to livestock.

PREMIX

OPTILL *(saflufenacil + imazethapyr)* Site of Action: 14 + 2 **($17.70)**

2 oz Optill 68WDG (0.022 + 0.063 lb ai)

Premix containing 17.8% saflufenacil (Sharpen) and 50.2% imazethapyr (Pursuit) per gallon. Provides foliar and residual control of several broadleaf species and grass species such as foxtail. After application, at least 0.5 inches of rain is needed to activate the herbicide. Crop injury may occur during stressful conditions such as extreme hot or cold conditions, excessive moisture or drought, high soil pH, or disease injury. Do not tank-mix or apply sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products), or flumioxazin (e.g., Valor), within 30 days of planting.

For foliar activity, add either MSO (1% v/v, minimum 1 pt/A) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier volume is 5 gpa for ground or 3 gpa for aerial applications. Crop rotation restriction is 4 months for rye, wheat or alfalfa, 8.5 months for corn, 18 months for oats, sorghum, sunflower, or safflower, 26 months for flax, and 40 months for most other crops with a successful field bioassay. Do not harvest for 85 days after application. Do not graze or feed soybean forage, hay, or straw.

EPP, PRE. Apply preplant through preemergence for most soils. Allow a minimum 30-day interval between application and planting for coarse soils with less than 2% OM. Do not apply after soybeans are in the cracking stage or after emergence. Make sure seeds are completely covered prior to application.

OPTILL PRO *(saflufenacil + imazethapyr + dimethenamid)* Site of Action: 14 + 2 + 15

Co-pack containing a dry component (17.8% saflufenacil (Sharpen) + 50.2% imazethapyr (Pursuit)) and a liquid component (6.0 lb dimethenamid (Outlook)). Each unit contains 2.5 lb of the dry component and 1.56 gallons of the liquid which will treat 20 acres. To treat an area smaller than 20 acres use a ratio of 2 oz/A dry to 10 oz/A liquid.

Provides foliar and residual control of broadleaf and grass species. After application, at least 0.5 inches of rain is needed to activate the herbicide. Crop injury may occur during stressful conditions. Do not tank-mix or apply sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products), or flumioxazin (e.g., Valor products) within 30 days of planting.

Do not apply Group 14 herbicides labeled for postemergence until 14 days after emergence. Do not harvest for 85 days after application. Do not graze or feed soybean forage, hay, or straw. In South Dakota see Sec. 24(c) label for list of vulnerable sandy soil types where Optill Pro application is prohibited when ground water is within 30 feet from the surface.

Rotation interval is 4 months for wheat, rye, edible beans, and peas (other than Southern); 8.5 months for corn; 9 months for alfalfa and Southern peas; 9.5 months for barley, Clearfield canola, and Clearfield sunflowers; 18 months for oats, safflower, sorghum and sunflower; 26 months for flax and potatoes; and 40 months and a successful field bioassay for most other crops.

Add MSO (1% v/v, minimum 1 pt/A) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier volume is 5 gpa for ground applications or 3 gpa for aerial applications.

FALL. Apply prior to first killing frost.

EPP, PRE. Apply preplant through preemergence for most soils. Allow a minimum 30-day interval between application and planting for coarse soils with less than 2% OM. Do not apply after soybeans are in the cracking stage or after emergence. Make sure seeds are completely covered prior to application.

VERDICT *(saflufenacil + dimethenamid)* Site of Action: 14 + 15 **($9.95-29.80)**

5-15 oz Verdict 5.57L (0.022-0.066 + 0.2-0.6 lb ai)

Premix containing 0.57 lb saflufenacil (Sharpen) and 5.0 lb dimethenamid (Outlook) per gallon. Provides foliar and residual control of several broadleaf weed species and residual control of grass species such as foxtail and barnyardgrass. Temporary crop injury may occur if applied during stressful conditions that reduce soybean growth. Properly closed furrows will help minimize the chance of seedling injury from PRE applications. Minimum carrier volume is 3 gpa for ground or aerial applications. If weeds are emerged at the time of application and foliar activity is desired, add AMS (8.5-17 lb/100 gal.) or UAN (1.25-2.5% v/v) and MSO (1% v/v). Rainfast 1 hour after application.

There are no crop rotation restrictions for the spring following application. Do not graze of feed forage, hay, or straw to livestock. In South Dakota, see Sec. 24(c) label for list of vulnerable sandy soil types where Verdict application is prohibited when ground water is within 30 feet from the surface. Do not tank-mix or apply sequentially with Group 14 herbicides such as sulfentrazone (e.g., Authority products), or flumioxazin (e.g., Valor products) within 30 days of planting for Verdict rates of 5-7.5 fl oz/A or within 44 days for 10 fl oz/A.

FALL. Apply 5-15 fl oz/A prior to a killing frost.

EPP or PRE. Apply 5, 7.5, or 10 fl oz/A EPP or 5 fl oz/A PRE. A minimum preplant interval of 30 days is required on coarse soils (sand, loamy sand, or sandy loam) with less than 2% organic matter. Refer to label for preplant interval for higher use rates and other soil types. Verdict may be applied in the spring if another saflufenacil product (Sharpen, OpTill, or Verdict) was applied the previous fall.

RAPTOR, OCTIVIO or VULTURE *(imazamox)* Site of Action: 2 **($9.95-23.45)**

4-5 oz Raptor, Octivio or Vulture 1L (0.03-0.04 lb ai)

Raptor controls several annual grasses and annual broadleaf weeds. Raptor is an imidazolinone herbicide with foliar and root uptake action. Residual activity is less than for Pursuit. Foxtail control has been very good. Also controls velvetleaf, cocklebur, sunflower, non-ALS kochia, mustard, and black nightshade. Raptor will suppress woolly cupgrass, wild proso millet, and sandbur; however, control will be best if a soil herbicide is included in the program. Perennials (such as Canada thistle), common waterhemp, and ALS-resistant weed biotypes are not controlled. Common ragweed control is variable. Lambsquarters should be treated with the high rate when small.

Treat early when weeds are less than 4-5 inches. Crop tolerance has been adequate in SDSU tests. Stress reduces crop tolerance; avoid application immediately after cold weather. Hot, humid weather may cause temporary response. Clearfield crops can be planted anytime. For areas East of Highway 83; wheat and alfalfa may be planted in 3 months; rye 4 months; corn 8.5 months; barley, oat, sunflower, sorghum, and several other crops after 9 months; canola and crops not listed on the label 18 months. See label for additional rainfall and pH restrictions for wheat and barley. For areas West of Highway 83 see label for rotation restrictions. Application of Pursuit, Classic, Scepter, or products containing similar residual herbicides in the same year as imazamox may increase injury to rotational crops. Make only 1 application with a maximum of 5 oz/A per growing season.

POST. Raptor is used only postemergence. Apply before bloom stage. The rate is 4 oz/A when used following a soil-applied grass herbicide such as pendimethalin or 5 oz per acre in a total postemergence program. Minimum carrier is 10 gpa for ground (20 gpa for no-till) or 5 gpa for air. Use COC or MSO at 1-2 gal/100 gal or NIS at 1 qt/100 gal and 2.5 gal/100 gal 28% N or 12-15 lb/100 gal AMS. Aerial application requires an adjuvant and 28% N or AMS.

TANK-MIXES/SEQUENTIAL. Raptor may be applied postemergence following a soil-applied grass herbicide or tank-mixed with postemergence grass herbicides. Use the full complement of COC or MSO plus 28% N for the tank-mixes. Avoid antagonism for grass control by delaying the postemergence grass herbicide for 7 days after applying Raptor; delay Raptor for 3 days if the grass herbicide is applied first.

PREMIX

VARISTO *(imazamox + bentazon)* Site of Action: 2 + 6 **($30.40-39.10)**

21-27 oz Varisto 4.19L (0.03-0.04 + 0.66-0.84 lb ai)

Varisto contains 0.19 lb imazamox (Raptor) and 4.0 lb bentazon (Basagran) per gallon. Controls several annual grasses and annual broadleaf weeds. Bentazon improves annual broadleaf and Canada thistle control. Treat early when weeds are less than 3-5 inches. Stress reduces crop tolerance; avoid application immediately after cold weather. Hot, humid weather may cause temporary response. Minimum carrier is 10 gpa for ground (20 gpa for no-till) or 5 gpa for air. Use MSO at 1% v/v or COC at 1-2% v/v or NIS at 0.25% v/v and 2.5 gal/100 gal 28% N or 12-15 lb/100 gal AMS. MSO is recommended when weeds are under stress.

Clearfield corn can be planted anytime. Rotation interval is 1 month for Clearfield crops (canola sunflower and wheat). For areas East of Highway 83; wheat and alfalfa may be planted in 3 months; rye 4 months; corn 8.5 months; barley, oat, sunflower, sorghum, and several other crops after 9 months; canola and crops not listed on the label 18 months. See label for additional rainfall and pH restrictions for wheat and barley. For areas West of Highway 83 see label for rotation restrictions. Do not graze or harvest for forage or hay for 30 days after application.

POST. Apply from emergence to before bloom stage

TANK-MIXES/SEQUENTIAL. Varisto may be applied postemergence following a soil-applied grass herbicide or tank-mixed with postemergence grass herbicides. Products include Basagran, Outlook, Poast, Prowl H2O, Zidua, glyphosate, and others.

PURSUIT, IMAZETHAPYR, PEMEX, PRAXIS, THUNDER or TRONIDO **($5.65-14.50)**
(imazethapyr) Site of Action: 2

4 oz Pursuit, Imazethapyr, Pemex, Praxis, Thunder or Tronido 2L (0.06 lb ai)

Pursuit action is by root and foliar uptake. It controls several annual broadleaves and provides some foxtail control. Control of redroot pigweed, mustard, non-ALS kochia, velvetleaf, and black nightshade has been very good to excellent. Velvetleaf is controlled most effectively with preplant incorporated treatments. Cocklebur and sunflower are controlled postemergence. If heavy grass, lambsquarters, or common ragweed is expected, use Pursuit with another herbicide. Not satisfactory for common waterhemp. Crop tolerance is adequate. Delay or stunting has been noted in situations associated with stress. There are no major soil pH or texture limitations.

Rain is the primary factor affecting carryover. Early-season stunting of rotational crop has been associated with low precipitation and in turn or overlap areas; however, yield reductions have not been noted. Wheat, alfalfa, rye, edible peas, and beans may be planted 4 months after application; some risk with fall-planted wheat if rain is below normal. Field corn may be planted in 8.5 months; barley in 9.5 months; safflower, sorghum, and sunflower in 18 months; potatoes and flax in 26 months; and other non- listed crops in 40 months. Oats and sorghum have shown considerable injury; do not plant the following year. Apply in a minimum of 10 gpa for ground or 5 gpa for air; use at least 20 gpa when applying soil treatments in liquid fertilizer. Do not apply products containing chlorimuron (Classic), imazaquin (Scepter), and flumetsulam (Python) the same year as Pursuit. Do not graze vines or feed to livestock.

EPP or PPI. Apply within 45 days of planting. Incorporate before planting or surface apply as an early preplant in no-till. Incorporate into the top 1-2 inches. Make second pass at an angle to insure uniform mixing.

PRE. Rain required. Control is more variable than for preplant or postemergence applications.

POST. Apply early postemergence when weeds are less than 3 inches and growing actively. Apply before soybean bloom. Weed size and stress-free growing conditions are important. Add MSO or COC at 1 gal or NIS at 1 qt/100 gal plus 28% N at 1-2 qt or AMS at 2.5 lb per acre. If weeds are stressed, COC or MSO preferred.

TANK-MIXES. Combinations with pendimethalin (Prowl), trifluralin (Treflan), s-metolachlor (Dual) improves preemergence grass control. Pursuit labeling includes tank-mixes with Basagran or Cobra broadleaf herbicides or grass herbicides including Fusilade DX, Poast Plus, Select, Fusion, and Assure. Activity of grass herbicides may be reduced. Refer to section for each herbicide alone.

PREMIX

PRE-TECTOR PLUS *(imazethapyr + pendimethalin)* Site of Action: 2 + 3

2.5 pt PRE-Tector Plus EC 2.9L (0.0625 + 0.84 lb ai)

Premix containing 0.2 lb imazethapyr and 2.7 lb pendimethalin per gallon. Minimum carrier is 10 gpa for ground or 5 gpa for aerial application. Do not make more than one application per year. Do not graze or feed treated forage, hay or straw.

FALL. Apply after October 31 and before freeze-up in no-till soybeans.

EPP. Apply up to 45 days before planting. One-inch rainfall or mechanical incorporation required.

PPI. Apply up to 45 days before planting. Immediate incorporation preferred but may be delayed up to 7 days. Incorporate into the top 1-2 inches.

EXTREME, DOG FIGHT, PRAXIS PLUS or THUNDER MASTER **($11.45)**
(imazethapyr + glyphosate) Site of Action: 2 + 9

3 pt Extreme, Dog Fight, Praxis Plus, or Thunder Master 2.17L (0.06 + 0.75 lb ai)

For postemergence use in Roundup Ready soybeans. The standard rate for Extreme is 3 pt/A which is equivalent to 24 oz/A glyphosate (3 lb ae/gallon product) + 4 oz/A Pursuit 2L. Extreme contains 0.17 lb imazethapyr (Pursuit) plus 2 lb ai glyphosate per gal. Controls several annual broadleaves; especially useful for nightshade and velvetleaf control and residual activity on other weeds. For ground applications, add NIS at 0.125% v/v and AMS at 8.5-17 lb/100 gal in at least 10 gpa carrier. For aerial applications, add NIS at 0.125% v/v and AMS at 2.5 lb/A in at least 5 gpa carrier. Rotational restrictions as for Pursuit.

EPP, PRE. Apply 3 pt/A in no-till soybeans.

POST. Apply to glyphosate-resistant soybeans before bloom and 85 days before harvest.

SCEPTER *(imazaquin)* Site of Action: 2 **($7.60-15.25)**

1.4-2.8 oz Scepter 70DG (0.06-0.125 lb ai)

Labeling includes use in South Dakota east of Highway 81. Scepter controls several annual broadleaves and gives limited control of annual grasses. Scepter gives excellent control of pigweed, smartweed, lambsquarters, non-ALS kochia, and sunflower. Cocklebur control has been satisfactory but is more variable. Velvetleaf and black nightshade control has been good to very good; these weeds are controlled best with preplant incorporated applications. Crop tolerance appears good. There are no major soil pH or texture limitations.

Soil carryover affects susceptible crops the following season. Scepter labeling prohibits planting field corn, wheat, barley, oats, or other sensitive crops in the fall or spring following a soil application at any rate, or a postemergence application at rates above 1.4 oz per acre. Postemergence applications not exceeding 1.4 oz per acre may be rotated to wheat, barley, oats, field corn, edible beans, or grain sorghum in the fall or the following spring, if at least 10 inches of rainfall occurs from application through October. Do not plant IMI corn for 9.5 months; sorghum for 11 months; wheat, barley, corn, oats, and most other crops for 18 months; and canola or potatoes for 26 months. High rates for all soil applications have additional restrictions. Risk of carryover is greater after dry, cool seasons. Do not graze or harvest vines for feed.

PPI. Incorporate into the top 1-2 inches. Rate is 1.4-2.8 oz per acre; 2.15 oz may be used on light soil. Apply up to 45 days before planting. Double-pass incorporation required if using disk or field cultivator. Preplant incorporated results have been most consistent.

PRE. Apply before crop emergence. Rates as for preplant incorporated.

POST. Apply before weeds reach 12 inches. Rate is 1.4-2.8 oz per acre. The low rate is primarily for cocklebur, sunflower, and volunteer corn. Control of sunflower has been very good; velvetleaf control has been less than for preplant incorporated applications. Use 20 gpa for ground equipment. Add 1 qt NIS/100 gal.

TANK-MIXES. Scepter may be tank-mixed with other soil-applied herbicides such as trifluralin, pendimethalin, or Dual, to improve grass control. Scepter may also be mixed with postemergence herbicides such as Basagran or Pursuit to improve weed spectrum.

AXIOM *(flufenacet + metribuzin*) Site of Action: 15 + 5 **($14.90-27.70)**

7-13 oz Axiom 68DF (0.24-0.44 + 0.06-0.11 lb ai)

Axiom premix controls/suppresses annual grasses and selected broadleaf weeds in soybeans. Axiom contains 54.4% flufenacet + 13.6% metribuzin. Rates are based on soil texture and organic matter. The 13-oz rate provides extended control of annual grasses and broadleaf weeds on coarse textured soils but provides only early season weed control on medium and fine textured soils. Rates lower than 13 oz per acre provide only early-season weed control. Do not apply more than 13 oz per acre in soybeans. Seed should be planted a minimum of 1-1.5 inches deep.

Minimum carrier is 10 gpa for ground application. If any crop treated with Axiom is lost, corn or soybeans may be replanted immediately. Do not make a second application of Axiom. Winter wheat and triticale can be planted after 7 days (< 10 oz/A) or 4 months (>10 oz /A). Potatoes can be planted after 1 month; spring wheat after 4 months; alfalfa, barley, buckwheat, proso millet, oats, popcorn, rye, sorghum, and most other crops after 12 months. Do not graze or feed forage, hay or straw to livestock.

EPP, PPI, PRE. May be applied up to 14 days before planting.

BASAGRAN, BASHAZON or BROADLOOM *(bentazon)* Site of Action: 6 **($8.50-17.45)**

1-2 pt Basagran, BashAzon, Broadloom 4L (0.5-1 lb ai)
0.8-1.6 pt Basagran 5L (0.5-1 lb ai)

Gives excellent control of cocklebur and very good control of small sunflower and velvetleaf. Pigweed, waterhemp, and kochia usually are not controlled. Weeds should be small. Excellent crop tolerance. Some leaf margin burn may occur if plants are under stress. Best results under good growing conditions; less effective under low humidity or dry conditions. Rain within 4 hours reduces effectiveness.

Use 1.5 pt (4L) or 1.2 pt (5L) for cocklebur under 6 inches, velvetleaf under 2 inches, sunflower under 5 inches or mustard under 4 inches. The high rate is for larger weeds, cocklebur up to 10 inches, velvetleaf to 5 inches, or sunflower or mustard to 8

inches. Primarily contact action. Good coverage important. Minimum carrier is 20 gpa for ground or 5 gpa for air with minimum of 40 psi pressure. Do not use flood-jet nozzles. Do not cultivate for 3-5 days before or after application.

A COC additive or COC plus UAN is suggested for weeds such as ragweed and lambsquarters. With the 4L; COC rate is 1-2 pt for ground and 1 pt per acre for air. With the 5L; use COC or MSO at 1% v/v or NIS at 0.25-0.5% v/v. For velvetleaf, use 28% N or AMS in addition to COC. Do not graze or cut for forage or hay for 30 days.

POST. Soybeans are tolerant at all growth stages.

SPLIT POST. Two applications improve control of weeds such as sunflower, mustard, velvetleaf, and Venice mallow. Apply 1.5 pt (4L) or 1.2 pt (5L) when weeds are small and make a second application at the same rate 4-7 days later.

TANK-MIXES. Basagran may be tank-mixed with several broadleaf and grass herbicides. Refer to individual herbicide labels or the section for each herbicide.

ACIFLUORFEN PRODUCTS *(acifluorfen)* Site of Action: 14 **($4.70-14.20)**

0.5-1.5 pt Avalanche Ultra, Acifin, Acifluorfen, Levity, Ultra Blazer 2L (0.125-0.38 lb ai)

Good to excellent control of annual broadleaves including black nightshade, pigweed, waterhemp, and wild mustard. Results on velvetleaf and cocklebur are variable. Foliar burn on field bindweed and Canada thistle has been satisfactory in most situations. Some annual grass suppression noted. Fair crop tolerance. Leaf burn or speckling is frequently noted. Crop recovers rapidly under good growing conditions. Most risk is during high humidity and high temperature. Delay cultivation for 7 days before or after application. Rain within 6 hours reduces control.

Primarily a contact herbicide. Good coverage is important. Low rates primarily for susceptible weeds such as wild mustard or pigweed. Add 1 pt NIS/100 gal. Increase NIS to 2 pt for lambsquarters, buffalo bur, and other hard to control weeds. Fields may be retreated if necessary. The use of 2 qt 28% N per acre improves velvetleaf control and causes less crop leaf burn than COC. Do not use flood nozzles. Minimum carrier is 20 gpa for ground and 5 gpa for air. Use 40-60 psi pressure. Do not apply within 50 days of harvest. Do not graze or harvest vines for feed. Do not apply more than 1.5 pt/A per application or more than 2 pt/A per growing season.

POST. Apply when weeds are small, at the 2- to 4-leaf stage.

TANK-MIXES. Ultra Blazer, Acfin or Avalance Ultra may be tank-mixed with several broadleaf and grass herbicides. Refer to individual herbicide labels or the section for each herbicide.

PREMIX

STORM *(acifluorfen + bentazon)* Site of Action: 14 + 6 **($19.40)**

1.5 pt Storm 4L (0.25 + 0.5 lb ai)

Postemergence control of smartweed, lambsquarters, Venice mallow, ragweed (common or giant), pigweed, waterhemp, and other weeds 2-6 inches tall. Temporary soybean leaf speckling, yellowing, or bronzing may occur. Rainfast 4 hours after application. Good coverage is important. Minimum carrier volume is 10 gpa for ground applications or 5 gpa for aerial applications. Add 1 of the following: AMS, UAN, NIS, or COC. See label for specific adjuvant rates based on tank mix options.

POST. Apply to small weeds at least 50 days before harvest.

CLASSIC or CURIO *(chlorimuron)* Site of Action: 2 **($4.70-6.25)**

0.25-0.33 oz Classic or Curio 25DF (0.004 - 0.005 lb ai)

Chlorimuron is used for postemergence annual broadleaf and nutsedge control. The maximum rate is 0.33 oz. Provides control of pigweed, cocklebur, and sunflower.

Soil persistence is influenced considerably by pH. Carryover increases with high pH. However, the maximum rate labeled for South Dakota provides considerable rotation flexibility without pH restrictions. Rotation restrictions are 3 months for cereal grains; 9 months for peas, dry beans, corn, alfalfa, and sunflower; 18 months for flax, canola, and lentil; and 30 months for crops not listed on the label guidelines. On all soils, a single application containing up to 0.33 oz/A may be applied. On soils with pH 7.0 or less, two applications may be applied without increasing rotational crop intervals.

Apply in a minimum of 10 gpa for ground or 3 gpa for air. Add NIS at 2 pt/100 gal. Under dry conditions, COC at 1 gal/100 gal may replace the NIS. An ammonium fertilizer product should be added for velvetleaf. Do not graze or use vines for feed.

POST. Apply after the first trifoliate leaf up to 60 days before physiological maturity.

PREMIX

SYNCHRONY XP *(thifensulfuron + chlorimuron)* Site of Action: 2 + 2 **($4.95)**

0.375 oz Synchrony XP 28.4DG (0.002 + 0.005 lb ai)

Synchrony XP contains 6.9% thifensulfuron (Harmony) + 21.5% chlorimuron (Classic). The 0.375 oz rate provides the equivalent of 0.052 oz Harmony SG + 0.33 oz Classic per acre. Add NIS (0.25%v/v) and UAN (2 qt/A) or AMS (2 lb/A). See herbicide resistant soybean section for additive recommendations in STS or STS/RR soybeans. Do not graze or harvest hay for 14 days. Do not apply within 60 days of harvest. Rotation intervals similar to Classic. See label for specific crops.

POST. Apply after the first trifoliate leaf is expanded and weeds are 1-4 inches tall.

TANK-MIXES. Synchrony labeling includes tank-mixing with postemergence herbicides for grass control and to improve waterhemp, nightshade, velvetleaf, or common ragweed control. Use NIS rather than COC or MSO in post grass tank-mix combinations; grass control may be reduced under some conditions.

HARMONY SG or TREATY *(thifensulfuron)* Site of Action: 2 **($5.05)**

0.125 oz Harmony 50SG (0.004 lb ai) 0.083 oz Treaty 75WDG (0.004 lb ai)

Thifensulfuron is particularly effective on lambsquarters, but also has activity on some other broadleaf weed species, such as pigweed and smartweed. Russian thistle control has been good in SDSU tests. Velvetleaf results are less than for several other treatments. Kochia is often resistant. Crop tolerance is adequate. Stunting and chlorosis on upper leaves may occur under humid, hot conditions.

In STS soybeans, may apply Harmony SG at 0.125-0.5 oz/A or 75WDG products at 0.083-0.33 oz/a. Lower rates are often used in combination with other broadleaf herbicides. There are no soil pH or crop rotation restrictions. Do not graze vines or harvest for livestock feed. Do not apply within 60 days of harvest.

Good coverage is important. Minimum carrier is 10 gpa for ground or 5 gpa for air. NIS at 1-2 pt/100 gal is required. Use low NIS rate except under stress conditions. Adding 28% N at 2-4 pt or AMS at 2-4 lb per acre improves control of velvetleaf. COC at 4 pt/100 gal is labeled in place of NIS under dry or cool conditions; however, crop response may increase. If tank-mixing with a grass herbicide, such as Assure II, only use NIS. Do not tank-mix with Poast Plus (sethoxydim) or Select Max (clethodim) or soybean injury may result.

EPP, PPS, PRE. May apply 0.45-0.9 oz/A (50SG) or 0.3-0.6 oz/A (75WDG) before planting or slightly after planting but before emergence.

POST. Apply after the first trifoliate leaf is fully expanded. Weeds should be small and actively growing. Do not cultivate 7 days before or after application.

PREMIXES

THIFENSULFURON + TRIBENURON PRODUCTS *(thifensulfuron + tribenuron)* Site of Action: 2 + 2

May be applied with a burndown application to help control emerged weeds that may be difficult to control, such as wild buckwheat or mustard species. Several products are available:

Trade name	Concentration (% of total product wt)		Ratio	Rate (oz wt/A)
	Thifensulfuron	Tribenuron		
Affinity Broadspec, Audit 1:1, Edition Broadspec, Rapport Broadspec, T-Pac	25	25	1:1	0.4-1.0
Affinity Tankmix, Audit 4:1, Edition Tankmix, Rapport Tankmix	40	10	4:1	0.6-1.0
Harmony Extra SG	33	17	2:1	0.45-0.9
Nimble, T-Square	50	25	2:1	0.3-0.6
Panoflex	10	40	1:4	0.3-0.6

EPP, PPS. Most products must be applied at least 7 days prior to soybean planting or 14 days prior to planting if applied on light textured soils (sands, loamy sands) or soils with pH > 7.9. Plantback intervals vary for some products; see individual labels for specific information.

AUTUMN SUPER *(iodosulfuron + thiencarbazone)* Site of Action: 2 + 2 **($8.05-13.40)**

0.3-0.5 oz Autumn Super 51WDG (0.001-0.0019 + 0.008-0.014 lb ai)

Maximum use rate is 0.5 oz wt/A. The addition of thiencarbazone may increase activity on some grass and broadleaf weed species. When tank-mixed with glyphosate in the fall, 0.5 oz Autumn Super increased foxtail barley control relative to a 1X rate of glyphosate alone in one SDSU trial. Mostly for foliar activity, so apply to small (broadleaf weeds less than 3 inches tall and grasses less than 1 inch tall), actively growing weeds if possible.

Minimum carrier rate is 10 gpa for ground applications. Use higher carrier rates for dense weed populations or high residue. Add a surfactant such as COC or MSO at 1% v/v and a nitrogen fertilizer (28 or 32% UAN at 1.5-2 qt/A or AMS at 1-3 lb/A). Rainfast after 2 hrs. Rotation restrictions are 1 month for field corn, 2 months for soybeans unless above 7.5 pH, 3 months for wheat, 9 months for barley or soybeans over 7.5 pH and 18 months for crops not listed on the label.

FALL, EPP. Apply in the fall after harvest but up to 60 days prior to soybean planting. Do not apply to frozen ground. Do not apply prior to soybeans on high pH soil (7.5 or above) as rotation interval is 9 months. This interval may be decreased to 4 months if STS soybeans are planted.

COBRA, BOA, MONGOOSE or PHOENIX *(lactofen)* Site of Action: 14 **($14.85-23.15)**

8-12.5 oz Cobra, Boa, Mongoose or Phoenix 2L (0.125-0.195 lb ai)

Cobra and Phoenix are selective formulations for postemergence control of certain broadleaf weeds. Phoenix has a built- in adjuvant system developed to reduce crop response. Rates are based on weed species and height. Primarily a contact herbicide. Apply when weeds are small, usually at the 2- to 4-leaf stage.

Good to excellent control of several annual broadleaves including pigweed, wild mustard, nightshade, kochia, and buffalo bur. Common ragweed control has been excellent, even with low rates. Results on cocklebur and velvetleaf have been variable. Fair to marginal crop tolerance. Leaves show some speckling or discoloration; newest leaves may show some crinkling.

Leaf burn is greatest in humid, hot weather. Crop recovers under good growing conditions. Do not apply to stressed plants. Poor conditions, such as drought, may delay recovery. Do not cultivate within 5 days of treating. Rainfast 30 minutes after application. Do not apply more than 25 fl oz product per season.

For Cobra, Boa & Mongoose COC is the preferred adjuvant. Crop response is greater with COC/MSO than for other additives. NIS at 0.25% v/v or COC/MSO at 1 pt/A is used with high humidity (over 80%). COC/MSO at 1.5 pt/A is used for moderate (60-80%) humidity. Use COC/MSO at 2 pt/A with low humidity (under 60%). The addition of AMS at 2.5 lb/A or 28% N at 1 qt/A will enhance weed control. For velvetleaf under ideal conditions, use minimum of 1 pt per acre COC; for other situations use NIS at 2 pt/100 gal plus 28% N at 1 gal per acre or AMS at 2.5 lb per acre.

With Phoenix use NIS at 1-2 pt/100 gal at the 8-12.5 oz rate until weeds reach maximum weed height; then COC at 1 pt per acre is an option.

Minimum carrier is 20-30 gpa for ground and 5-10 gpa for aerial application. COC at 1 qt per acre has been approved for aerial application. Use 40-60 psi to insure good coverage. Do not graze or harvest vines for feed.

PPS or PRE. Controls emerged weeds.

POST. Apply up to the R6 growth stage. Do not apply within 45 days of harvest. Although the registration allows applications up to the R6 growth stage (full seed), the soybean canopy may interfere with weed coverage after the third trifoliate.

TANK-MIXES. Several tank-mix options available including Basagran, Firstrate, glyphosate, Raptor, Select Max, and others. Refer to label section for each product.

FOMESAFEN PRODUCTS *(fomesafen)* Site of Action: 14 **($3.95-9.60)**

0.75-1 pt Flexstar, Agent 1.88, Battle Star, Fomesafen, Rumble, Sedona, Shafen Star, Top Gun Flex 1.88L 0.75-1 pt Reflex, Ringside, Top Gun 2L (0.18-0.25 lb ai)
0.52-0.7 pt Sinister 2.87L (0.19-0.25 lb ai)

Flexstar and Reflex are postemergence contact herbicides for annual broadleaf weeds. Rates and use in South Dakota are limited to defined geographical areas (see label for regional maps). The maximum rate of 1 pt per acre may be used east of I-29 from North Dakota to Watertown, east of Hwy 81 from Watertown to Madison, and south of Hwy 34 and east of Hwy 281 to Nebraska. In addition to the above area, a maximum of 0.75 pt per acre may be applied east of Hwy 281. Depending on the application region in South Dakota, a maximum of 0.75-1 pt Flexstar or 0.19-0.25 lb ai/A fomesafen from any source is allowed only in alternate years.

Flexstar has demonstrated good activity on wild mustard, Venice mallow, common ragweed, wild mustard, pigweed, common waterhemp, and smartweed at the low rate. Weeds should be at the 2- to 3-true leaf stage. Nightshade and lambsquarters control may not be satisfactory, kochia control has been fair. The higher rate improves control, especially under less favorable conditions. Crop tolerance is adequate; temporary leaf burn will be noted under stress conditions. Coverage is important.

Minimum carrier is 10-15 gpa for ground or 5 gpa for air. Use 30-60 psi pressure. Products listed as 2.0 are similar to the 1.88 except they contain less adjuvant. Flexstar contains surfactant; however, COC (0.5-1% v/v), MSO (0.5-1% v/v) or NIS (0.25-0.5% v/v) is required and 28% N (1-2.5 % v/v) or AMS (8.5 lb/100 gals) can also be added.

Rotation restriction is anytime for soybean or dry bean; 4 months for wheat, barley, or rye; 10 months for corn; 18 months for alfalfa, sunflowers, sorghum or most other crops. Do not graze or harvest forage or straw from small grain planted on treated areas. Do not graze or harvest soybeans for forage. Do not apply within 45 days of soybean harvest.

POST. Apply from emergence to before bloom stage.

TANK-MIXES. Flexstar can be tank-mixed with several postemergence grass and broadleaf herbicides. Several programs include: Fusion, Classic, Pursuit, Resource, Basagran and others.

PREMIXES

FLEXSTAR GT, AGENT GT or BATTLE STAR GT *(fomesafen + glyphosate)* **($17.45-22.80)**

2.68-3.5 pt Flexstar GT 3.5, Agent GT or Battle Star GT 2.8L (0.19-0.25 + 0.76-1 lb ai)

Provides control of waterhemp, pigweed, nightshade, common ragweed, and others. The application rate of 3.5 pt/A contains similar quantity of active ingredient as 44 fl oz glyphosate (3 lb ae) and 1 pt Flexstar 2L. Rates and use in South Dakota are limited to defined geographical areas (see label for regional maps). Depending on the application region in South Dakota, a maximum of 2.68 pt or 3.5 pt Flexstar GT 3.5 or 0.19-0.25 lb ai/A fomesafen from any source is allowed only in alternate years. Do not use other fomesafen products during the same year as Flexstar GT.

Add AMS at 8.5-17 lb per 100 gal spray solution. Adjuvants are not necessary for most situations but may be added for difficult

weeds or adverse growing conditions. Adjuvant options include NIS (0.25-0.5% v/v), or a COC or MSO (0.5-1% v/v). COC or MSO may reduce crop tolerance. Be sure to use adjuvants that do not antagonize glyphosate. Recommended carrier rate is 15- 20 gpa for ground applications or 5 gpa for aerial applications.

Rotation restriction is 4 months for wheat, barley, or rye; 10 months for corn or peas; 18 months for alfalfa, sunflowers, sorghum or most other crops. Do not graze or harvest treated areas for forage. Do not apply within 45 days of harvest.

EPP or PRE. Residual weed control may be reduced if adequate moisture (at least 0.25 in) is not received within 7 days after application.

POST. Glyphosate resistant soybeans only. Avoid applications when the crop is stressed from drought, extreme temperatures, excessive water, low humidity, low soil fertility, or mechanical/chemical injury.

TORMENT or CAMO *(fomesafen + imazethapyr)* Site of Action: 14 + 2 **($11.50-15.30)**

0.75-1 pt Torment or Camo 2.5L (0.188-0.25 + 0.047-0.0625 lb ai)

Observe geographic application restrictions described for Flexstar or Reflex. A maximum of 1 pt/A may be applied on alternate years. Rainfast 1 hour after application. Add COC (0.5-1% v/v), MSO (0.5-1% v/v), or NIS (0.25-0.5% v/v). Minimum carrier is 15 gpa for ground and 5 gpa for air. Do not graze or harvest treated areas for forage or hay. Do not apply within 85 days of harvest. Rotation interval is 4 months for small grains, wheat, and rye; 9.5 months for barley; 10 months for corn and peas; 18 months for alfalfa, sunflowers, and sorghum; 26 months for flax and potatoes; and 40 months for most other crops.

EPP, PPI, PRE. May apply up to 45 days before planting until after planting before crop emergence. Thoroughly incorporate 1-2 inches.

EPOST. Apply to actively growing weeds smaller than 3 inches. Temporary soybean leaf crinkling, spotting, or bronzing may occur.

INTIMIDATOR *(s-metolachlor + metribuzin + fomesafen)* Site of Action: 15 + 5 + 14

2.4-3 pt Intimidator 4.8L (1-1.27 + 0.22-0.28 + 0.2-0.25 lb ai)

Limited use areas to east of I-29 from North Dakota to Watertown, east of Hwy 81 from Watertown to Madison and south of Hwy 34 and east of Hwy 281 to Nebraska. Do not use more than 2.5 pt/A on soils over 7.0 pH. Injury to soybeans may occur on soils with calcareous surface area or ≥7.5 pH. Soybean injury may also occur when planted less than 1.5 inches deep.

Minimum 10 gpa for ground and 5 gpa for aerial applications. Do not harvest for 90 days. Do not graze or feed forage to livestock.

PPI, PRE. Do not use poor quality seed or seed sensitive to metribuzin. Do not use fomesafen (Flexstar) postemergence.

RESOURCE *(flumiclorac)* Site of Action: 14 **($8.50-25.55)**

4-12 oz Resource 0.86L (0.027-0.08 lb ai)

Resource is a foliar active herbicide used to control certain annual broadleaf weeds. It has contact activity; effects become apparent within 1-2 days. Resource is usually used in a tank-mix to provide broadspectrum control. Crop tolerance has been good.

Velvetleaf is one of the most sensitive weeds. Control has been very good to excellent in SDSU tests. Common ragweed is also sensitive. Rates are 4 oz for velvetleaf up to 6-leaf and ragweed up to 2-leaf; 6 oz for velvetleaf (8 lf), ragweed (4 lf), lambsquarters (2-3 lf); and 8 oz per acre for velvetleaf (10 lf), ragweed (6 lf), lambsquarters (3 lf), and cocklebur (3 lf). Rate of 12 oz per acre is used for velvetleaf up to 30 inches.

Use COC at 1 qt per acre when using Resource alone. Addition of 28% N at 2 gal/100 gal improves velvetleaf activity, especially on larger weeds. Minimum carrier is 15 gpa for ground and 7 gpa for aerial applications. Do not apply more than 8 fl oz/A by air in a single application. Do not apply if rain is expected in 1 hour. Do not graze or harvest forage from treated fields. There are no crop rotation restrictions for the next season.

POST. May be applied up to 60 days before harvest.

TANK-MIXES. Resource may be used as a sequential after most soil-applied herbicides; or in a tank-mix with Select, Assure, Poast and others for postemergence grass control. It may be tank-mixed with Basagran, Classic, Cobra, Firstrate, Flexstar and others to improve weed spectrum. Refer to section and labeling for each product.

CADET *(fluthiacet-methyl)* Site of Action: 14 **($4.15-9.30)**

0.4-0.9 oz Cadet 0.91L (0.003-0.006 lb ai)

Cadet is a PPO-inhibiting herbicide with a similar mechanism of action as Resource, Reflex, or Cobra. The standard rate range is 0.6-0.9 fl oz/A depending on the size of the weeds. When tank-mixing with glyphosate, use 0.5 fl oz/A for many weed species or 0.4 fl oz/A for velvetleaf. Controls some common broadleaf weed species, such as pigweed, waterhemp, lambsquarters, velvetleaf, and nightshade. Generally, controls broadleaf weeds 2-6 inches tall, but may control velvetleaf up to 36 inches tall. Controls or injures weeds within 48 hours. Control may decline if weeds are large or not actively growing. May be tank-mixed with several broadleaf or grass herbicides. Some soybean leaf spotting or bronzing may occur.

Thorough coverage is important to optimize control. Minimum carrier is 15 gpa for ground applications. Use up to 40 gpa if canopy is dense. Minimum carrier is 5 gpa for aerial applications. May use NIS (0.25% v/v), COC up to 2.5% v/v

(recommended during dry conditions), or a silicone-based surfactant (0.25% v/v). May also add UAN at 1-2 qt/A or AMS. Do not irrigate or apply within 4 hours of precipitation. Do not apply within 60 days of harvest. Do not feed treated foliage to livestock.

EPP, POST. May be applied prior to planting or up to full flowering.

PREMIXES

MARVEL *(fluthiacet-methyl + fomesafen)* Site of Action: 14 + 14 **($7.30-10.60)**

5-7.25 oz Marvel 3L (0.005-0.007 + 0.11-0.16 lb ai)

Marvel is a premix containing 0.117 lb fluthiacet (Cadet) and 2.883 lb fomesafen (Flexstar) per gallon. Rates and use in South Dakota are limited to defined geographical areas (see regional maps on label). A maximum rate of 9.75 oz/A in alternate years may be used East of I-29 from North Dakota to Watertown, East of Hwy 81 from Watertown to Madison, and South of Hwy 34 and East of Hwy 281 to Nebraska. All areas East of Hwy 281 except those previously mentioned have a maximum rate of 8.25 oz/A in alternate years.

Apply Marvel to actively growing weeds with thorough coverage to optimize control. Some temporary soybean leaf crinkling, spotting or bronzing may occur. May be tank-mixed with other registered herbicides. Minimum carrier is 10 gpa for ground and 5 gpa for air. Add NIS (0.25-0.5% v/v), COC (0.5-1% v/v) or MSO (0.5-1% v/v). During dry conditions and low relative humidity COC or MSO are recommended. May also add UAN (1-2 qt/A) or AMS. Do not apply within 60 days of harvest. Do not graze or feed treated forage or hay to livestock. Dry beans and potatoes can be planted anytime. Rotation interval is 4 months for wheat, barley and rye; 10 months for corn and peas; and 18 months for alfalfa, sunflowers, sugarbeets, sorghum and most other crops.

EPP, POST. May be applied preplant through full flowering stage.

ANTHEM MAXX *(fluthiacet + pyroxasulfone)* Site of Action: 14 + 15 **($14.20-40.45)**

2-5.7 oz Anthem Maxx 4.3L (0.002-0.006 + 0.07-0.186 lb ai)

Anthem contains 0.126 lb fluthiacet (Cadet) and 4.174 lb pyroxasulfone (Zidua) per gallon. A preplant or preemergence treatment provides residual control of most grasses, pigweed, waterhemp, nightshade, and suppression of several other broadleaves. A burndown or early post treatment controls many broadleaf weeds up to 2-4 inches. Some temporary crop response may occur with high moisture conditions. Anthem can be tankmixed with several herbicides to control emerged grasses and larger broadleaves. Follow adjuvant recommendations for use with the tank mix partner.

Minimum carrier for postemergence application is 10 gpa ground and 3 gpa air. May use up to 40 gpa if canopy is dense. Can add NIS (0.25% v/v), COC or MSO (1-2 pt/A – maximum 2.5% v/v), or silicone-based surfactant (0.25% v/v) for burndown and postemergence applications. UAN (1-2 qt/A) or AMS can also be used in addition to adjuvants. Do not apply when crop foliage is wet or if crop is under stress. Do not mix with chlorpyrifos insecticides postemergence. Do not graze or feed treated forage or hay. Do not harvest for 60 days. Rotation interval for 4.875 oz/A or less is 1 month sunflower and peas; 4 months for wheat; 6 months for flax; 10 months for alfalfa, lentils and grain sorghum; 11 months for edible beans and other small grains; and 18 months for other crops. Corn and soybeans can be planted anytime. See label for rotation interval with higher use rates.

EPP, PRE. Apply 2.5-5.5 oz/A depending on soil texture and organic matter. May be applied up to 45 days before planting. Plant soybeans a minimum of 1 inch deep.

POST. Apply 2-5.7 oz/A depending on soil texture. May be applied from emergence through the V6 growth stage.

LOROX or LINEX *(linuron)* Site of Action: 7 **($12.95-25.95)**

1-2 pt Linex 4L (0.5-1 lb ai)
1-2 lb Lorox 50DF (0.5-1 lb ai)

Lorox or Linex offer another mode of action for preemergence broadleaf weed control. Good control of small seeded broadleaf weeds such as lambsquarters, pigweed, and mustard. Partial control of kochia, velvetleaf and waterhemp. Requires rainfall for activation. Rate depends on soil texture and organic matter. Not labeled for all coarse soil types.

Minimum carrier is 15 gpa for ground. Do not apply by air. Labeled crops may be planted anytime. Rotation interval is 4 months for barley, oats, rye, wheat and most other crops, and 12 months for other cereal crops. Do not feed treated forage or hay to livestock. For burndown treatment add COC at 1 % v/v or NIS at 0.25 % v/v.

EPP, PRE. May be applied up to 30 days before planting. Apply 14 days or less for optimum residual control. Do not apply after soybeans have emerged. Shallow planted soybeans may be injured.

ASSURE II, QUIZ, SE-CURE or TARGA *(quizalofop)* Site of Action: 1 **($4.05-9.90)**

5-12 oz Assure II, Quiz, Se-Cure or Targa 0.88L (0.03-0.06 lb ai)

POST. Good to excellent control of foxtail, volunteer corn, and wild proso millet. Corn, shattercane, and wild proso millet are controlled at the lower rates. Does not control broadleaves. Excellent crop tolerance. Weed growth is reduced soon after application. Symptoms usually appear in 1-2 weeks. Moisture stress reduces activity.

For volunteer corn, apply 4 oz for 1-12 inch corn, 5 oz for 12-18 inch corn, or 8 oz for 18-30 inch corn. May be tank-mixed with glyphosate for volunteer corn control. For weeds, rates are 5-8 oz for shattercane (6-12 inches), and wild proso millet (2-6 inches); 7-8 oz for green, yellow, and bristly foxtail, giant foxtail, fall panicum, sandbur, wheat, barley, rye, oats, and wild oat (2-6 inches); 8-10 oz for barnyardgrass and crabgrass (2-6 inches); 9-10 oz for woolly cupgrass (2-4 inches); 10-12 oz for

downy brome (cheatgrass) and jointed goatgrass (2-6 inches); and 10-12 oz per acre for quackgrass (6-10 inches). Do not apply more than 18 oz per year.

Add NIS at 1 qt/100 gal or non-vegetable base COC at 4-8 qt/100 gal for ground or 2 qt/100 gal for air. Crop oil preferred. Do not apply if rain is expected within 1 hour after application. Do not cultivate within 7 days before or after application.

Coverage is important. Minimum carrier is 10 gpa for ground and 3 gpa for air. Tank-mixing with other herbicides, except as noted on label, can reduce effectiveness. Allow 7 days or more between sequential applications. Do not apply within 80 days of harvest. Do not rotate to unlabeled crops for 120 days. Do not graze or harvest vines for feed.

TANK-MIXES. Follow directions to reduce antagonism response. Allow at least 24 hours after applying Assure II before applying a broadleaf herbicide. If applying the broadleaf herbicide first, allow 7 days before applying Assure II. Reduced grass control can be expected due to antagonism with tank-mixes. Increase Assure II rate 2 oz from the rate used alone except for volunteer corn, shattercane, or giant foxtail.

FUSILADE DX *(fluazifop)* Site of Action: 1 **($7.45-14.90)**

6-12 oz Fusilade DX 2L (0.1-0.2 lb ai)

POST. Good to excellent control of wild proso millet, and volunteer corn. Fair to good control of annual grasses. Provides suppression of quackgrass. Does not control broadleaved weeds. Excellent crop tolerance. Weeds show leaf yellowing or browning 10-14 days after treatment. Control of foxtail has been variable under stress conditions. Volunteer corn control is more consistent.

Use 6 oz for wild proso (4-8 inches), and volunteer corn (12-24 inches); 8 oz for wild oat and volunteer small grain (2-6 inches); and 12 oz for barnyardgrass (2-3 inches), foxtail, woolly cupgrass, and witchgrass (2-4 inches) per acre. For quackgrass (6-10 inches), apply 12 oz and make a second application of 8 oz per acre 2-3 weeks after the first application if required.

Use 2-4 qt COC or 1-2 qt NIS/100 gal with all Fusilade ground applications. Use 1 pt COC or NIS per acre with air applications. Avoid cultivation for 1 week before and 1 week after application. Rain within 1 hour after application reduces effectiveness.

Coverage is important. Do not use flood nozzles. Minimum carrier is 5 gpa for ground or aerial application. Use 40-60 psi. Tank- mixing with other herbicides can reduce effectiveness.

Do not apply more than 6 oz/A at or after soybeans begin to bloom or within 60 days of harvest. Do not plant crops other than soybeans for 60 days after application. Do not graze or harvest vines for feed.

TANK-MIXES. Some tank-mix options include Flexstar, Basagran, Ultra Blazer, glyphosate and others. Refer to the section for each broadleaf herbicide used alone to determine weed size, rate, and application precautions. Fusilade DX 2L rates vary according to the tank-mix partner to allow for antagonistic reactions. Some combinations may also be used sequentially. For sequential use, allow 7-10 days for grasses to resume growth and develop new leaves if broadleaf herbicide is applied first. If Fusilade is applied first, allow 2-3 days before applying a broadleaf herbicide or mixture.

FUSION *(fluazifop + fenoxaprop)* Site of Action: 1 + 1 **($7.70-15.15)**

0.38-0.75 pt Fusion 2.56L (0.095-0.187+0.027-0.053 lb ai)

POST. Fusion is a premix containing 2 lb fluazifop-butyl (Fusilade) + 0.56 lb fenoxaprop-ethyl per gal. Good to excellent control of foxtail, volunteer corn, and wild proso millet. Does not control broadleaves. Excellent crop tolerance.

Weed growth is reduced soon after application. Symptoms appear somewhat later. Moisture stress reduces activity. Rates are 0.38 pt for shattercane (6-12 inches), volunteer corn (12-24 inches), and wild proso millet (4-8 inches); 0.5 pt for foxtail species, woolly cupgrass, sandbur, barnyardgrass (2-4 inches), crabgrass (1-4 inches), fall panicum, volunteer cereals, and wild oat (2-6 inches).

For quackgrass, apply 0.75 pt per acre when quackgrass is 6-10 inches. Make a second application using 0.5 pt per acre 2-3 weeks later if required. Add COC at 2-4 qt/100 gal or NIS at 1-2 qt/100 gal for ground application. Add 1 pt per acre COC or NIS for air. In addition to COC or NIS, UAN can be added at 4 gal/100 gal. Do not apply more than 1.5 pt of Fusion per year. Coverage is important. Use a minimum of 40 psi and 5 gpa for ground or air. Increase carrier and pressure if grass is dense. Do not cultivate 7 days before or after application. Do not graze or harvest for forage or hay. Do not plant grass crops for 60 days after application. Do not spray after bloom. Rain within 1 hour reduces results.

TANK-MIXES. Some tank-mix options include Basagran, Cobra, Firstrate, Flexstar, Ultra Blazer, glyphosate, glufosinate, 2,4-D and others. Refer to the section for each broadleaf herbicide used alone to determine weed size, rate, and application precautions. For sequential use, allow 7-10 days for grasses to resume growth and develop new leaves if broadleaf herbicide is applied first. If Fusion is applied first, allow 2-3 days before applying a broadleaf herbicide or mixture. Follow restrictions, application directions, and requirements for tank-mix partner.

POAST or POAST PLUS *(sethoxydim)* Site of Action: 1 **($7.40-22.25)**

0.75-2.25 pt Poast Plus 1L
0.5-1.5 pt Poast 1.5L (0.1-0.3 lb ai)

POST. Very good to excellent control of annual grasses. Provides suppression of quackgrass. Does not control broadleaves. Excellent crop tolerance. Poast Plus contains activating agents to enhance herbicide uptake.

Rates for Poast Plus and maximum grass size are 0.75 pt for wild proso millet (10 inches); 1.5 pt for green and yellow foxtail (8 inches), barnyardgrass (8 inches), wild oat (4 inches), volunteer corn (20 inches), and woolly cupgrass (8 inches); 1.9 pt

for sandbur (3 inches); 2.25 pt for volunteer cereals (4 inches), stinkgrass (6 inches); and 3 pt for downy brome (3 inches) per acre. For quackgrass, use 2.25 pt at 6-8 inches and retreat with 1.5 pt per acre if necessary. Poast 1.5L rates are approximately 67% of Poast Plus 1L product rates.

COC at 1 qt/A or MSO at 1.5 pt/A is required. AMS at 2.5 lb per acre or 0.5-1 gal 28% N may be used in addition to COC to improve control of quackgrass, volunteer corn and cereals, wild oat, or crabgrass. Avoid cultivation for 1 week before and 1 week following application. Rain within 1 hour after application reduces effectiveness. Control after drought stress is diminished.

Coverage is important. Use flat-fan or hollow-cone nozzles. Minimum carrier is 5 gpa for ground or air. Tank-mixing with other herbicides, except as noted on the label, can reduce effectiveness. Pressure should be 40-60 psi. Do not apply within 75 days of harvest. Avoid drift to sensitive crops such as corn, sorghum, or cereals. Do not graze or ensile vines; soybean hay may be fed to livestock. Clean sprayer thoroughly before mixing.

TANK-MIXES. May be tank-mixed with Basagran, Pursuit, Raptor, Firstrate, Flexstar, glyphosate, Liberty and others. Do not use MSO with Basagran, Pursuit, or Raptor tank-mixes. Refer to the section for each product alone.

PREPACK

REZULT *(sethoxydim + bentazon)* Site of Action: 1 + 6

1.6 pt each of Rezult G and Rezult B with duplex system

POST. Rezult is available in plastic duplex jug or Prodigy mini-bulk system. The Prodigy system delivers Rezult at 1.6 pt Poast Plus + 1.6 pt Basagran 5L per acre. Provides broadleaf and grass control. Add 1 pt COC + 1-2 qt 28% N per acre.

TANK-MIXES. Labeled tank-mixes include Ultra Blazer, Raptor, Pursuit, Classic and Firstrate. Refer to individual product labels.

CLETHODIM PRODUCTS *(clethodim)* Site of Action: 1 **($1.90-29.10)**

6-16 oz Select, Arrow, Avatar, Cleanse, Clethodim, Dakota, Gatlin, Intensity, Shadow, Vaquero, Volunteer 2L (0.09-0.25 lb ai)
9-32 oz Select Max, Intensity One, Tapout 0.97L (0.07-0.24 lb ai)
4-10.67 oz Section Three, Shadow 3EC, Trizenta 3EC 3L (0.09-0.25 lb ai)

POST. Good to excellent control of several annual grasses and volunteer corn. Use high rates for quackgrass suppression. Excellent crop tolerance. Apply 6-8 oz/A (2L) or 9-16 oz/A (0.97L) or 4-5.33 oz/A (3L) for annual grasses (2-6 inches) including foxtail, sandbur, wild oat, barnyardgrass, and volunteer cereals. Use the high rate for heavy weed pressure. Weed control has been consistent in SDSU tests. Symptoms appear 7-14 days after application.

Clethodim Rate for Volunteer Corn Control (oz/A)

Clethodim Formulation	Volunteer Corn Height (in)		
	4-12	12-24	24-36
0.97L	6-12	9-14	12-16
2L	4-6	6-8	--
3L	2.67-4	4-5.33	5.33-6.67

Use COC at 1%v/v with Select or other 2L products. For Select Max use NIS (0.25% v/v) or COC/MSO (1% v/v) and AMS at 2.5-4 lb/A depending on tankmix partner. For Section Three use COC at 1% v/v or 1 qt/A or MSO at 1% v/v or 1.5 pt/A by ground and COC at 1 pt/A by air. Use 28% N at 1-2 qt per acre to speed activity. Adjuvant recommendations may vary; see individual product labels. Avoid cultivation 1 week before or after application. Rain within an hour of application may reduce control. Apply in a minimum of 10 gpa carrier for ground or 3 gpa for air. Do not graze treated fields or feed treated forage to livestock. Do not apply within 60 days of harvest.

TANK-MIXES. Several combination treatments are listed on the label. Refer to the section for each broadleaf herbicide used alone to determine weed size, rate, and application directions. High rates used to override antagonistic reaction. Increase Select Max rate by 33% when targeting volunteer corn and tank-mixing with any herbicide other than glyphosate. Higher rates are recommended for suppression of perennial grass. See label for proper COC rates for each tank-mix partner and for ground or air equipment. Do not tank-mix if broadleaf weeds will prevent proper spray coverage of grasses.

BUTYRAC 200 *(2,4-DB)* Site of Action: 4 **($2.50-3.20)**

0.7-0.9 pt Butyrac 200 or 2,4-DB 200 2L (0.18-0.23 lb ae)

2,4-DB may be applied alone or in tank-mixes. Intended to control emerged weeds including cocklebur, marestail, or other annuals. Apply Butyrac in a minimum of 10 gpa for ground or 5 gpa for aerial equipment.

PRE. Apply to emerged weeds before planting to before soybeans emerge.

2,4-D Site of Action: 4 **($1.75-7.70)**

0.75-2 pt 2,4-D ester or 2,4-D amine 3.8L (0.38-1 lb ai)

Provides no-till burndown of emerged annual broadleaf weeds, especially for marestail, winter annual mustards, and prickly lettuce. Also controls topgrowth on broadleaf perennials prior to planting. Less effective for kochia when used alone. Apply no-till burndown as near as possible to planting; however, follow minimum time interval or injury risk increases. Ester forms preferred; interval to planting is less. Frequently mixed with glyphosate for grass. Check 2,4-D product for labeling. Plant seed at least 1.5 inches deep.

BURNDOWN. Application to planting interval for 0.75-1 pt of ester 4L per acre is 7 days or 15 days for amines. For rates of 1-2 pt, the interval is 30 days for both ester and amine forms.

AIM EC *(carfentrazone)* Site of Action: 14 **($1.60-9.70)**

0.25-1.5 oz Aim 2L (0.004-0.023 lb ai)

Aim is a contact herbicide used to control certain broadleaf weeds. It controls kochia (including ALS and glyphosate resistant) and velvetleaf; also gives control of redroot pigweed, nightshade, and lambsquarters. Weeds should be 1-4 inches. Minimum carrier is 10 gpa. Results on small, susceptible weeds has been very good; stressed weeds or large weeds are affected less.

PREPLANT BURNDOWN. Rate is 0.5-1.5 oz Aim per acre. Add NIS at 2 pt/100 gal or COC at 1.5-2 pt per acre; 28% N at 2-4 gal/100 gal may also be added. Burndown of small weeds has been effective in SDSU tests. May tank-mix 0.5-1 fl oz/A with glyphosate, glufosinate, or 2,4-D.

HARVEST AID. Rate is 1-1.5 fl oz Aim per acre. Apply when soybeans are mature and have begun to dry down. May desiccate broadleaf weeds such as morningglory, pigweed, and velvetleaf. Do not harvest for 3 days. Minimum spray volume is 10 gpa for ground application or 5 gpa for aerial applications. Add NIS at 0.25% v/v (2 pt/100 gal) or COC or MSO at 1-2% v/v (1-2 gal/100 gal). UAN (2-4% v/v) or AMS (2-4 lb/A) may be added to the NIS, COC, or MSO.

VIDA *(pyraflufen)* Site of Action: 14 **($2.10-8.40)**

0.5-2 oz Vida 0.2L (0.0008-0.0032 lb ai)

Vida is a contact herbicide with a similar mode of action as Aim (carfentrazone). It has activity on broadleaf weeds including cocklebur, sunflower, lambsquarters, pigweed, Russian thistle, wild buckwheat, and wild mustard. Vida is used primarily in a tank-mix with glyphosate. Results used alone have been variable; especially for kochia. Minimum carrier is 10 gpa for ground application or 5 gpa for aerial application. Do not graze forage or cut for hay within 7 days of application. Do not harvest grain within 70 days of application.

PREPLANT BURNDOWN. Apply 0.5-2 fl oz/A with labeled tank-mix herbicide. Recommended adjuvants include NIS at 0.25% v/v or COC at 1-2% v/v. Do not apply more than 2 fl oz/a per crop season.

POST. Apply 0.5-1 fl oz/A from emergence to the V6 growth stage. Do not use COC. Some temporary leaf speckling may occur. Do not apply more than 1 fl oz/A or more than 2 applications per crop season.

DICAMBA PRODUCTS *(dicamba)* Site of Action: 4 **Restricted Use Pesticides** **($1.70-25.50)**

4-32 oz dicamba 4L (0.125-1 lb ai)

There are several dicamba products available including Banvel, Clarifier, Clarity, Clash, Detonate, Diablo, Rifle, Sterling Blue, Vision and others.

Dicamba may be applied as a preplant or preharvest application in soybeans for the control of broadleaf weeds. May be tank-mixed with other registered herbicides for both preplant and preharvest applications.

PREPLANT. 4-16 oz/A Following application a minimum rainfall of 1 inch and a 14-day interval for 8 oz/A or less; or a 28-day interval for 16 oz/A is required before planting.

PREHARVEST. 8-32 oz/A Apply once soybean pods have reached a mature brown color and at least 75% leaf drop has occurred. Do not harvest soybean for 7-14 days depending on individual product label. Do not feed soybean fodder or hay. Do not use treated soybeans for seed unless tested for germination resulting in a 95% germination or better.

GLYPHOSATE in CONVENTIONAL SOYBEANS Site of Action: 9

0.38-3.75 lb ae/A

Glyphosate is available in several products having different formulations and different amounts (lb) of acid equivalent (ae) and active ingredient (ai).

Glyphosate rates in this section are listed for products having 3 lb acid equivalent (4 lb ai). Use the chart below to adjust for other concentrations.

Glyphosate Products-Equivalent Rates

Formulation	Amount of product (oz) for equivalent lb ae			
	0.38 ae	0.75 ae	1.5 ae	3 ae
3 lb ae (4 lb ai)	16	32	64	128
4 lb ae (5.4 lb ai)	12	24	48	96
4.5 lb ae (5.5 lb ai)	11	21	43	85

The amount required varies according to weed species and size. Green foxtail, mustard, sandbur seedlings, and volunteer wheat seedlings are more susceptible than many other species. Suggested rate is 16 oz per acre for most small annuals; 12 oz may be adequate for some situations. Use 20-24 oz for larger or more tolerant annuals or for post-harvest stubble burndown. Rates of 32-64 oz are used for perennials.

Glyphosate is a non-selective, translocated, foliage-applied herbicide used in reduced tillage systems. Glyphosate is applied before planting up to emergence, used as a spot treatment, applied in special equipment, or used as a perennial treatment. Refer to section for Herbicide Resistant Soybeans for in-crop glyphosate programs.

Carrier is 3-40 gpa for ground and 3-15 gpa for air. Maximum rate is 1 qt of 3 lb ae product. Use precaution to avoid droplet drift to non-target crops. Water having more than 500 ppm combined calcium, magnesium, or iron may reduce activity, especially at high carrier volumes. Daytime temperatures below 55 degrees F may also reduce activity. Follow cleanup procedures to avoid damage from equipment contamination.

BURNDOWN. Weeds should be growing actively. Avoid tillage for 1 day after treating annuals; 3-7 days for perennials.

SPOT TREATMENT. Use 2-4 qt 3 lb ae per acre to control small patches of perennial weeds such as quackgrass or Canada thistle. Crop contacted by spray or drift will be damaged or killed.

PREHARVEST. Apply glyphosate 3 lb ae at 1-6 qt per acre preharvest to control annual and perennial weeds. Preharvest application is especially effective for perennials. Apply after soybean pods have lost all green color. Allow a minimum of 7 days before harvest. Do not apply more than 1 qt per acre by air. Not recommended for seed fields.

TANK-MIXES. Glyphosate products may be tank-mixed with many early preplant or preemergence herbicides labeled for use in soybeans. This combines the burndown herbicide with a soil-applied residual herbicide used in no-till programs. Follow directions for each herbicide.

PARAQUAT PRODUCTS ***(paraquat)*** Site of Action: 22 **Restricted Use Pesticide**

2-4 pt Gramoxone 2.0 2SL ($4.05-14.00)
1.3-2.7 pt Bonedry, Devour, Gramoxone 3.0, Helmquat, Paraquat, Para-Shot 3.0, Parazone or Purgatory 3L (0.5-1.0 lb ai)

BURNDOWN. Paraquat is a non-selective, contact herbicide used to control emerged weeds at planting. May be applied preplant or preemergence. Gramoxone 3.0 rate range is 1.3-2 pt/A for weeds 1-3 inches tall and 2-2.7 pt/A for weeds 3-6 inches tall. See individual labels for 3L rates. Add NIS at a minimum of 0.125% v/v for ground application or 0.25% v/v for aerial applications or add COC at 1% v/v for ground application or 1 pt/A for aerial application. Minimum carrier is 10 gpa for ground or 5 gpa for air. Thorough coverage is very important. Several tank-mix options. Follow handling precautions as paraquat is toxic if ingested.

TANK-MIXES. Gramoxone may be tank-mixed with several preemergence herbicides. Refer to the section for each herbicide or combination for rates and application/rotation restrictions.

8-16 oz Gramoxone 2.0 2SL ($1.00-3.55)
5.4–10.7 oz Bonedry, Devour, Gramoxone 3.0, Helmquat, Paraquat, Para-Shot 3.0, Parazone or Purgatory 3L (0.13-0.25 lb ai)

HARVEST AID. Apply when at least 65% of the seed pods have reached a mature color or when seed moisture is under 30%. The purpose is to dry weeds to facilitate harvest. Less effective on large kochia than on other actively growing weeds. Contact action. Minimum carrier is 20 gpa for ground or 5 gpa for air. Add NIS at a minimum of 0.125% v/v for ground application or 0.25% v/v for aerial applications or add COC at 1% v/v for ground application or 1 pt/A for aerial application. Do not harvest for 15 days. Do not graze or harvest for forage or hay. Follow handling precautions, as paraquat is highly toxic when ingested.

1-2 pt Gramoxone 2.0 2SL (0.25-0.5 lb ai) ($0.95-4.00)
0.7-1.3 pt Gramoxone 3.0 3L (0.26-0.5 lb ai)
3-5.3 oz Bonedry, Devour, Helmquat, Paraquat, Para-Shot 3.0, Parazone Purgatory 3L (0.07-0.13 lb ai)

HOODED or DIRECTED SPRAY. Nonselective, non-residual treatment to control emerged weeds between the rows. Apply when weeds are actively growing and less than 6 inches tall. Severe damage or complete kill can occur if spray contacts soybean plants. Do not apply to soybeans less than 8 inches tall and do not exceed 30 psi nozzle pressure when using direct spray. Some visual crop speckling should be expected. Minimum carrier is 10 gpa for ground application. Add NIS at a minimum of 0.125% v/v or COC at 1% v/v. Do not graze or harvest forage or hay until 46 days after application.

Herbicide Resistant Soybeans

GLYPHOSATE PRODUCTS *(Roundup Ready Soybeans)* Site of Action: 9 **($3.05-17.35)**

Only glyphosate products licensed and labeled for use with glyphosate-resistant seed may be used. Several products are listed below, representing amount (lb) of acid equivalent (ae) and active ingredient (ai). Examples include:

Glyphosate Concentration	Trade Names	Rate for (0.38-1.5 lb ae/A)
3 ae, 4 ai	Buccaneer (Plus), Cornerstone Plus, Credit 41 Extra, Four Power Plus, Gly Star Original, Glyphogan (Plus), Glyphosate 4 plus, Helosate Plus Advanced, Mad Dog (Plus), Makaze (Yield Pro), Showdown, Tomahawk 4	16-64 oz
4 ae	Buccaneer 5 Extra, Cinco, Cornerstone 5 Plus, Duramax, Durango DMA, Gly Star 5 Extra, Tomahawk 5	12-48 oz
4.5 ae, 5.5 ai	Abundit Edge, Roundup Powermax, Roundup Weathermax, RT 3	11-43 oz
4.5 ae, 5.83 ai	Credit Xtreme	11-43 oz
4.8 ae, 5.88 ai	Roundup Powermax 3	10-40 oz

Glyphosate rates in this section are listed for products having 3 lb acid equivalent (4 lb ai).

Use the chart below to adjust for other concentrations.
Glyphosate Products-Equivalent Rates

Formulation	Amount of product (oz) for equivalent lb ae			
	0.38 ae	0.75 ae	1.5 ae	3 ae
3 lb ae (4 lb ai)	16	32	64	128
4 lb ae (5.4 lb ai)	12	24	48	96
4.5 lb ae (5.5 lb ai)	11	21	43	85

Apply postemergence through flowering. There is flexibility for timing burndown. The maximum rate for any single in-crop application is 2 qt of 3 lb ae per acre. Allow 14 days from last application to harvest. Maximum rates for application timings are listed below:

Maximum Rates of Glyphosate Allowed for Glyphosate Resistant Soybeans

Formulation	Preemergence/ Preplant	Cracking to Flowering	Single Application	Preharvest	Total/ Season
3 lb ae	5 qt	3 qt	2 qt	2 pt	8 qt
4 lb ae	3.7 qt	2.2 qt	1.5 qt	1.5 pt	6 qt
4.5 lb ae	3.3 qt	2 qt	1.3 qt	1.3 pt	5.2 qt

Narrow row or drill-planted crop provides important early canopy to reduce late flushes; wide row planting may require a sequential treatment. Glyphosate rate can be adjusted to control most annual weeds. It is an effective option for perennials such as Canada thistle, quackgrass, field bindweed, and milkweed. It has performed well in SDSU tests for biennial wormwood and ALS-resistant kochia. Sequential application is frequently required for weeds such as velvetleaf, black nightshade, woolly cupgrass, or waterhemp. Waterhemp control will be most consistent if initial application is made before weeds reach 6-8 inches. Perennials require 1-2 qt 3L ae per acre for control or suppression.

Use 5-20 gpa for ground or 3-15 gpa for air application. Be aware of wind conditions that may cause droplet drift. Follow other mixing and application directions for the product being used.

VOLUNTEER ROUNDUP READY CORN TANK-MIX

Glyphosate + quizalofop *(Assure II, etc.)*, Fusion, Fusilade DX, clethodim *(Select/Select Max, etc.)*, or Poast/ Poast Plus

POST. SDSU trials indicate that only 1 volunteer corn plant in a 10 m2 area can reduce soybean yield by 2.5%. Tank-mixes required for volunteer RR corn control. Application at 6-10 inches is more effective than treating later at 16-20 inches. Add AMS. Adding COC or MSO not required with the higher rates of the post grass herbicide. Adding COC or MSO may reduce glyphosate activity if the glyphosate rate is marginal for the other weed problems.

GLUFOSINATE PRODUCTS *(Liberty Link Soybeans)* Site of Action: 10 **($16.80-25.15)**

29-43 oz Liberty, Cheetah, Fever, Interline, Noventa, Nullify A/P, Refer 280, or Total SL 2.34L (0.53-0.79 lb ai)
22-36 oz Forfeit 280, Inflame 280, Glufosinate 280, Reckon 280, or Surmise 2.34L (0.4-0.66 lb ai)

Liberty 280 (glufosinate) may only be applied to Liberty Link soybeans. Provides broadspectrum grass and broadleaf weed control. Controls glyphosate-resistant weeds. Use higher rates or tank-mix partners to control field sandbur, marestail, common waterhemp and Russian thistle. Applications during full sunlight, warm temperature, and high humidity may improve control.

Apply between dawn and 2 hours before sunset to avoid reduced control of common lambsquarters and velvetleaf. Adverse weather conditions, such as drought or cool temperatures, may reduce Liberty efficacy more than glyphosate. Heavy dew or

fog may reduce efficacy. Rainfast within 4 hours after application.

For best results, apply when weeds are actively growing to small weeds (≤3 inches). Add AMS at 1.5-3 lb/A (3 lb preferred) to improve control. Coverage is important for glufosinate. Do not use nitrogen solutions as spray carriers. Do not use nozzles or pressures that result in coarse spray droplets. Do not graze or cut for hay. Do not apply within 70 days of harvest. Rotation restriction is 70 days for small grains.

Applying a preemergence herbicide is recommended to reduce weed competition. Several tank-mix options for residual herbicides, grass herbicides (Assure II, Select Max, Fusilade (DX), PPO-inhibiting herbicides (Cobra, Phoenix, Flexstar, Reflex, Resource, Ultra Blazer), ALS-inhibiting herbicides (Pursuit, Raptor, Harmony, FirstRate, Synchrony XP), and others. Additional surfactants are not necessary when tank-mixing with Liberty.

LIBERTY, CHEETAH, FEVER, INTERLINE, NOVENTA, NULLIFY A/P, REFER 280, and TOTAL SL:
Minimum carrier is 15 gpa (20 gpa preferred) for ground or 10 gpa for aerial application. Do not apply more than 43 oz/A per application or 87 oz/A per year.

BURNDOWN. Apply 29-43 oz/A (Liberty or Noventa 32-43 oz/A). For Liberty and Interline, may apply only one postemergence application if applied burndown.

POST. Apply 29-43 oz/A from emergence up to but not including bloom stage. May apply 2 postemergence applications with a minimum 5-day interval.

FORFEIT 280, GLUFOSINATE 280, INFLAME 280, RECKON 280 and SURMISE:
Minimum carrier is 10 gpa (20 gpa preferred) for ground or 10 gpa for aerial application. Do not apply more than 36 fl oz/A in a single application. May make a total of 2 applications with a maximum of 65 oz/A per year.

BURNDOWN. The recommended rate for burndown applications is 29-36 oz/A. If applied burndown, only 1 application of 22-29 oz/A may be applied postemergence.

POST. Apply 22-36 oz/A (29-36 oz/A for Inflame) from emergence up to but not including the soybean bloom growth stage. May apply a second postemergence application at 22-29 oz/A with a minimum 5-day interval.

ENLIST ONE (2,4-D choline) *(Enlist Soybeans)* Site of Action: 4 **($9.95-13.30)**

1.5-2 pt Enlist One 3.8L (0.71-0.95 lb ai)

Provides flexible tank mix options for glyphosate or glufosinate products (see EnlistTankMix.com for complete list of approved tank mix partners) for applications in Enlist soybeans. Contains “Colex-D Technology” to reduce drift.

Follow nozzle and buffer zone requirements to minimize off-target movement. Apply with water carrier at 10-15 gpa. Not labeled for aerial application. Do not apply more than 2 pt/A per application. Do not graze or harvest for forage or hay. Do not apply within 30 days of harvest.

ENLIST SOYBEANS:
PPS, PRE. Apply 1.5-2 pt/A before or after planting and before soybean emergence.

POST. Apply 1.5-2 pt/A when weeds are small and not after the R2 (full flower) soybean growth stage. Do not apply more than 2 POST applications per season with at least 12 days between applications.

NON-ENLIST SOYBEANS:
EPP. Apply up to 1 pt/A 7 days prior to soybean planting or up to 2 pt/A 14 days prior to soybean planting. Do not use on sandy soils with less than 1% O.M. Do not plant soybeans less than 1 inch deep. Do not make more than 1 application regardless of rate.

ENLIST DUO *(glyphosate + 2,4-D (choline)) (Enlist Soybeans)* Site of Action: 9 + 4 **($15.40-20.92)**

3.5-4.75 pt Enlist Duo 3.3L (0.75-1 + 0.7-0.95 lb ai)

Premix of glyphosate (DMA salt) and 2,4-D choline. Enlist Duo may be applied preplant or preemergence to Enlist soybeans and preplant to soybeans that do not contain the Enlist trait. Only apply postemergence to soybeans that has the Enlist trait. Provides control of emerged grass and broadleaf weeds. Apply 3.5-4.75 pt for weeds that are 3-6 inches tall. Use the 4.75 pt rate for weeds that are greater than 6 inches, glyphosate-resistant weeds, or during stressful conditions. Check label for recommendations on specific weeds.

Follow nozzle and buffer zone requirements to minimize off-target movement. Use a minimum of 10 gpa for ground application. Not labeled for aerial application. For burndown in non-Enlist soybeans, make only one application and do not apply more than 4.75 pt/A. For Enlist soybeans, do not apply more than 4.75 pt/A per application or 14.25 pt/A per season. Only tank-mix with products listed on EnlistTankMix.com. Do not graze or harvest forage or hay.

ENLIST SOYBEANS:
PPS. Apply before or after planting but before emergence.

POST. Apply only to Enlist soybeans any time after emergence up to the R2 growth stage (full flowering). Do not make more than 2 postemergence applications with at least 12 days between applications.

NON-ENLIST SOYBEANS:
PPS. Apply at least 30 days before planting. Do not apply to sandy soils with <1% O.M.

XTENDIMAX or ENGENIA *(Dicamba-tolerant soybeans)* Site of Action: 4 **($12.45-14.30)**
Restricted Use Pesticides.

22 oz Xtendimax 2.9L (0.5-1 lb ai) 12.8 oz Engenia 5L (0.5 lb ai)

Applicators must complete auxin-specific (dicamba) training this year and every other year moving forward before spraying. Certified applicator records must be saved for 2 years.

May be applied preplant, preemergence, and postemergence in dicamba tolerant (DT) Roundup Ready2 Xtend or XtendFlex soybeans to control broadleaf weeds. Apply to small (<4 inch) actively growing weeds. Xtendimax is a diglycolamine salt with Vaporgrip technology and Engenia is a BAPMA salt for reduced volatility. Minimum carrier 15 gpa. Do not exceed 10 MPH ground speed. Maximum boom height is 24 inches above target weeds or crop canopy. Do not apply Xtendimax or Engenia by air.

Apply when wind is between 3-10 mph (boom height). Do not apply after June 30 or RI growth stage whichever comes first. Do not apply if wind is blowing toward sensitive areas or crops including non-Xtend soybeans. A 240 foot downwind buffer for 22 oz (2.9L) or 12.8 oz (5L) to the closet downwind edge is required.The label describes areas that may be included in the buffer distance (roads, unplanted fields, corn, dicamba tolerant soybeans, etc.) Applicators must check sensitive crop registries before spraying. See https://www.epa.gov/endangered-species for a list of counties that may have an endangered species protection bulletin with additional buffer requirements

Apply between 1 hour after sunrise and 2 hours before sunset and do not apply when there is a temperature inversion. Do not apply if rain amount is expected to exceed field capacity in the next 48 hours, Rainfast in 4 hours. Do not exceed 88 oz (2.9L) or 51.2 oz(5L) total per year for all applications. Allow 7 days for harvest/feeding of forage.

Tankmix only with approved products. Always add a drift reduction adjuvant (DRA) and a volatility reduction adjuvant (VRA) as required. Use only approved adjuvants. Do not use AMS, UAN, or other products with ammonium salts. The sprayer must be cleaned before and after spraying. For approved nozzles, pressures, additives, tank-mix partners, and other application directions check www.xtendimaxapplicationrequirements.com or www.engeniatankmix.com, depending on product used within 7 days before application.

DICAMBA TOLERANT SOYBEANS:
PPS, PRE. Apply 22 oz/A (2.9L) or 12.8 oz/A (5L) before or after planting to control emerged weeds with limited residual. Do not exceed 44 oz (2.9L) or 25.6 oz (5L) combined for preplant and preemergence applications.

POST. Apply 22 oz (2.9L) or 12.8 oz (5L) from emergence to (R1) stage or June 30 whichever comes first. A second application a minimum of 7 days later may be used to control new weed flushes if stage permits. Do not exceed two applications and do not apply more than 44 oz/A (2.9L) or 25.6 oz/A (5L) total postemergence.

TAVIUM *(dicamba + s-metolachlor) (Dicamba-tolerant soybeans)* Site of Action: 4 + 15 **($25.70)**
Restricted Use Pesticide

56.5 oz Tavium 3.38L (0.49 + 0.99 lb ai)

Premix containing 1.12 lb ae dicamba and 2.26 lb s-metolachlor per gallon. For grass weed control, apply before grass emergence. For control of emerged broadleaf weeds, apply to small weeds (<4 inches). For approved nozzles, pressures, additives, tank-mix partners, and other application directions check www.TaviumTankMix.com. May add NIS at 0.25% v/v or COC or MSO at 0.5-1% v/v. COC or MSO is not recommended for postemergence applications due to the risk of crop injury. Minimum carrier is 15 gpa for ground application.

Apply when wind is between 3-10 mph (boom height). Do not apply after June 30 or V4 growth stage whichever comes first.

Do not apply if wind is blowing toward sensitive areas or crops including non-Xtend soybeans. A 240 foot downwind buffer to the closet downwind edge is required. The label describes areas that may be included in the buffer distance (roads, unplanted fields, corn, dicamba tolerant soybeans, etc.) Applicators must check sensitive crop registries before spraying. See https://www.epa.gov/endangered-species for a list of counties that may have an endangered species protection bulletin with additional buffer requirements.

Apply between 1 hour after sunrise and 2 hours before sunset and do not apply when there is a temperature inversion. Do not apply if rain amount is expected to exceed field capacity in the next 48 hours, Rainfast in 4 hours. Allow 7 days for harvest/feeding of forage

Do not feed treated forage or hay for 30 days following a preplant, at planting or preemergence application. Do not graze or feed treated forage or hay following a postemergence application. Preharvest interval is 75 days. Rotation interval is 4 months for corn; 4.5 months for barley, oats, rye and wheat; 6 months for alfalfa, lentil, sorghum, and sunflower; and 12 months for most other crops.

Tankmix only with approved products always add a drift reduction adjuvant (DRA) and a volatility reduction adjuvant (VRA) as required. Use only approved adjuvants. Do not use AMS, UAN, or other products with ammonium salts. The sprayer must be cleaned before and after spraying.

DICAMBA TOLERANT SOYBEANS:
The maximum annual rate is 113 oz/A per year. Do not make more than one preplant or at planting or premergence application and/or one postemergence application.

PPS or PRE. Apply before, during, or after planting but before crop emergence. Apply behind the planter for at planting or preemergence applications.

POST. Apply through V4 (fourth trifoliate) or through June 30; whichever comes first.

ALITE 27 ***(isoxaflutole) (GT27 or isoxaflutole-resistant)*** Site of Action: 27

1.5-3 oz Alite 27 4L (0.047-0.094 lb ai)

Alite provides excellent preemergence broadleaf and some annual grass control in GT 27 soybeans. Alite has the same active ingredient that is in Balance Flexx used in Corn. LLGT 27 soybeans also have tolerance to glyphosate and glufosinate. Alite has provided excellent control of velvetleaf, waterhemp, pigweed, lambsquarter, common ragweed and wild buckwheat control in SDSU tests.

Ground application only, Minimum of 10 gpa. Rotate anytime to corn or GT 27 soybeans; 4 months to wheat, rye or triticale; 6 months to soybeans, barley, sorghum, oats, and sunflowers; 10 months alfalfa; most other crops 18 months. Cover crops may be planted at own risk with no grazing or haying allowed.

If the water table is less than 25 feet below the soil surface, do not apply to sandy, sandy loam, or loamy sand soils or subsoils where the average organic matter in the upper 12 inches is less than 2% by weight. Do not exceed 6 oz/A per year. Off-site movement may occur if applied in areas that receive less than 15 inches annual precipitation. Do not mix or load within 50 feet of wells, sinkholes, streams, rivers, lakes, or reservoirs.

GT 27 SOYBEANS:
PPS, PPI, PRE. Apply 1.5-3 oz/A up to 21 days before planting and up to before soybean emergence. If incorporating, incorporate less than 2 inches deep. Plant soybeans at least 1 inch deep and make sure the seed is adequately covered. If using as burndown COC or MSO may be added for better weed control.

SYNCHRONY XP ***(STS, Bolt or STS/RR Soybeans)*** Site of Action: 2 **($4.95-9.90)**

0.375-0.75 oz Synchrony XP 28.4DF (thifensulfuron + chlorimuron) (0.002-0.003 + 0.005-0.01 lb ai)

Synchrony XP contains 6.9% thifensulfuron (Harmony) + 21.5% chlorimuron (Classic). Synchrony XP may be used at greater rates (0.375-0.75 oz/A) on STS and Bolt herbicide resistant than conventional soybeans (0.375 oz/A). The 0.375 oz rate may be used on all soils with any pH and the 0.75 oz rate is for soils with a pH less than 7.0. The 0.375 oz rate provides the equivalent of 0.052 oz Harmony SG plus 0.33 oz Classic per acre. The 0.375 oz rate controls cocklebur, sunflower, and pigweed. Rates of 0.75 oz/A may provide control of buffalobur, velvetleaf, and common/giant ragweed. Synchrony labeling includes tank-mixing with postemergence herbicides for grass control and to improve waterhemp, nightshade, velvetleaf, or common ragweed control.

Minimum carrier is 10 gpa for ground or 3 gpa for air. Add COC at 1% v/v solution plus 28% N at 2-4 qt or AMS at 2-4 lb per acre. Small grain may be planted after 3 months; corn, alfalfa, sunflowers, and sorghum after 9 months. Canola, flax, and lentil require an 18-month interval.

POST. Apply after first trifoliate leaf stage but 60 days before physiological maturity.

WEED RESPONSE to SOYBEAN HERBICIDES

Weed control percentages are intended as a guide for comparing alternatives. Percentages are estimated based on favorable conditions.

10,9	Excellent	90-99%	Usually over 90%	Best choice for weed
8,7	Good	80-90%	Sometimes under 80%	Usually satisfactory
6	Fair	70-80%	Sometimes under 70%	Sometimes unsatisfactory
5	Marginal	50-70%	Seldom over 70%	Seldom satisfactory
2, 3, 4	Poor	<50%	Usually under 50%	Not effective
0	None	0%	No control	

Herbicide	Green foxtail	Yellow foxtail	Barnyardgrass	Field sandbur	Woolly cupgrass	Wild buckwheat	Wild mustard	Horseweed (Marestail)	Kochia (ALS)	Common ragweed	Lambsquarters	Pigweed	Waterhemp	Smartweed	Nightshade	Cocklebur	Sunflower	Velvetleaf	Venice mallow
PPI/PRE:																			
Authority Assist	9	9	8	8	6	6	9	6	7	5	8	9	9	6	9	5	4	7	6
Authority First/Sonic	5	4	4	4	4	4	5	8	8	9	8	9	9	8	9	7	7	9	9
Authority MTZ	5	4	4	4	4	5	9	7	8	8	8	9	9	8	8	7	4	7	7
Boundary	7	6	6	5	5	6	10	7	7	7	7	9	8	8	6	6	6	7	8
Command	8	7	7	7	6	4	4	4	8	6	7	5	5	7	5	6	5	10	9
Dual II Mag.	9	8	8	5	6	3	0	2	4	4	4	6	7	3	6	0	0	0	3
Enlite	5	4	4	4	4	8	9	8	8	8	8	9	8	8	9	7	8	8	9
Fierce	9	8	8	6	6	6	8	4	8	7	8	9	9	5	9	4	0	6	8
Metribuzin	6	5	4	4	4	6	10	7	6	8	7	8	7	8	4	5	6	6	8
OpTill	7	7	7	5	5	7	9	9	6	7	8	8	7	7	9	7	6	8	7
Outlook	9	8	8	5	6	4	0	2	4	4	5	7	7	4	7	0	0	0	0
Pendimethalin	10	9	9	8	8	4	0	2	6	0	6	8	7	4	0	0	0	4	4
Prefix	9	8	8	5	6	4	8	6	5	8	7	8	9	7	8	6	5	6	7
Python	0	0	0	0	0	4	10	9	4	6	8	9	8	8	6	6	7	8	9
Sharpen	0	0	0	0	0	7	7	9	6	7	7	6	6	7	7	6	6	7	7
Sonalan	10	9	9	8	8	5	0	2	6	0	7	9	7	4	5	0	0	4	4
Spartan	5	4	4	4	4	4	5	3	8	4	8	9	8	5	8	4	0	6	6
Surveil	6	5	5	4	4	6	10	8	8	9	8	10	9	8	10	6	6	9	10
Trifluralin	10	9	9	8	8	5	0	2	6	0	6	9	7	4	0	0	0	0	0
Warrant	9	9	8	6	6	0	0	0	3	3	6	8	8	3	6	0	0	0	0
Valor	5	4	4	4	4	6	8	4	8	7	7	9	8	5	9	4	0	6	8
Verdict	8	8	7	6	6	7	7	9	6	7	7	7	7	7	7	6	6	7	7
POST:																			
Assure II	10	10	8	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Basagran	0	0	0	0	0	6	9	2	5	7	6	4	4	9	6	9	7	8	9
Blazer, Ultra	4	4	4	4	4	7	10	5	6	8	5	10	9	8	7	6	5	5	6
Cadet	0	0	0	0	0	4	5	3	4	5	7	8	8	4	7	5	4	9	4
Classic	0	0	0	0	0	5	10	6	4	7	4	9	7	8	4	9	9	6	5
Cobra/Phoenix	4	4	4	4	4	6	10	4	7	9	5	10	8	6	8	8	6	7	7
FirstRate	0	0	0	0	0	4	9	9	4	9	4	4	5	8	4	9	10	8	9
Flexstar/Reflex	4	4	4	4	4	5	10	5	6	8	5	9	9	8	6	7	7	6	8
Fusilade DX	8	7	7	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fusion	10	8	9	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glyphosate	10	10	10	10	0	6	10	9	9	9	8	9	8	8	7	10	9	7	9
Harmony SG	0	0	0	0	0	5	10	4	4	5	8	9	3	8	4	6	6	6	6
Liberty	9	9	9	9	9	7	10	8	9	9	8	7	8	7	8	8	9	7	9
Poast	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pursuit	8	6	6	5	5	6	10	7	4	6	5	9	5	7	9	8	7	8	4
Raptor	9	7	7	6	5	7	10	7	4	6	7	9	6	7	9	9	8	9	4
Synchrony XP	0	0	0	0	0	4	10	4	4	7	8	9	6	8	4	9	10	7	5
Resource	0	0	0	0	0	4	5	5	4	6	6	6	5	4	4	6	4	9	4
Select	10	10	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Foliar Insecticides in Soybean

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The soybean aphid is the most economically important insect pest of soybean in South Dakota. The other insect pests capable of reducing soybean yields tend to be more sporadic. Such sporadic pests include defoliating insects like bean leaf beetle, cutworm, green cloverworm, and yellow striped armyworm. The two spotted spider mite can also cause injury to soybean, especially when plants are drought stressed. Typically, multiple pest species must be present to cause significant injury that warrants management action. When determining if insecticide management is necessary, scout the soybean field and follow management recommendations provided by SDSU Extension personnel.

The development of insecticide resistance by the targeted insect population is a major concern associated with applying insecticides. To reduce the probability of resistance development, insect pest management plans should include insecticides with different modes of action. This could mean using multiple insecticides with different modes of action or using a single insecticide that has two or more active ingredients that vary in their modes of action. In addition to rotating insecticides, rotate crops periodically to a non-host crop for the targeted insect population. Crop rotations can result in minimizing the need for insecticides to manage insect pests. The goal of these strategies is to reduce the selection pressure on the targeted insect populations and prevent the development of insecticide resistance.

The insecticides presented in this chapter are restricted use, which means that applicators must have a license issued by the state of South Dakota to purchase and apply these products. When applying insecticides, be sure to follow insecticide labels carefully and always wear the appropriate personal protective equipment to reduce personal exposure. Remember, the label is law and any deviation from the label is considered unlawful. Do not apply insecticides for insects that are not listed on the label.

When choosing an insecticide, refer to labels for precise rates based on observed pest insects. The rates in this book are general and may not directly reflect the rate required for management. Always follow the labeled recommended rates for a crop and insect pest, and never go under or over the recommended rates listed on a label.

On Aug. 21, 2021, the U.S. Environmental Protection Agency (EPA) published a final rule revoking all food tolerances for the active ingredient chlorpyrifos. This rule took effect on Oct. 29, 2021. This decision has effectively removed chlorpyrifos as a management tool for insect pests in South Dakota. Furthermore, this does not provide for the use of existing stocks of chlorpyrifos products. The tolerances for any chlorpyrifos residues present on products will expire Feb. 28, 2022, and after this date, products that have chlorpyrifos residues will be rendered unusable. Products harvested prior to Feb. 28, 2022, are still usable if application of the insecticide occurred while the residues were still lawful. Insecticide application records must prove that the chlorpyrifos products were applied to a harvested crop prior to the effective date of this decision.

The products in this chapter are presented as follows:

Trade name(s) *(Chemical common name)* Mode of action: Group code (chemical class)

Additional resources regarding insecticide safety include:

- IRAC Insecticide Resistance Action Committee (http://www.irac-online.org/modes-of-action/)
- EPA United States Environmental Protection Agency (https://www.epa.gov/pesticide-worker-safety)
- South Dakota Department of Agriculture (https://sdda.sd.gov/ag-services/pesticide-program/)

Insecticide Modes of Action

Mode of Action Group Number	Insecticide Class
1A	carbamate
1B	organophosphate
3A	pyrethroid, pyrethrin
4A	neonicotinoid
4D	butenolides
5	spinosyn
9D	inscalis
15	benzoylureas
18	diacylhydrazine
28	diamide

Check list of insects managed by each foliar insecticide for soybeans

Product Name(s)	Soybean aphid	Black cutworm	Dingy cutworm	Green cloverworm	Soybean looper	Thistle caterpillar	Alfalfa caterpillar	Bean leaf beetle	Japanese beetle	Yellow striped armyworm	Grasshopper	Stink bug	Two spotted spider mite	Dectes stem borer
Abamectin *(Agri-Mek SC)*	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Acephate *(Acephate 90 Prill, Acephate 90 WDG, Acephate 97 WDG, Acephate 97UP, Livid 97 Prill, Orthene 97)*	+	-	-	+	-	-	-	+	-	-	-	-	-	-
Alpha-cypermethrin *(Fastac CS, Fastac EC)*	+	+	+	+	+	+	+	+	+	+	+	+	-	-
Alpha-cypermethrin + Afidopyropen *(Renestra)*	+	+	+	+	+	-	+	+	+	+	+	+	-	-
Beta-cyfluthrin *(Baythroid XL, Sultrus)*	+	+	+	+	+	-	-	+	+	+	+	+	-	-
Bifenthrin *(Alpine, Batallion 2 EC, Batallion LFC, Bi-Dash 2E, Bifen 2 AG Gold, Bifen 2 Ag Gold, Bifen 25% EC, Bifen 2EC Select, Bifender FC, Bifenthrin 2EC, Bifenture EC, Bifenture LFC, Brigade 2EC, COMA RTU, Discipline 2EC, Ethos XB, Fanfare EC, Fanfare ES, Frenzy Veloz, Lancer 2EC, Reveal, Reveal Endurx, Revere 2.0, Sniper, Sniper Helios, Strict, Tigris Bifenthrin LFC, Tundra EC, Willowood Bifenthrin 2EC, XPedient Plus V)*	+	+	+	+	-	+	+	+	+	+	+	+	+	-
Bifenthrin + Acetamiprid *(Argyle OD, Savoy EC)*	+	-	-	+	-	-	+	+	+	-	+	+	+	-
Bifenthrin + Chlorantraniliprole *(Elevest)*	+	+	+	+	+	-	+	+	+	-	+	+	+	+
Bifenthrin + Imidacloprid *(Avenger Bold S3, Avenger S3, Brigadier, SkyRaider, Swagger)*	+	+	+	+	+	-	+	+	+	+	+	-	+	-
Bifenthrin + Imidacloprid + Zeta-cypermethrin *(Triple Crown)*	+	+	+	+	-	+	+	+	+	+	+	+	-	+
Carbaryl *(Carbaryl 4L, Sevin 4F, Sevin XLR Plus)*	-	+	+	+	-	+	-	+	-	+	-	+	-	-
Chlorantraniliprole *(Coragen, Prevathon, Vantacor)*	+	+	+	+	-	+	-	+	+	+	+	+	+	-
Clothianidin *(Belay)*	+	-	-	-	-	-	-	+	+	-	-	+	-	-
Cyfluthrin *(Tombstone, Tombstone Helios)*	+	+	+	+	+	-	-	+	+	+	+	+	-	-
Deltamethrin *(Delta Gold)*	+	+	+	+	-	+	-	+	+	+	+	+	+	-
Diflubenzuron *(Diflumax 2L)*	-	-	-	+	+	-	-	-	-	-	+	-	-	-
Dimethoate *(Dimate 4E, Dimethoate 4 E, Dimethoate 400, Dimethoate 400 EC, Dimethoate 4EC, Dimethoate LV-4)*	+	-	-	-	-	-	-	+	-	-	+	-	+	-
Esfenvalerate *(Asana XL, S-FenvaloStar, Zyrate)*	+	+	+	+	-	-	-	+	+	-	+	-	-	-
Flupyradifurone *(Sivanto HL, Sivanto 200 SL, Sivanto Prime)*	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Gamma-cyhalothrin *(Declare, Proaxis)*	+	+	+	+	-	+	-	+	+	+	+	+	+	-
Imidacloprid *(Acronyx 4F, Admire Pro, Alias 2F, Alias 4F, Imidacloprid 2F, Imidacloprid 4F, Imidacloprid 5SC, Malice 2F, Midash 2SC, Montana 4F, Nuprid 2SC, Nuprid 4.6F Pro, Nuprid 4F Max, Prey 1.6, Provoke, Willowood Imidacloprid 4SC)*	+	-	-	-	-	-	-	+	+	-	-	-	-	-
Imidacloprid + Beta-cyfluthrin *(Leverage 360)*	+	+	+	+	-	+	-	+	+	+	+	+	-	-
Imidacloprid + Cyfluthrin *(Leverage 2.7)*	+	-	-	+	-	-	-	+	+	-	+	+	-	-
Imidacloprid + Lambda-cyhalothrin *(Kilter)*	+	+	+	+	+	+	-	+	+	+	+	+	+	-
Indoxacarb *(Steward EC)*	-	-	-	+	+	-	-	-	-	+	-	-	-	-

Product Name(s)	Soybean aphid	Black cutworm	Dingy cutworm	Green cloverworm	Soybean looper	Thistle caterpillar	Alfalfa caterpillar	Bean leaf beetle	Japanese beetle	Yellow striped armyworm	Grasshopper	Stink bug	Two spotted spider mite	Dectes stem borer
Lambda-cyhalothrin *(Cavalry II, Crossover, Crossover Pro, Crusader 1EC, Crusader 2ME, Firestone, Grizzly Too, Kendo, Kendo 22.8 CS, Lambda Select, L-C Insecticide, Lambda-Cy 1EC, Lambda T, Lambda T-2, Lambda-CY AG, Lambda-Cy EC, Lambda-Cyhalothrin 1 EC, LambdaStar 1 CS, LambdaStar, LambdaStar Plus, Paradigm VC, Province II, Ravage, Ravage 2.0, Roundhouse 1 EC, Serpent 1 EC, Silencer, Silencer VXN, Warrior II, Willowood Lambda 1EC)*	+	+	+	+	+	+	-	+	+	+	+	+	+	-
Lambda-cyhalothrin + Chlorantraniliprole *(Besiege)*	+	-	-	+	-	+	-	+	+	+	-	+	+	-
Lambda-cyhalothrin + Thiamethoxam *(Endigo ZC)*	+	+	+	+	-	+	-	+	+	+	+	+	+	-
Methomyl *(Corrida 29 SL, Corrida 90 WSP, Lannate LV, Lannate SP, Nudrin LV, Nudrin SP)*	+	-	-	+	-	-	-	+	-	-	-	-	-	-
Methoxyfenozide *(Inspirato 2F, Intrepid 2F, Invertid 2F, Turnstyle, Vexer, Zylo)*	-	-	-	+	+	-	-	-	-	+	-	-	-	-
Permethrin *(Arctic 3.2 EC, Perm-UP 25DF, Perm- UP 3.2 EC, PermaStar AG, Permethrin, Permethrin 3.2 AG)*	-	+	+	+	+	+	-	+	-	-	-	-	-	-
Spinetoram *(Radiant SC)*	-	-	-	+	+	-	-	-	-	+	-	-	-	-
Spinosad *(Blackhawk, Conserve SC, Entrust, Entrust SC, Tracer)*	-	-	-	+	+	-	-	-	-	+	-	-	-	-
Zeta-cypermethrin *(Mustang, Mustang Maxx)*	+	+	+	+	+	+	+	+	+	+	+	+	+	-
Zeta-cypermethrin + Bifenthrin *(Hero, Hero EW, Steed)*	+	+	+	+	+	+	+	+	+	+	+	+	+	+

+ = provides protection
- = Does not provide protection

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Acephate 90 Prill, Acephate 90 WDG, Acephate 97 WDG, Acephate 97UP, Livid 97 Prill, Orthene 97 *(acephate)* Mode of Action: 1B (organophosphates)

Application Rate: 0.25-1.1 lbs/A

Re-Entry Interval (REI): 24 hours **Pre-Harvest Interval (PHI):** 28 days

Targeted Insects: Green cloverworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not apply more than 1.66 lbs/A in a single season. Do not reapply within seven days.

Acronyx 4F, Admire Pro, Alias 2F, Alias 4F, Imidacloprid 2F, Imidacloprid 4F, Imidacloprid 5SC, Malice 2F, Midash 2SC, Montana 4F, Nuprid 2SC, Nuprid 4.6F Pro, Nuprid 4F Max, Prey 1.6, Provoke, Willowood Imidacloprid 4SC *(imidacloprid)* Mode of Action: 4A (neonicotinoids)

Application Rate: 1.3 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Green cloverworm caterpillars, soybean aphid nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not reapply within seven days. Do not apply more than 3.9 fl oz/A in a single season.

Agri-Mek SC *(abamectin)* Mode of Action: 6 (avermectins)

Application Rate: 1.75-3.5 fl oz/A

REI: 12 hours **PHI:** 28 days

Targeted Insects: Two spotted spider mite nymphs and adults.

Restrictions: Do not reapply within seven days. Do not apply more than 7.0 fl oz/A in a single season.

Alpine, Batallion 2 EC, Batallion LFC, Bi-Dash 2E, Bifen 2 AG Gold, Bifen 2 Ag Gold, Bifen 25% EC, Bifen 2EC Select, Bifender FC, Bifenthrin 2EC, Bifenture EC, Bifenture LFC, Brigade 2EC, COMA RTU, Discipline 2EC, Ethos XB, Fanfare EC, Fanfare ES, Frenzy Veloz, Lancer 2EC, Reveal, Reveal Endurx, Revere 2.0, Sniper, Sniper Helios, Strict, Tigris Bifenthrin LFC, Tundra EC, Willowood Bifenthrin 2EC, XPedient Plus V *(bifenthrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 2.1-8.5 fl oz/A or 0.033-0.10 lb ai/A

REI: 12 hours **PHI:** 18 days

Targeted Insects: Alfalfa caterpillars, black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two spotted spider mite nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.3 lb ai/A in a single season. Do not apply more than 0.10 lb ai/A in a single application.

Arctic 3.2 EC, Perm-UP 25DF, Perm-UP 3.2 EC, PermaStar AG, Permethrin, Permethrin 3.2 AG *(permethrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 2.0-12.8 fl oz/A or 0.05-0.2 lb ai/A

REI: 12 hours **PHI:** 60 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, thistle caterpillars, and bean leaf beetle adults.

Restrictions: Do not apply more than 0.4 lb ai/A in a single season.

Argyle OD, Savoy EC *(bifenthrin + acetamiprid)* Modes of Action: 3A (pyrethroids) and 4A (neonicotinoids)

Application Rates: 2.5-5.0 fl oz/A for Savoy EC, 5.0-9.0 fl oz/A for Argyle OD

REI: 12 hours **PHI:** 30 days

Targeted Insects: Alfalfa caterpillars, bean leaf beetle adults, grasshoppers, green cloverworms, Japanese beetle adults, soybean aphids, stink bugs, two-spotted spider mites

Restrictions: Do not apply more than 0.07 lb ai/A of Savoy EC and 10 fl oz/A of Argyle OD in a single season. Do not apply more than once every seven days. Do not apply more than two times in a single season.

Asana XL, S-FenvaloStar, Zyrate *(esfenvalerate)* Mode of Action: 3A (pyrethroids)

Application Rate: 2.9-9.6 fl oz/A or 0.015-0.05 lb ai/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.2 lb ai/A in a single season. Do not apply more than 0.05 lb ai/A in a single application.

Avenger Bold S3, Avenger S3, Brigadier, SkyRaider, Swagger *(bifenthrin + imidacloprid)* Modes of Action: 3A (pyrethroids) and 4A (neonicotinoids)

Application Rate: 3.8-12.2 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, alfalfa caterpillars, green cloverworm caterpillars, soybean looper caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, two spotted spider mite nymphs and adults, bean leaf beetle adults, grasshopper nymphs and adults, and Japanese beetle adults.

Restrictions: Do not apply more than two applications in a single season. Do not apply more than 24.4 fl oz/A of Avenger Bold S3, Avenger S3, or Swagger in a single season. Do not apply more than 17.92 fl oz/A of Brigadier or SkyRaider in a single season. Do not reapply within 30 days.

Baythroid XL, Sultrus *(beta-cyfluthrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 0.8-2.8 fl oz/A or 0.007-0.022 lb ai/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stink bug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.022 lb ai/A in a single application. Do not reapply within seven days. Do not apply more than 0.088 lb ai/A in a single season.

Belay *(clothianidin)* Mode of Action: 4A (neonicotinoids)

Application Rate: 3.0-6.0 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Green cloverworm caterpillars, soybean aphid nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not reapply within seven days. Do not apply within 45 days of planting neonicotinoid treated seed. Do not apply more than 12 fl oz/A in a single season.

Besiege *(lambda-cyhalothrin + chlorantraniliprole)* Modes of Action: 3A (pyrethroids) and 28 (diamides)

Application Rate: 5.0-10.0 fl oz/A

REI: 24 hours **PHI:** 30 days

Targeted Insects: Green cloverworm caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, bean leaf beetle adults, Japanese beetle adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, and two spotted spider mite nymphs and adults.

Restrictions: Do not use more than 20 fl oz/A in a single season.

Blackhawk, Conserve SC, Entrust, Entrust SC, Tracer *(spinosad)* Mode of Action: 5 (spinosyns)

Application Rate: 0.75-1.25 fl oz/A

REI: 4 hours **PHI:** 28 days

Targeted Insects: Green cloverworm caterpillars, yellow striped armyworm caterpillars, and soybean looper caterpillars.

Restrictions: Do not apply more than 3.72 fl oz/A in a single season. Do not reapply within four days. Do not use more than four applications within a single season.

Carbaryl 4L, Sevin 4F, Sevin XLR Plus *(carbaryl)* Mode of Action: 1A (carbamates)

Application Rate: 0.5-1.5 qt/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, stinkbug nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not apply more than 6 qt/A in a single season. Do not apply these products in combination with 2,4DB herbicides. Avoid applications when bees are actively foraging.

Cavalry II, Crossover, Crossover Pro, Crusader 1EC, Crusader 2ME, Firestone, Grizzly Too, Kendo, Kendo 22.8 CS, L-C Insecticide, Lambda Select, Lambda-Cy 1EC, Lambda T, Lambda T-2, Lambda-CY AG, Lambda-Cy EC, Lambda-Cyhalothrin 1 EC, LambdaStar 1 CS, LambdaStar, LambdaStar Plus, Paradigm VC, Province II, Ravage, Ravage 2.0, Roundhouse 1 EC, Serpent 1 EC, Silencer, Silencer VXN, Warrior II, Willowood Lambda 1EC *(lambda- cyhalothrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 0.96-3.84 fl oz/A or 0.015-0.03 lb ai/A
Crossover Application Rate: 8-9.5 fl oz/A
Crossover Pro Application Rate: 2-4 fl oz/A

REI: 24 hours **PHI:** 30 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two spotted spider mite nymphs and adults, bean leaf beetle and Japanese beetle adults.

Restrictions: Do not apply more than 0.03 lb ai/A per application or 0.06 lb ai/A per season. Do not reapply within five days.

Coragen, Prevathon, Vantacor *(chlorantraniliprole)* Mode of Action: 28 (diamides)

Coragen, Prevathon Application Rate: 2.0-7.5 fl oz/A
Vantacor Application Rate: 0.7-2.5 fl oz/A

REI: 4 hours **PHI:** 1 days

Targeted Insects: Green cloverworm caterpillars, cabbage/soybean looper caterpillars, and grasshopper nymphs and adults.

Restrictions: Do not use more than 15.4 fl oz/A in a single season. Do not make more than four applications in a single season. Do not reapply within three days.

Corrida 29 SL, Corrida 90 WSP, Lannate LV, Lannate SP, Nudrin LV, Nudrin SP *(methomyl)* Mode of Action: 1A (carbamates)

Application Rate: 0.75-1.5 pt/A or 0.125-0.5 lb/A

REI: 48 hours **PHI:** 14 days

Targeted Insects: Green cloverworm caterpillars, soybean aphid nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not apply more than 4.5 pt/A or 1.5 lb/A in a single season. Do not make more than three applications in a single season.

Declare, Proaxis *(gamma-cyhalothrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 0.77-3.84 fl oz/A or 0.0075-0.015 lb ai/A

REI: 24 hours **PHI:** 45 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two spotted spider mite nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.015 lb ai/A in a single application. Do not reapply within five days. Do not apply more than 0.03 lb ai/A in a single season.

Delta Gold *(deltamethrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 1.0-2.4 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 8.5 fl oz/A in a single season.

Dimate 4E, Dimethoate 4 E, Dimethoate 400, Dimethoate 400 EC, Dimethoate 4EC, Dimethoate LV-4 *(dimethoate)* Mode of Action: 1B (organophosphates)

Application Rate: 19.1 fl oz/A or 0.5 lb ai/A or 1.0-1.5 pt/A

REI: 48 hours **PHI:** 21-28 days

Targeted Insects: Grasshopper nymphs and adults, soybean aphid nymphs and adults, two spotted spider mite nymphs and adults, and bean leaf beetle adults.

Restrictions: Do not apply more than 0.5 lb ai/A in a single application and do not reapply within seven days. Do not apply more than 1.0 lb ai/A in a single season.

Diflumax 2L *(diflubenzuron)* Mode of Action: 15 (benzoylureas)

Application Rate: 2-4 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Green cloverworm caterpillars, soybean looper caterpillars, and grasshopper nymphs.

Elevest *(chlorantraniliprole + bifenthrin)* Modes of Action: 3A (pyrethroids) and 28 (diamides)

Application Rate: 4.8 - 9.6 fl oz/A

REI: 12 hours **PHI:** 18 days

Targeted Insects: Black cutworm, dingy cutworm, green cloverworm, soybean looper, alfalfa caterpillar, bean leaf beetle, Japanese beetle, grasshoppers, soybean aphid, stink bug, two-spotted spider mite, and Dectes stem borer.

Restrictions: Do not apply more than 0.2 lb ai/A of chlorantraniliprole and 0.3 lb ai/A of bifenthrin per year. Do not reapply within seven days. Do not make more than three applications per acre per year.

Endigo ZC *(lambda-cyhalothrin + thiamethoxam)* Modes of Action: 3A (pyrethroids) and 4A (neonicotinoids)

Application Rate: 3.5-4.5 fl oz/A

REI: 24 hours **PHI:** 30 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two spotted spider mite nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 4.5 fl oz/A in a single application. Do not reapply within seven days. Do not use more than 9.0 fl oz/A in a single season.

Fastac CS, Fastac EC *(alpha-cypermethrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 1.3-3.8 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, alfalfa caterpillars, green cloverworm caterpillars, soybean looper caterpillars, thistle (painted lady) caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle, and Japanese beetle adults.

Restrictions: Do not apply more than 3.8 fl oz/A in a single application. Do not reapply within seven days. Do not apply more than 11.4 fl oz/A in a single season.

Hero, Hero EW, Steed *(zeta-cypermethrin + bifentrhin)* Mode of Action: 3A (pyrethroids)

Application Rate: 2.5-11.2 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Alfalfa caterpillars, black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two spotted spider mite nymphs and adults, dectes stem borer adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 10.3 fl oz/A of Hero or more than 11.2 fl oz/A of Hero EW in a single application. Do not apply more than 46.35 fl oz/A of Hero or 44.9 fl oz/A of Hero EW in a single season. Do not make more than two foliar applications in a single season. Do not apply more than 11.75 fl oz/A of Steed in a single application. Do not reapply Steed within 14 days. Do not apply more than 35.25 fl oz/A of Steed in a single season.

Inspirato 2F, Intrepid 2F, Invertid 2F, Turnstyle, Vexer, Zylo *(methoxyfenozide)* Mode of Action: 18 (diacylhydrazines)

Application Rate: 4.0-8.0 fl oz/A or 0.06-0.12 lb ai/A

REI: 4 hours **PHI:** 14 days

Targeted Insects: Green cloverworm caterpillars, soybean looper caterpillars, and yellow striped armyworm caterpillars.

Restrictions: Do not apply more than 0.12 lb ai/A in a single application. Do not apply more than 1 lb ai/A in a single season. Do not make more than four applications per year.

Kilter *(imidacloprid + lambda-cyhalothrin)* Modes of Action: 4A (neonicotinoids) and 3A (pyrethroids)

Application Rate: 1.9-3.8 fl oz/A

REI: 24 hours **PHI:** 30 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, thistle (painted lady) caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, two-spotted spider mite nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 7.7 fl oz/A in a single season. Do not reapply within seven days. Do not apply within 45 days of planting neonicotinoid treated seed. Do not apply when bees are actively foraging.

Leverage 2.7 *(imidacloprid + cyfluthrin)* Modes of Action: 4A (neonicotinoids) and 3 (pyrethroids)

Application Rate: 3.0-3.8 fl oz/A

REI: 12 hours **PHI:** 45 days

Targeted Insects: Green cloverworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 11.4 fl oz/A in a single season. Do not reapply within seven days.

Leverage 360 *(imidacloprid + beta-cyfluthrin)* Modes of Action: 4A (neonicotinoids) and 3A (pyrethroids)

Application Rate: 2.4-2.8 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, yellow striped armyworm caterpillars, thistle caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 9.0 fl oz/A in a single season. Do not reapply within seven days. Do not apply when bees are actively foraging.

Mustang, Mustang Maxx *(zeta-cypermethrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 1.28-4.3 fl oz/A or 0.008-0.05 lb ai/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Alfalfa caterpillars, black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, thistle caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.3 lb ai/A of Mustang in a single season. Do not apply more than 0.15 lb ai/A of Mustang Maxx in a single season. Do not reapply within seven days.

Radiant SC *(spinetoram)* Mode of Action: 5 (spinosyns)

Application Rate: 2.0-4.0 fl oz/A

REI: 4 hours **PHI:** 28 days

Targeted Insects: Green cloverworm caterpillars, yellow striped armyworm caterpillars, and soybean looper caterpillars.

Restrictions: Do not apply more than 14 fl oz/A in a single season. Do not reapply within four days. Do not use more than four applications within a single season.

Renestra *(alpha-cypermethrin + afidopyropen)* Modes of Action: 3A, 9D (pyrethroid, inscalis)

Application Rate: 6.8 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, alfalfa caterpillars, soybean looper caterpillars, stink bug nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, bean leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 13.7 fl oz/A in a single season. Do not make more than two consecutive applications of Renestra. Do not feed or graze soybean hay or forage.

Sivanto HL, Sivanto 200 SL, Sivanto Prime *(flupyradifurone)* Mode of Action: 4D (butenolides)

Application Rate: 7.0-10.5 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Soybean aphid nymphs and adults.

Restrictions: Do not reapply within 10 days. Do not apply more than 28 fl oz/A in a single season.

Steward EC *(indoxacarb)* Mode of Action: 22 (pyrethroids)

Application Rate: 4.6-11.3 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Green cloverworm caterpillars, soybean looper caterpillars, and yellow striped armyworm caterpillars.

Restrictions: Do not reapply within five days. Do not make more than four applications in a single season. Do not apply more than 46.2 fl oz/A in a single season.

Tombstone, Tombstone Helios *(cyfluthrin)* Mode of Action: 3A (pyrethroids)

Application Rate: 0.8-2.8 fl oz/A or 0.013-0.044 lb ai/A

REI: 12 hours **PHI:** 45 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, green cloverworm caterpillars, soybean looper caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, been leaf beetle adults, and Japanese beetle adults.

Restrictions: Do not apply more than 0.044 lb ai/A in a single application. Do not reapply within seven days. Do not apply more than 0.175 lb ai/A in a single season.

Triple Crown *(bifenthrin + imidacloprid + zeta-cypermethrin)* Modes of Action: 3A (pyrethroids) and 4A (neonicotinoids)

Application Rate: 3.5-4.8 fl oz/A

REI: 12 hours **PHI:** 21 days

Targeted Insects: Black cutworm caterpillars, dingy cutworm caterpillars, alfalfa caterpillars, green cloverworm caterpillars, thistle (painted lady) caterpillars, yellow striped armyworm caterpillars, grasshopper nymphs and adults, soybean aphid nymphs and adults, stinkbug nymphs and adults, been leaf beetle adults, dectes stem borer adults, and Japanese beetle adults.

Restrictions: Do not apply more than 14.2 fl oz/A in a single season. Do not reapply within 30 days.

Soybean Seed Treatments

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Soybean seed treatments are useful tools in promoting stand establishment and seedling vigor. They may also help preserve yield potential and prevent quality losses in grain by preventing development of seed- and soil-borne pathogens, as well as nematodes and insects that feed or colonize the seed, seedlings or roots early in the season. Seed treatments addressed in this guide are those consisting of fungicides, nematicides, insecticides or a combination of these products.

Consider these factors when deciding on seed treatments: field history of seedling diseases/pests, time of planting (early when soils are still cooler vs later when soils are warmer), crop following the same crop as previous season, tillage practices, disease rating for the cultivar to be planted (e.g., Phytophthora root rot ratings) and the desired plant population per acre (low planting population may require seed protectants).

Integrated Disease Management
Disease management in agricultural crops requires a multi-faceted approach as part of an integrated disease management program. Effective components of an integrated plant disease management program include the following:

- Crop rotation with non-host crops to reduce pathogen/pest load.
- Residue and volunteer management for reduction of residue-borne and overwintering diseases.
- Use of high quality, disease-free seed to prevent the spread of seed-borne diseases.
- Proper variety selection for host resistance and adaptation to the growing region.
- Proper plant health management (fertility program, row spacing, planting population, weed control etc.). Healthy plants are more able to resist or tolerate the development of plant diseases and insect pests.
- Judicious use of plant protectant products such as herbicides, insecticides, and fungicides to reduce losses, promote healthy plants, and prevent quality losses in seed.

Newly Opened Land – a Special Consideration
Newly opened land, such as CRP being returned to crop production, may have increased risk for certain root rot diseases. Also, diseases such as root rots, as well as seedling blights, can often be more severe when certain crops are planted into high-residue environment, such as a CRP ground. Insect pressure on newly cultivated lands may differ from a typical cropping situation. In such conditions, a seed treatment may be beneficial.

Proper Application and Use Precautions
Seed treatment products vary in formulation type, packaging and use requirements. Products may be dry or liquid as a concentrate or ready-to-use formulations. While many seed treatments may be applied on-farm, several products are limited to use only by commercial applicators using closed application systems. Use caution when handling or working with seed treatment products. Fungicide seed treatments can be highly poisonous partly because of high active ingredient concentration and many are irritants, therefore proper handling precautions must be taken. Producers and applicators must strictly adhere to all label directions regarding safe handling, mixing, storage, and disposal. Using personal protection equipment, including an approved respirator, goggles and pesticide resistant gloves, is recommended even when not specifically required by the fungicide label.

Follow label rates, as over-application may result in unintentional damage to the seed, and under-application or poor coating may reduce the product's effectiveness. Properly calibrate all application equipment to ensure uniform coverage. Uniform coverage of the seed is critical to optimize effectiveness of the seed treatment.

Several seed treatment methods are available, though not all are appropriate for every situation. Commercial application or application through dedicated seed treatment equipment will likely provide the most uniform coverage. Grain auger mounted treatment equipment is available and may provide adequate coverage in an on-farm situation; however, an auger that has been used to treat seed may be unusable for moving grain intended for food or feed.

Treated seed should not be allowed to contaminate equipment used to transport or store food or feed grains. Use caution when considering planter-applied (planter-box) seed treatments. Good disease control depends on uniform fungicide coverage of the seed, and this is more difficult to accomplish in planter-applied situations. Always read and follow label directions. Understand the product-specific guidelines for proper application: how and when to apply, feeding or grazing restrictions, as well as important safety precautions. Always dispose of pesticide containers properly. Do not use treated seed for food or feed. For more details on handling seed treatments, refer to the American Seed Trade Association guide on seed treatment stewardship www.seed-treatment-guide.com.

This section includes the seed treatment fungicides, insecticide or fungicide/insecticide/nematicide combinations currently labeled for use on soybean in South Dakota. Always check the list of products currently registered with the South Dakota Department of Agriculture for legality of use in the state https://apps.sd.gov/doa/cat/PRSProductSearch.aspx?type=prs.

Fungicide/Insecticide/Nematicide products

Fungicide products

Nematicide produces

Insecticide products

Fungicide FRAC Codes and Group Names

FRAC Code	Group Name
1	Methyl benzimidazole carbamate (MBC)
3	Demethylation inhibitor (DMI)
4	Phenylamide (PA)
7	Succinate dehydrogenase inhibitor (SDHI)
11	Quinone outside inhibitor (QoI)
12	Phenylpyrroles (PP)
22	Benzamide, thiazole carboxamide
44	Microbial
M3	Dithiocarbamate
M4	Pthalimide

Insecticide Modes of Action

Mode of Action Group Number	Insecticide Class
4A	Neonicotinoid
6	Avermectin
28	Diamide

Check list of nematodes, insects and diseases managed by seed treatment products for soybean

Product Name	Soybean cyst nematode (SCN)	Bean leaf beetles	Seed-corn maggot	White grub	Wireworm	Seed and seedling rots	Fusarium root rot	Sudden death syndrome	Rhizoctonia root rot	Phytophthora/Pythium root rot
Combo Treatments										
Armis FI, Intego Suite Soybeans, Halifax FnI,	-	+	+	+	+	+	+	-	+	+
Avicta Complete Beans 500	+	+	+	+	+	+	+	-	+	+
Clariva Elite Beans	+	+	+	+	+	+	+	-	+	+
CruiserMaxx, CruiserMaxx Advanced, CruiserMaxx EZ, UpShot	-	+	+	+	+	+	+	-	+	+
CruiserMaxx Vibrance, Warden CX	-	+	+	+	+	+	+	-	+	+
Enhance AW	-	+	+	-	+	+	+	-	+	+
Equity VIP	-	+	+	+	+	+	+	-	+	+
Poncho/VoTiVo	+	+	+	+	+	-	-	-	-	-
Saltro	+	-	-	-	-	-	+	-	-	-
Seed Shield Beans	+	+	+	+	+	+	+	-	+	+
Seed Shield MAX Beans	-	+	+	+	+	-	+	-	+	+
SoyStar Premier ST, Spirato IMTm348 ST	-	+	+	+	+	+	+	-	+	+
Fungicide products										
42-S Thiram, Signet 480 FS, Thiram Granuflo Ag Fungicide	NA	NA	NA	NA	NA	+	-	-	-	-
Acquire, Allegiance FL, Belmont 2.7 FS, Dyna-Shield Metalaxyl, Dyna-Shield Metalaxyl 318 FS, MetaStar 2E, Sebring 318 FS, Sebring 480 FS	NA	NA	NA	NA	NA	+	-	-	-	+
ApronMaxx RFC, Maxim XL, Warden RTA	NA	NA	NA	NA	NA	+	+	-	+	+
Apron Maxx RTA + Moly	NA	NA	NA	NA	NA	+	+	-	+	+
Apron XL, Ridomil Gold GR, Ridomil Gold SL	NA	NA	NA	NA	NA	+	-	-	-	+
Azoxystrobin 100 ST, Dynasty	NA	NA	NA	NA	NA	+	-	-	+	+
Captan 4L ST	NA	NA	NA	NA	NA	+	-	-	-	-
Enhance	NA	NA	NA	NA	NA	+	+	-	+	+
EverGol Energy SB	NA	NA	NA	NA	NA	+	+	-	+	+
Fludioxonil 4L ST, Maxim 4FS, Spirato 480 FS	NA	NA	NA	NA	NA	+	+	-	+	-
Lumisena, Plenaris	NA	NA	NA	NA	NA	-	+	-	-	+
Mertect 340-F, Thiabendazole 4L ST	NA	NA	NA	NA	NA	+	-	+	+	-
Rancona 3.8 FS	NA	NA	NA	NA	NA	+	+	-	+	-
Rancona CTS, Rancona Summit	NA	NA	NA	NA	NA	+	+	-	+	+
Rancona V 100 Pro FS	NA	NA	NA	NA	NA	+	+	-	+	+
Relenya	NA	NA	NA	NA	NA	-	+	-	+	-
Serenade Soil	NA	NA	NA	NA	NA	-	+	-	+	+
ST-Methyl 540 FS	NA	NA	NA	NA	NA	+	+	-	+	-
Systiva XS	NA	NA	NA	NA	NA	+	+	-	+	-
Trilex Flowable, Trilex 2000	NA	NA	NA	NA	NA	+	+	-	+	-
Vibrance	NA	NA	NA	NA	NA	+	-	-	-	-
Vitavax-34	NA	NA	NA	NA	NA	+	-	-	-	-

Product Name	Soybean cyst nematode (SCN)	Bean leaf beetles	Seed-corn maggot	White grub	Wireworm	Seed and seedling rots	Fusarium root rot	Sudden death syndrome	Rhizoctonia root rot	Phytophthora/Pythium root rot
Nematicide Products										
Aveo EZ Nematicide	+	NA	NA	NA	NA	NA	NA	NA	NA	NA
BioST Nematicide 100	+	NA	NA	NA	NA	NA	NA	NA	NA	NA
Clariva PN	+	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trunemco	+	NA	NA	NA	NA	NA	NA	NA	NA	NA
Insecticide Products										
Acceleron IX-409, Attendant 480 FS, Attendant 600 FS, Axcess, Dyna-Shield Imidacloprid 5, Gaucho 480 Flowable, Gaucho 600 Flowable, Gaucho SB Flowable, Nitro Shield IV, Resonate 480 ST, Resonate 600 ST, Revize IMIDA, Senator 600 FS, Sharda Imidacloprid 5SC, STartUP IMIDA	NA	+	+	+	+	NA	NA	NA	NA	NA
Adage ST, Cruiser 5FS	NA	+	+	+	+	NA	NA	NA	NA	NA
Belay, NipsIt Inside, Poncho 600	NA	+	+	+	+	NA	NA	NA	NA	NA
Exirel, Fortenza, Verimark	NA	+	-	+	+	NA	NA	NA	NA	NA

+ = product provides control
- = product does not provide control
NA = Not Applicable

Fungicide/Insecticide/Nematicide (Combo) products

ARMIS FI, INTEGO SUITE SOYBEANS, HALIFAX FNI *(ethaboxam + ipconazole + metalaxyl + clothianidin)* Fungicide Mode of Action: 22 (benzamide, thiazole carboxamide), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 3.37 fl oz/cwt

Targeted diseases: Seed and seedling rots, Pythium root rot, Fusarium and Rhizoctonia root rots.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not graze or feed soybean forage and hay to livestock.

AVICTA COMPLETE BEANS 500 *(abamectin + thiomethoxam + mefenoxam + fludioxonil)* Fungicide Mode of Action: 4 (phenylamides), 12 (phenylpyrroles), Insecticide Mode of Action: 6 (avermectins), 4A (neonicotinoids)

Application rate: 6.2 fl oz/ cwt (100 lb) of seed

REI: 48 hours

Targeted diseases: Soybean cyst nematode (Heterodera glycines), Damping off and seedling rots due to Pythium and Phytophthora, Early-season Phytophthora root rot, Fusarium and Rhizoctonia root rots. Suppression only: seed-borne Sclerotinia and Phomopsis Spp.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

CLARIVA ELITE BEANS *(thiamethoxam + mefenoxam + fludioxonil + sedaxane + Pasteuria nishizawae)* Fungicide Mode of Action: 4 (phenylamides), 7 (SDHI), 12 (phenylpyrroles), Insecticide Mode of Action: 6 (avermectins), 4A (neonicotinoids)

Application rate: 5.6 fl oz/ cwt (100 lb) of seed

Targeted diseases: Soybean cyst nematode (Heterodera glycines), Damping off and seedling rots due to Pythium and Phytophthora, Early-season Phytophthora root rot, Fusarium and Rhizoctonia root rots. Suppression only: seed-borne Sclerotinia and Phomopsis Spp.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

CRUISERMAXX, CRUISERMAXX ADVANCED, CRUISERMAXX EZ, UPSHOT *(fludioxonil + mefenoxam + thiamethoxam)* Fungicide Mode of Action: 4 (phenylamides), 12 (phenylpyrroles), Insecticide Mode of Action: 4A (neonicotinoids)

Application rates:
CruiserMaxx: 2.95 fl oz/cwt
CruiserMaxx Advanced: 3.1 fl oz/cwt
CruiserMaxx EZ: 2.94 oz/cwt

REI: 48 hours

Targeted diseases: Seed and seedling rots, Fusarium, Pythium, and Rhizoctonia root rots.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Additional Apron XL can be added (see label for instructions).

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

CRUISERMAXX VIBRANCE, WARDEN CX *(thiamethoxam + mefenoxam + fludioxonil + sedaxane)* Fungicide Mode of Action: 4 (phenylamides), 12 (phenylpyrroles), 7 (SDHI), Insecticide Mode of Action: 4A (neonicotinoids)

Application rates:
CruiserMaxx Vibrance: 3.22 fl oz/100 lb of seed
Warden CX: 3.38 fl oz/100 lb of seed

REI: 48 hours

Targeted diseases: Seed and seedling rots, Fusarium, Pythium, and Rhizoctonia root rots.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

ENHANCE AW *(captan + carboxin + imidacloprid)* Fungicide Mode of Action: M4 (multi-site), 7 (SDHI), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 5 oz/cwt

REI: 12 hours

Targeted diseases: Fusarium, Pythium and Rhizoctonia root rot.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae and wireworm larvae.

EQUITY VIP *(fludioxonil + mefenoxam + sedaxane + thiabendazole + thiamethoxam)* Fungicide Mode of Action: M4 (multi-site), 7 (SDHI), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 5 oz/cwt

REI: 48 hours

Targeted diseases: Fusarium, Pythium and Rhizoctonia root rot.

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

PONCHO/VOTIVO *(Bacillus firmus strain I-1582 + clothianidin)* Fungicide Mode of Action: 44 (microbial), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 0.13 mg ai/seed

REI: Not provided

Targeted diseases: Soybean cyst nematode.

Targeted insects: Overwintering bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not graze or feed forage and hay to livestock.

SALTRO *(pydiflumetofen)* Mode of Action: 7 (SDHI)

Application rate: 1.52 fl oz/cwt

REI: 4 hours

Targeted diseases: Sudden death syndrome of soybean. Early season suppression of brown leaf spot. Soybean cyst nematode, and other soybean nematodes.

SEED SHIELD BEANS *(mefenoxam + fludioxonil + azoxystrobin + thiamethoxam)* Fungicide Mode of Action: 4 (phenylamide), 11 (QoI), 12 (phenylpyrroles), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 3 fl oz/cwt

REI: 48 hours

Targeted diseases: Seed and seedling rots, Fusarium root rot, Pythium root rot, Rhizoctonia root rot.

Targeted insects: Overwintering bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season. Forage may not be grazed until 30 days after planting.

SEED SHIELD MAX BEANS *(mefenoxam + fludioxonil + azoxystrobin + thiamethoxam + sedaxane)* Fungicide Mode of Action: 4 (phenylamide), 7 (SDHI), 11 (QoI), 12 (phenylpyrroles), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 3 fl oz/cwt

Targeted diseases: Fusarium root rot, Pythium root rot, Rhizoctonia root rot.

Targeted insects: Overwintering bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season. Do not apply a neonicotinoid insecticide within 45 days of planting soybean seed treated with this product.

SOYSTAR PREMIER ST, SPIRATO IMTM348 ST *(thiophanate-methyl + metalaxyl + fludioxonil + imidacloprid)* Fungicide Mode of Action: 1 (MBC), 4 (phenylamide), 12 (phenylpyrroles), Insecticide Mode of Action: 4A (neonicotinoids)

Application rate: 4 fl oz/cwt

Targeted diseases: Seed and seedling rots, Fusarium root rot, Pythium root rot, Rhizoctonia root rot.

Targeted insects: Overwintering bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Fungicide products

42-S THIRAM, SIGNET 480 FS, THIRAM GRANUFLO AG FUNGICIDE *(thiram)* Mode of Action: M3 (multi-site)

Application rates:
42-S Thiram: 2 fl oz/cwt
Signet 480 FS: 2 fl oz/cwt
Thiram Granuflo Ag Fungicide: 2.2 oz/cwt

Targeted diseases: Seed and seedling rots.

REI: 24 hours

Restrictions: Do not forage or feed livestock on treated areas until 60 days after planting.

ACQUIRE, ALLEGIANCE FL, BELMONT 2.7 FS, DYNA-SHIELD METALAXYL, DYNA-SHIELD METALAXYL 318 FS, METASTAR 2E, SEBRING 318 FS, SEBRING 480 FS *(metalaxyl)* Mode of Action: 4 (phenylamide)

Application rates:
Acquire: 0.75 fl oz/cwt
Allegiance FL: 075-1.5 fl oz/cwt
Belmont 2.7 FS: 0.7501.5 fl oz/cwt
Dyna-Shield Metalaxyl: 0.75 fl oz/cwt
Dyna-Shield Metalaxyl 318 FS: 075-1.5 fl oz/cwt
MetaStar ST: 0.75-1.5 fl oz/cwt
Sebring 318 FS: 0.75-1.5 fl oz/cwt
Sebring 480 FS: 0.25-0.50 fl oz/cwt

REI: 24 hours

Targeted diseases: Pythium root rot.

APRONMAXX RFC, MAXIM XL, WARDEN RTA *(fludioxonil + mefenoxam)* Mode of Action: 12 (phenylpyrroles), 4 (phenylamide)

Application rates:
ApronMaxx RFC: 1.5 fl oz/cwt
Maxim XL: 0.67-0.334 fl oz/cwt
Warden RTA: 5 fl oz/cwt

REI: 48 hours

Targeted diseases: Seed and seedling rots, Fusarium, Pythium, and Rhizoctonia root rots. Suppression of seed-borne white mold and Phomopsis.

Additional Apron XL can be added (ApronMaxx RFC and Maxim XL, see label for instructions).

APRON MAXX RTA + MOLY *(mefenoxam + fludioxonil + molybdenum)* Mode of Action: 4 (phenylamide), 12 (phenlypyrroles), Unknown

Application rate: 5 fl oz/cwt

REI: 48 hours

Targeted diseases: Seed and seedling rots, Fusarium root rot, Pythium root rot, Rhizoctonia root rot.

Additional Apron XL can be added (see label for instructions).

APRON XL, RIDOMIL GOLD GR, RIDOMIL GOLD SL *(mefenoxam)* Mode of Action: 4 (phenylamide)

Application rates:
Apron XL: 0.16-0.64 fl oz/cwt
Ridomil Gold GR: 6 oz/1,000 linear ft row (full season control). 1.5-3 oz/1000 linear ft row (mid-season control)
Ridomil Gold SL: 0.08-0.28 fl oz/1000 row ft.

REI: 48 hours

Targeted diseases: Pythium root rot.

Restrictions: Do not graze or feed livestock on soybean forage or hay.

AZOXYSTROBIN 1OO ST, DYNASTY *(azoxystrobin)* Mode of Action: 11 (QoI)

Application rate: 0.153-0.459 fl oz/cwt

REI: 4 hours

Targeted diseases: Seed- and soil-borne pathogens causing seed decay, Pythium root rot, Rhizoctonia root rot.

CAPTAN 4L ST *(captan)* Mode of Action: M4 (multi-site)

Application rate: 2.6 fl oz/cwt

REI: 24 hours

Targeted diseases: Seed and seedling rots.

ENHANCE *(captan + carboxin)* Mode of Action: M4 (multi-site), 7 (SDHI)

Application rate: 5 oz/cwt

REI: 12 hours

Targeted diseases: Fusarium, Pythium and Rhizoctonia root rot.

Restrictions: Do not graze or feed forage or hay from treated areas to livestock.

EVERGOL ENERGY SB *(prothioconazole + penflufen + metalaxyl)* Mode of Action: 3 (DMI), 7 (SDHI), 4 (phenylamide)

Application rate: 1 fl oz/cwt

REI: 24 hours

Targeted diseases: Seed and seedling rots, Fusarium, Rhizoctonia, and Pythium root rots. Additional metalaxyl can be added for longer season control of Phythophthora (see label).

Restrictions: Plant treated seed into the soil at a minimum depth of 0.5 inch. Do not graze or feed soybean forage and hay to livestock.

FLUDIOXONIL 4L ST, MAXIM 4FS, SPIRATO 480 FS *(fludioxonil)* Mode of Action: 12 (phenylpyrrole)

Application rate: 0.08-0.16 fl oz/cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots, Fusarium and Rhizoctonia root rots.

Restrictions: Green forage may not be grazed until 30 days after planting.

LUMISENA, PLENARIS *(oxathiapiprolin)* Mode of Action: U15 (Unknown)

Application Rate: 1.033-2.066 fl oz/cwt

Targeted diseases: Phytophthora root rot.

MERTECT 340-F, THIABENDAZOLE 4L ST *(thiabendazole)* Mode of Action: 1 (MBC)

Application rate: 0.08-0.16 fl oz/cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots and Rhizoctonia and Fusarium root rots.

RANCONA 3.8 FS *(ipiconazole)* Mode of Action: 3 (DMI)

Application rate: 0.085 fl /cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots, Fusarium and Rhizoctonia root rots.

RANCONA CTS, RANCONA SUMMIT *(ipiconazole + metalaxyl)* Mode of Action: 3 (DMI), 4 (phenylamide)

Application rates:
Rancona CTS: 1.53 fl oz/cwt
Rancona Summit: 4 fl oz cwt

REI: 24 hours

Targeted diseases: Seed and seedling rots, Pythium root rot, Fusarium and Rhizoctonia root rots.

RANCONA V 100 PRO FS *(ipiconazole + carboxin)* Mode of Action: 3 (DMI), 7 (SDHI)

Application rate: 1.5 fl /cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots, Pythium root rot.

RELENYA *(mefentrfluconazole)* Mode of Action: 3 (DMI)

Application rate: 0.2-0.8 fl oz/cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots, Fusarium and Rhizoctonia root rots.

Restrictions: Do not apply with planting application treatment such as hopper box, planter box or on-farm seed treaters. Do not plant crops within 20 days after planting Relenya seed treated seed.

SERENADE SOIL *(Bacillus subtilis strain QST 713)* Mode of Action: 44 (microbial)

Application rate: 2-6 qt/A

REI: 4 hours

Targeted diseases: Pythium spp., Rhizoctonia spp., Fusarium spp., and Phytophthora spp.

ST-METHYL 540 FS *(thiophanate-methyl)* Mode of Action: 1 (MBC)

Application rate: 0.14-0.28 fl oz/cwt

REI: 12 hours

Targeted diseases: Seed and seedling rots, Fusarium and Rhizoctonia root rots.

Restrictions: Do not graze forage or feed livestock on treated areas until 45 days after planting.

SYSTIVA XS *(fluxapyroxad)* Mode of action: 7 (SDHI)

Application rate: 0.24-0.47 fl oz/cwt

Targeted diseases: Seed and seedling disease (damping-off) caused by Rhizoctonia solani and Fusarium solani. Suppression of seed and seedling disease caused by Fusarium spp.

TRILEX FLOWABLE, TRILEX 2000 *(trifloxystrobin)* Mode of Action: 11 (QoI)

Application rates:
Trilex Flowable: 0.32 fl oz/cwt
Trilex 2000: 1.0 fl oz/cwt

REI: 24 hours

Targeted diseases: Seed and seedling rots, Fusarium root rot, Rhizoctonia root rot.

Restrictions: Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.

VIBRANCE *(sedaxane)* Mode of Action: 7 (SDHI)

Application rate: 0.075 - 0.16 fl oz/cwt

REI: 12 hours

Targeted diseases: Rhizoctonia root rot.

VITAVAX-34 *(carboxin)* Mode of Action: 7 (SDHI)

Application rate: 3-4 fl oz/cwt

REI: 12 hours

Targeted diseases: Rhizoctonia root rot, seedling and seed rots.

Restrictions: Do not graze or feed livestock on soybean forage or hay.

Nematicide products

AVEO EZ NEMATICIDE *(Bacillus amyloliquefaciens strain PTA-4838)* Mode of Action: Unknown (Biological agent)

Application Rate: 0.1 fl oz/80,000 seed unit

REI: 4 hours

Targeted nematodes: Soybean cyst nematodes.

BIOST NEMATICIDE 100 *(Heat-killed Burkholderia spp)* Mode of Action: Unknown (Biological agent)

Application Rate: 8 oz/cwt

REI: 4 hours

Targeted nematodes: Soybean cyst nematodes.

CLARIVA PN *(Pasteuria nishizawae-PN1)* Mode of action: Unknown (Biological agent)

Application rate: 1-3 fl oz/cwt

Targeted nematodes: Soybean cyst nematodes.

TRUNEMCO *(Bacillus amyloliquefaciens strain MBPI-600 + cis-Jasmone)* Mode of action: Unknown (Biological agent)

Application rate: 0.31 fl oz/cwt

Targeted nematodes: Soybean cyst nematodes

Restrictions: Trunemco is only for use in commercial seed treatment facilities

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Insecticide products

ACCELERON IX-409, ATTENDANT 480 FS, ATTENDANT 600 FS, AXCESS, DYNA-SHIELD IMIDACLOPRID 5, GAUCHO 480 FLOWABLE, GAUCHO 600 FLOWABLE, NITRO SHIELD IV, RESONATE 480 ST, RESONATE 600 ST, REVIZE IMIDA, SENATOR 600 FS, SHARDA IMIDACLOPRID 5SC, STARTUP IMIDA *(imidacloprid)* Mode of Action: 4A (neonicotinoids)

Application rates:
Acceleron IX-409, Attendant 600 FS, Axcess, Dyna-Shield Imidacloprid 5, Gaucho 600 Flowable, Nitro Shield, Resonate 600 ST, Senator 600 FS, Sharda Imidacloprid 5SC, STartUP IMIDA: 1.6-3.2 fl oz/cwt
Attendant 480 FS, Gaucho 480 Flowable, Nitro Shield IV, Resonate 480 ST, Revize IMIDA: 2-4 fl oz/cwt

REI: 12 hours

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply by seed treatment more than 0.67 lb of imidacloprid per acre per season.

ADAGE ST, CRUISER 5FS *(thiamethoxam)* Mode of Action: 4A (neonicotinoids)

Application rate: 1.28 fl oz/cwt

REI: 12 hours

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

Restrictions: Do not apply more than 0.266 lb thiamethoxam per acre per season.

BELAY, NIPSIT INSIDE, PONCHO 600 *(clothianidin)* Mode of Action: 4A (neonicotinoids)

Application rate: 1.28 fl oz/cwt

REI: 12 hours

Targeted insects: Overwintering population of bean leaf beetle adults, seed corn maggot larvae, white grub larvae, and wireworm larvae.

EXIREL, FORTENZA, VERIMARK *(cyantraniliprole)* Mode of Action: 28 (diamides)

Application rate: 0.076 mg/seed

REI: 12 hours

Targeted insects: Overwintering population of bean leaf beetle adults, white grub larvae and wireworm larvae.

Foliar Fungicides in Soybean

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Several fungal pathogens infect soybeans in South Dakota that may require an in-season fungicide to manage them. Common foliar fungal diseases found on soybeans include Septoria/brown spot, Sclerotinia stem rot (white mold), frogeye leaf spot, downy mildew, powdery mildew and Cercospora leaf spot. Foliar fungicides provide effective control of fungal diseases and protect soybean against yield loss in years of high fungal disease pressure.

Soybeans in the early reproductive stages can also be infected by several root and stem rot pathogens which may not be managed effectively with foliar fungicides. These diseases include sudden death syndrome, brown stem rot, charcoal rot and stem canker. Part of the reason why foliar fungicides may not be as effective for stem and root rot diseases is due to fact that infection takes place through the roots or through the stem in the middle canopy, and fungicide coverage in mid and lower canopy is poor.

The driving factor for fungicide application in soybeans should be the level of fungal diseases developing. Some diseases, such as brown spot, can be found on lower leaves without causing significant yield loss. Scouting and diagnosing fungal diseases before applying a fungicide could save producers from unnecessary fungicide purchase and application expenses. Other factors to consider when deciding on a foliar fungicide treatment include field history of foliar diseases, susceptibility of the cultivar, whether the soybean is following soybeans in a no-till/minimum till field, and potential yield (low yielding environments respond poorly to fungicides).

It should be noted that fungicide application alone is not the most effective fungal disease management strategy. Almost all soybean fungal pathogens are residue-borne. Therefore, a combination of other management practices, including crop rotation, residue management, planting clean seed, and cultivar selection, is effective in limiting these diseases from developing and hence reducing the chances for the need of fungicides.

Fungicide resistance management
Fungicide resistance is when a fungicide that used to control a given pathogen no longer provides any protection to that fungus. Fungicide resistance arises because of several factors including:

- Using the same class of a fungicide more than recommended times in a season or every season.
- High variability within the pathogen.
- Using low fungicide rates or off-label products.

Strobilurin fungicides tend to have a higher risk for resistance development while triazoles have a lower risk. Already, fungicide resistance for frogeye pathogen has been detected in our state. Fungicides with multi modes of actions like carbamate- and organochlorine- based fungicides have very low chances of resistance development. Growers should monitor performance of the fungicides used to detect fungicide resistance. One way to do this is to leave a strip of soybeans untreated and use this to compare with the treated soybeans. If the two areas (untreated vs treated) have comparable disease severity, this would mean that the fungicide did not work as it was supposed to and one of the reasons could be fungicide resistance. Leaving an untreated strip can also indicate whether applying a fungicide was beneficial or not if the yield from the equivalent treated area is similar.

Some ways to reduce chances of fungicide resistance from developing are:

- Rotate between different classes (modes of action) of fungicide within a season and between seasons.
- Scout to determine the need for fungicides and avoid applying fungicides when not necessary or when it is too late.
- Use a mixture of fungicide classes. Luckily, several fungicide products are marketed as combos.
- Practice integrated disease management to reduce the disease pressure.
- Always follow label directions to determine rates, growth stage of the crop, compatibility with other pesticides, and safety handling information.

Once a fungicide is determined to be necessary, growers should ensure that the sprayer is calibrated to deliver the recommended rates (as per the fungicide label), and that it is not too windy (>10 mph) or too hot and at least two hours of a rain/dew free period.

Fungicide timing is crucial to obtain maximum benefits. If fungicides are applied when the severity is already high, benefits will be limited. The best fungicide timing in soybeans is between beginning flowering (R1) and beginning seed development (R5). This period is also when several fungal diseases increase in severity. R1 timing is for white mold control while late application is for managing frogeye leaf spot.

The following is a list of fungicides labeled for use in South Dakota at the time of this publication. The list is dynamic, is not exhaustive, and should not be considered a substitute for label information. Always read and follow label directions for approved uses of these products and check with the South Dakota Department of Agriculture for up-to-date product registration information.

Product Table of Contents

Fungicide FRAC Codes and Group Names

FRAC Code	Group Name
1	Methyl benzimidazole carbamate (MBC)
3	Demethylation inhibitor (DMI)
7	Succinate dehydrogenase inhibitor (SDHI)
11	Quinone outside inhibitor (QoI)
M1	Inorganic (copper)
M5	Chloronitriles

Check list of diseases controlled by each foliar fungicide

Product Name(s)	Brown spot	Frogeye leaf spot	Cercospora leaf spot	Pod and stem blight	Powdery mildew	Downy mildew	White mold	White mold suppression only	Stem canker	Bacterial blight and Bacterial pustule
Acropolis	+	+	+	+	+	-	+	-	-	-
Affiance	+	+	+	+	+	-	+	-	-	-
Aframe, Azoxy 2SC, Azoxystar, Quadris, Satori	+	+	+	+	-	-	-	-	-	-
Aframe Plus	+	+	+	+	-	-	-	-	-	-
Alto 100 SL	+	+	+	+	-	-	-	-	-	-
Aproach	+	+	+	+	+	+	-	+	-	-
Aproach Prima	+	+	+	+	+	+	-	-	-	-
Avaris, Cover XL, Quilt Xcel	+	+	+	+	-	-	-	-	-	-
Bravo Ultrex, Bravo Weather Stik, Echo 720, Echo 90DF, Equus 720 SST, Initiate 720 Flowable, Initiate ZN	+	+	+	+	-	-	-	-	-	-
Bumper 41.8 EC, Fitness, Propicure 3.6F, Propi-Star EC, Shar-Shield PPZ, Topaz, Tide Propiconazole 41.8% EC, Tilt, Vigil	+	+	-	-	-	-	-	-	-	-
Contans WG	+	+	+	+	-	-	+	-	+	-
Cuproxat, Cuprofix Ultra 40 Disperss	+	+	+	+	+	+	-	-	-	+
Custodia	+	+	+	+	+	-	-	-	-	-
Delaro Complete	+	+	+	+	+	-	-	+		
Domark 230 ME	+	+	+	-	+	-	+	-	-	-
Endura	+	(+)	(+)	-	-	-	-	+	-	-
Evito 480 SC, Aftershock	+	+	+	+	-	-	-	-	-	-
Fortix	+	+	+	+	+	-	+	-	-	-
Headline, Headline SC	+	+	+	+	-	-	-	-	-	-
Incognito 4.5F, Incognito 85 WDG, Topsin 4.5FL, Topsin M WSB	+	+	+	+	-	-	+	-	-	-
Kocide 3000	-	-	-	-	-	+	-	-	-	+
Microthiol Disperss	-	-	-	-	+	-	-	-	-	-
Miravis Neo	+	+	+	+	+	-	-	+	-	-
Miravis Top	+	+	+	+	+			+		
Monsoon, Teb 3.6SC, Onset 3.6L, Orius 3.6F, Tebustar 3.6L, Tebuzol 3.6F, Toledo 3.6F	-	-	-	-	+	-	-	-	-	-
Muscle ADV	+	+	+	+	-	-		-	-	-
Omega 500F	+	+	+	+	-	-	+	-	-	-
Preemptor SC	+	+	+	+	+	-	+	+	-	-
Priaxor	+	+	+	+	-	-	-	+	-	-
Priaxor D	+	+	+	+	+	-	+	-	-	-
Proline 480 SC	+	+	-	-	+	-	-	+	-	-
Propulse	+	+	-	+	+	-	+	-	-	-
Protocol	+	+	+	-	+	-	+	-	-	-
Quadris Xtra, Azure Xtra, Rustease	+	+	+	+		-	-	-	-	-
Quadris Top, Radius ESQ	+	+	+	+	+	-	-	-	-	-
Revytek	+	+	+	+	+	-	-	+	-	-
Serenade Aso, Serenade Max, Serenade Soil	-	-	-	-	-	-	+	-	-	-
Sonata	+	-	+	-	+	+	-	-	-	-
Stratego, Delaro 325 SC	+	+	+	+	+	-	-	+	-	-
Stratego YLD	+	+	+	+	+	-	-	-	-	-
Super Six Liquid Sulfur	-	-	-	-	+	-	-	-	-	-
Topguard	+	+	+	-	+	-	-	+	-	-
Topsin XTR	+	+	+	-	+	-	+	-	-	-
Trivapro	+	+	+	+	+	-	-	-	-	-
Veltyma	+	+	+	+	+	-	-	-	-	-
Vertisan, Fontelis	+	+	+	+	+	-	+	-	-	-
Viathon	+	+	-	-	+	+	-	-	-	-
Zolera FX	+	+	+	+	+	-	+	-	-	-

+ = provides protection
(+) = provides early season suppression only
- = Does not provide protection

ACROPOLIS *(thiophanate-methyl + tetraconazole)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 20-22.5 fl oz/A for foliar diseases
22.5 fl oz/A for white mold control

REI: 24 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: For white mold control, apply at R1 (early bloom), if favorable conditions persist, apply a second application after 14 days. For foliar diseases, apply at early pod fill (R3). Do not make more than two sequential applications before alternating to another fungicide with a different mode of action. Do not apply after R5 (beginning seed stage). Do not graze or feed treated forage or hay to livestock. Do not apply within 21 days of harvest.

AFFIANCE *(tetraconazole + azoxystrobin)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 10-14 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply prior to disease development when conditions favor disease development. Repeat applications on a 15-21 day interval if disease pressure is severe.

Do not apply after growth stage R5 (beginning seed). Do not make more than three applications per season. Do not apply more than 28.7 fl oz/A per season. Do not apply within 14 days of harvest.

Use as a part of an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation. Affiance may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air and 10 gal/A by ground.

AFRAME, AZOXY 2SC, AZOXYSTAR, QUADRIS, SATORI *(azoxystrobin)* Mode of Action: 11 (QoI)

Application rate: 6-15.5 fl oz/A

REI: 4 hours

Targeted diseases: Brown spot *(Septoria glycines*), Pod and stem blight *(Diaporthe spp)*, Frogeye leaf spot *(Cercospora kikuchii)*.

Restrictions: Apply prior to disease development. Use the high rates under conditions favorable for severe disease pressure or dense plant canopies.

Do not apply within 14 days of harvest. Do not apply more than two sequential applications of Quadris, Aframe, Azoxy 2SC, or Satori without alternating with another fungicide chemistry. Do not apply more than 90 fl oz of product/A per season.

Use only in an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation. May be applied by ground, air or through chemigation. An adjuvant may be added at recommended rates.

AFRAME PLUS *(azoxystrobin + propiconazole)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 10.5-21 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(C. kickuchil)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe spp.)*.

Restrictions: Foliar diseases: Apply 14-21 fl oz/A at growth stage R3 (early pod set) when pods are 1/8-1/4 inch long and 14-21 days later at growth stage R5 (pod fill). Aframe Plus may be applied earlier should conditions be conductive for disease.

On certain verities, applications may cause crinkled, smaller, and/or greener leaves. Yields of beans displaying these characteristics have not been reduced due to Aframe Plus treatments.

Do not apply more than 42 fl oz/A. Apply up to R6 growth stage.

ALTO 100 SL *(cyproconazole)* Mode of Action: 3 (DMI)

Application rate: 4.0-5.5 fl oz/A

REI: 12 hours

Targeted diseases: Diaporthe pod and stem blight *(Diaporthe spp)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: Apply prior to disease development. Use the high rates under conditions favorable for severe disease pressure or dense plant canopies. Do not apply within 30 days of harvest. Do not apply more than 11 fl oz/A per season. Alto may be applied by ground, air or through chemigation.

A spreading/penetrator type adjuvant is recommended for enhanced coverage and efficacy. Do not use soybean forage or hay as livestock feed if more than one application at 5.5 fl oz/A has been applied. Do not graze forage within 14 days of application.

APROACH *(picoxystrobin)* Mode of Action: 11 (QoI)

Application rate: 6-12 fl oz/A
Application rate: 8-12 fl oz/A for White mold (Sclerotinia sclerotiorum)

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina*), Pod and stem blight *(Diaporthe phaseolorum)*, Downy mildew *(Peronospora manshurica)*, Powdery mildew *(Erysiphe spp.)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Begin applications prior to disease development and continue on a 7-14 day interval. Use the higher rate and shorter intervals when disease pressure is high. Do not apply within 14 days of harvest for grain, forage and hay.

Do not apply more than 12 fl oz/A/season if grown for forage and hay. Do not apply more than 36 fl oz/A/season if grown for grain. Aproach may be applied by ground, air or chemigation. Do not apply more than two sequential applications of Aproach without alternating with another fungicide chemistry.

APROACH PRIMA *(picoxystrobin + cyproconazole)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 5-6.8 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Downy mildew *(Perenospora manshurica)*, Powdery mildew *(Erysiphe spp.)*.

Restrictions: Begin applications prior to disease development and continue with 14-28 day intervals. Use the higher rate and shorter intervals when disease pressure is high. Do not apply within 30 days of harvest for grain and 14 days of harvest for forage and hay. Do not use soybean forage or hay as livestock feed if making more than one application at 6.8 fl oz/A.

Do not apply more than 13.6 fl oz/A per year. Aproach Prima may be applied by ground, air or chemigation. Do not apply more than two applications of product per year

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AVARIS, COVER XL, QUILT XCEL *(azoxystrobin + propiconazole)* Mode of Action: 11, 3 (QoI, DMI)

Avaris application rate: 14-20.5 fl oz/A
Cover XL application rate: 10.5-21 fl oz/A
Quilt Xcel application rate: 14-21 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Pod and stem blight *(Diaporthe spp)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: Apply at R3 (early pod set when pods are 1/8-1/4 inch long) and 14–21 days later at R5 (pod fill). Restricted-entry interval: 12 hours. Do not apply within 21 days of harvest for seed and 0 days for forage and hay (Avaris). Quilt Xcel can be applied up to R6 (full seed).

Apply by ground, air or through chemigation. Do not apply more than 42 fl oz of product/A per season.

BRAVO ULTREX, BRAVO WEATHER STIK, ECHO 720, ECHO 90DF, EQUUS 720 SST, INITIATE 720 FLOWABLE, INITIATE ZN *(chlorothalonil)* Mode of Action: M5 (multi-site)

Bravo Ultrex application rate: 1.4-2.2 lbs/A
Bravo Weather Stik, Echo 720 application rate: 1.5-2.25 pints/A
Echo 90DF application rate: 1.25-2.25 pints/A
Equus 720 SST application rate: 1.5-2.25 lbs/A
Initiate 720 Flowable application rate: 1.5-2.25 pints/A
Initiate Zn application rate: 2.25-3.25 pints/A

REI: 12 hours

Targeted diseases: Diaporthe pod and stem blight *(Diaporthe spp)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Stem canker *(Diaporthe phaseolorum)*.

Restrictions: Make the first application when the largest pods are 1–1 1/4 inches in length. Make the second application 14 days later. Do not apply within 6 weeks (Bravo Ultrex, Bravo Weather Stik, Equus 720 SST, Initiate 720 Flowable, Initiate ZN) or 42 days (Echo 720, Echo 90DF, Echo Zn) of harvest.

Do not apply more than 5.4 lbs (Bravo Ultrex), 4.5 lbs a.i. (Echo 720, Echo 90DF, Echo ZN), 8.5 pints (Initiate Zn), 6 pints (Bravo Weather Stik, Equus 720 SST, Initiate 720 Flowable) of product per acre per season. Use sufficient water to obtain adequate coverage, 5–10 gal/A for concentrated ground and aerial application. Do not feed to livestock soybean hay or threshings from treated fields.

BUMPER 41.8 EC, FITNESS, PROPICURE 3.6F, PROPI-STAR EC, SHAR-SHIELD PPZ, TOPAZ, TIDE PROPICONAZOLE 41.8% EC, TILT, VIGIL *(propiconazole)* Mode of action: 3 (DMI)

Application rate: 4-6 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: Apply at growth stage R3 (early pod set when pods are 1/8-1/4 inch long) and 14-21 days later at growth stage R5 (pod fill). Apply up to growth stage R6 (full seed).

Do not apply more than 12 fl oz/A per season. Apply a minimum of 2 gal/A by air or 10 gal/A ground (Tilt, AmTide Propiconazole, Bumper 41.8 EC, Bumper ES, Fitness, Propicon 3.6EC, Propicure 3.6F, Propi-Star EC, Topaz, Vigil) and a minimum of 5 gal/A by air or 15 gal/A ground (Shar-Shield PPZ).

CONTANS WG *(Coniothyrium minitans strain CON/M/91-08)* Mode of Action: Biological control, acts on resting sclerotia of white mold pathogen.

Application rate: 1-4 lb/A

REI: 4 hours

Target diseases: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply Contans WG to the soil prior to planting, or at planting, after crop emergence, or after transplant, or postharvest. Make broadcast applications and incorporate Contans WG into top 2 inches of soil by light mechanical incorporation or by irrigation or rainfall soon after application. If incorporation will displace the soil greater than two inches, increase the application rate to 3 to 6 lbs per acre Apply three months prior to onset of disease development.

Incorporate into the soil using a rotary harrow to a depth of 4-8” of top soil. Contans WG-treated soils should not be ploughed prior to planting the crop. Care should be taken not to disturb treated soil when planting. Apply Contans WG at a rate of 2.6 lb/A to harvested crop debris. Once the debris has been treated, it must be incorporated into the upper soil layer to a depth of 4”. Contans WG may also be applied to plant debris that remains in the field after harvest, prior to replant of a susceptible crop..

Make a maximum of eight (8) applications of Contans WG per season or per year, at labelled rates, as required to maintain disease control.

This product may be applied the day of harvest

Do not tank mix Contans WG with pesticides, acids, alkalines or any product that attracts organic material.

CUPROXAT, CUPROFIX ULTRA 40 DISPERSS *(basic copper sulfate)* Mode of Action: M1 (multi-site)

Cuproxat application rate: 3.9 pints/A
Cuprofix Ultra 40 Disperss application rate: 0.75-2 lbs/A

REI: 48 hours

Target diseases: Bacterial blight *(Pseudomonas syringae)*, Bacterial pustule *(Xanthomonas campestris)*, Brown spot *(Septoria glycines)*, Pod and stem blight *(Diaporthe spp)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera difuusa)*, Downy mildew *(Perenospora manchurica)*.

Restrictions: Bacterial diseases, apply at 1st through 3rd node development when extended periods of wet weather are favorable for disease development.

Begin applications when conditions first favor disease development. Continue on a 7-10 day interval if weather conditions remain favorable for disease development.

Do not apply more than 3.9 pints of Cuproxat per acre. Minimum treatment interval is 7 days.

CUSTODIA *(azoxystrobin + tebuconazole)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 8.6 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Pod and stem blight *(Diaporthe spp)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera difuusa)*.

Restrictions: Apply prior to disease development. Repeat applications on 10-14 day intervals if conditions are favorable for disease. Use a shorter interval is disease pressure is high..

Do not apply within 21 days of harvest. Do not apply more than 25.9 fl oz/A per crop. Apply a minimum of 5 gal/A by air or 10 gal/A by ground. Apply Custodia with the lowest labeled rate of a spray surfactant.

DELARO COMPLETE *(prothioconazole + tryfloxystrobin + fluopyrum)* Mode of Action: 3, 11, 7 (DMI, QoI, SDHI)

Application rate: 8-11 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera difuusa)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply when disease at early flowering or prior to disease development, whichever is earlier. Repeat applications on 10–21 day spray intervals if disease monitoring or environmental factors indicate favorable conditions for continued disease development. Use the higher rate and shorter intervals when disease pressure is severe.

Do not make more than 3 applications per season. Do not apply more than 33 fl oz/A per season. Do not graze or feed soybean forage or hay to livestock. Pre-Harvest Interval: 21 days.

Use sufficient water to obtain adequate coverage, a minimum of 2 gal/A for aerial and 10 gal/A for ground application. Use as a part of an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation.

DOMARK 230 ME *(tetraconazole)* Mode of Action: 3 (DMI)

Application rate: 4-5 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*, Powdery mildew *(Microsphaera difuusa)*.

Restrictions: Apply at growth stage R3 (early pod stage) or when conditions are favorable for disease. Repeat applications on 15–21 day intervals if disease pressure is severe. Use the higher rate and shorter intervals when disease pressure is high.

Do not apply after growth stage R5 (beginning seed). Do not make more than 2 applications per season. Do not apply more than 10 fl oz/A per season. Do not graze or feed soybean forage or hay to livestock.

Use as a part of an integrated disease management approach with resistant hybrids, proper fertility, residue management and crop rotation. Domark may be applied by ground, air or chemigation. Use sufficient water to obtain adequate coverage, a minimum of 2 gal/A for aerial and 10 gal/A for ground application.

ENDURA *(boscalid)* Mode of Action: 7 (SDHI)

Application rate: 5.5 fl oz/A
Application rate: 5.5-11 fl oz/A for white mold

REI: 12 hours

Targeted diseases: Suppression only: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply prior to disease development or when conditions are favorable for disease development. Repeat applications on 7–14 day intervals if conditions are favorable. Use shorter intervals when disease pressure is high. Do not apply within 21 days of harvest. Do not apply more than 22 oz of product/A per season. Do not apply more than two applications per season.

EVITO 480 SC, AFTERSHOCK *(fluoxastrobin)* Mode of Action: 11 (QoI)

Application rate: 2-5.7 fl oz/A

REI: 12 hours

Targeted diseases: Diaporthe pod and stem blight *(Diaporthe spp)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: Apply prior to disease development and repeat on 14-21 day intervals if conditions are favorable. Do not apply more than two applications. Do not apply within three days of forage harvest or 30 days of seed harvest.

Do not apply after the R5 growth stage. Do not apply more than 11.4 fl oz/A per season. May be applied by ground, air or chemigation.

FORTIX *(fluoxastrobin + flutriafol)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 4-6 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*, Pod and stem blight *(Diaporthe phaseolorum)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply prior to disease development and repeat on 14-21 day intervals if conditions are favorable. No more than

two applications per season. Do not apply within 21 days of forage harvest or 30 days of seed harvest.

Do not apply after the R5 growth stage. Apply a minimum of 5 gal/A by air or 10 gal/A ground. Do not apply more than 12 fl oz/A per season. Do not graze or feed soybean forage or hay to livestock.

HEADLINE, HEADLINE SC *(pryaclostrobin)* Mode of Action: 11 (QoI)

Application rate: 6-12 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*.

Restrictions: Apply before diseases occur. If conditions favorable for disease persist, reapply every 7–14 days. Use the higher rate and shorter intervals when disease pressure is high. Do not apply within 21 days of harvest.

Do not apply more than 24 fl oz/A/season. Do not apply more than two sequential applications without alternating with a fungicide that has a different mode of action for at least one application.

Adjuvants may be used with Headline and Headline SC. Soybean forage may be fed no sooner than 14 days after the last application. Soybean hay may be fed no sooner than 21 days after the last application.

INCOGNITO 4.5F, INCOGNITO 85 WDG, TOPSIN 4.5 FL, TOPSIN M WSB *(thiophanate-methyl)* Mode of Action: 1 (MBC)

Incognito 4.5F application rate: 10-20 fl oz/A
Incognito 85 WDG application rate: 0.4-0.8 lbs/A
Topsin 4.5FL application rate: 10-20 fl oz/A
Topsin M WSB application rate: 0.5 – 1 lb/A
Incognito 4.5F white mold application rate: 15-20 fl oz/A
Incognito 85 WDG white mold application rate: 0.6-0.8 lbs/A
Topsin 4.5 FL white mold application rate: 15-20 fl oz/A
Topsin M WSB white mold application rate: 0.75-1 lb/A

REI: 24 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply from full bloom to when pods are 1/8–1/4 inch in length. Make a second application 14–21 days later. Do not make the second application after pods have reached 1/4 inch in length or when beans form in the pod.

Pre-harvest interval of 21 days (Incognito 4.5F, Incognito 85 WDG,Topsin 4.5FL, Topsin M WSB).

Do not apply more than 40 fl oz (Incognito 4.5F, Topsin 4.5FL), 2 lbs (Topsin M WSB) of product/A/season. Do not make more than two applications per year (Incognito 4.5F, Incognito 85 WDG).

Do not graze or feed treated vines or hay to livestock. Apply a minimum of 5 gal/A by air (Incognito 4.5F, Topsin 4.5FL, Topsin M WSB). Apply a minimum of 20 gal/A by ground (Incognito 4.5F, Topsin 4.5 FL, Topsin M WSB).

KOCIDE 3000 *(copper hydroxide)* Mode of action: unknown

Application rate: 0.75-1.5 lbs/A

REI: 48 hours

Targeted diseases: Downy mildew *(Perenospora manshurica)*, Bacterial blight *(Pseudomonas syringae)*.

Restrictions: For protective sprays, make first application when plants are 6 inches tall. Repeat on a 7-14 day interval if needed depending on environmental conditions. Use the higher rates for more severe disease.

MICROTHIOL DISPERSS *(sulfur)* Mode of action: M4 (multi-site)

Application rate: 10-15 lb/A

REI: 24 hours

Targeted disease: Powdery mildew *(Microsphaera diffusa)*

Restrictions: Apply at early leaf stage and repeat at 7-14 day intervals or as needed.

MIRAVIS NEO *(pydiflumetofen + azoxystrobin + propiconazole)* Mode of action: 7, 3, 11 (SDHI, DMI, QoI)

Application rate: 13.7-20.8 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight (*Diaporthe phaseolorum)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Powdery mildew *(Microsphaera diffusa)*, suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Begin applications prior to disease development. Apply at growth stage R3. Do not apply more than two applications per season. Minimum application interval: 14 days. Do not apply after R6. Pre-harvest interval 14 days.

MIRAVIS TOP *(pydiflumetofen + Difenoconazole)* Mode of action: 7, 3 (SDHI, DMI)

Application rate: 13.7 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum),* Cercospora blight and leaf spot *(Cercospora kikuchii)*, Powdery mildew *(Microsphaera diffusa)*, suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Begin applications prior to disease development. For white mold, make the first application at R1 (early bloom) to R2 (full bloom). Apply second applicaiton if needed 14 days later after early pod formation (R3).

Do not apply more than two consecutive applications of Miravs Top or Group 3 and 7 fungicides before alternation with a fungicide that is not in Group 3 or 7.

MONSOON, TEB 3.6SC, ONSET 3.6L, ORIUS 3.6F, TEBUSTAR 3.6L, TEBUZOL 3.6F, TOLEDO 3.6F *(tebuconazole)* Mode of action: 3 (DMI)

Application rate: 3-4 fl oz/A

REI: 12 hours

Targeted disease: Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply as a broadcast foliar spray, as a preventative spray, or at first visible symptoms of disease. Repeat applications on a 10-14 day interval if environmental conditions are favorable for continued disease development. Use of the higher rates and shorter spray intervals are recommended when disease pressure is severe. The lowest label recommended rate of a spray surfactant must be tank-mixed with MONSOON. Apply in a minimum of 10 gallons of spray solution per acre by ground sprayer or in a minimum of 5 gallons per acre by aircraft.

Applications may not be made within 21 days of harvest. Do not apply more than three applications per season. Do not apply more than 12 fl oz/A per season.

MUSCLE ADV *(chlorothalonil + tebuconazole)* Mode of Action: M5, 3 (multi-site, DMI)

Application rate: 0.8-1.1 pints/A

REI: 12 hours

Targeted diseases: Diaporthe pod and stem blight *(Diaporthe spp)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: For complete control, add Echo 720 in tank mix with Muscle ADV. Make the first application from late vegetative (L5) to early flowering (R1) growth stage. Make a second application from early pod set (R3) to seed formation (R5).

A third application can be made at a 14-day interval in areas having a history of moderate to severe disease pressure. Do not apply more than 3.2 pints of product/A per season. Do not feed to livestock soybean hay or threshings from treated fields.

OMEGA 500F *(fluazinam)* Mode of action: 29

Application rate: 12-16 fl oz/A

REI: 12 hours

Targeted disease: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply at R1 (early bloom) to R2 (full bloom) and if needed again at R3.

Do not apply more than 32 fl oz per acre during each growing season. Do not apply more than two applications per acre per year. Do not feed treated hay or allow livestock to graze treated areas. Do not apply after R3. Restricted entry interval is 12 hours.

PREEMPTOR SC *(fluoxastrobin + flutriafol)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 4-6 fl oz/A

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera diffusa)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*; Sudden death syndrome *(Fusarium virguliforme*).

REI: 12 hours

Restrictions: Apply before disease occurs and repeat on a 14-21 day interval, if conditions continue to favor disease. Do not apply after R5. Do not apply more than two applications per year. Do not apply within 30 days of harvest. Do not feed forage or hay to animals or permit animals to graze.

Do not apply more than 12 fl oz of product/A per season. Restricted entry interval is 12 hours.

PRIAXOR *(fluxapyroxad + pyraclostrobin)* Mode of Action: 7, 11 (SDHI, QoI)

Application rate: 4-8 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply before diseases occur. If conditions favorable for disease persist, reapply every 7-14 days. Use the higher rate and shorter intervals when disease pressure is high.

Do not apply within 21 days of harvest. Do not apply more than two applications of Priaxor without alternating with a fungicide that has a different mode of action for at least one application. Do not apply more than 16 fl oz/A/season.

Adjuvants may be used with Priaxor. Soybean forage may be fed no sooner than 14 days after the last application. Soybean hay may be fed no sooner than 21 days after the last treatment.

PRIAXOR D *(fluxapyroxad + pyraclostrobin + tetraconazole)* Mode of Action: 3, 11, 7 (DMI, QoI, SDHI)

Application rate: 4 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, White mold *(Sclerotinia sclerotiorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply before diseases occur. If conditions favorable for disease persist, reapply every 7-14 days. Priaxor D may be used with adjuvants.

Do not apply within 21 days of harvest. Do not apply more than 8 fl oz/A/year. Do not apply Priaxor D after soybean growth stage R5 (beginning seed).

PROLINE 480 SC *(prothioconazole)* Mode of Action: 3 (DMI)

Application rate: 2.5-3.0 fl oz/A
Application rate: 3-5 fl oz/A white mold suppression

REI: 12 hours

Targeted diseases: Frogeye leaf spot *(Cercospora sojina)*, Brown spot *(Septoria glycines)*, Powdery mildew *(Microsphaera diffusa)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply as a preventative spray or at the first signs of disease. Repeat applications on a 10–21 day interval if conditions are favorable. Use higher rates and shorter intervals when disease pressure is severe. Do not apply within 21 days of harvest.

Do not apply more than three applications per season. Do not apply more than 12.9 fl oz/A per season. Proline may be applied by ground, air or chemigation. Apply a minimum of 5 gal/A by air or 10 gal/A by ground.

PROPULSE *(fluopyram + prothioconazole)* Mode of action: 7, 3 (SDHI, DMI)

Application rate: 10.2 fl oz/A
Application rate: 6-8 fl oz/A for white mold, brown spot, Phomopsis stem blight

REI: 12 hours

Targeted diseases: Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*, White mold *(Sclerotinia sclerotiorum)*, charcoal rot *(Macrophomina phaseolina)*, Brown spot *(Septoria glycines)*, Phomopsis stem blight (*Diaporthe phaseolorum)*.

Restrictions: Do not apply more than 30.9 fl oz/acre per year. Regardless of formulation or method of application, do not apply more than 0.446 lbs fluopyram or 0.403 lbs prothioconazole per acre per year, including seed treatment, soil and foliar uses. Apply by either ground, aerial, or chemigation application equipment.

Do not apply PROPULSE within 21 days of harvest. To limit the potential for development of disease resistance to this fungicide, do not make more than two sequential applications of PROPULSE or any Group 7 or Group 3 containing fungicide before rotating with a fungicide from a different Group. Do not allow livestock to graze soybean forage or hay and do not harvest soybean forage or bean hay for food or feed.

PROTOCOL *(thiophanate-methyl + propiconazole)* Mode of Action: 1, 3 (MBC, DMI)

Application rate: 2 pints/A

REI: 24 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply at R3 (early pod) growth stage and make a second application 14-21 days later at R5 (pod fill). Apply up to

the R6 growth stage. For white mold, apply at growth stage R1-R2 and repeat on a 14-day interval.

Do not apply more than 4 pints/A per season. Maximum amount of propiconazole allowed per season is 0.34 lbs ai/A. Maximum amount of thiophanate-methyl allowed per season is 1.4 pounds active ingredient per acre. Apply a minimum of 2 gal/A by air or 10 gal/A by ground.

QUADRIS XTRA, AZURE XTRA, RUSTEASE *(azoxystrobin+ cyproconazole)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 5.0–6.8 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Pod and stem blight *(Diaporthe spp)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*.

Restrictions: Apply prior to disease development. Use the high rates under conditions favorable for severe disease pressure or dense plant canopies or when disease is present. Do not apply within 30 days of harvest. Do not apply more than two strobilurin applications per season. Do not apply more than 13.6 fl oz of product/A per season.

Product may be applied by ground, air or through chemigation. An adjuvant may be added at recommended rates. Do not use soybean forage or hay as livestock feed if more than one application at 6.8 fl oz/A has been applied. Do not graze forage within 14 days of an application.

QUADRIS TOP, RADIUS ESQ *(azoxystrobin + difenconazole)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 8.0–14 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Pod and stem blight *(Diaporthe spp)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply prior to disease development. Use the higher rate for high disease pressure and dense canopies. Do not apply within 14 days of harvest.

Do not apply more than two sequential applications of Quadris Top without alternating with fungicide chemistry. Do not apply more than 26.5 fl oz of product/A per season. Do not feed soybean hay, forage and silage to livestock.

REVYTEK *(mefentrifluconazole + fluxapyroxad + pyraclostrobin)* Mode of Action: 3, 7, 11 (DMI, SDHI, QoI)

Application rate: 8-15 fl oz/A

REI: 12 hours

Targeted diseases: Anthracnose leaf blight *(Colletotricum truncatum)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, and Pod and stem blight *(Diaporthe phaseolorum)*, Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Do not apply more than 15 fl oz per acre per application. Do not apply more than two applications per year. Post-harvest interval: 21 days. Soybean forage may be fed no sooner than 14 days after last application. Soybean hay may be fed no sooner than 21 days after last application.

SERENADE ASO, SERENADE MAX, SERENADE SOIL *(Bacillus subtilis strain QST 713)* Mode of action: 44 (microbial)

Application rate: 0.5-4 quarts/A

Targeted disease: White mold (Sclerotinia sclerotlorum).

REI: 4 hours

Serenade Soil. All soil surface (Drench), Shanked-in, injected and in furrow applications: Mix 2 qt to 6 qt in the appropriate amount of water per acre. Use the stated higher application rates when the weather conditions are expected to be conducive to disease development, if the field has history of disease problems, or if minimum/low till programs are in place. Can be mixed with chemical fungicides registered for soil applications.

Restrictions: Drench applications at planting: Use at planting, seeding, or transplant. Apply finished spray mixture, at a rate to thoroughly soak the growing media through the root zone, as a drench or directed spray using hand-held, mechanical, or motorized spray using applicable sprinkler or drip irrigation systems.

Shanked-in and Injected applications: Can be shanked-in or injected into the soil prior to, at, or post planting/transplanting of crops alone or with most types of liquid nutrients.

In-furrow applications: Apply as an in-furrow spray in the appropriate amount of water per acre for the crop at planting. Mount the spray nozzle so the spray is directed in the furrow just before the seeds are covered.

Drench applications at any stage of growth: Apply finished spray mixture to the surface of the soil as a drench or directed spray using hand-held, mechanical, or motorized spray equipment, or as a chemigation drench or directed spray using applicable sprinkler or drip irrigation systems. When applying as a spray, it is important to irrigate to move the material into the seed, root, or transplant zone. Normal operation of overhead sprinklers and drip irrigation systems are sufficient for effective

applications. Optimal performance is obtained with preventative treatments repeated every 21-28 days throughout the growing cycle.

SONATA *(Bacillus pumilus strain QST 2808)* Mode of action: 44 (microbial)

Application rate: 2-4 qt/A

REI: 4 hours

Targeted diseases: Powdery Mildew *(Erysiphe spp.)*, Brown spot *(Septoria glycines)*, Cercospora leaf spot *(Cercospora spp.)*, Downy mildew *(Peronospora manschurica)*.

Restrictions: Begin applications when environmental conditions are conducive to disease development. Continue at 7-14 day intervals or as needed. Use the stated higher rates and shorter application intervals under heavy disease pressure.

STRATEGO, DELARO 325 SC *(trifloxystrobin + propiconazole)* Mode of Action: 3, 11 (DMI, QoI)

Stratego application rate: 10 fl oz/A
Delaro 325 SC application rate: 8-11 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera diffusa)*, White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply at early flowering or prior to disease development whichever is earlier. Repeat applications on a 10-21 day interval if conditions are favorable.

Do not apply within 21 days of harvest. Do not apply more than three applications per season. Do not apply more than 30/33 fl oz/A per season Stratego/Delaro. Do not apply more than two sequential applications without alternating with a fungicide that has a different mode of action for at least one application. Do not graze or feed soybean forage or hay.

STRATEGO YLD *(trifloxystrobin + prothioconazole)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 4-4.65 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply at early flowering or prior to disease development, whichever is earlier. Repeat applications on a 10-21 day interval, if conditions are favorable. Use higher rates and shorter intervals when disease pressure is severe.

Do not apply within 21 days of harvest. Do not apply more than three applications per season. Do not apply more than 13.95 fl oz/A/season. Do not apply more than two sequential applications of Stratego YLD without alternating with a fungicide that has a different mode of action for at least one application.

Stratego YLD may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air or 10 gal/A by ground. Do not graze or feed soybean forage or hay.

SUPER SIX LIQUID SULFUR *(sulfur)* Mode of action: unknown

Application rate: 0.5-2 gallons/A

Targeted disease: Powdery mildew *(Microsphaera diffusa)*.

REI: 24 hours

Apply at first sign of infection and repeat every 14 days as needed. Do not apply more than 2.5 gal/A per year.

TOPGUARD *(flutrialfol)* Mode of action: 3 (DMI)

Application rate: 7-14 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*. Suppression only: White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Apply at first visible flower or when conditions are favorable for disease. Repeat at a 14-35 day interval if conditions are favorable for heavy disease pressure. Do not apply within 21 days of harvest. No more than three applications per season.

Do not apply more than 28 fl oz/A per season. Apply a minimum of 5 gal/A by air or 10 gal/A ground. Do not graze or feed soybean forage or hay to livestock.

TOPSIN XTR *(thiophanate-methyl + tebuconazole)* Mode of Action: 1, 3 (MBC, DMI)

Application rate: 16-20 fl oz/A

REI: 24 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, White mold *(Sclerotinia sclerotiorum)*, Powdery mildew *(Microsphaera diffusa)*.

Restrictions: Apply as a preventative spray or at first visible signs of disease. Repeat applications on a 14-day interval if conditions are favorable. For white mold, apply at R1-R2.

Do not apply later than 14 days after pods average a 1/4 inch in length. Do not apply more than 49.8 fl oz/A per year. Do not apply within 21 days of harvest. Do not graze or feed treated soybean forage or hay to livestock.

TRIVAPRO *(azoxystrobin + propiconazole + benzovindiflupyr)* Mode of Action: 7 (SDHI)

Application rate: 13.7-20.7 fl oz/A

REI: 12 hours

Targeted diseases: Brown spot *(Septoria gylcines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*, Pod and stem blight *(Diaporthe phaseolorum)*.

Restrictions: Apply at growth stage R3. Apply Trivapro no closer than a 14 day schedule.

Do not apply more than 41.4 floz/year of Trivapro. Do not exceed two applications a year. Do not apply within 14 days of harvest of grain, hay or silage. Restricted entry interval: 12 hours.

VELTYMA *(mefentrifluconazole + pyraclostrobin)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 7-10 fl oz/A

REI: 12 hours

Targeted diseases: Anthracnose leaf blight *(Colletotricum truncatum)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*.

Restrictions: Do not apply more than 10 fl oz per acre per application. Apply at 14-day intervals. Do not apply more than two applications per year. Post- harvest interval: 21 days. Soybean forage may be fed no sooner than 14 days after last application. Soybean hay may be fed no sooner than 21 days after last application.

VERTISAN, FONTELIS *(penthiopyard)* Mode of Action: 7 (SDHI)

Application rate: 10-30 fl oz/A
Application rate: 16-30 fl oz for white mold

REI: 12 hours

Targeted diseases: Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Frogeye leaf spot *(Cercospora sojina)*, Pod and stem blight *(Diaporthe phaseolorum)*, Powdery mildew *(Erysiphe spp)*, White mold *(Sclerotinia sclerotiorum)*.

Restrictions: Begin applications prior to disease development and continue on a 7-14 day interval. Use the higher rate and shorter intervals when disease pressure is high.

Do not apply within 14 days of harvest. Do not apply more than two sequential applications of Vertisan without alternating with another fungicide chemistry. Do not apply more than 61 fl oz/A/season. Apply a minimum of 2 gal/A by air or 15 gal/A ground. Do not use soybean forage or hay for livestock feed.

VIATHON *(tebuconazole + potassium phosphite)* Mode of Action: 3 (DMI)

Application rate: 2 pints/A

REI: 12 hours

Targeted diseases: Frogeye leaf spot *(Cercospora sojina)*, Brown spot *(Septoria glycines)*, Powdery mildew *(Microsphaera diffusa)*, Downy mildew *(Perenospora manshurica)*.

Restrictions: Apply when disease is forecasted. Repeat applications on 10-14 day intervals. Do not make more than two applications a year.

Do not apply within 21 days of harvest. Apply a minimum of 5 gal/A by air or 10 gal/A by ground. Do not feed soybean forage or hay to livestock.

ZOLERA FX *(fluoxastrobin + tetraconazole)* Mode of action 11, 3 (QoI, DMI)

Application rate: 4.4-6.8 fl oz/A

REI: 12 hours

Targeted diseases: Frogeye leaf spot *(Cercospora sojina)*, Powdery mildew *(Microsphaera diffusa)*, Brown spot *(Septoria glycines)*, Cercospora blight and leaf spot *(Cercospora kikuchii)*, Pod and stem blight *(Diaporthe phaseolorum)*, white mold *(Sclerotinia sclerotiorum)*.

Restrictions: For optimum results, begin applications preventively. Under severe disease conditions, the higher specified rate should be used. Apply a minimum of 10 gal/A by ground, 2 gal/A (5 gal/A for white mold) by air, or through chemigation in sufficient water to obtain thorough coverage of plants.

Do not apply more than 6.8 fl oz (0.09 lb ai tetraconazole, 0.09 lb ai fluoxastrobin) per acre per application. A maximum of one application may be made per year.

If tank mixing or sequentially applying another product containing tetraconazole, do not apply more than 0.150 lb ai tetraconazole per acre per year. If tank mixing or sequentially applying another product containing fluoxastrobin, do not apply more than 0.36 lb ai fluoxastrobin per acre per year. Do not apply within 30 days of seed harvest. Do not graze or feed treated forage or hay to livestock.