2021 South Dakota Pest Management Guide

Wheat

A guide to managing weeds, insects, and diseases.

South Dakota Department of Agriculture

SDSU Extension

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.

This book was published by SDSU Extension. For more information in the fields of agriculture, farming and rural living available in print, electronically, or on-line, visit extension.sdstate.edu.

This publication was developed through funding from SDSU Extension and the National Institute of Food and Agriculture, Crop Protection and Pest Management, Applied Research and Development Program support through grant 2017-04417.

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.

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2,000 copies, $1.28 each, SDSU Extension. Printed on recycled paper. FS525W P-00011 12/20

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Weed Control in Wheat, Small Grains and Millet

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Herbicide Suggestions
Information in this publication is based on research by the South Dakota Agricultural Experiment Station 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.

This information provides a summary of herbicide uses and does not imply a guarantee. The label is the legal source of information.

Rates
Rates for most treatments are stated as the amount of product per acre; however, rates for MCPA, 2,4-D, bromoxynil, and glyphosate are stated as acid equivalent (ae) per acre. Refer to the charts provided to determine the amount required for the specific product being used.

Time to Apply
The time to apply most treatments is based on crop and/or weed growth stage.

Cost
The cost for low and high rates is listed. Cost of additives is not included. Prices vary. Consult your dealer for actual price.

Resistance Management
Refer to the table on the next page 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 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.

Abbreviations Used

oz = ounce
pt = pint
qt = quart
gal = gallon
lb = pound
gpa = gallon per acre
lb/gal = pound per gallon
A = acre
L = liquid or EC
G = granule
DF = dry flowable (spray)
EC = emulsifiable concentrate
ai = active ingredient
ae = acid equivalent
AMS = ammonium sulfate
COC = crop oil concentrate
MSO = methylated (processed) seed oil
NIS = non-ionic surfactant
SG = soluble granule
WDG = water dispersible granule
WSP = water soluble packet
XP = extruded paste
UAN = Urea+ammonium nitrate liquid fertilizer
%v/v = percent volume per volume

Group Numbers Associated with Herbicide Sites or Modes of Action

WSSA Group Number	Site or Mode of Action	Examples
1	ACCase inhibitor	fenoxaprop, clodinafop
2	ALS inhibitor	mesosulfuron, flucarbazone
3	Microtubule inhibitor	trifluralin
4	Growth regulator	2,4-D, dicamba
6	Photosynthesis inhibitor (contact)	bromoxynil
7	Photosynthesis inhibitor (urea)	propanil
8	Lipid synthesis inhibitor (thiocarbamates)	triallate
9	EPSP inhibitor	glyphosate
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WHEAT, RYE, BARLEY, TRITICALE, MILLET, and OATS (not planted with legumes)

TREFLAN *(trifluralin)* Site of Action: 3 **($3.00-9.90)**

1-1.5 pt Treflan 4L (0.5-0.75 lb ai)
5-7.5 lb Treflan TR-10 10G (0.5-0.75 lb ai)

Trifluralin is available in additional brand products; including Trust, Triflurex, and others.

TARGET WEED: FOXTAIL
Spring application after planting, shallow incorporated. Incorporate 1 to 1.5 inches deep with two flextine or spike-tooth harrowing. Plant seed 2 to 3 inches deep. Does not control wild oats. Better crop tolerance than fall-incorporated application. Minimum carrier is 5 gpa. Do not plant oats or sorghum the following year. Do not apply where Treflan or Sonalan was applied at a rate greater than 0.5 lb ai the previous season.

Spring preplant incorporated. Barley only. Spray or granules. Use 1 pt Treflan 4L or 5 lb per acre Treflan 10G. Incorporate within 24 hours. Incorporated with a second pass before planting; for granules allow at least 7 days before the second pass.

Fall-Applied, preplant incorporated. Granules preferred. Apply after September 1. Granules may be applied into standing stubble. Incorporate within 24 hours. Make second incorporation in the spring before planting. Consistent foxtail control. Crop tolerance may be adequate; however, some stand reduction may be noted in certain conditions. Note precautions as for spring application.

HARD RED SPRING WHEAT, DURUM, and BARLEY. Apply liquid in spring after planting and incorporate shallowly or apply in the fall and incorporate. Apply granules in fall and incorporate. May be applied in the spring preplant and incorporated before planting for barley only. Not for winter wheat or rye.

5-10 lb Treflan TR-10 10G (0.5-1 lb ai) **($6.60-13.20)**

FALLOW. Use for foxtail control during the fallow period. Plant hard red spring, or durum wheat, and barley the following spring. Incorporate within 24 hours. Complete the second incorporation whenever escaping weeds make it necessary. Plant seed 2 inches deep.

PROWL H2O, SATELLITE HYDROCAP or STEALTH *(pendimethalin)* Site of Action: 3 **($8.10-19.70)**

1.5-3 pt Prowl H2O or Satellite HydroCap 3.8L (0.71-1.42 lb ai)
1.8-3.6 pt Stealth 3.3L (0.74-1.5 lb ai)

Selective herbicide for the control of most annual grasses and some broadleaf weeds. Use rates are dependent on soil texture. Emerged weeds will not be controlled, tank-mix with other labeled herbicides to control emerged weeds. The addition of an adjuvant is not necessary when applied alone but may be recommended with tank-mixes. Follow adjuvant directions on tank-mix labels.

Minimum carrier is 5 gpa for aerial application and 10 gpa for ground application. Do not apply more than 3 pt (3.8L) or 3.6 pt (3.3L) per season. Do not apply within 60 days of grain or straw harvest, within 28 days of hay harvest, or within 11 days of forage harvest. Rotation intervals are dependent on rate of pendimethalin applied, see label for specific restrictions.

WHEAT (SPRING OR WINTER). Stealth only. Preemergence or delayed preemergence. Plant wheat at least 1 inch deep.

WHEAT (SPRING OR WINTER), or TRITICALE. Postemergence: Apply from the first leaf stage but before flag leaf is visible. Plant wheat at least 0.5-1 inch deep.

FALLOW. Apply to stubble following harvest. Do not make more than one application during a fallow period before planting fall cereal crops. Allow at least 4 months between application and planting with at least 12 inches precipitation.

FAR-GO or AVADEX *(triallate)* Site of Action: 8 **($15.10-24.25)**

1-1.5 qt Far-go 4L (1-1.5 lb ai)
10-15 lb Avadex 10G (1-1.5 lb ai)

TARGET WEED: WILD OAT
SPRING WHEAT, DURUM, BARLEY, TRITICALE. Spring Application. Control is fair to very good. Spray formulation preferred. Incorporate immediately into the top 2 inches of soil either before seeding or after planting with two harrowings. Use Far-go at 1 qt for spring and durum wheat or 1.5 qt for barley and triticale. Apply Avadex 10G at 10-12.5 lb for spring wheat or durum and apply 12.5-15 lb for barley or triticale. Use the low rate when seeding wheat with a press drill. Best wheat tolerance when applied after planting.

BUCKLE *(triallate + trifluralin)* Site of Action: 8 + 3 **($16.30-24.40)**

10-15 lb Buckle 13G (1.3-2 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL
Intended for residual control of wild oats, green and yellow foxtail, and downy brome suppression in winter wheat, durum wheat, and barley. Best results if granules are incorporated within 24 hours after application to a depth not exceeding 3-4 inches.

BARLEY Spring Application. Apply 10-12.5 lb/A for barley or barley/pea mix. To incorporate, use equipment such as a culti- harrow but not disc implements. A second incorporation at a right angle may improve efficacy.

WINTER WHEAT, DURUM, BARLEY Fall Application. Apply 10-12.5 lb/A for barley or durum wheat or 12.5-15 lb/A for winter wheat. If incorporating with a single pass in the fall, a second incorporation must be performed in the spring during seedbed preparation. Avoid working the soil in the spring any deeper than fall tillage. If no spring work is anticipated, than two incorporations must be completed in the fall. Buckle may be applied at 10 lb/A in the fall prior to planting spring wheat in Corson, Dewey, Harding, Perkins, and Ziebach counties. Average soil temperature from 0-2 inches deep must be less than 40 degrees F. at the time of application. Do not plant wheat deeper than 1.5-2 inches and delay planting until soil is 45 degrees F or warmer. There is a risk of crop injury on hilltop soils. Crop rotation restriction is 12 months for peas and lentils and 16 months for sorghum, proso millet, corn, or oats.

PRE-PARE *(flucarbazone)* Site of Action: 2 **($3.40-6.75)**

0.15-0.3 oz Pre-Pare 70WDG (0.006-0.013 lb ai)

TARGET WEEDS: CHEATGRASS SUPRESSION, FOXTAILS, WILD OATS
Intended to be tank-mixed with a burndown herbicide such as glyphosate to improve control of grass species such as “cheatgrass” (downy or Japanese brome), mustards, and provide residual control for wild oat and foxtail suppression. SDSU trials have demonstrated good wild oat and green foxtail control when Pre-Pare was applied prior to spring wheat emergence, but a low rate of a postemergence grass herbicide may be needed to control escapes in dense weed infestations. In some SDSU trials, grass escapes did not reduce wheat yield. Pre-Pare contains a similar active ingredient (flucarbazone) as Everest 3.0. Activity may be reduced if there is no rain within 7-10 days after application.

Do not apply over coarse textured soils with low organic matter (less than 1%) and high pH (above 8). Do not apply preplant or preemergence ahead of durum wheat. Do not apply more than a total of 0.027 lb a.i. Pre-Pare or Pre-Pare followed by Everest 3.0. Do not apply Pre-Pare as a preplant or preemergence ahead of Batalium herbicide in the same crop. Do not mix, load, or clean spray equipment within 33 feet or spray within 50 feet of a well head or standing water, such as marshes, ditches, ponds, lakes, etc.

For foliar activity, add NIS at.0.25% v/v. For increased activity, add liquid nitrogen fertilizer up to 50% of spray solution in spring applications or AMS at an equivalent of 1.5 lb N/A to the NIS. If mixing with glyphosate, use only approved adjuvants for glyphosate. Recommended carrier is 5-10 gpa for ground applications or 3 gpa for aerial applications.

Rotation restriction is 9 months for barley, canola, dry edible beans, flax, safflower, soybeans (6 months for STS soybeans), sunflowers; 11 months for corn or field peas; or 24 months for lentils or mustard. Risk for carryover may increase after prolonged cool or dry soil conditions.

WINTER or SPRING WHEAT. Apply preplant or preemergence. 0.2-0.3 oz for winter wheat or 0.15-0.3 oz spring wheat depending on PH and OM.

MESOTRIONE PRODUCTS *(mesotrione)* Site of Action: 27 **($3.55-15.80)**

3-6 oz Callisto, Argos, Bridle, Calleron, Cavallo, Explorer, Incinerate, Meso, Meso Star, Mesotrione, MesoTryOne, Motif, Quartz or Sotrion 4L (0.094 + 0.19 lb ai)

TARGET WEEDS: LAMBSQUARTERS, PIGWEEDS, SEVERAL OTHERS
For oats and pearl millet only. Controls several common broadleaf weed species, such as kochia, lambsquarters, pigweed, mustard, and velvetleaf, and common ragweed.

If weeds are emerged at the time of application, add a NIS (0.25% v/v) or COC (1% v/v). Using COC rather than NIS may increase the risk of crop injury. In addition to NIS or COC, UAN (28%N, 2.5% v/v) or AMS (8.5 lb/100 gal. spray solution) may be added for improved weed control but it is not required, and it may increase the risk of oat injury. Do not make more than one application per year. Minimum carrier is 10 gpa ground. Do not apply by air. Rotate to corn, flax, pearl millet, oats, and sorghum anytime; wheat, barley, and rye 4 months; alfalfa, canola, peas, soybeans and sunflowers 10 months; and most other crops 18 months.

OAT. Apply 6 fl oz/A for preemergence applications or 3 fl oz/A for postemergence (after weed and oat emergence) applications. Do not apply both pre and post emergence and make only one application per year. Apply to weeds less than 5 inches tall. Postemergence applications may result in temporary oat injury, which may include leaf bleaching, leaf burn, or stunting. Tank-mixing with other herbicides or pesticides (particularly those with EC formulations) may increase the risk of foliar oat injury. Do not graze or feed forage within 30 days or harvest for 50 days after application.

PEARL MILLET. Apply up to 6 oz/A after planting but prior to millet emergence. Tolerance has been good in SDSU trials.

MCPA AMINE or MCPA ESTER Site of Action: 4 **($1.50-3.60)**

0.25-0.5 lb ae MCPA amine or MCPA ester (0.25-0.5 lb ae)

TARGET WEEDS: SOME BROADLEAVES
Selective, translocated herbicides for annual broadleaves. Equal to 2,4-D on wild mustard, lambsquarters, and Canada thistle. Weeds must be small; early spraying is important. Less effective than 2,4-D on larger weeds. Kochia and wild buckwheat control usually unsatisfactory. Excellent crop tolerance at a wide range of stages. Avoid spraying at boot to heading. Most situations require 0.33 to 0.5 lb ae per acre. Ester forms have appeared slightly more effective on some species. Apply by air or ground. Do not graze dairy or slaughter animals on treated areas for 2 weeks after treatment.

WINTER WHEAT, RYE. Apply in the spring after tillering but before early boot. MCPA is not widely used alone because other treatments frequently give better control of weed problems.

HARD RED SPRING WHEAT, DURUM, BARLEY. Apply from the 5-leaf to early boot stage. Frequently used in combination treatments.

OAT. Apply at the 3-4 leaf stage. Excellent crop tolerance.

2,4-D AMINE or 2,4-D ESTER Site of Action: 4 **($0.75-2.50)**

0.25-0.5 lb ae 2,4-D amine or 2,4-D ester (0.25-0.5 lb ae)

TARGET WEEDS: BROADLEAVES
Selective, translocated herbicide for several annual and perennial broadleaved weeds. Best choice for field bindweed. Very good control of several annual broadleaves but less effective for kochia or wild buckwheat. Good crop tolerance at proper growth stage. Avoid treating at boot to heading. Better crop tolerance with amine.

Ester usually used at slightly lower rate than amine. Rates of 0.33 lb ester or 0.5 lb ae amine per acre have been satisfactory for most general broadleaved problems. Rate of 0.25 lb ae per acre will control small susceptible weeds such as wild mustard. Use maximum rate for perennials. Some labels allow rates to 0.75 lb ae per acre for improved perennial control if some crop injury can be tolerated. Apply by air or ground. Label does not support preplant applications. Do not graze dairy or slaughter animals on treated areas for 2 weeks after application.

Harvest aid application of 1 lb ae per acre may be made after the dough stage. Do not use straw for feed.

WINTER WHEAT, RYE. Apply in spring when crop is fully tillered until early boot. Do not apply in fall.

HARD RED SPRING WHEAT, DURUM, BARLEY. Apply from the 5-leaf to early boot stage after crop has tillered. Earlier treatment may reduce number of tillers.

OAT. Apply only 2,4-D amine at 0.25-0.33 lb ae/A at the 3-4 leaf stage. Do not apply at boot or heading. Crop tolerance is marginal and varies among varieties. Considerable yield reduction is possible. Weak on wild buckwheat and kochia. Higher rates for larger weeds or perennials.

MILLET. Apply 2,4-D amine 3.8L at 0.5-1 pt/A from 5-leaf to early boot stage after crop tillering. Earlier treatment may reduce number of tillers.

DICAMBA PRODUCTS Site of Action: 4 **RESTRICTED USE PESTICIDE** **($0.60-3.20)**

2-4 oz dicamba 4L (0.06-0.12 lb ae)

Dicamba is available in several products including **Banvel**, **Clarifier**, **Clarity**, **Clash**, **Detonate**, **Diablo**, **Dicamba**, **Disha DMA**, **Opti-DGA**, **Oracle**, **Rifle**, **Sterling Blue**, **Strut**, **Vision**, and others.

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Excellent broadleaved weed control, including wild buckwheat and kochia. Use lower rates for small susceptible weeds under favorable growing conditions. Use higher rates for best kochia control. Application time is usually too early for maximum perennial control. Crop stage is critical. Late applications may cause injury. Lower rates improve crop tolerance and may be adequate if conditions are favorable; however, even lower rates should not be applied past recommended crop stages. Minimum carrier is 3 gpa for ground and 1 gpa for air.

For lactating dairy animals do not graze for 7 days and do not harvest hay for 37 days after application. There are no grazing restrictions for non-lactating animals. Wait 22 days to plant wheat, barley, oat and other grasses per 8 oz of dicamba.

Labeling allows preharvest application in winter and spring wheat and barley. Apply 8 oz after crop is in hard dough stage; allow at least 7 days before harvest. May tank mix with other herbicides labeled for preharvest such as 2,4-D. Do not graze or feed straw from treated fields. Test germination if crop is used for seed purposes.

WINTER WHEAT. Apply in the spring before jointing stage of crop. Not for rye.

SPRING WHEAT, DURUM. Apply at the 3-4 crop leaf stage for best tolerance. Do not apply if the crop exceeds the 6-leaf stage. Durum is slightly less tolerant than hard red spring.

BARLEY. Apply 2-3 oz before barley exceeds the 4-leaf stage. Poor crop tolerance. See dicamba labels for other tank-mix partners. Tank-mixing with 2,4-D is not recommended for early season applications.

TRITICALE. Apply dicamba at 2-4 oz per acre. Apply prior to jointing for winter types and prior to 6-leaf stage for spring types. Tank-mix with bromoxynil for better performance. Disha DMA, Oracle and Rifle not labeled for triticale.

OAT. Apply at the 3-4 oat leaf stage. Do not apply after the 4-leaf stage. Crop tolerance is adequate within the narrow application window. Adding MCPA improves mustard control. Do not tank-mix with 2,4-D.

PROSO MILLET. Apply 4 oz with 0.375 lb ae 2,4-D at the 2-5 leaf crop stage. Crop tolerance is marginal. Banvel, Diablo, Disha DMA, Oracle and Rifle are not labeled for proso millet.

OTHER TANK-MIXES – WHEAT. Rates of dicamba 4L are 2-3 oz in most situations. A rate of 3 fl oz dicamba 4L + 0.25- 0.38 lb ae MCPA or 0.25-0.38 lb ae 2,4-D amine suggested for most situations; ester forms not recommended. MCPA in the combination gives best crop safety. Dicamba 4L at 2-4 oz may be used in two-way tank-mixes with other herbicides including Ally, Ally Extra, Amber, Express, Finesse, Harmony Extra, Peak, bromoxynil, bromoxynil + MCPA, Curtail, and Stinger. These combinations control additional weeds and improve control of weeds less susceptible to dicamba. Dicamba 4L at 3-4 oz may be tank-mixed with reduced rates of other herbicides including Ally (0.05 oz); Amber (0.14 oz); Express; and Finesse (0.16 oz) per acre. Reduced rate combinations suggested for small weeds under good conditions.

SPECIAL THREE-WAY TANK-MIXES – WHEAT. Dicamba 4L at 3-4 oz per acre may be used in 3-way combinations. These mixtures have potential where there is concern for resistant weeds and a need for broad spectrum control. Several combinations include dicamba 4L + 2,4-D + one of the following: Ally 60XP, Amber, Finesse, or tribenuron 75DF.

DICAMBA + 2,4-D PRODUCTS *(dicamba +2,4-D)* Site of Action: 4 + 4 **($1.70-5.10)**

1.5-2 pt Outlaw 2.54L (0.2-0.27 + 0.27-0.36 lb ae)
0.5-1.33 pt Spitfire 3.57L (0.031-0.08 + 0.19-0.51 lb ae)
0.5-1.33 pt Brash, Magma, Range Star, Rifle-D, Weedmaster 3.9L (0.06-0.17 + 0.18-0.48 lb ae)
0.5-1 pt Saddle-Up 4L (0.063-0.125 + 0.188-0.375 lb ae)
0.5-1.2 pt BurnMaster 4.07L (0.063-0.15 + 0.192-0.46 lb ae)
1.25 pt Latigo 4.2L (0.28 + 0.38 lb ae)
1-1.25 pt Brush-Rhap 4.2L (0.22-0.28 + 0.3-0.38 lb ae)

TARGET WEEDS: BROADLEAVES. For general broadleaf weed control. Several broadleaf herbicide tank-mix options, such as Aim (0.3 oz), Ally (0.05-0.1 oz), bromoxynil (1-1.5 pt), Curtail (2-2.67 pt), and others.

Harvest aid application in wheat up to 1.33 pt/A Brash, Magma, Outlaw, Range Star, Rifle-D, Spitfire, Weedmaster, up to 1.2 pt BurnMaster, up to 1.25 pt/A Brush-Rhap or Latigo or up to 2 pt/A Outlaw when wheat is in the hard dough stage and the nodes (joints) are no longer green. Wait 7 days after application until harvesting. Do not use on wheat being used for seed.

WHEAT. Apply 0.5-1 pt Brash, BurnMaster, Magma, Range Star, Rifle-D, Saddle-Up, Spitfire, Weedmaster, 1 pt Brush-Rhap, 1.5 pt Outlaw, or 1.25 pt Latigo after tillering but before the 6-leaf stage in spring wheat and from tiller to before jointing in winter wheat.

PERMIT or SANDEA *(halosulfuron)* Site of Action: 2 **($11.75-29.75)**

0.5-0.66 oz Permit or Sandea 75DF (0.023-0.03 lb ai)

Halosulfuron is a selective herbicide for the control of annual broadleaf weeds. Apply to actively growing weeds. Minimum carrier is 10 gpa for ground, 5- gpa for air. Add NIS at 0.25-0.5% v/v. COC/MSO at 1% v/v may be used with Permit. COC or MSO may cause crop injury. May also add UAN at 2-4 qt/A or AMS at 2-4 lb/A with Permit.

Do not exceed 0.66 oz in a year. Do not harvest grain or straw for 50 days or hay for 37 days. Rotation interval is 1 month for corn, 2 months for most small grains, forage grasses and sorghum, 9 months for soybeans, clovers, and peas 15 months canola, 18 months sunflower. Check label for other crops.

PROSO MILLET. Apply postemergence from 2 leaf stage to before heading. If applied during stressful conditions, a temporary stature reduction may occur 7-10 days following application.

YUKON *(dicamba + halosulfuron)* Site of Action: 4 + 2 **($12.55-16.75)**

3-4 oz Yukon 67.5WG (0.1-0.14 + 0.023-0.031 lb ai)

Provides more broadspectrum control than halosulfuron alone. Yukon is a selective herbicide for the control of annual broadleaf weeds. Apply to actively growing weeds. Minimum carrier is 10 gpa for ground, 5- gpa for air. Add NIS at 0.25-0.5% v/v or COC at 1% v/v, or MSO at 1% v/v. COC or MSO may cause crop injury at higher Yukon rates. May also add UAN at 2-4 qt/A or AMS at 2-4 lb/A.

Do not exceed 4 oz/A Yukon in a year. Do not harvest grain or straw for 50 days or hay for 37 days. Rotation interval is 1 month for corn, 2 months for most small grains and sorghum, 9 months for soybeans, 15 months for canola, 18 months for sunflower. Check label for other crops.

PROSO MILLET. Apply postemergence to 3-5 leaf millet. If applied during stressful conditions, a temporary stature reduction may occur 7-10 days following application.

STARANE ULTRA, FLAGSTAFF or FLUROX *(fluroxypyr)* Site of Action: 4 **($9.15-12.20)**

0.3-0.4 pt Starane Ultra, Flagstaff or Flurox 2.8L (0.11-0.14 lb ae)

TARGET WEEDS: KOCHIA, ANNUAL BROADLEAVES
Starane Ultra is a translocated postemergence herbicide used to control certain broadleaf weeds. Fluroxypyr provides an alternative mode of action to control ALS-resistant kochia biotypes. Labeling also includes cocklebur, sunflower, common ragweed, and Venice mallow. Mustard, Russian thistle, pennycress, wild buckwheat, and other broadleaves may require tank-mix partners. Starane has been tested extensively in SDSU tests; kochia control has been excellent and crop tolerance very good. Lower rates have been satisfactory for kochia in SDSU tests. Weeds should be actively growing.

Minimum carrier is 8 gpa for ground or 3 gpa for air. Do not graze or harvest forage within 8 days of application. Rainfast 1 hour after application.

Allow at least 40 days after application before harvesting grain or straw. Only wheat, barley, or oats may be planted in treated fields within 120 days of application.

WINTER WHEAT, SPRING WHEAT, DURUM, OATS, TRITICALE and BARLEY. Apply from the 2-leaf crop stage up to and including flag leaf. Follow crop stage guidelines for the most restrictive product when tank-mixing.

COMET *(fluroxypyr)* Site of Action: 4 **($4.40-5.85)**

0.5-0.66 pt Comet 1.5L (0.09-0.12 lb ae)

Comet is a translocated postemergence herbicide used to control certain broadleaf weeds. Fluroxypyr provides an alternative mode of action to control ALS-resistant kochia biotypes. Apply to actively growing weeds 8 inches or less. Rates vary depending on weed sizes.

Minimum carrier is 5 gpa for ground or 3 gpa for air. Do not harvest forage or graze treated areas within 7 days of application. Do not apply within 40 days of harvest grain and straw or within 14 days before cutting hay. Avoid drift or contact to susceptible broadleaf plants and crops.

WHEAT, OATS, and BARLEY. Apply from the 2-leaf crop stage up to and including flag leaf. Do not apply more than 1 application or 1 1/3 pt per growing season.

MILLET. Apply from the 2-leaf to early boot stage. Apply before weeds are 4 inches tall. Allow 14 days between applications. Do not apply more than 2 applications or 1 1/3 pt per growing season.

COLT+SALVO or TRUMP CARD *(fluroxypyr + 2,4-D)* Site of Action: 4 + 4 **($6.90-20.65)**

1-1.33 pt Colt + Salvo 3.75 L (0.093-0.125 + 0.375-0.5 lb ai)
1.25-2 pt Trump Card 3.31 L (0.01-0.165 + 0.41-0.66 lb ai)

TARGET WEEDS: KOCHIA, ANNUAL BROADLEAVES
Adding 2,4-D with Starane improves control of some broadleaf weed species, such as prickly lettuce, mustard species, wild buckwheat, lambsquarters, pigweed, and others. Colt + Salvo rates are 1 to 1.33 pt/A. The high rate is equivalent to 6 oz Starane Ultra and 1 pt 2,4-D ester. Trumpcard is slightly less concentrated, but the rates of active ingredient are slightly higher. For example, Trumpcard rates are 1.25-2 pt/A. The high rate is equivalent to 8 oz/A Starane Ultra and 1.3 pt/A 2,4-D ester.

WINTER WHEAT, SPRING WHEAT, DURUM, and BARLEY. Apply from the 2-leaf crop stage up to and including flag leaf.

MILLET, Trump Card only Apply from 2-leaf to pre-boot stage Apply 10-12 oz or up to 16oz if weeds are large do not graze for seven days or hay for 14 days or harvest for seed or straw for 40 days. Remove grazing animals two days before slaughter.

COLT+SWORD or VOUCHER *(fluroxypyr + MCPA)* Site of Action: 4 + 4 **($8.50-13.40)**

1.125-1.5 pt Colt + Sword 3.55L (0.1-0.13 + 0.4-0.53 lb ai)
1.125-1.5 pt Voucher 3.24L (0.09-0.12 + 0.37-0.49 lb ai)

TARGET WEEDS: KOCHIA, ANNUAL BROADLEAVES
Adding MCPA to Starane increases activity on mustards, pigweed, lambsquarters, and other broadleaf weed species. Adding MCPA is generally not as effective as 2,4-D, but MCPA often has greater crop safety which is particularly important for sensitive crops such as oats. The high rate of Colt + Sword is equivalent to 6 oz Starane Ultra + 1 pt MCPA ester 4.

Minimum carrier for ground applications is 8 gpa or 3 gpa for aerial applications. Rainfast 1 hour after application. Adjuvants may improve control during stressed environmental conditions (e.g., drought, cool temperatures, etc.). Do not cut for hay for 14 days or harvest grain or straw for 40 days.

WINTER WHEAT, SPRING WHEAT, DURUM, BARLEY, and OATS. Apply from the 3-leaf crop stage up to and including flag leaf. Apply to small (less than 8 inches tall), actively growing weeds.

STARANE FLEX *(fluroxypyr + florasulam)* Site of Action: 4 + 2 **($7.90)**

13.5 oz Starane Flex 0.875L (0.088 lb ae + 0.004 lb ai)

TARGET WEEDS: KOCHIA, BUCKWHEAT, MUSTARDS
Starane Flex is a premix of fluroxypyr (e.g., Starane) and florasulam (e.g., Orion). Adding florasulam improves control of some annual broadleaf weed species, such as wild buckwheat, mustard species, and others.

Minimum carrier rate is 8 gpa for ground applications or 3 gpa for aerial applications. Rainfast 4 hours after application. Adjuvants only needed during adverse conditions, such as when weeds are slightly stressed, kochia is very small, low carrier volumes are used, the tank-mix partner requires an adjuvant, etc. Do not apply during severe stress, such as drought, cold temps, etc., as that can increase the risk of crop injury. Crop rotation intervals are 3 months to corn or sorghum, 9 months for soybeans, sunflower, alfalfa, safflower, lentils, peas, dry beans, chickpeas, and canola, and 12 months for all other crops not listed on the label.

WHEAT (including DURUM), BARLEY, OATS, RYE, TRITICALE. Apply to small (less than 4 inches tall), actively growing weeds when the crop is between the 3-leaf and flag leaf emergence growth stages.

STARANE NXT *(fluroxypyr + bromoxynil)* Site of Action: 4 + 6 **($10.00-19.60)**

14-27.4 oz Starane NXT 2.9L (0.06-0.12 + 0.25-0.5 lb ae)

TARGET WEEDS: KOCHIA, BUCKWHEAT, ANNUAL BROADLEAVES
Starane NXT may control similar weeds as Starane (fluroxypyr) alone, plus additional weed species such as wild buckwheat, lanceleaf sage, and several mustard species. Rates depend on the targeted weed species to be controlled.

Minimum spray volume is 8 gpa for ground application or 3 gpa for aerial application. A NIS or COC may improve control when using low carrier volumes, applying during adverse growing conditions (cool temperatures, low humidity, or drought), or when applying to small, heavily pubescent kochia. Do not graze, harvest straw or grain for 45 days. Any crop may be replanted in treated fields 120 days after application.

FALL or SPRING SEEDED WHEAT (including DURUM), BARLEY, OATS and TRITICALE. Apply after the 3-leaf growth stage but prior to flag leaf emergence.

PIXXARO EC *(fluroxypyr + halauxifen)* Site of Action: 4 + 4 **($6.95)**

6 oz Pixxaro EC 2.43EC (0.11 + 0.005 lb ai)

TARGET WEEDS: KOCHIA, WILD BUCKWHEAT, PIGWEED SPECIES, LAMBSQUARTERS, OTHER ANNUAL BROADLEAF WEED SPECIES
Intended for greater kochia control and broader weed control spectrum than fluroxypyr alone. Provides more fluroxypyr than other premix products, such as WideMatch and PerfectMatch. Relative to fluroxypyr alone, the addition of Arylex (halauxifen) provides some additional kochia activity and control of additional broadleaf weed species such as pigweed species and lambsquarters. Pixxaro EC only suppresses Canada thistle and mustard species, so tank mix partners may be needed.

Minimum carrier is 8 gpa for ground applications or 5 gpa for aerial applications. Adjuvants not necessary, but may improve activity during adverse growing conditions, small heavily pubescent kochia, or low carrier volumes.

Crop rotation interval is 14 days for field corn, oats, sorghum; 4 months for soybeans, millet, sunflower; 9 months for alfalfa, many pulse crops, camelina, safflower, and 15 months for crops not listed on the label.

SPRING WHEAT (including DURUM), WINTER WHEAT, BARLEY, or TRITICALE: Apply from the 2 leaf wheat stage up to flag leaf emergence. Best control may occur when weeds are < 4 inches tall and actively growing.

SENTRALLAS *(fluroxypyr + thifensulfuron)* Site of Action: 4 + 2 **($6.90-13.80)**

7-14 oz Sentrallas 1.56L (0.07-0.14 + 0.014-0.027 lb ae)

TARGET WEEDS: KOCHIA, ANNUAL BROADLEAVES
Sentrallas is a translocated postemergence herbicide used to control certain broadleaf weeds. Fluroxypyr provides an alternative mode of action to control ALS-resistant kochia biotypes. Labeling also includes cocklebur, sunflower, common ragweed, and Venice mallow. Mustard, Russian thistle, pennycress, wild buckwheat, and other broadleaves may require tank-mix partners. Kochia control has been excellent and crop tolerance very good. Weeds should be actively growing.

Minimum carrier is 8 gpa for ground or 3 gpa for air. Rainfast 1 hour after application. Add NIS 0.06-0.25%v/v or COC at 1%v/v and 2-4qts/A UAN or 2 lb/A AMS.

Allow at least 45 days after application before harvesting grain or 30 days for hay or forage for 7 days. Do not graze or harvest forage within 7 days of application. All crops may be planted in treated fields 120 days after application.

WINTER WHEAT, SPRING WHEAT, DURUM, and BARLEY. Apply 7-14 oz Sentrallas from the 2-leaf crop stage tobefore flag leaf. Follow crop stage guidelines for the most restrictive product when tank-mixing.

OATS Apply 7-9 oz Sentrallas from the 3 leaf crop stage up to jointing. Do not apply to Ogle, Porter, or Premier varieties. Follow crop stage guidelines for the most restrictive product when tank-mixing.

SCORCH *(dicamba + 2,4-D + fluroxypyr)* Site of Action: 4 + 4 + 4 **($3.40-8.90)**

0.5-1.3 pt Scorch 4.77L (0.063-0.163 + 0.19-0.49 + 0.047-0.122 lb ae)

TARGET WEEDS: ANNUAL BROADLEAVES
Scorch controls annual broadleaf weed species such as wild buckwheat, lambsquarters, pigweed, kochia, Russian thistle, and others. Higher rates increase risk of crop injury. Minimum carrier is 2 gpa for air or 10 gpa for ground applications. Do not add sufactants or oils postemergence. For millet; may graze 7 days and harvest for hay 37 days after application. For all other crops listed; do not graze or harvest for livestock feed prior to crop maturity and preharvest interval is 40 days.

WINTER WHEAT Apply up to 1.3 pt in the fall after tillering. Cold and wet weather may increase risk of crop injury.

WHEAT, BARLEY, OATS, TRITICALE. Apply 0.5-1 pt in the spring after tillering to before jointing stage.

PROSO MILLET. Apply 1 pt to 2-5 leaf millet before weeds are 4 inches. May cause crop injury.

STINGER, BITE, CLEAN SLATE, SPUR or STIGMATA *(clopyralid)* Site of Action: 4 **($6.40-22.60)**

0.25-0.33 pt Stinger, Bite, Clean Slate, Spur or Stigmata 3L (0.09-0.12 lb ae)

TARGET WEEDS: CANADA THISTLE, SOME ANNUAL BROADLEAVES
Especially effective for Canada thistle; also controls annual broadleaves such as sunflower and cocklebur. Very good crop tolerance. Use the high rate for Canada thistle. Stinger may be tank-mixed with bromoxynil, dicamba, MCPA, 2,4-D, Ally, or Express for improved control of other species. Commercial premix of Curtail generally preferred for use in small grain. Plant barley, canola, corn, flax, oats, or wheat anytime, 10.5 months for alfalfa, grain sorghum, or safflower, for most other crops 18 months and conduct a field bioassay.

WINTER WHEAT, HARD RED SPRING WHEAT, DURUM, OAT, and BARLEY. Apply at 3-leaf to early boot crop stage.

WIDEMATCH, COLT AS, FAR REACH, TRUSLATE or WHIPLASH **($9.75-12.95)**
(clopyralid + fluroxypyr) Site of Action: 4 + 4

1-1.33 pt WideMatch, Colt AS, Far Reach, Truslate, or Whiplash 1.5L (0.09-0.12 + 0.09-0.12 lb ae)

TARGET WEEDS: ANNUAL BROADLEAVES
WideMatch is a premix containing 0.75 lb clopyralid (Stinger) plus 0.75 lb fluroxypyr (Starane) per gallon. It controls several annual and perennial broadleaved weeds, including clover, dandelion, kochia, curly dock, ragweed, several thistles, and biennial wormwood. Weak on mustards and common lambsquarters. Wild buckwheat must be treated early. Crop tolerance is excellent to both components.

Rates are 1 to 1.33 pt per acre. The low rate is suggested for small, susceptible weeds. The 1 pt rate provides the equivalent of 3.8 oz Stinger and 4.1 oz Starane Ultra. Minimum carrier is 8 (10 for Widematch) gpa for ground or 3 gpa for air. Additives are not required but may improve control under difficult conditions. For wheat, liquid fertilizer up to 50% of the total volume may be used. Rainfast 6 hours after application. Do not graze treated areas or harvest forage for 7 days or cut hay for 14 days or harvest grain or straw for 40 days. Avoid spreading manure or using hay or straw from treated areas for mulching or use on land to be planted to susceptible broadleaf crops.

Barley, grasses, oats, corn, and wheat can be planted anytime. Avoid planting flax and canola for 120 days; alfalfa, sorghum, safflower, sunflower, field peas, dry beans, and soybeans for 10.5 months; chickpeas and lentil for 18 months.

WHEAT (WINTER, SPRING, DURUM), OATS, and BARLEY. Apply from the 3-leaf through flag leaf emergence crop stage.

WIDEARMATCH *(clopyralid + fluroxypyr+ halauxifen)* Site of Action: 4 + 4 + 4 **($13.00)**

14 oz WideARmatch 1.88L (0.09 + 0.11 + 0.004 lb ae)

TARGET WEEDS: ANNUAL BROADLEAVES
WideARmatch is a premix containing 0.82 lb clopyralid, 1.02 lb fluroxypyr and0.04 lb halauxifen per gallon. It controls several annual and perennial broadleaf weeds, including clover, dandelion, horseweed, lambsquarters, kochia, curly dock, ragweed, and several thistles. Provides suppression of pennycress, Russian thistle and wild mustard. Crop tolerance is excellent.

Minimum carrier is 8 gpa for ground or 5 gpa for air. Additives are not required but may improve control under difficult conditions. Liquid fertilizer may be used as the carrier at up to 50% of the total volume. Do not apply more than 30 lbs of N per acre. Rainfast 1 hour after application. Do not apply more than once per season. Do not graze treated areas for 7 days or harvest grain for 60 days. Do not harvest hay. Allow 7 days before transferring grazing livestock to sensitive broadleaf crops.

Barley, triticale and wheat can be planted anytime. Rotation interval is 14 days for corn and oats; 4 months for canola and millet; 9 months for flax; 10.5 months for rye and sorghum; 10.5 months with >7 inches precipitation for alfalfa, dry bean, field peas, soybean, sunflower, and safflower and 18 months for most other crops.

WHEAT (including DURUM), TRITICALE and BARLEY. Apply from the 2-leaf up to flag leaf emergence crop stage.

WELD or TRUSLATE PRO *(clopyralid + fluroxypyr + MCPA)* Site of Action: 4 + 4 + 4 **($7.85-15.75)**

1-2 pt Weld or TruSlate Pro 2.9L (0.063-0.125 + 0.08-0.16 + 0.22-0.44 lb ae)

TARGET WEEDS: ANNUAL BROADLEAVES
Weld contains similar active ingredients as WideMatch (clopyralid + fluroxypyr), but Weld contains slightly less clopyralid relative to fluroxypyr. However, Weld also contains MCPA to enhance control of common lambsquarters and mustard species.

Rates are 1 to 2 pt per acre. Apply 1-1.5 pt/A to weeds less than 4 inches tall. The 1.5-2 pt/A rate is intended for dicamba resistant kochia (not yet confirmed in SD). Add additional herbicides as tank-mix partners to control difficult species, high weed densities, larger weeds, difficult growing conditions, etc.

Rotation restriction is 120 days for canola, brassica species, flax, and turnips; 10.5 months for sorghum, safflower, soybeans, sunflowers, dry beans, alfalfa (18 months for soybean, sunflower, dry beans, and alfalfa if less than 15 inches rainfall and soil O.M. < 2%); 18 months for lentils and peas. There is no rotation restriction for corn. Minimum carrier rate is 8 gpa for ground applications or 3 gpa for aerial applications. Rainfast 6 hours after application. Avoid spreading manure or using hay or straw from treated areas for mulching or use on land to be planted to susceptible broadleaf crops.

WHEAT (including DURUM), OATS, and BARLEY. Apply from the 3-leaf through flag leaf. Apply to actively growing weeds less than 4 inches tall.

HAT TRICK, BOOMER or FULL DECK *(clopyralid + fluroxypyr + MCPA)* Site of Action: 4 + 4 + 4

1.5-2 pt Hat Trick 2.8L (0.09-0.12 + 0.09-0.12 + 0.3-0.5 lb ai)
1.5-2pt Boomer 2.91L (0.04-0.05 + 0.09-0.12 +0.4-0.6 lb ai)
1-1.5 pt Full Deck 3.71L (0.07-0.11 + 0.08-0.12 + 0.3-0.47 lb ai)

TARGET WEEDS: CANADA THISTLE, ANNUAL BROADLEAVES
For slightly greater control of mustard species and lambsquarters relative to other clopyralid + fluroxypyr products or mixes. Apply Hat Trick at 1.5 pt/A to actively growing susceptible weeds that are less than 4 inches tall or 1.5-2 pt/A to weeds 4-8 inches tall or during adverse growing conditions. Risk of crop injury increases and weed control may decrease if extreme adverse conditions such as drought or near freezing temperatures occur within 3 days of application. Weed control may decrease if foliage is wet at the time of application or if temperatures are less than 45ºF or greater than 85ºF during application. Rainfast within 6 hours after application.

Minimum carrier volume is 3 gpa for ground or aerial applications. Using at least 10 gpa may result in the best control. Adding NIS is not necessary but may be used during adverse growing conditions or for small pubescent kochia. Rotation restriction is 120 days for brassica (mustard) crop species, 10.5 months for alfalfa, sunflower, safflower, soybeans, sorghum, and dry beans, and 18 months for lentils and peas. Do not allow livestock to graze or harvest treated fields for forage within 7 days of application. Do not cut for hay prior to 14 days after application or harvest for grain prior to 40 days after application.

WHEAT (including DURUM), BARLEY, OATS. Apply to actively growing weeds up to small grain jointing but prior to the boot stage.

CURTAIL or COMMANDO *(clopyralid + 2,4-D amine)* Site of Action: 4 + 4 **($15.10-20.10)**

2-2.66 pt Curtail or Commando 2.38L (0.095-0.13 + 0.5-0.66 lb ae)

TARGET WEEDS: CANADA THISTLE, ANNUAL BROADLEAVES
Commercial premix. Curtail contains 0.38 lb clopyralid + 2 lb ae 2,4-D amine per gal. Curtail has a supplemental 2(ee) label which allows for a reduced rate of 1.5 pt for annual weeds. Rates of 2 to 2.66 pt per acre are suggested for less susceptible annuals or perennial weeds. Crop tolerance is good. Clopyralid gives excellent seasonal control of Canada thistle; it also controls mustard, lambsquarters, sunflower, and cocklebur. Wild buckwheat control has been fair to good; kochia control is variable. Thistle should not exceed 6 inches or be past bud stage. Minimum carrier is 5 gpa for ground or 2 gpa for air. Do not harvest hay from treated fields. Do not rotate to any crop except small grain, corn, or forage grass for one year after treatment. Carryover is possible in dry or cool conditions.

WINTER WHEAT, HARD RED SPRING WHEAT, DURUM, and BARLEY. In spring after tillering up to jointing stage.

TANK-MIXES. Curtail may be tank-mixed with bromoxynil, dicamba, MCPA, or 2,4-D, Ally, Harmony Extra, and Express. Refer to each product for precautions and application directions.

CURTAIL M *(clopyralid + MCPA)* Site of Action: 4 + 4 **($14.15-18.60)**

1.75-2.3 pt Curtail M 2.77L (0.09-0.12 + 0.5-0.68 lb ae)

TARGET WEEDS: CANADA THISTLE, ANNUAL BROADLEAVES
Curtail M contains 0.42 lb clopyralid + 2.35 lb ae MCPA per gal. Apply 1.75 to 2.3 pt/A. Higher rates may be used during adverse conditions, but risk of crop injury will increase. Curtail M provides control of several annual broadleaf species and Canada thistle. Minimum carrier is 2 gpa, but at least 10 gpa is recommended for adequate coverage. Do not harvest hay from treated fields. Do not harvest within 72 days of application. Do not graze for 45 days after application. Crop rotation restriction is 30 days for barley, grasses, oats, or wheat; 60 days for field corn; 5 months for canola and flax; 10.5-18 months (depending on O.M. and rainfall) for alfalfa, dry beans, sorghum, safflower, soybeans, and sunflowers; and 18 months for lentils and peas. May be rainfast 6 hours after application.

WHEAT, OATS, and BARLEY. Apply after 3 leaves have unfolded but prior to the jointing stage. For Canada thistle control between jointing and the boot stage, apply only if the risk of crop injury is acceptable. Apply to weeds after emergence but smaller than 3 inches tall or wide.

TANK-MIXES. Do not tank-mix with 2,4-D or dicamba unless crop injury is acceptable.

BROMOXYNIL PRODUCTS *(bromoxynil)* Site of Action: 6 **($5.90-15.15)**
BROMOXYNIL + MCPA or 2,4-D Site of Action: 6 + 4 **($5.10-11.00)**

Trade Names	Concentration Per Gallon	Use Rates
Broclean, Brox, Maestro 2EC, Moxy	2 lb ae bromoxynil	1-2 pt/A
Bison, Brox M, Bromac, Maestro MA, Vendetta, WildCard Xtra	2 lb ae bromoxynil + 2 lb ae MCPA	1-1.5 pt/A
Bromac Advanced, Maestro Advanced	2.5 lb ae bromoxynil + 2.5 lb ae MCPA	0.8-1.6 pt/A
Maestro D, Double Up B+D	2 lb ae bromoxynil + 1.9 lbae 2,4-D est	0.75-1.5 pt/A
Deadbolt	2.5 lb bromoxynil + 3.125 lb 2,4-D est	0.8-1.25 pt/A

TARGET WEEDS: WILD BUCKWHEAT, SUNFLOWER, SEVERAL ANNUAL BROADLEAVES
Bromoxynil is a contact herbicide with excellent crop tolerance. Applications with 2,4-D or MCPA in a tank-mix or commercial premix may improve weed control in many situations. Bromoxynil/MCPA premix contains bromoxynil and MCPA ester. Broad- spectrum annual broadleaf control. Excellent wild buckwheat and good kochia control. Not for perennials. Weeds should be in the 1-4 leaf stage. Very good crop tolerance at a wide range of growth stages.

Rate of 0.25 lb bromoxynil + 0.25 lb ae MPCA per acre has been satisfactory for small weeds under favorable growing conditions. Use 0.38 lb ae per acre of each for larger weeds or less favorable conditions.

Good coverage required. Carrier rate is 10 gpa for ground or 5 gpa for air. Reduced carrier to 5 gpa for ground or 3 gpa for air may result in reduced control.

Rates of bromoxynil 2L to 2 pt or 4L to 1 pt per acre may be used on winter wheat. Use high rates of MCPA for best perennial weed control. An additional 0.25 lb ae per acre MCPA may be added to the rates listed in the combination. MCPA provides better crop tolerance than combinations with 2,4-D. Some labels recommend a maximum of 1 pt per acre bromoxynil when tank-mixing with 2,4-D whereas 2 pt per acre bromoxynil may be applied when tank-mixing with MCPA. MCPA ester formulation suggested. Avoid treating during adverse growing conditions, such as cold temperatures. Tank-mixing with some EC formulated fungicides may increase the risk of leaf burn. Do not graze treated fields for 30-45 days depending on Label.

WINTER WHEAT, RYE. Apply bromoxynil in spring after crop green up but before the crop has reached boot stage. When tank-mixed with 2,4-D, apply from fully tillered up to jointing stage and with MCPA apply from 3-leaf to boot.

HARD RED SPRING WHEAT, DURUM, BARLEY. Apply bromoxynil at emergence to early boot stage. When tank-mixed with 2,4-D, apply from fully tillered up to jointing stage and with MCPA apply from 3-leaf to boot.

TRITICALE. Apply bromoxynil alone as for wheat.

OAT. When tank-mixed with 2,4-D, apply from fully tillered up to jointing stage and with MCPA apply from 3-leaf to boot. Some reports of floret abortion if applied after the 5-leaf stage. Lower rates preferred for best crop safety.

OTHER TANK-MIXES. Tank-mixes for special situations include bromoxynil or premix products with dicamba, Amber, Curtail, Express, Finesse, and Harmony Extra. Bromoxynil is also labeled for use with several herbicides for grass control but may antagonize some grass herbicides.

PREMIXES

CARNIVORE or CLEANSWEEP M *(bromoxynil + fluroxypyr + MCPA)* **($8.80-13.20)**
Site of Action: 6 + 4 + 4

1-1.5 pt Cleansweep M or Carnivore 4L (0.2-0.3 + 0.08-0.12 + 0.2-0.3 lb ae)

TARGET WEEDS: WILD BUCKWHEAT, KOCHIA, RUSSIAN THISTLE, PRICKLY LETTUCE, RAGWEED, LAMBSQUARTERS
Do not harvest for hay within 14 days after application; harvest forage or graze within 45 days; or harvest grain and straw within 40 days after application. Do not apply more than 2.4 pt/A per growing season. The risk for crop injury increases and weed control efficacy declines if applied during adverse growing conditions, such as drought or near freezing temperatures.

WHEAT, BARLEY, OATS. Apply after the 2-leaf stage up to flag leaf emergence. Best if applied when weeds are less than 8 inches tall. May apply 1 pt/A to weeds less than 4 inches tall or 1.5 pt/A to weeds 4-8 inches tall or during adverse growing conditions.

KOCHIAVORE, CLEANSWEEP D *(bromoxynil + fluroxypyr + 2,4-D)* **($9.45-14.20)**
Site of Action: 6 + 4 + 4

1-1.5 pt Cleansweep D 4.25L (0.2-0.3 + 0.08-0.12 + 0.25-0.38 lb ae)
1-1.5 pt Kochiavore 4L (0.21-0.31 + 0.08-0.125 + 0.21-0.31 lb ae)

For control of several common broadleaf weed species, such as wild buckwheat, kochia, mustards, lambsquarters, prickly lettuce, common ragweed, and several others. Use the higher rate when weed densities are high or growing conditions are poor.

Do not graze or harvest forage within 45 days after application or harvest for hay within 14 days after application. Do not harvest grain or straw within 40 days. Do not feed straw to livestock. Do not apply more than 1.5 pt/A per growing season. The risk for crop injury increases and weed control efficacy declines if applied during adverse growing conditions, such as drought or near freezing temperatures.

WHEAT, BARLEY. Apply Kochiavore from 4 leaf to flag leaf.

WHEAT, BARLEY, OATS, TRITICALE. Apply Cleansweep D after full tiller but prior to jointing.

HUSKIE *(pyrasulfotole + bromoxynil)* Site of Action: 27 + 6 **($10.35-14.10)**

11-15 oz Huskie 2.06L (0.028-0.038 + 0.15-0.21 lb ai)

TARGET WEEDS: KOCHIA, MUSTARDS, PRICKLY LETTUCE, LAMBSQUARTERS, WILD BUCKWHEAT, OTHERS
Standard rate is 11 oz/A, but may use 13-15 oz/A for improved control of difficult weeds or Canada thistle suppression. May provide very good control of kochia, Russian thistle, prickly lettuce, lambsquarters, pigweed, mustards, and several other broadleaf weed species. Huskie may be tank-mixed with several grass and broadleaf herbicides.

Add nitrogen fertilizer and/or NIS to improve control. AMS at 0.5-1 lb/A is the preferred N source, but may use UAN at 1-2 qt/A. NIS may be added at 0.25-0.5% v/v. Combinations of NIS and either AMS or UAN may be added at these rates. Minimum carrier is 10 gpa for ground applications (5 gpa with AMS under ideal conditions) or 5 gpa for aerial applications. Rainfast 1 hour after application. Do not graze or harvest forage for 25 days or harvest straw or grain for 60 days.

Crop rotation restrictions are 7 days for wheat, barley and sorghum, 1 month for oats, rye, and triticale; 4 months for millet, corn and soybeans; 9 months for canola, chickpeas, dry beans, flax, field peas, safflower, and sunflowers, a field bioassay is needed before planting any crop not listed in carryover section.

WHEAT, DURUM, BARLEY, TRITICALE, and RYE. Apply from 1 leaf up to flag leaf emergence. Best if applied to young broadleaf weeds (1-6 inches tall) that are actively growing.

HUSKIE COMPLETE *(pyrasulfotole + bromoxynil + thiencarbazone)* **($22.85)**
Site of Action: 27 + 6 + 2 **Restricted Use Pesticide**

13.7 oz Huskie Complete 2.39L (0.028 + 0.22 + 0.004 lb ai)

TARGET WEEDS: ANNUAL BROADLEAVES, GRASSES
Standard rate is 13.7 oz/A (do not apply more). Intended to control annual broadleaf weeds, similar to those controlled by Huskie, and annual grass weed species, such as wild oat, foxtails (green and yellow), and barnyardgrass.

Crop rotation restrictions are 3 months for wheat; 9 months for corn, barley, alfalfa, canola, dry beans, flax, oats, peas, soybeans, grain sorghum, and sunflowers; 18 months for lentils. All other crops require a bioassay. Minimum carrier rate is 10 gpa for ground applications or 5 gpa for aerial applications. Rainfast 1 hour after application. Adjuvants not necessary. Do not harvest forage for 25 days, hay for 30 days, and grain or straw for 60 days after application.

SPRING OR WINTER WHEAT (including DURUM). Apply from 1 leaf up to 60 days prior to harvest. Best if applied to young (1-6 inches tall), actively growing weeds.

TALINOR *(bicyclopyrone + bromoxynil)* Site of Action: 6 + 27 **($12.40-16.45)**

13.7-18.2 oz Talinor 1.77L (0.033-0.044 + 0.156-0.208 lb ai)

Controls several common broadleaf weed species, including wild buckwheat, marestail, kochia, lambsquarters, mustard, waterhemp and others. Minimum carrier is 10 gpa for ground and 5 gpa for aerial applications. Always add the surfactant CoAct+ (included in the copak) based on the rate of Talinor used. For a Talinor rate of 13.7, 16, or 18.2 oz/A add 2.75, 3.2 or 3.6 oz/A of CoAct+ respectively. May also add COC (1%v/v) or NIS (0.25%v/v), however COC is preferred. Do not add AMS as it may result in severe crop injury. May be tank-mixed with many broadleaf and grass herbicides.

Make only one application per year with a maximum of 18.2 oz/A Talinor or 0.5 lb/A bromoxynil or 0.045 lb/A bicyclopyrone. If an organophosphate or carbamate insecticide is tank-mixed with or applied within 7 days before or after Talinor severe crop injury may occur. Do not graze or harvest hay for 30 days. Allow 60 days before grain harvest. Do not feed straw to livestock for 60 days.

SPRING WHEAT, WINTER WHEAT, and BARLEY. Apply from the 2-leaf stage to pre-boot stage. Best results when weeds are actively growing.

TRIUMPH or PICLORAM 22K + 2,4-D or MCPA *(picloram + 2,4-D or MCPA)* **($0.55-0.85)**
Site of Action: 4 + 4 **Restricted Use Pesticide**

1-1.5 oz Triumph or Picloram 22K 2L + 0.25-0.5 lb ae MCPA (0.016-0.023 + 0.25-0.5 lb ai)
1-1.5 oz Triumph or Picloram 22K 2L + 0.25-0.5 lb ae 2,4-D (0.016-0.023 + 0.25-0.5 lb ai)

Tank-mix. Selective translocated herbicide used primarily where wild buckwheat is the major problem, also good on sunflowers. Tank-mix helps with control of other small broadleaves. Not effective on kochia. Crop tolerance acceptable. May see some crop height reduction. Do not harvest for 50 days. Do not graze or feed forage for 14 days. Do not harvest hay from treated fields. Rotate only to barley, oats, wheat, grain sorghum, grass or fallow the following year. Minimum carrier is 2 gpa air, 5 gpa ground.

SPRING WHEAT, BARLEY, and OATS. Apply from 3-5 leaf stage to early jointing. Best results when weeds are in the 2 to 4 leaf stage. Do not use the 2,4-D mix on oats.

AIM *(carfentrazone)* Site of Action: 14 **($3.20-6.35)**

0.5-1 oz Aim EC 2L (0.008-0.016 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Aim is a postemergence herbicide with contact activity on broadleaf weeds. It has provided good control of susceptible and ALS-resistant kochia. Aim also has fair to good activity on wild buckwheat, pigweed, and black nightshade. Pennycress and wild mustard have also been controlled in SDSU tests. Weed response is rapid. Good coverage is important. Crop tolerance at the lower rate appears adequate; temporary leaf chlorosis may be noted. High moisture and humidity increase the risk of leaf speckling.

Minimum carrier is 10 gpa for ground or 3 gpa for air. Add NIS at 2 pt/100 gal. Under stress conditions AMS at 2 to 4 lb or 28% N may be added at 2 to 4 gal/100 gal. Do not use Aim postemergence with COC, MSO, or silicone-based surfactants. Corn, wheat, barley, sorghum, oats, soybeans and other registered crops may be planted anytime; other crops may be planted after 12 months. Do not harvest for forage for 7 days after application. Do not apply more than 2 oz/A per season.

WINTER WHEAT. Apply from 4 inch to boot stage.

SPRING WHEAT, DURUM, BARLEY, RYE, OAT, TRITICALE, PROSO AND PEARL MILLET. Apply from 4 inch up to jointing stage.

TANK-MIXES. May mix Aim at 0.5-1 oz/A with 2,4-D at 0.25 lb ae/A or MCPA (ester or amine) at 0.375 lb ae/A. Aim may be tank-mixed with several other broadleaf or grass herbicides. Refer to other labels for specific instructions and restrictions.

ORION *(florasulam + MCPA ester)* Site of Action: 2 + 4 **($10.30)**

17 oz Orion 2.37L (0.004 + 0.311 lb ai)

TARGET WEEDS: ANNUAL BROADLEAVES
Controls several common broadleaves weed species, such as lambsquarters, pigweed, mustard, common ragweed, wild buckwheat, and several others.

Does not require an adjuvant. Minimum carrier volume is 3 gpa for air or 8 gpa for ground application. Preharvest interval is 60 days. Rainfast 4 hours after application. Rotation restrictions are less than 12 months for most crops. Crop may be grazed 7 days after application.

WINTER WHEAT, SPRING WHEAT, DURUM, BARLEY, OATS, RYE, TRITICALE. Apply from the 3-leaf crop growth stage to jointing. Results may be best when applied to small, actively growing weeds.

QUELEX *(florasulam + halauxifen)* Site of Action: 2 + 4 **($4.50-6.10)**

0.55-0.75 oz Quelex 20.4 WG (0.0034 + 0.0036 - 0.0047 + 0.0049 lb ai)

TARGET WEEDS: BROADLEAVES
Controls several broadleaf weed species, such as wild buckwheat, lambsquarters, pigweed, mustards, and several others. Tank mix partner may be needed for additional broadleaf weeds, such as kochia and Canada thistle.

Minimum carrier is 8 gpa for ground applications, 5 gpa for aerial applications. When applied alone, add NIS at 0.2-0.5% v/v, or COC or MSO at 0.5-1.0% v/v. Adjuvant not required if mixing with another herbicide that is an emulsifiable concentrate (EC) formulation, such as 2,4-D ester or MCPA ester. Rainfast 4 hours after application. Do not apply more than 2.25 oz Quelex per year. Do not graze until 7 days after application or cut for hay until 21 days after application. Rotation intervals are 3 months for corn, soybean, millet, oats, sorghum, sunflower; 9 months for alfalfa, peas, dry beans, chickpeas, and safflower.

SPRING WHEAT, WINTER WHEAT, DURUM, BARLEY and TRITICALE. Apply 0.75 oz between the 2-leaf stage and flag leaf emergence. Best results may occur when broadleaf weeds are 2-4 leaf stage and less than 4 inches tall and actively growing. For winter wheat, may be applied in fall or spring to emerged weeds. May also be applied as a preplant/ preemergence burndown after weed emergence but prior to crop emergence at 0.55 – 0.75 oz per acre.

HARMONY 50SG, TREATY, or VOLTA *(thifensulfuron)* Site of Action: 2 **($2.95-34.55)**

0.45-0.9 oz Harmony 50SG (0.014-0.028 lb ai)
0.3-0.6 oz Treaty, Volta 75 WDG (0.014-0.028 lb ai)

TARGET WEEDS: MUSTARDS, ANNUAL BROADLEAVES
Harmony controls several annual broadleaved weeds. Gives very good to excellent control of Russian thistle, wild sunflower, and buckwheat. Does not control ALS-resistant kochia. Weeds should be actively growing and free of moisture stress. Grass is not controlled. Apply after weeds are emerged but less than 3 inches tall or across for best results. Crop tolerance is very good. Wheat, barley, and oats may be planted any time after application, any other crop may be planted 45 days after application. Do not graze or feed forage or hay from treated areas. Harvested straw may be used for bedding and/or feed.

Apply 0.3 to 0.6 oz 75DF or 0.45 to 0.9 oz 50SG per acre. Use 0.5 to 0.6 oz 75DF or 0.75-0.9 50SG per acre for most situations if wild buckwheat is a significant problem. Sequential treatments may be applied provided total amount applied does not exceed 0.047 lb ai/A. Add NIS at 0.25%-0.5% v/v (1 to 2 qt/100 gal) or COC (1% v/v or 2% under arid conditions). Minimum carrier is 5 gpa for flat fan nozzles on ground equipment; 10 gpa for flood nozzles on 30 in spacing, and higher volume for wider spacing. Minimum carrier is 2 gpa for air. May be applied in liquid nitrogen fertilizer carrier. Do not use Harmony plus malathion as crop injury will occur.

WINTER WHEAT, HARD RED SPRING WHEAT, DURUM, BARLEY, and TRITICALE. Postemergence after the crop is in the 2-leaf stage but before the flag leaf is visible.

OAT. Rates are 0.45-0.6 oz/A. Apply after the 3-leaf stage but before jointing. Do not apply to Ogle, Porter, or Premier varieties as injury can occur. Crops affected by drought or prolonged cold, wet conditions are less tolerant. Using a COC rather than NIS may increase the risk of crop injury. Do not make more than one application per season on oat.

TANK-MIXES. Harmony may be tank-mixed with dicamba, 2,4-D, Curtail, Express, Ally, or bromoxynil to control additional weed species. For specific tank-mix recommendations, refer to individual labels and sections in this guide for each product.

FALLOW. Apply in the spring or fall when the majority of weeds have emerged and are actively growing. May be tank-mixed with Fallowmaster, glyphosate+2,4-D, glyphosate+dicamba, 2,4-D, or dicamba.

1:1 RATIO THIFENSULFURON: TRIBENURON PRODUCTS Site of Action: 2 + 2 ($4.35-12.05)

0.4-1 oz Affinity BroadSpec, Audit 1:1, T-Pac, Edition Broadspec, Rapport Broadspec (0.006-0.016 + 0.006-0.016 lb ai)

Controls several broadleaf weeds species when applied alone, such as mustard species, pigweed species, lambsquarters, and wild buckwheat. A tank-mix partner is recommended for difficult weed species. For Canada thistle, apply 0.8 oz/A when thistle is 4-8 inches tall or add 2,4-D (0.5-0.75 pt/A of 4 lb ai/gallon product) or dicamba (2-4 fl oz/A Banvel or Clarity) for improved control. For common ragweed or lanceleaf sage, apply 0.4 to 0.8 oz/A Affinity BroadSpec plus 2,4-D ester (0.5-0.75 pt/A of 4 lb ai/gallon product). For kochia, Russian thistle, and prickly lettuce, apply in a tank-mix with fluroxypyr (e.g., Starane), dicamba, and 2,4-D or in a tank-mix with bromoxynil and 2,4-D. See label for more specific details regarding tank- mixes.

Add a NIS at 0.06-0.5% v/v. In addition to the surfactant, an ammonium nitrate fertilizer, such as 28% N or 32% N, may be added at 2 qt/A or spray grade ammonium sulfate at 2 lb/A or double these fertilizer rates under dry conditions. May use a COC at 1% v/v, or 2% v/v when conditions are dry. Select adjuvants that are authorized with the tank-mix partner.

Minimum carrier for ground application is 5 gpa for flat-fan nozzles or 10 gpa for flood nozzles. Minimum carrier for aerial application is 2-5 gpa. Do not graze or feed treated plants to livestock.

WHEAT, BARLEY, TRITICALE. Apply after the 2-leaf stage but before the flag leaf is visible.

OAT. Apply after the 3-leaf stage but prior to jointing. Do not apply on Ogle, Porter, or Premier varieties. Do not make more than one application per year. Risk of crop injury increases during stressful growing conditions (drought, flood, disease/insect damage, low fertility, etc.). Crop is most susceptible to injury during the 2-5 leaf stage.

2:1 RATIO THIFENSULFURON: TRIBENURON PRODUCTS Site of Action: 2 + 2 ($5.70-11.40)

0.3-0.6 oz Treaty Extra, Nimble or T-Square 75WDG (0.009-0.019 + 0.005-0.009 lb ai)
0.45-0.9 oz Harmony Extra 50SG

Controls several common broadleaf weed species, such as mustards, pigweed and wild buckwheat, but add a tank-mix partner for most weed species. For Canada thistle 4-8 inches tall, apply 0.6 oz/A of 75DF or 0.9 oz/A 50SG with surfactant plus 2,4-D (0.25-0.38 lb ae/A). For common cocklebur, common ragweed, and lanceleaf sage, apply 0.4-0.5 oz/A of 75DF or 0.6-0.75 oz/A 50SG with 2,4-D (0.25-0.38 lb ae/A). For kochia, Russian thistle, and prickly lettuce less than 2 inches tall, apply with dicamba + 2,4-D or bromoxynil + 2,4-D. See label for additional tank-mix options.

Add a NIS at 0.25-0.5% v/v. For ground applications, minimum carrier volume is 5 to 13 gpa depending on nozzles. Minimum carrier is 2 to 5 gpa for aerial applications. Do not graze or feed treated plants to livestock.

WHEAT, BARLEY, TRITICALE. Apply after the crop is in the 2-leaf stage but before the flag leaf is visible. May make 2 applications, but do not exceed 1 oz/A of 75DF or 1.5 oz/A of 50SG per crop season.

OAT. Apply after the 3-leaf stage but before jointing. Do not apply more than 0.4 oz/A of 75 DF or 0.6 oz/A of 50SG. Do not make more than one application per crop season on oats. Do not use on Ogle, Porter, or Premier varieties.

4:1 RATIO THIFENSULFURON: TRIBENURON PRODUCTS Site of Action: 2 + 2 ($5.40-9.15)

0.6-1 oz Affinity TankMix, Audit 4:1, Edition TankMix, Rapport TankMix 50WDG (0.015-0.025 + 0.004-0.006 lb ai)

Intended to be tank-mixed with other broadleaf or grass herbicides, such as bromoxynil, 2,4-D, dicamba, fluroxypyr, carfentrazone, and several other broadleaf and grass herbicides. The label describes several tank-mix options for specific weed species or weed communities.

Add a NIS at 0.25-0.5% v/v. In addition to a surfactant, a nitrogen fertilizer may be added such as UAN (28% or 32% N) at 2 qt/A or AMS at 2 lb/A. May use a COC at 1 gallon per 100 gallons of spray solution (1% v/v) or 2% v/v when conditions are dry. Select adjuvants that are authorized with the tank-mix partner. Do not graze or feed treated plants to livestock.

Minimum carrier for ground application is 5 gpa for flat-fan nozzles or 10 gpa for flood nozzles. Minimum carrier for aerial application is 2-5 gpa.

WHEAT, BARLEY, TRITICALE. Apply to wheat or barley after the 2-leaf stage but before the flag leaf is visible.

OAT. Apply after the 3-leaf stage but before jointing. Do not apply on Ogle, Porter, or Premier varieties. Using COC rather than NIS will increase the risk of crop injury. Do not apply more than 0.75 oz/A and do not make more than one application per year.

EXPRESS or VICTORY *(tribenuron)* Site of Action: 2 **($4.10-8.20)**

0.25-0.5 oz Express 50SG (0.008-0.16 lb ai)
0.17-0.33 oz Victory 75DF (0.008-0.16 lb ai)

TARGET WEEDS: SOME ANNUAL BROADLEAVES
Use as tank-mix with other broadleaf herbicides. It is a sulfonyl urea with very little soil activity. Gives good to excellent control of wild mustard, pennycress, Russian thistle, and non-ALS kochia. Control of wild buckwheat, smartweed, and sunflower is more variable. Weeds should be less than 4 inches tall or across and be actively growing. Crop tolerance is satisfactory. Warm temperature and good soil moisture enhance results. There are no rotational restrictions.

Rates are 0.25 to 0.5 oz Express 50SG and 0.17 to 0.33 oz 75DF per acre. Use 0.25-0.38 oz/A Express or 0.17-0.25 oz/A 75 DF for light infestations when conditions are favorable. Use 0.5 oz Express or 0.33 oz 75 DF for less tolerant species and for Canada thistle suppression. Add NIS (0.5-4 pt per 100 gal) or COC (1 gal per 100 gal or 2 gal per 100 gal during arid conditions). MSO may be added at 2 qt per 100 gal if specified by a Company program. In addition, a N fertilizer such as UAN (28% or 32% N) at 2 qt/A or AMS at 2 lb/A may be added. The N rate may be doubled during arid conditions. Sequential treatments may be made but do not exceed 0.5 oz/A Express or 0.33 oz/A 75 DF.

Minimum carrier is 5 gpa for flat fan nozzles in ground equipment; 10 gpa for flood nozzles on 30 inch spacing, and higher volume for wider spacing. Minimum carrier is 2 gpa for air. May be applied in liquid nitrogen carrier. Risk of crop yellowing is increased with surfactant and fertilizer carrier. Do not tank-mix with Malathion or Lorsban insecticide. Mixes with organophosphate insecticides may produce crop discoloration or injury. Do not graze or feed forage from treated fields. Straw may be used for feed or bedding. Rotation interval is 1-45 days depending on specific crop, soil texture and pH.

Tank-mix with other herbicides improves consistency and reduces the risk of resistant weeds. Tank-mixes with 2,4-D or MCPA (0.12-0.38 lb ae) used for most situations. Add 1-2 pt NIS when tank-mixing 0.12 lb ae 2,4-D or MCPA and 1 pt NIS when tank-mixing 0.25-0.38 lb ae 2,4-D or MCPA. Combinations with bromoxynil or dicamba have provided very good control of weeds such as wild buckwheat. There are many other tank-mix options available, see label for specific recommendations.

WINTER WHEAT, SPRING WHEAT, BARLEY, and TRITICALE. Postemergence after crop is in the 2-leaf stage but before flag leaf is visible. Do not harvest within 45 days of application.

OTHER TANK-MIXES. Express may also be tank-mixed with broadleaf herbicides such as Aim or Curtail or grass herbicides such as Everest, Discover, or Outrider/Maverick. Express may be used in 3-way combinations to manage weed resistance.

FALLOW. Provides short-term annual broadleaf weed control; including kochia, lambsquarters, pigweed, and winter annual mustards. Apply in spring before planting or after cereal crop harvest in reduced tillage systems. May be tank-mixed with most herbicides labeled for fallow. Tank-mix with 2,4-D or dicamba is suggested for wild buckwheat, kochia, prickly lettuce, and Russian thistle. Rates as for application alone.

SUPREMACY *(thifensulfuron + tribenuron + fluroxypyr)* Site of Action: 2+2+4 **($7.75-9.70)**

4-5 oz Supremacy 42DF (0.011-0.014 + 0.0038-0.0047 + 0.09-0.11 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Supremacy contains similar active ingredients as Audit (thifensulfuron + tribenuron at the 3:1 ratio) at 0.4 oz product/A (which is the low rate) and Starane Ultra (fluroxypyr) at 0.25 pt/A. Intended to control several common broadleaf weed species, such as pigweed species, mustard species, common lambsquarters, kochia, wild buckwheat, and several others. Consider tank- mixing another growth regulator herbicide (Site of Action 4) for prickly lettuce control. Several tank-mix options are available.

If using alone or with an amine (water soluble) herbicide, add a basic blend adjuvant at 0.5-1% v/v (2-4 qt per 100 gallons). If mixing with an ester or EC formulated herbicide, no adjuvant is required if applying at least 8 oz/A of the tank-mix partner. If less than 8 oz/A or during stressful growing conditions, NIS may be added at 0.25% v/v (1 qt per 100 gallons). Minimum carrier rate is 8 gpa for ground applications or 3 gpa for aerial applications. Rainfast 2 hours after application.

Rotation restriction is 45 days for corn or sorghum or 120 days for all other crops. Do not graze or feed forage or hay to livestock. Allow 45 days before the harvest of mature crop or straw for bedding or feed.

WHEAT (including DURUM), BARLEY, TRITICALE. Apply after the crop is in the 2-leaf stage but before the flag leaf is visible. Best if applied while weeds are actively growing.

OAT. Apply after the crop is in the 2-leaf stage but prior to jointing. Some oat varieties may be sensitive to ALS-inhibiting herbicides (site of action 2).

METSULFURON PRODUCTS *(metsulfuron)* Site of Action: 2 **($0.35-0.90)**

0.1 oz Ally 60XP, Ciramet, Patriot, Plotter 60, Purestand, MSM 60DF (0.004 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Ally is a sulfonyl-urea herbicide with some soil residual. Use as a tank-mix with other broadleaf herbicides. Residual properties extend control for 1 to 6 weeks. Pennycress, pigweed, prickly lettuce, wild mustard, and volunteer sunflower are among species most susceptible. Non-ALS kochia, wild buckwheat, Russian thistle, and tansy mustard are controlled or suppressed, depending on weed size and rainfall. Ally will not control wild oats or grasses. Results in field tests have been very good. Lower rates of 2,4-D or MCPA are adequate for susceptible weeds.

Symptoms develop slowly. Crop tolerance appears adequate at recommended rates. Apply when weeds are small but before they are 4 inches tall or across. Rainfall after application improves results. Use 1 to 2 qt surfactant per 100 gal. Use lower surfactant rate for combinations. Do not use on soil with pH over 7.9. Minimum carrier is 3 gpa for flat fan nozzles in ground equipment. Minimum carrier is 1 gpa for air. There are no grazing restrictions for Ally alone. Rainfast in 4 hours.

Follow rotational guidelines. Winter or spring wheat may be planted after 1 month; CRP grasses after 4 months if below 7.5 PH if 7.6-7.9 wheatgrasses only; durum, barley, or oats after 10 months; flax, safflower, soybeans and sunflower after 22 months. Grain sorghum or proso millet in the south part of the state (south of Hwy 212 east of the Missouri River and south of Hwy 34 west of the Missouri River) may be planted after 12 months if there has been 13 inches of precipitation between application and planting. Field corn may be planted after 12 months east of the Missouri River and west of the Missouri River south of Hwy 14 if there has been 15 inches of precipitation since application. All other crops require 34 mo and at least 28 inches precipitation. Do not apply to frozen or snow-covered ground.

ALS-resistant kochia biotypes are significant in most areas. Rotate crops and herbicides or use tank-mixes or sequential treatments that include other modes of action that are effective for kochia.

WINTER WHEAT, TRITICALE, BARLEY. Postemergence in spring when weeds are small and from 2-leaf to before boot stage.

DURUM. Postemergence from tiller to early boot stage. Use 2,4-D tank-mix.

PREHARVEST. Wheat, Barley, Triticale. Apply 0.1 oz Ally 60XP plus 0.25 to 0.5 lb ae 2,4-D ester with surfactant at 1 qt/100 gal. Crop should be at dough stage; allow at least 10 days before harvest. Do not feed straw or graze stubble after preharvest treatment.

TANK-MIXES. Ester forms of 2,4-D or MCPA perform best; surfactant can be reduced to 1 to 2 pt/100 gal. Surfactant improves control; crop tolerance may be reduced when used with the high rates of some combinations. Results on large mustard have been very good. Ally may be used in 3-way combinations. These mixtures have been useful to manage weed resistance.

ALLY EXTRA, ACCURATE EXTRA, or PLOTTER EXTRA **($2.60-4.30)**
(thifensulfuron + tribenuron + metsulfuron) Site of Action: 2 + 2 + 2

0.2-0.4 oz Accurate Extra 71.25WDG or Plotter Extra 72WDG (0.0089-0.018 lb ai)
0.3-0.5 oz Ally Extra 51.8SG (0.0097-0.016 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Accurate Extra 71.25DF 0.2-0.4 oz and Ally Extra 51.8SG 0.3-0.5 oz contains 0.005-0.009 lb ai thifensulfuron, 0.002-0.005 lbs ai tribenuron, and 0.002-0.004 lb ai metsulfuron. Very good to excellent control of mustard, pennycress, Russian thistle, wild sunflower, wild buckwheat, and several other annual broadleaves. At high rates (0.4 oz), wild buckwheat control is improved over either product used alone; residual effects will extend 4 to 6 weeks. Does not control ALS-resistant kochia. At low rates (0.2 oz) the potential residual is reduced compared to metsulfuron (Ally) alone. Labeling requires a tank-mix with another herbicide when using rates less than 0.4 oz. Grass is not controlled. Crop tolerance is good. Weeds should be actively growing and free of stress for best results.

The high rate is suggested for best results. It is equivalent to 0.1 oz Ally + 0.3 oz Harmony Extra per acre. Do not make more than one application of Ally Extra per crop season. Ally Extra may be tank-mixed with 2,4-D, MCPA, or other registered small grain herbicides. Ester formulation of 2,4-D or MCPA is preferred. Use the low surfactant rate with 2,4-D or MCPA tank-mixes. See the label for additional recommended tank-mix partners.

Minimum carrier is 5 gpa for flat fan nozzles in ground equipment; 10 gpa for flood nozzles on 30-inch spacing and higher volumes for wider spacing. Minimum carrier is 1 gpa for air. Add NIS at 1 to 2 pt/100 gal. May be applied in liquid nitrogen carrier. Do not tank-mix with Malathion. Do not harvest for 45 days after application. Do not graze treated areas or feed forage or hay from treated areas; however, straw may be used for bedding or feed.

Maximum soil pH is 7.9. Winter or spring wheat and triticale may be planted after 1 month; durum, barley, or oats after 10 months; flax or safflower after 22 months. Grain sorghum or proso millet in the southern part of the state (south of Hwy 212 east of the Missouri River and south of Hwy 34 west of the Missouri River) may be planted after 12 months if there has been 13 inches of precipitation between application and planting. Field corn may be planted after 12 months east of the Missouri River and west of the Missouri River south of Hwy 14 if there has been 15 inches of precipitation

since application. All other crops require 34 months and at least 28 inches precipitation. At 0.2 oz 71.25DF or 0.3 oz 51.86SG, grain sorghum may be planted after 4 months and safflower after 10 months and at pH 6.8 or less for peas, lentil, alfalfa, and dry beans the interval is 10 months; increase the interval to 22 months if pH is 6.9 to 7.9. At 0.3 oz 71.25DF or 0.4 oz 51.86SG, may rotate to sunflower after 10 months. At higher rates, the rotation interval for sunflowers is 22 months.

RESISTANT KOCHIA. Special management is required for resistant weed biotypes. Include herbicides with other modes of action if ALS-resistant kochia is present. Tillage and crop rotation are useful to reduce the development of resistant populations.

WINTER WHEAT, SPRING WHEAT, BARLEY, TRITICALE. Postemergence after the 2-leaf stage but before the flag leaf is visible.

DURUM. Postemergence after crop is tillered but before boot stage. When using on durum spring wheat, only use 2,4-D as a tank-mix partner and apply between tillering and the boot stage.

FALLOW. Apply in the spring or fall when most weeds have emerged and are actively growing. Winter or spring wheat may be planted in 1 month; durum wheat, barley and oats may be planted after 10 months.

AGILITY ***(dicamba + thifensulfuron + tribenuron + metsulfuron)*** Site of Action: 4+2+2+2 **($4.05-8.10)**

1.6-3.2 oz Agility 72.6SG (0.064-0.127 + 0.005-0.009 + 0.002-0.005 + 0.002-0.004 lb ai)

Agility 72.6SG at 1.6-3.2 oz is equivalent to 2-4 fl oz 4L dicamba product plus 0.2-0.4 oz Accurate Xtra 71.25DF or 0.3-0.5 oz Ally Extra 51.8SG. Relative to Ally Extra, Agility provides additional control of black nightshade, wild buckwheat, and velvetleaf. Apply 3.2 oz/A for heavy weed infestations or difficult species or apply 1.6-2.4 oz/A for light infestations and optimal conditions. Weed control may be reduced in dry, dusty conditions. Do not apply when the crop is stressed by severe weather conditions, drought, low fertility, water saturated soil, disease, or insect damage.

Recommended spray adjuvants, minimum carrier volume, and rotation restrictions are similar to Ally Extra.

WINTER WHEAT, BARLEY, TRITICALE. Apply after the crop is in the 2-leaf stage but before the joint stage.

SPRING WHEAT, SPRING TRITICALE. Apply after the crop is in the 2-leaf stage but before it exceeds the 6-leaf stage.

SPRING BARLEY. Apply after the crop is in the 2-leaf stage but before it exceeds the 4-leaf stage. Do not tank-mix with 2,4-D for early season applications.

AMBER ***(triasulfuron)*** Site of Action: 2 **($3.10-6.25)**

0.28-0.56 oz Amber 75DF (0.013-0.026 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Amber controls several annual broadleaved weeds. It is a sulfonyl-urea with extended soil residual activity. It is usually used in a tank-mix application. Pennycress, pigweed, tansy mustard, sunflower, and kochia are among the most sensitive species. Does not control ALS-resistant kochia. Wild buckwheat and Russian thistle control may be more variable, depending on weed size and conditions. Downy brome is included as suppression at special rates. Amber does not control wild oat or foxtail. Warm temperature and good moisture improve results. The addition of low rates of 2,4-D or dicamba is suggested.

Rates are 0.28 to 0.56 oz Amber 75DF per acre. The lower rates of 0.28 oz or 0.35 oz is suggested for most situations. The low rate is adequate for small, susceptible weeds and is used in most tank-mixes. The 0.47 oz rate is for larger, more difficult weeds. The maximum rate of 0.56 oz is suggested for suppression of downy brome. The maximum rate is 0.35 oz per acre for soils with a pH over 7.9. Minimum carrier is 3 gpa for ground or 2 gpa for air. Add NIS at 1 to 2 qt/100 gal. Follow grazing or haying restrictions for the tank-mix partner; no restrictions for Amber alone.

Follow rotation guidelines. Barley, rye, or oats may be planted in 6 months if pH is 6.9 or less or 18 months if higher pH. Corn may be planted in 4 months if IR hybrid is used; in 22 months if pH is 7.9 or less, or 36 months if higher pH. Proso millet may be planted in 4 months; grain sorghum 24 months; soybeans 36 months; sunflower 24 months and bioassay; other crops require bioassay. ALS-resistant kochia biotypes are significant in most areas. Rotate crops and herbicides or use tank-mixes or sequential treatments that include other modes of action and are effective for kochia.

RESISTANT KOCHIA. Special management of Amber is required to reduce the risk of increasing populations of weeds resistant to sulfonyl-urea herbicides. Tank-mixing postemergence applications with another herbicide having a different mode of action reduces the risk. Crop rotations and tillage are other important management practices. Do not apply Amber or other herbicides with a similar mode of action within 12 months of an Amber application, except for split Amber treatments. Increase the interval to 15 months if soil pH exceeds 7.5.

WINTER WHEAT – SPLIT APPLICATION. For soils less than 7.5 pH. Use 0.28 oz per acre for each application. The initial treatment may be soil applied or postemergence; the second application must be tank-mixed with another herbicide with a different mode of action.

WINTER WHEAT, HARD RED SPRING WHEAT. Preplant, shallow incorporated or preemergence. Use only disk drill if

preplant or shallow incorporated. Soil applied treatment provides downy brome suppression and control of susceptible winter annuals. Rainfall timing with application and weed emergence is important for performance.

WINTER WHEAT, SPRING WHEAT, DURUM, BARLEY. Postemergence. Wheat may be any stage up to preboot; barley should be at the 2-leaf to preboot stage.

OTHER TANK-MIXES. Amber may be tank-mixed with labeled rates of other herbicides including Curtail, or with Gramoxone or glyphosate for burndown.

FALLOW. Wheat may be planted after application; barley, rye, or oats may be planted 6 months after application according to soil pH and rate guidelines. Rate as for Amber alone.

RAVE *(dicamba + triasulfuron)* Site of Action: 4 + 2 **($3.25-6.45)**

2-4 oz Rave 58.8WDG (0.06-0.12 lb ae + 0.01-0.02 lb ai)

Rave is a commercial premix containing 50% dicamba + 8.8% triasulfuron (Amber). Weed control similar to Amber + dicamba tank-mix. The 4 oz rate provides equivalent to 4 oz of dicamba 4L per acre. Minimum carrier is 5 gpa for ground or 2 gpa for air. Add NIS at 1 to 2 pt/100 gal. Follow rotational guidelines for Amber. Rave may be tank-mixed with bromoxynil or bromoxynil/MCPA. Do not apply Rave for 60 days after an organophosphate insecticide.

WINTER WHEAT. After emergence to jointing.

SPRING WHEAT, DURUM. After emergence before 6-leaf stage.

BARLEY. After emergence to 4-leaf stage. Tolerance in barley is marginal; maximum rate for barley is 2 oz per acre.

FINESSE or REPORT EXTRA *(chlorsulfuron + metsulfuron)* Site of Action: 2 + 2 **($3.35-8.35)**

0.2-0.5 oz Finesse Cereal and Fallow or Report Extra 75DF (0.009-0.023 lb ai)

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Finesse is a commercial premix of two sulfonyl-urea herbicides containing 62.5% chlorsulfuron (Glean) plus 12.5% metsulfuron (Ally). The combination controls several annual broadleaves such as pennycress, tansymustard, non-ALS kochia, and wild buckwheat. Soil residual extends into the following season or longer. Do not use on soil with a pH exceeding 7.9.

The rate is 0.2 to 0.3 oz Finesse 75DF per acre. Labeling does not include higher rates used in other regions for suppression of “cheatgrass.” Control with lower rates will be more erratic. Use NIS at 1 to 2 qt/100 gal for postemergence applications. Minimum carrier is 3 gpa for flat fan nozzles in ground equipment; 10 gpa for flood nozzles on 30-inch spacing, and higher volume for wider spacing. Minimum carrier is 1 gpa for air. Wheat, triticale, or rye may be planted anytime; oats after 10 months and barley after 10 months if pH is 6.5 or lower or 16 months if pH exceeds 6.5. Other crops require a bioassay.

WINTER WHEAT. Apply after planting but before crop emergence or postemergence at the 2-leaf but before boot stage.

SPRING WHEAT. Apply up to 0.3 oz preplant or preemergence and up to 0.4 oz postemergence from 1-leaf to before boot stage.

BARLEY. Apply up 0.4 oz postemergence from 1-leaf to before boot stage.

TRITICALE. Apply up 0.4 oz postemergence from 2-leaf until flag leaf is visible

OTHER TANK-MIXES. Finesse may also be tank-mixed with MCPA ester (0.25-0.5 lb) or Curtail (1-2 pt); or in 3-way combinations using bromoxynil+MCPA (0.75-1.5 pt 4L) or 2,4-D (0.25 lb) plus dicamba (0.12 pt) per acre.

PEAK *(prosulfuron)* Site of Action: 2 **($4.60-9.20)**

0.25-0.5 oz Peak 57DF (0.009-0.018 lb ai) TARGET WEEDS: ANNUAL BROADLEAVES

Sulfonyl-urea herbicide with moderate residual. Usually used in a tank-mix with other broadleaf herbicides. Gives good to excellent control of pennycress, lambsquarters, Russian thistle, kochia, and other annuals. Wild buckwheat control has been adequate with combinations. Crop tolerance has been very good in SDSU tests. Does not control grasses or ALS-resistant kochia.

Rates are 0.38 to 0.5 oz Peak 57DF per acre applied alone. Use the lower rate for sensitive weeds under favorable conditions. Most weeds should be small (1-2 in) for best results. Wild buckwheat should have 1 to 2 true leaves.

Follow rotation guidelines. Rotation is anytime for small grain, 1 month for proso millet, corn and sorghum grains, when used within soil pH guidelines and following crop use directions. Rotation for alfalfa, canola, flax, soybeans, sunflower and most other crops is 22 months, when used within in soil pH guidelines and applied before July 1. Carryover is greater under high pH. Do not graze or forage for 30 days or harvest grain for 60 days. Minimum carrier is 5 gpa for ground or 2 gpa for air. Use NIS at 1 to 2 qt/100 gal; COC may be used for Peak alone under poor growing conditions.

Use tank-mixes to reduce risk of ALS weed biotypes and to improve weed control consistency. Use NIS additive with tank- mixes. Follow crop stage guidelines and limitations for each product; use combinations only on labeled crops.

WINTER WHEAT, SPRING WHEAT, RYE, and BARLEY. Postemergence from the 3-leaf to before second node is detectable in stem elongation.

TRITICALE. Apply as for wheat. Tank-mix with herbicides labeled for triticale.

OAT. Tank-mixes with MCPA may be preferred for best crop tolerance. Peak rates as low as 0.25 oz are used in some tank- mixes.

PROSO MILLET. Apply from the 3-leaf but before the second node is detectable in stem elongation. Crop tolerance is generally good, but often less at earlier stages.

GLEAN XP *(chlorsulfuron)* Site of Action: 2 **($3.90-7.55)**

0.17-0.33 oz Glean XP 75DF (0.008-0.015 lb ai)

Use 0.17 oz for short-term control or suppression or 0.33 oz for soil residual weed control where soil pH is <6.5 or for controlling difficult weed species. Controls some mustard species, pigweed, waterpod, primrose, and others.

Add NIS at 0.25 to 0.5% v/v. For ground applications, minimum carrier is 3 gpa. For aerial applications, minimum carrier is 1 gpa. Do not apply on soils with pH>7.9. Carryover risk increases with high soil pH and dry or cool soil conditions. Rotate to wheat, rye and triticale anytime, oats 10 months, barley 10 months if under 6.5 pH, 6.6-7.9 pH 16 months, all other crops field bioassay.

WHEAT, BARLEY, OAT, TRITICALE. Apply 0.17-0.33 oz postemergence from the 2-leaf stage but before boot stage. For triticale apply from 2-leaf stage to before flagleaf.

TANK-MIXES. 2,4-D (amine or ester) or MCPA (amine or ester) may be tank-mixed at 0.25 to 0.5 lb ai/A. Adding surfactant (0.5-1 qt/100 gallons) increases the chance of crop injury and do not add any surfactant when applying with liquid fertilizer. With 2,4-D or MCPA, apply at the 3- to 4-leaf stage. Other Glean tank-mix options include bromoxynil, Banvel (0.125-0.25 pt/A), or Curtail (1-2 pt/A).

OUTRIDER *(sulfosulfuron)* Site of Action: 2 **($13.00)**

0.67 oz Outrider 75DF (0.03 lb ai)

TARGET WEEDS: “CHEATGRASS”, SOME BROADLEAVES
Outrider is a selective sulfonyl-urea herbicide used to control certain annual grasses and broadleaved weeds. The primary use is for downy brome and Japanese brome in winter wheat. Control has been very good to excellent in SDSU tests. Outrider also gives excellent control of winter annual mustards including pennycress and tansy mustard. Emerged wild oat will be controlled; however wild oat emerges in spring and would not be consistently controlled with fall application.

Outrider has activity by root and foliar uptake. Rainfall is required for preemergence response from soil residual. Crop tolerance is very good. Minimum carrier is 5 gpa for air or ground equipment. Add NIS at 2 qt/100 gal.

Carryover restricts crop rotation options. Treated fields can be rotated to wheat or fallow the following year. Other crops may be planted at shorter rotation if certain soil and precipitation criteria are met. Millet, IR corn, or STS soybean may be planted after 3 months on soil with less than 7.5 pH and with 18 inches precipitation. Corn and soybean may be planted after 22 months on soils with less than 7.5 pH and with 24 inches precipitation. Sunflower may be planted after 22 months on soils with less than 6.5 pH and 35 inches precipitation. Sorghum may be planted after 34 months on soils with 6.5-7.5 pH and 45 inches precipitation. A field bioassay is recommended before planting rotational crops.

Wheat may be grazed after application. Do not harvest for hay for 30 days. Allow 55 days after application before harvesting grain or straw.

Outrider has considerable potential for “cheatgrass” control in wheat. Postemergence timing allows treating field borders or parts of fields. Crop rotation, herbicides with other mode of action and cultural control should be used in the program to reduce risk associated with resistant weed biotypes.

WINTER WHEAT. Fall postemergence timing gives the most consistent results on downy brome. Weeds should be in seedling stage and not exceed 2 or 3 leaves. Preemergence applications require rain. Spring postemergence applications are usually less effective; suppression can be expected if applied very early and downy brome has not become well established.

SPRING WHEAT. Postemergence only. Apply after emergence to jointing crop stage.

OLYMPUS *(propoxycarbazone-sodium)* Site of Action: 2 **($3.25-14.55)**

0.2-0.9 oz Olympus 70WDG (0.026-0.039 lb ai)

TARGET WEEDS: "CHEATGRASS", SOME BROADLEAVES
Olympus is a postemergence sulfonyl-urea herbicide used to control certain annual grasses and broadleaved weeds. The primary use is for "cheatgrass" in winter wheat. Japanese brome is more sensitive than downy brome. It also controls foxtail barley and has some activity on wild oat. Olympus controls broadleaves including pennycress, tansy mustard, blue mustard, and pigweed. Control in SDSU tests has been very good to excellent.

Olympus may be applied in fall or spring; however, grassy weeds should be treated at the 2-leaf up to 2-tiller stage. Downy brome control has been most consistent with early postemergence fall application. Spring applications may result in only downy brome suppression (about 60% control) and control will diminish as grasses tiller and grow. Broadleaf weeds should be less than 2 inches in diameter.

The low rate has been satisfactory for early fall applications on Japanese brome and broadleaves. The high rate is suggested for most consistent downy brome control and wild oat suppression. For jointed goatgrass suppression, apply 0.6-0.9 oz/A in the fall and 0.3-0.6 oz/A in the spring. Minimum carrier is 5 gpa for ground or air. Add NIS at 0.25 to 0.5% volume. Olympus may be applied with nitrogen fertilizer; however, it should not exceed 50% of the carrier. Leaf burn may increase. A buffer for native plants of 50 feet for ground and 350 feet for air is required.

After application rotate to spring and winter wheat or triticale anytime. Rotation intervals for 0.2-0.4 oz/A are; durum and proso millet 4 months; grain soghum 6 months; barley, canola, dry beans, peas, soybeans, sunflowers and conventional corn 10 months; and all other crops not listed require a field bioassay. Rotation intervals for 0.6-1.2 oz/A are; 4 months for proso millet or 6 months for grain sorghum with 10 inches cumulative precipitation; 22 months for conventional corn with 24 inches cumulative precipitation; and all other crops not listed require a field bioassay. Wheat may be harvested for grain or straw after 71 days.

WINTER WHEAT.
BURNDOWN. For brome control apply pre-emergence at 0.6 oz in the fall with glyphosate. May follow-up with an application of 0.6 oz in the spring if necessary.
POST. Fall or Spring: Apply 0.6-0.9 oz from the 2-leaf stage but before crop jointing. Fall and Spring: Apply 0.6-0.9 oz followed by 0.3-0.6 oz. Do not apply more than 1.2 oz/A per season.

SPRING WHEAT.
BURNDOWN. For preemergence apply 0.2 oz with glyphosate in the fall or early spring. May follow with other labeled herbicides for brome control.
POST. Apply 0.2 oz from 2-leaf stage but before crop jointing. Do not apply more than 0.4 oz/A per season.

TRITICALE.
POST. Apply 0.6-0.9 oz from 2-leaf stage but before crop jointing.

RIMFIRE MAX *(propoxycarbazone + mesosulfuron)* Site of Action: 2 + 2 **($12.20)**

3 oz Rimfire Max 6.67WDG (0.009 + 0.004 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL, "CHEATGRASS", FOXTAIL BARLEY, PERSIAN DARNEL, SOME BROADLEAVES
Rimfire Max contains 4.8% propoxycarbazone + 1.9% mesosulfuron. Labeled for winter or spring wheat, with spring applications recommended. Rimfire is primarily intended for wild oat control, but may suppress some other grasses, such as downy brome or "cheatgrass" and broadleaf weed species. May also provide partial control of foxtail barley if applied prior to the weed tillering stage.

Minimum carrier rate is 10 gpa for ground applications or 5 gpa for aerial applications. Always use a recommended adjuvant. May use MSO at 1.3-1.5 pt/A, a Basic Blend at 1-1.25%v/v or NIS at 0.25-0.5%v/v. With NIS also add UAN at 1-2 qt/A or AMS at 1.5-3 lb/A. Do not forage for 30 days or grain and straw for 71 days.

Crop rotation restrictions are 4 months for millet; 10 months for alfalfa, barley, canola, corn, dry beans, flax, peas, safflower, soybeans, and sunflower. Field bioassay for crops not listed.

WINTER WHEAT, SPRING WHEAT, DURUM. Apply 3 oz from wheat emergence to flag leaf emergence. Do not apply more than 3 oz per year. Best control achieved when grasses are in the 1 leaf to 2 tiller stage and broadleaf weeds are less than 2 inches in diameter.

OSPREY *(mesosulfuron)* Site of Action: 2 **($12.80-19.00)**

3.2-4.75 oz Osprey 4.5WDG (0.009-0.013 lb ai)

TARGET WEED: WILD OAT
Osprey is a sulfonyl-urea herbicide with a safener used for postemergence wild oat control in winter wheat. Winter wheat has very good tolerance. Osprey also controls wild mustard and pigweed and has suppression activity on downy brome at early stages. Wild oat should be at the 1-leaf to the 2-tiller stage.

The 3.2 oz rate may be used for wild oat; the high rate is suggested for other weeds. Minimum carrier is 10 gpa for ground or 5 gpa for air. Add UAN at 1-2 qt/A or AMS at 1.5-3 lb/A and NIS at.5% v/v or MSO at 1.3-1.5 pt/A. A buffer strip of 50 feet between treatment and native plants for ground or 350 feet for aerial application is required.

Wheat or triticale may be planted after 7 days; barley and sunflower 30 days; soybean, lentil, dry beans, corn, sorghum and peas 90 days; and other crops after 10 months. Do not harvest wheat or triticale for forage for 30 days or hay, grain, or straw for 60 days.

WINTER WHEAT or WINTER TRITICALE. Apply from emergence up to jointing stage of the crop. Osprey is not labeled for spring wheat or spring triticale.

TANK-MIXES. Tank-mix labeling includes Ally, Ally Extra, bromoxynil, Curtail M, Harmony Extra, Peak, Starane, and MCPA ester (0.25 to 0.38 lb/A). Several fungicides and insecticides are also included in tank-mix labeling; however, do not mix with malathion, mancozeb, or di-syston because of injury risk.

POWERFLEX HL, GR1, TEAMMATE or GR2 *(pyroxsulam)* Site of Action: 2 **($14.10-14.40)**

2 oz PowerFlex HL or GR1 13.13WDG (0.016 lb ai)
1 oz TeamMate or GR2 21.5WG (0.013 lb ai)

TARGET WEEDS: "CHEATGRASS", GRASSES, SOME BROADLEAVES
Controls "cheatgrass" species (downy brome and Japanese brome), wild oats, yellow foxtail, and broadleaf weed species such as mustard species, chickweed, and others. Activity may be somewhat slow and may not show on weeds for 1-2 weeks after application. TeamMate and GR2 are more concentrated formulations than Powerflex HL or GR1. The 21.5WG products are registered for use on spring wheat due to added safener and a slightly less rate of active ingredient.

Minimum carrier is 5 gpa for ground or aerial applications, but 10 gpa is suggested for ground applications. When applied alone, use NIS at 0.25-0.5% v/v or COC at 1-1.25% v/v. Potential for crop injury increases if COC is used rather than NIS. Use higher NIS rate for dry conditions. AMS (1.5-3 lb/A) or UAN (1-2 qt/A) may be added in addition to NIS to enhance control. Use a lower rate of NIS (0.125-0.25%) if TeamMate/GR2 is tank-mixed 6 oz/A or more of an EC (emulsifiable concentrate) formulated product.

Rainfast 4 hours after application. Do not mix with dicamba, 2,4-D amine, or MCPA amine as they may antagonize grass control, but it is permissible to tank-mix with 2,4-D ester or MCPA ester. Do not tank-mix with organophosphate insecticides. Do not apply more than 2 oz/A per season. Do not graze treated crop within 7 days or cut for hay within 28 days. Do not apply within 60 days of harvest. Rotation interval is 5 months for soybeans, 9 months for alfalfa, barley, corn, millet, oats, sorghum, sunflower, and many pulse crops, and 12 months for crops not listed on the label. Adverse weather conditions (cold or dry) may decrease breakdown in the soil and increase the risk for carryover.

Powerflex HL or GR1:
WINTER WHEAT or TRITICALE. Apply in the fall (for downy brome control) or spring from the 3-leaf stage to jointing. Best results may occur when weeds are small and actively growing. Slight yellowing or height reduction of crop may occur, but disappears within 14 days and has no yield affect.

TeamMate or GR2:
SPRING WHEAT, WINTER WHEAT or TRITICALE. Apply in the spring from the 3-leaf stage to jointing. Best results may occur when weeds are small and actively growing. Slight yellowing or height reduction of crop may occur, but disappears within 14 days and has no yield affect.

OPENSKY *(pyroxsulam + fluroxypyr)* Site of Action: 2 + 4 **($19.90)**

1 pt OpenSky 1.1SE (0.013 + 0.12 lb ai)

Controls grass weeds such as wild oat, downy or Japanese brome (or "cheat"), and foxtails and broadleaf weeds such as kochia, mustard species, lambsquarters, pigweed, wild buckwheat, and others. More flexible rotation options relative to clopyralid-containing products.

Minimum carrier is 10 gpa for ground applications or 5 gpa for aerial applications. Add NIS at 0.25 – 0.5% v/v (1 – 2 qt per 100 gallons). Use higher NIS rate for dry conditions. AMS (1.5 – 3 lb/A) or UAN (1 – 2 qt/A) may be added in addition to NIS to enhance control. If tank-mixed with an EC product at more than 6 oz/A add NIS up to 0.25% v/v. Rainfast within 4 hrs of application.

Do not mix with dicamba or amine formulations of 2,4-D or MCPA, which could result in reduced grass control. Do not tank mix with organophosphate insecticides, which could result in crop injury. Do not apply an organophosphate product 5 days before or after an OpenSky application. Do not graze for 7 days, cut for hay for 28 days, or harvest for 60 days after application. Crop rotation interval is 9 months for soybeans, corn, millet, oats, sorghum, safflower, sunflower, alfalfa, many pulse crops, and others, and 12 months for crops not listed on the label (see label for complete rotation details).

SPRING WHEAT (including DURUM), WINTER WHEAT, or TRITICALE: Apply from the 3 leaf wheat to just prior to flag leaf emergence. Intended for use on spring wheat, but rates may be increased on winter wheat and tritcale (up

to 1.25 pt/A) to allow for equivalent pyroxsulam rate as PowerFlex which may be important if targeting brome (cheat) species. Best control may occur when weeds are small and actively growing. Slight yellowing or height reduction of crop may occur temporarily, but generally disappears within 14 days and does not affect yield. Risk of crop response is greatest on stressed wheat (drought, water-logged soil, frost, nutrient deficiency, etc.).

GOLDSKY *(florasulam + fluroxypyr + pyroxsulam)* Site of Action: 2 + 4 + 2 **($20.50)**

1 pt GoldSky 0.838L (0.002 + 0.089 + 0.014 lb ai)

TARGET WEEDS: ANNUAL GRASSES and BROADLEAVES
Controls wild oat and suppresses several other grass species and controls several broadleaf weed species, such as wild buckwheat, lambsquarters, kochia, mustards, Russian thistle, and several others. GoldSky at 1 pt/A is equivalent to 8.7 oz/A Orion (florasulam), 4 oz/A Starane Ultra, and 1.7 oz/A PowerFlex HL.

Minimum carrier is 5 gpa, but 10 gpa is recommended. May be applied by ground or air. When applied alone, add NIS at 0.25- 0.5% v/v. Add AMS at 1.5 lb/A during conditions of moisture stress. Do not apply adjuvant if mixing with another herbicide that is an emulsifiable concentrate (EC) formulation, such as 2,4-D ester or MCPA ester. Rainfast 4 hours after application. Slight yellowing or stunting may occur on wheat plants after application, particularly during stressful weather conditions such as drought, frost, or nutrient deficiency. Wheat often grows out of the injury symptoms within 2 weeks. Do not graze until 7 days after application or cut for hay until 28 days after application.

SPRING WHEAT, WINTER WHEAT, DURUM and TRITICALE. Apply between the 3-leaf stage and jointing. Best results may occur when grass weeds are 2-leaf to 2-tillering and broadleaf weeds are less than 2 inches tall and the weeds are actively growing.

PERFECTMATCH *(clopyralid + fluroxypyr + pyroxsulam)* Site of Action: 4 + 4 + 2 **($20.70)**

1 pt PerfectMatch 1.61 SE (0.094 + 0.094 + 0.014 lb ai)

TARGET WEEDS: ANNUAL GRASSES and BROADLEAVES
Controls wild oat and cheat, controls or suppresses foxtails, and controls several broadleaf weed species such as wild buckwheat, lambsquarters, pigweed, kochia, mustards, Canada thistle, Russian thistle, and several others. PerfectMatch at 1 pt/A is equivalent to 1 pt/A WideMatch and 1.7 oz/A PowerFlex HL.

Minimum carrier is 5 gpa for ground applications (but 10 gpa is recommended), 5 gpa for aerial applications. When applied alone, add NIS at 0.25-0.5% v/v. Add AMS at 1.5 lb/A for added control, particularly during adverse conditions. Do not apply adjuvant if mixing with another herbicide that is an emulsifiable concentrate (EC) formulation, such as 2,4-D ester or MCPA ester, if the rate of the EC product is 6 fl.oz/A or greater. Do not add 2,4-D amine as that may antagonize grass activity. Rainfast 4 hours after application. Slight yellowing or stunting may occur on wheat plants after application, particularly during stressful weather conditions such as drought, frost, or nutrient deficiency. Wheat often grows out of the injury symptoms within 2 weeks. Do not graze until 7 days after application or cut for hay until 28 days after application. Rotation intervals are 9 months for corn and millet; 10.5 months for soybeans, alfalfa, sorghum, sunflower, safflower, peas, dry beans; and 18 months for lentils.

SPRING WHEAT, WINTER WHEAT, DURUM and TRITICALE. Apply between the 3-leaf stage and jointing. Best results may occur when grass weeds are 2-leaf to 2-tillering and broadleaf weeds are less than 2 inches tall and the weeds are actively growing.

EVEREST 3.0 or SIERRA *(flucarbazone)* Site of Action: 2 **($7.25-14.50)**

1 oz Everest 3.0 (0.027 lb ai)
0.5-1 oz Sierra 3.5L (0.014-0.027 lb ai)

TARGET WEEDS: "CHEATGRASS", FOXTAILS, BARNYARDGRASS
Controls green foxtail and wild oat and suppresses yellow foxtail, foxtail barley, and downy brome. The low rates may be used for green foxtail and the high rate for wild oat and downy brome suppression. Grasses should be at the 1 to 4-leaf stage with up to 2 tillers. Crop tolerance is adequate, but may cause temporary chlorosis under some conditions. Everest 3.0/Sierra is a liquid formulation that also includes a safener to improve crop tolerance. Do not apply more than a total of 0.027 lb a.i. Everest 3.0/Sierra or Pre-Pare followed by Everest 3.0/Sierra.

An adjuvant must be added. The preferred adjuvant is a basic blend at 0.5-1 % v/v, NIS at 0.25-0.5% v/v or MSO at 1% v/v. When using NIS or MSO, it is recommended to also use N, such as 28%UAN at 1-2 qt/A or AMS at 1-2 lb/A (8.5-17.5 lbs per 100 gallons). When tank-mixing with EC herbicides, follow adjuvant restrictions of tank-mix partner. Minimum carrier is 5 gpa for ground or 3 gpa for aerial application. Higher carrier rates may be used during dry conditions or high weed densities.

Rotation restrictions are spring or winter wheat anytime, 4 months for Durum or sunflowers, 9 months for barley, canola, dry beans, flax, safflower, or soybeans; 11 months for corn, alfalfa, and field peas; and 18 months for lentils, oats, sorghum or forage millet; all other crops require a field bioassay. Carryover risk increases in soils with <2% O.M., pH >8.0, or drought. Do not graze or harvest forage for 30 days or harvest grain for 60 days.

SPRING and DURUM WHEAT. Apply Everest 3.0 from 1 leaf to 60 days prior to harvest. Apply Sierra from 1 leaf to jointing.

WINTER WHEAT. For fall applications, wheat must have at least 1 leaf. For spring applications apply Everest 3.0 from 1 leaf to 60 days prior to harvest or apply Sierra from 1 leaf to jointing.

TANK-MIXES. Several bromoxynil, growth regulator, or sulfonylurea herbicides may be tank-mixed with Everest 3.0/ Sierra for increased broadleaf control. Tank-mixes with products containing dicamba will reduce grass control (except for green foxtail).

BATALIUM *(flucarbazone + fluroxypyr + bromoxynil)* Site of Action: 2 + 4 + 6

13.7 oz Batalium 3.47L (0.027 lb ai + 0.094 lb ae + 0.25 lb ae)

TARGET WEEDS: ANNUAL BROADLEAF WEEDS, GREEN FOXTAIL, WILD OAT
Controls several common broadleaf weed species, including kochia, lambsquarters, mustard, pigweed, velvetleaf, venice mallow, wild buckwheat and others. Controls green foxtail and wild oat and suppresses yellow foxtail, foxtail barley, and downy brome. Grasses should be targeted at the 1 to 4-leaf stage, while broadleaf weeds should be targeted at a maxmimum of 4 inches in height or a 2-inch rosette. Batalium is a liquid formulation that also includes a safener to improve crop tolerance. Do not apply Batalium herbicide if Pre-Pare was applied as a preplant or preemergence for the same crop season.

An adjuvant must be added. A basic blend at 0.5-1 % v/v or NIS at 0.25-0.5% v/v. When using NIS, it is recommended to also use N, such as 28%UAN at 1-2 qt/A or AMS at 1-2 lb/A (8.5-17.5 lbs per 100 gallons). When tank-mixing with EC herbicides, follow adjuvant restrictions of tank-mix partner. Carrier volume is 8-15 gpa for ground and 3-5 gpa for aerial application. Use the higher carrier rates during dry conditions or high weed densities.

Rotation restrictions are spring or winter wheat anytime, 4 months for Durum or sunflowers, 9 months for barley, canola, dry beans, flax, safflower, or soybeans; 11 months for corn, alfalfa, and field peas; and 18 months for lentils, oats, sorghum or forage millet; all other crops require a field bioassay. Carryover risk increases in soils with <2% O.M., pH >8.0, or drought. Do not graze or harvest forage for 30 days or harvest grain for 60 days.

SPRING WHEAT, DURUM, and WINTER WHEAT. From 2 leaf, up to 60 days prior to harvest. May be applied in the fall or spring to winter wheat. Make only one application per year.

TANK-MIXES. Batalium can be tank mixed with a number of herbicide products to enhance the spectrum of weed control. Tank-mixes with products containing dicamba will reduce grass control (except for green foxtail). Refer to the Batalium and respective tank-mix partner label for further restrictions. Do not tank mix with organophosphate or carbmamate insecticides.

RAZE *(flucarbazone + fluroxypyr)* Site of Action: 2 + 4

7-9 oz Raze 2L (0.018-0.02 lb ai + 0.092-0.12 lb ae)

TARGET WEEDS: WILD OAT, FOXTAILS, KOCHIA, MUSTARDS
Raze controls several annual grass weed species and some broadleaf weed species, such as kochia and mustards. Raze at 7 fl oz/A is equivalent to Everest 3.0 at 1.29 oz/A (Sierra at 0.66 oz/A) and Starane Ultra at 4 oz/A. Lower rates of Raze may be used if PrePare (flucarbazone) was applied preplant or preemergence. Minimum carrier is 8 gpa for ground applications or 3 gpa for aerial applications.

Applications to a stressed crop (from saturated soils, drought, cold temperatures, disease, low fertility, etc.) could result in crop injury. Add an adjuvant, such as a basic blend (0.5-1% v/v), a NIS (0.25-0.5% v/v), or MSO (1% v/v). Crop rotation restriction is 9 months for soybeans, sunflowers, safflower, flax, canola, and dry edible beans, 11 months for corn and field peas, and 24 months for lentils and mustard. Increased risk to rotational crops may occur during conditions of reduced microbial breakdown, such as cold, drought, low O.M. and high pH (greater than 7.5) soils. Do not hay for 14 days. Do not harvest grain or straw for 60 days.

SPRING, DURUM, WINTER WHEAT. Apply from the 2-leaf stage to jointing. May be applied in the fall or spring to winter wheat. Best if applied to small (less than 3 inches tall), actively growing weeds.

VARRO *(thiencarbazone)* Site of Action: 2 **($15.35)**

6.85 oz Varro 0.083L (0.004 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL, PIGWEED, MUSTARD, PENNYCRESS
Provided good control of yellow foxtail in SDSU tests. Mainly a grass compound but has some broadleaf activity. Best control with young actively growing weeds.

Minimum carrier is 5 gpa for air or 10 gpa for ground. Rainfast after 1 hour. Crop rotation is 3 months for soybean, and wheat; 9 months for alfalfa, barley, corn, canola, dry beans, flax, lentils, oats, peas, safflower, sorghum (grain) and sunflower. Do not graze forage for 7 days or harvest hay for 30 days.

WINTER, SPRING WHEAT or DURUM. Apply from 1 leaf up to jointing stage. Allow 60 days between application and harvest.

LUXXUR *(tribenuron + thiencarbazone)* Site of Action: 2 + 2 **($17.95)**

0.214 oz Luxxur A + 6.85 oz Luxxur B (0.0047 + 0.0044 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL, PIGWEED, MUSTARD, PENNYCRESS
Luxxur is a co-pack containing Luxxur A (tribenuron) and Luxxur B (thiencarbazone). Provided good control of yellow foxtail in SDSU tests. A grass and broadleaf mixture with good activity. Best control with young actively growing weeds.

Minimum carrier is 5 gpa for air or 10 gpa for ground. Rainfast after 1 hour. Crop rotation is 3 months for soybean and wheat; 9 months for alfalfa, barley, corn, canola, dry beans, flax, lentils, oats, peas, safflower, sorghum (grain) and sunflower. Do not graze or feed forage for 7 days or harvest hay for 30 days. Do not harvest grain for 60 days. For Luxxur B; there is a 25 foot buffer for ground applications and 200 foot buffer for aerial applications downwind to sensitive habitat areas.

WINTER, SPRING WHEAT or DURUM. Apply from 2 leaf up to jointing stage.

DISCOVER NG or NEXTSTEP NG *(clodinafop)* Site of Action: 1 **($16.75-20.95)**

12.8-16 oz Discover NG or Nextstep NG 0.5L (0.05-0.0625 lb ai)

TARGET WEEDS: WILD OAT, GREEN and YELLOW FOXTAIL, BARNYARDGRASS
Discover is used postemergence to control grassy weeds. The low rate is for wild oat, barnyardgrass, and volunteer oats. The high rate is for green or yellow foxtail. Wild oat control has been very good in SDSU tests. Crop tolerance has been very good. Crop tolerance is reduced if applied when temperature nears freezing 48 hours before or after application. Wild oat should be at the 1- to 6-leaf stage and before the 4th tiller emerges. Foxtail should be at the 1- to 5-lf stage and prior to the third tiller emergence.

Use 12.8 oz Discover NG 0.5L per acre for wild oat, barnyardgrass, volunteer oats, and corn. Use 16 oz Discover NG 0.5L per acre for green and yellow foxtail control. Discover NG 0.5L product contains the required surfactant. Lower rates are more variable. Minimum carrier is 5 gpa for ground or 3 gpa for air application. Spring wheat may be planted any time after application; any other crop may be planted 30 days after application. Do not graze or feed forage from treated areas for 30 days after application. Apply at least 60 days before harvest.

WINTER WHEAT, RED SPRING WHEAT, and DURUM. Apply at the 2-leaf to pre boot stage. Do not apply to winter wheat in the fall.

TANK-MIXES. Discover for green foxtail may be tank-mixed with herbicides for broadleaf control including Ally, Ally Extra, Amber, dicamba (2-3 oz), bromoxynil, Curtail, 2,4-D amine, MCPA amine and ester, Peak, Starane, and Stinger. For yellow foxtail tank-mixes include bromoxynil, bromoxynil + MCPA, Harmony Extra, and Peak. Follow growth stage and adjuvant requirements for the tank-mix partner.

DOUBLE CHECK, PARITY or TACOMA *(fenoxaprop)* Site of Action: 1 **($6.75-13.50)**

0.33-0.66 pt Double Check, Parity or Tacoma 1EC (0.041-0.082 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL
Controls wild oat and foxtail species. Some reports of resistant wild oats in South Dakota. Apply 0.33 pt/A to control green

foxtail, foxtail millet, and volunteer corn; 0.4 pt/A to control yellow foxtail, wild proso millet, or volunteer millet; or 0.66 pt/A to control many other grass weed species, such as wild oat, barnyardgrass, or field sandbur.

WHEAT, DURUM, and BARLEY. Apply to wheat from emergence up to 60 days before harvest. Apply to barley at emergence to the 5-leaf stage up to 57 days before harvest. Do not apply in barley after jointing begins. Grassy weeds should be in the 1-leaf to 2-tiller stage for best results. Minimum carrier is 10 gpa for ground or 5 gpa for air. Rainfast 1 hour after application.

TANK-MIXES. When tank-mixing with recommended herbicide options, do not exceed the labeled use rate shown for each tank-mix partner, as reduced annual grass control will occur. May be tank-mixed with bromoxynil, bromoxynil/MCPA, MCPA, Stinger, dicamba, Starane and others. Do not mix with dicamba or bromoxynil for barley. Can also be mixed with several insecticides. Refer to tank-mix partner label for further crop restrictions.

WOLVERINE ADVANCED *(fenoxaprop+pyrasulfotole+bromoxynil)* Site of Action: 1+27+6 **($23.25)**

1.7 pt Wolverine Advanced 1.58 L (0.085 + 0.028 + 0.22 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL, ANNUAL BROADLEAF WEEDS
Controls several grass and broadleaf weed species. Grass species include foxtail (green and yellow), barnyardgrass, wild oat, field sandbur, volunteer corn, and others. Apply to grass weeds in the 1 leaf to full tiller growth stage. Broadleaf weed species include wild buckwheat, kochia, lambsquarters, pigweed, ragweed, marshelder, and others. Rainfall within 1 hour of application may reduce control.

Minimum carrier rate is 10 gpa for ground applications or 5 gpa for aerial applications. Do not make more than

one application per season. Tank-mixing with fungicides may cause leaf yellowing and necrosis. Do not mix with tebuconazole. Do not graze or harvest wheat or barley for forage until at least 25 days after application. Do not harvest barley grain or straw for 57 days.

Rotation restriction is 1 month for wheat, barley, oats, rye, or triticale; 4 months for alfalfa, millet, grain sorghum, or soybeans, or 9 months for corn, canola, chickpeas, dry beans, flax, field peas, safflower, or sunflower 18 months for lentils all other field bioassay.

WHEAT (including DURUM) and BARLEY. Apply to wheat any time after emergence but at least 60 days prior to harvest. Apply to barley from after emergence up to the 5-leaf stage.

AXIAL XL *(pinoxaden)* Site of Action: 1 **($19.15)**

16.4 oz Axial XL 0.42 L (0.05 lb ai)

TARGET WEEDS: WILD OAT, FOXTAIL
Axial XL is premixed with an adjuvant. Axial is a grass herbicide that may be used to control wild oats, foxtail, barnyardgrass, and wild proso millet. Apply postemergence prior to the fourth tiller of wild oat or the third tiller of other grasses. May be tank- mixed with several broadleaf herbicides, including some sulfonyl-urea herbicides (Site of Action 2), bromoxynil herbicides, and growth regulator herbicides such as Starane, WideMatch, and MCPA.

Minimum carrier is 5-10 gpa for ground or 5 gpa for aerial application. For ground application, use at least 10 gpa during dry conditions or dense weed stands. Rainfast 30 minutes after application. Do not forage or hay for 30 days or harvest grain or straw for 60 days.

WINTER WHEAT, SPRING WHEAT, BARLEY. Apply from the 2-leaf stage up to the pre-boot stage.

FOXFIRE *(pinoxaden + fenoxaprop)* Site of Action: 1 + 1

8.2 oz Foxfire 0.84L (0.027 + 0.027 lb ai)

TARGET WEEDS: WILD OAT, FOXTAILS, BARNYARDGRASS
Standard rate is equivalent to 8.2 oz/A Axial XL and 0.21 pt/A (3.4 oz/A) Parity, which is approximately half the standard rate of each product. Intended to control annual grass weed species, such as wild oat, foxtail (green, yellow, giant), wild proso millet, barnyardgrass, and other grass weed species. Although Axial may control ACCase (site of action 1) resistant biotypes, the rate of pinoxaden in Foxfire may be too low to control these biotypes.

See label for several tank-mix options for broadleaf herbicides, which include Affinity products, WideMatch, bromoxynil, Huskie, Starane, and several others.

Minimum carrier is 5-10 gpa for ground or 5 gpa for aerial application. For ground application, use at least 10 gpa during dry conditions or dense weed stands. Rainfast 1 hour after application. Do not forage or hay for 30 days or harvest grain or straw for 60 days.

WINTER WHEAT, SPRING WHEAT (excluding DURUM), BARLEY. Apply from the 1-5 weed leaf stage (main stem) for foxtails, barnyardgrass, and wild proso millet or 1-6 leaf stage of wild oat.

AXIAL BOLD *(pinoxaden + fenoxaprop)* Site of Action: 1 + 1 **($18.65)**

15 oz Axial Bold 0.685L (0.054 + 0.027 lb ai)

TARGET WEEDS: WILD OAT, FOXTAILS, BARNYARDGRASS
Apply to actively growing weeds. Apply to 1-5 leaf grasses or 1-6 leaf wild oat. Provides a higher rate of pinoxaden (Axial) as compared to Foxfire.

See label for several tank-mix options for broadleaf herbicides, which include Affinity products, WideMatch, bromoxynil, Huskie, Starane, and several others.

Minimum carrier is 5-10 gpa for ground or 5 gpa for aerial application. For ground application, use at least 10 gpa during dry conditions or dense weed stands. Rainfast 30 minutes after application. Do not make more than one application. Do not apply more than 0.062 lb ai/A pinoxaden or 0.0825 lb ai/A fenoxaprop per year. Do not harvest grain or straw for 60 days.

WINTER WHEAT, SPRING WHEAT (excluding DURUM). Apply from emergence to pre-boot stage.

BARLEY. Apply from emergence to before jointing stage. Do not apply after jointing stage.

AXIAL STAR *(pinoxaden + fluroxypyr)* Site of Action: 1 + 4 **($20.15)**

16.4 oz Axial Star 1.15L (0.05+ 0.094 lb ae)

TARGET WEEDS: WILD OAT, FOXTAIL, KOCHIA, RAGWEED, COCKLEBUR, PRICKLY LETTUCE
Controls several annual grass and some broadleaf weed species, such as kochia, prickly lettuce, common ragweed, common sunflower, and cocklebur. Several tank-mix options available to enhance control of other broadleaf species. The normal rate of Axial Star is equivalent to 16.4 oz Axial XL and 4.3 oz Starane Ultra.

Recommended carrier rate is 8-10 gpa for ground applications or a minimum of 5 gpa for aerial applications. Rainfast one hour after application.

Rotation interval is 4 months for any crop species. Do not make more than one application per season. Do not graze livestock or harvest for forage within 30 days or harvest grain or straw for 60 days.

WINTER WHEAT, SPRING WHEAT (excluding DURUM), BARLEY. Apply from the 2-leaf to pre-boot stage. Best control if applied to grasses in the 1-6 leaf stage, prior to the 3rd or 4th tiller, or to broadleaf weeds less than 4 inches tall. Do not apply to crops stressed from fertility, moisture, cool temperatures, insect damage, or other factors.

HERBICIDE TOLERANT WHEAT

BEYOND *(imazamox)* CLEARFIELD WHEAT or CLEARFIELD PLUS WHEAT ONLY Site of Action: 2

4-6 oz Beyond 1L (0.031-0.047 lb ae) **($18.65-27.95)**

TARGET WEEDS: JOINTED GOATGRASS, "CHEATGRASS", ANNUAL BROADLEAVES
Use only on Clearfield wheat (imidazolinone tolerant) varieties. Beyond is applied postemergence. It controls special problem weeds like jointed goatgrass and "cheatgrass" (downy brome and Japanese brome) as well as several other annual broadleaves and grasses including mustards, black nightshade, pennycress, purslane, pigweed, smartweed, and foxtail. It has activity on wild oat and feral rye. Weeds should be less than 3 or 4 inches for most susceptible weeds. Jointed goatgrass and "cheatgrass" should have 1 to 5 leaves, preferably before tillers have developed. Wild rye control has been fair to good; only emerged plants in seedling stage are controlled.

Fall is the best timing if weeds have emerged. Spring treatment for "cheatgrass" will usually be less effective if the weeds started in the fall. Weeds will have already affected yield potential. The low rate is for sensitive species like mustards; the high rate is for larger or less susceptible weeds. Crop tolerance has been satisfactory. Temporary yellowing may occur under prolonged cold or water-stressed crop conditions. Rotate crops and herbicides to manage ALS-resistant weed biotypes. Beyond may be tank-mixed with herbicides such as Clarity, Starane, bromoxynil, or 2,4-D ester to improve control of weeds like wild buckwheat, ALS-resistant kochia, or lambsquarters.

Soybean, edible legumes, and Clearfield crops may be replanted/planted anytime. Allow 3 months for alfalfa; 4 months for rye; 8.5 months for corn; 9 months for grain sorghum, oat, millets, sunflower; 9-18 months for barley or 3-15 months for wheat depending on rainfall and soil pH; 18 months for canola (eastern area) and most other crops; and 26 months canola (western area). Dry conditions may extend residual effects.

Minimum carrier is 10 gpa for ground or 5 gpa for air equipment. Add NIS at 1 qt plus AMS at 12 to 15 lb or 28% N at 2.5 gal/100 gal solution. If the Clearfield wheat variety possesses the 2-gene tolerance, or is Clearfield Plus COC or MSO (1-2 gallons per 100 gal spray solution) or HSOC (0.5 gallons per 100 gal spray solution) may be used instead of NIS but AMS or 28%N should still be added. There are no restrictions for feeding or grazing forage or hay.

WINTER WHEAT (Clearfield only). Apply 4-6 fl oz/A early postemergence after tillers have initiated and before jointing. Weeds should be small.

SPRING WHEAT (Clearfield only). Apply 4-5 fl oz/A after start of tillering but prior to jointing.

AGGRESSOR *(quizalofop-P-ethyl)* AXIGEN TRAITED WHEAT ONLY Site of Action: 1 **($10.90-21.80)**

8-16 oz Aggressor 0.88L (0.055-0.11 lb ai)

TARGET WEEDS: WINTER AND SPRING ANNUAL GRASSES
Use only on CoAXium wheat with the AXigen wheat trait. Aggressor controls annual grasses such as downy brome, Japanese brome, jointed goatgrass, foxtails, wild oat, and other volunteer cereals. It has some perennial grass activity.

Minimum carrier is 5 gpa air or 10 gpa (15 gpa in arid areas) for ground. Add NIS (0.25% v/v), COC (1% v/v) or MSO (1% v/v). May add AMS (2 lb/A) or UAN (2 qt/A). Do not tank mix with amine formulations of 2,4-D or MCPA to avoid antagonism. Ester formulations of 2,4-D or MCPA may be used. Do not harvest treated wheat for forage or hay within 60 days of the last application. Treated wheat can be harvested for grain and straw at maturity. Allow 14 days between applications. Do not apply more than 2 applications or 16 oz/A per season. May rotate to canola, dry beans, flax, lentils, peas, soybeans, sunflowers, or wheat immediately. Allow 120 days for most other crops.

WINTER WHEAT (CoAXium wheat only). Apply 8-12 oz in the fall or spring to wheat from 4 leaf to before jointing. May apply as a split application with 8 oz in the fall followed by 8 oz in the spring. Apply to small actively growing weeds (≤4-5 leaves).

SPRING WHEAT (CoAXium wheat only). Apply 8-16 oz early postemergence to wheat from 4 leaf to before jointing.

BURNDOWN and POST-HARVEST

PARAQUAT PRODUCTS *(paraquat)* Site of Action: 22 **Restricted Use Pesticide** **($3.70-10.30)**

2-4 pt Gramoxone SL2.0, Cyclone SL 2L (0.5-1 lb ai)
1.3-2.7 pt Bonedry, Gramoxone SL3.0, Helmquat, Para-Shot, Paraquat, Parazone or Purgatory 3L (0.5-1 lb ai)

TARGET WEEDS: ANNUAL BROADLEAVES
NONSELECTIVE. May be used before planting barley, wheat or proso millet. Paraquat is a nonselective, contact herbicide that may be applied before planting until before crop emerges. Gramoxone 3L not labeled for millet. No soil residual. Useful for controlling emerged weeds before planting in no-till or reduced-tillage systems. Use low rate for most weeds under 3 inches or the high rate for weeds up to 6 inches. Minimum carrier for preplant and fallow applications is 5-10 gpa for ground or 5 gpa for air. Add NIS at 1 to 2 pt or COC at 1 gal/100 gal for ground. Use NIS at 2 pt/100 gallon or COC at 1 pt/A for air. Follow precautions, as paraquat is toxic when ingested.

TANK-MIXES. After harvest treatment in wheat or wheat fallow rotations. Addition of 2,4-D or dicamba improves control of some annuals and perennials. Useful for wild buckwheat or nightshade. Apply as for Gramoxone alone.

2 pt Gramoxone 2L + 0.25-1 lb ae 2,4-D ester or 0.25-1 pt dicamba 4L (0.5 ai + 0.25-1 or 0.125-0.5 lb ae)

GLYPHOSATE PRODUCTS *(glyphosate)* Site of Action: 9

Glyphosate is available in several products having different formulations and concentrations; however only certain products are labeled for burndown and preharvest in specific crops. Check specific product label. Examples include:

Glyphosate Concentration	Trade Names
3 ae, 4 ai	Abundit Extra, Buccaneer (Plus), Cornerstone Plus, Credit 41 (Extra), Four Power Plus, Gly Star Plus, Glyphogan (Plus), Helosate Plus Advanced, Honcho (Plus), Mad Dog (Plus), Makaze (Yield Pro), Showdown
4 ae	Cinco, Cornerstone 5 Plus, Duramax, Durango DMA, Gly Star 5 Extra
4.5 ae, 5.5 ai	Abundit Edge, Honcho K6, Roundup PowerMax, Roundup Weathermax, RT 3
4.5 ae, 5.83 ai	Credit Xtreme

TARGET WEEDS: GRASSES and BROADLEAVES
Glyphosate is a non-selective, translocated herbicide with no soil residual weed control. It may be applied before planting, at planting, before crop emergence, after harvest in wheat, barley, oat, rye, millet, and triticale or as a preharvest application in wheat and feed barley. Weeds should be growing actively. Allow for regrowth after harvest. Straw should be spread and settled for post-harvest spraying. 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. Avoid tillage for one day after application.

Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Maximum rate for air is 1 qt of 3L ae product. Use precaution to avoid droplet drift to non-target crops. Follow cleanup procedures to avoid damage from equipment contamination.

Glyphosate rates in this section are listed for products having 3 lb acid equivalent (4 lb ai). Refer to the application timing for product rates required for several formulations for most situations. Use the chart below to adjust for other concentrations.

Formulation	Amount of Product for lb ae			
	0.38 ae	0.75 ae	1.5 ae	3 ae
3 lb ae (4 lb ai)	16 oz	32 oz	64 oz	128 oz
4 lb ae (5 or 5.4 lb ai)	12 oz	24 oz	48 oz	96 oz
4.5 lb ae (5.5 lb ai)	11 oz	22 oz	43 oz	86 oz

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 (3L ae) per acre for most small annuals; 12 oz may be adequate for some situations. Use 20 to 24 oz for larger or more tolerant annuals or for post-harvest stubble burndown. Rates of 32 to 48 oz are for perennials.

16-48 oz glyphosate 3 lb ae (0.38-1.1 lb ae) **($1.45-7.80)**
12-36 oz glyphosate 4 lb ae (0.38-1.1 lb ae)
11-32 oz glyphosate 4.5 lb ae (0.38-1.1 lb ae)

BURNDOWN. Glyphosate at the rates above may be applied before planting, at planting, before crop emergence, after harvest in wheat, barley, oat, rye, millet, and triticale.

1 qt glyphosate 3 lb ae

PREHARVEST. Some glyphosate products are labeled for preharvest use in wheat and feed barley. Several 2,4-D products are also labeled for preharvest use. Maximum rate is 1 qt per acre of glyphosate 3 lb ae. Apply after hard dough stage in wheat with 30% or less moisture and in barley with 20% or less moisture. Allow at least 7 days before harvest. Not suggested for seed fields.

16-20 oz glyphosate 3 lb ae + 0.5 lb ae 2,4-D (0.38-0.48 + 0.5 lb ae)
16-20 oz glyphosate 3 lb ae + 0.5 pt dicamba 4L (0.38-0.48 + 0.25 lb ae)

POST-HARVEST. Glyphosate combinations are frequently used for post-harvest weed control. Rates can be selected based on the weed problem.

FALLOW STAR *(glyphosate + dicamba)* Site of Action: 9 + 4 **($5.25-8.80)**

32-54 oz Fallow Star 1.6L (0.27-0.46 + 0.12-0.21 lb ae)

Fallow Star is a broadspectrum herbicide for the control of emerged actively growing weeds. Apply as a burndown at least 15 days before planting wheat, barley, and oats. Rate depends on weeds present and weed size. Carrier volume is 3-10 gpa for ground application and 3-5 gpa for aerial application. Add AMS at 8.5-17 lb per 100 gallons. Corn, wheat, barley, oats, or sorghum can be planted 15 days after application; do not plant any other crop for 3 months after application.

SHARPEN *(saflufenacil)* Site of Action: 14 **($6.90-13.80)**

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

TARGET WEEDS: SEVERAL ANNUAL BROADLEAVES
Spring preplant surface, preplant incorporated, or preemergence. Intended for suppression or control of several annual broadleaf weed species. Good foliar activity and moderate to good residual weed control has been obtained in SDSU trials. For foliar activity add required adjuvants, MSO (1%v/v (minimum 1 pt/A)) plus AMS (8.5-17 lb/100 gal) or UAN (1.25-2.5%v/v) if weeds are emerged at the time of application. Can rotate to wheat, sorghum, or corn at any time after application or to several other crops 5 months after application.

WHEAT (SPRING, WINTER, DURUM), BARLEY, OATS, TRITICALE, and MILLET (pearl/proso only). Apply preplant surface, preplant incorporated, or preemergence. Minimum carrier volume is 5 gpa for ground applications or 3 gpa for aerial applications. For millet, do not apply on soils with pH greater than 7.8. Do not apply after small grain emergence.

HARVEST AID. Apply 1-2 oz to barley, wheat or triticale after the hard dough stage (less than 30% moisture). Apply a minimum of 3 days before harvest. Minimum carrier is 10 gpa for ground and 5 gpa for aerial applications. May be tank-mixed with glyphosate and other herbicides labeled for harvest aid. Do not tank-mix with glyphosate on seed fields. Do not apply to malting barley. Straw may be grazed or fed to livestock.

AIM EC *(carfentrazone)* Site of Action: 14 **($3.20-12.70)**

0.5-2 oz Aim EC 2L (0.008-0.031 lb ai)

BURNDOWN. 0.5-1 oz/A. For annual weeds up to 4 inches tall or rosettes less than 3 inches. Add NIS (0.25%v/v), COC (1- 2%v/v) or MSO (1-2%v/v). May also add N, such as 28% N at 2-4% v/v or AMS at 2-4 lb/A. Refer to in-crop section for weeds controlled. May also tank-mix other herbicides, such as glyphosate or glufosinate.

HARVEST AID. 0.5-2 oz/A. May be used as a defoliant or desiccant for broadleaf weed species such as morning glories, pigweeds, and velvetleaf after small grain maturity and the grain has begun to dry down. May be used in wheat, barley, oats, triticale, sorghum, or millet. Apply at least 7 days before harvesting. A COC (1-2% v/v) or MSO (1-2% v/v) adjuvant is required. May also add N, such as 28% N at 2-4% v/v or AMS at 2-4 lb/A. Use a minimum of 15 gpa of carrier for ground applications or 5 gpa for aerial applications. May tank-mix with other preharvest herbicides. Do not apply more than 2 oz/A per season.

VIDA *(pyraflufen)* Site of Action: 14 **($2.05-8.20)**

0.5-2 oz Vida 0.2L (0.0008-0.0031 lb ai)

Pyraflufen is a contact herbicide with a similar site of action as carfentrazone (e.g., Aim). Activity on broadleaf weeds such as cocklebur, sunflower, lambsquarters, pigweed, Russian thistle, wild buckwheat, wild mustard, and others. For best results apply to weeds 4 inches tall or less and rosettes 3 inches or less in diameter.

Minimum carrier rate is 10 gpa for ground applications or 5 gpa for aerial applications. A spray tank adjuvant is recommended for optimum weed control, see label for recommendations. Do not apply more than 3 fl oz/A per season.

WHEAT AND TRITICALE
BURNDOWN. Rates are 1-2 fl oz/A for Vida. May be tank-mixed with other labeled herbicides. Results alone have been variable, particularly with kochia. Do not apply more than 2 fl oz/A per season prior to planting or crop emergence.

POST. Apply 0.5-1 fl oz/A after wheat emergence but before the flag leaf is visible. Do not apply more than 1 fl oz/A or 2 applications per season. Temporary leaf speckling may occur. Do not harvest for hay within 21 days and do not harvest for grain within 60 days of the last application.

FACET *(quinclorac)* Site of Action: 4 **($21.70)**

22 oz Facet 1.5L (0.26 lb ai)

BURNDOWN. Facet controls annual grass and broadleaved weeds in fallow and preplant to wheat. Grasses include foxtail and barnyardgrass. Facet is especially useful for field bindweed and volunteer flax. There is partial control on dandelion, kochia, lambsquarters, sunflower, and ragweed. Annual weeds should be small, grasses should not exceed 1 to 2 inches for best results. Rate is 22 oz per acre. Minunium carrier is 5 gpa for ground equipment. Add MSO at 1 to 2 pt or COC at 2 pt per acre. Adding AMS at 2.5 lb or 28% N at 0.5 to 1 gal per acre improves consistency. Bindweed should be actively growing with at least 4-inch vine growth. Allow 30 days after tillage before treating.

Treated areas may be planted to spring or winter wheat or sorghum. Other crops may be planted after 10 months, except allow 24 months and complete a bioassay before planting alfalfa, flax, peas, safflower and lentils. Avoid drift to non-target plants.

FALLOW or PREPLANT to WHEAT. Apply in fallow or after harvest prior to frost.

TANK-MIXES. Facet may be tank-mixed with 2,4-D, Clarity, or glyphosate products for additional weed control.

VALOR, OUTFLANK, PANTHER, TUSCANY *(flumioxazin)* Site of Action: 14

Flumioxazin controls broadleaf weeds and suppresses some annual grasses. Can be applied as a harvest aid (wheat) or a burndown in the spring (wheat) or fall (wheat and barley). Do not apply to frozen or snow-covered ground.

At rates up to 2 oz/acre, corn (conventional tillage), sorghum, and sunflower can be planted 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. Interval for lentil is 6 months. 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. Soybeans may be planted immediately.

2-4 oz Valor SX, Outflank Panther, Tuscany 51DF (0.06-0.13 lb ai) **($6.95-21.85)**
2-4 oz Valor EZ Panther SC, Tuscany SC 4L (0.06-0.13 lb ai)

FALL BURNDOWN. Fall application before planting barley (up to 3 oz/A) and spring wheat (up to 4 oz/A). Can be tank-mixed with other labeled burndown herbicides including 2,4-D and glyphosate according to individual labels. Rates as low as 1 oz/a can be used to inhance burndown. Do not apply to frozen or snow-covered ground. Tillage after application will reduce residual control. Carrier volume is 15-50 gpa for burndown applications; for dense weeds or heavy crop residue use 20-50 gpa. Include COC, MSO, or NIS. May also add AMS (2-2.5lb/A) or UAN 28-32% (1-2 qt/A).

1-2 oz Valor SX, Outflank Panther, Tuscany 51DF (0.03-0.06 lb ai) **($3.50-10.90)**
1-2 oz Valor EZ Panther SC, Tuscany SC 4L (0.03-0.06 lb ai)

SPRING BURNDOWN. Wheat only (not Durum). Only for no-till or minimum tillage where crop residue has not been incorporated. Apply at least 14 days before planting. Plant wheat a minimum of 1 inch deep. Do not irrigate between emergence and spike. Do not graze until wheat is over 5 inches. Tank-mix with other burndown herbicides to control emerged weeds. Do not apply more than 2 oz/A during a single application or growing season. Minimum carrier volume is 15 gpa.

1.5-2 oz Valor SX, Outflank or Panther 51DF (0.048-0.06 lb ai) **($5.20-10.90)**
1.5-2 oz Valor EZ, Panther SC 4L (0.048-0.06 lb ai)

HARVEST AID. Wheat only. Apply after wheat reaches the hard dough stage and grain moisture is 30% or less. Do not harvest within 10 days of application. Add MSO at 1 qt/A. May also add AMS (2-2.5 lb/A) or UAN 28-32% (1-2 qt/A) to improve desiccation. May tank-mix with glyphosate to increase emerged weed control and aid in harvest. Minimum carrier volume is 10 gpa for ground or 5 gpa for aerial application. Do not apply more than 2 oz/A during a single application or growing season.

ZIDUA *(pyroxasulfone)* Site of Action: 15 **($7.70-24.85)**

0.7-2.5 oz Zidua 85WDG (0.037-0.133 lb ai)
1.25-4 oz Zidua SC 4.17L (0.04-0.13 lb ai)

Zidua has some surpression of foxtail, wild oats, kochia, and pigweed. It needs to be tank-mixed with other herbicides to have good control of weeds. Minimum 3 gpa air, 5 gpa ground. Rotate to corn or soybeans anytime, wheat or sunflower 4 months, lentils or peas 6 months, alfalfa or grain sorghum 10 months, small grains beside wheat or dry beans 11 months, all other crops 18 months. Do not apply more than 0.13 lb ai/A pyroxasulfone per year.

SPRING and WINTER WHEAT. 0.7-2 oz (WDG) or 1.25-2.5 oz (SC) delayed preemergence after 80% of wheat has

0.5-inch-long shoot but before emergence. Do not plant wheat over 1.5 inches deep. Do not apply to broadcast seeded wheat.

1-2.5 oz (WDG) or 1.75-4 oz (SC) Early postemergence spiking up to the fourth-tiller growth stage. Needs to be applied before weeds germinate to have control.

ANTHEM FLEX *(pyroxasulfone + carfentrazone)* Site of Action: 15 + 14 **($10.95-24.65)**

2-4.5 oz Anthem Flex 4L (0.058-0.13 + 0.004-0.009 lb ai)

Anthem Flex has some supression of foxtail, wild oats, kochia, and pigweed. Rates depend on soil texture and application timing. May be tank-mixed or applied sequentially with other labeled herbicides to increase weed spectrum. Minimum carrier is 3 gpa for air or 5 gpa for ground. At the rate of 3.64 oz/A or less crop rotation intervals are: anytime for chickpea, corn, lentils, field pea, potato, soybean and sunflower; 1 month for safflower or wheat; 4 months for flax; 6 months for sorghum; 9 months for dry bean, and edible peas/beans; 10 months for alfalfa; 11 months for small grains(other than wheat); 12 months for canola and sugarbeet; and 18 months for most other crops. Check label for rotation intervals with higher rates.

SPRING and WINTER WHEAT.
PREEMERGENCE. Apply 2-4.5 oz delayed preemergence after 80% of wheat has 0.5-inch-long shoot but before emergence. Do not plant wheat over 1.5 inches deep. Do not apply to broadcast seeded wheat.

POSTEMERGENCE Apply 2-4.5 oz early postemergence from spiking up to the forth-tiller growth stage. Limited weed spectrum postemergence. Will provide residual control of germinating weeds.

PERENNIAL WEEDS AFTER HARVEST

Glyphosate rates in this section are based on product containing 3 lb acid equivalent (4 lb active ingredient) per gallon. Use the Glyphosate Table on page 32 to adjust amount for other formulations.

1-2 lb ae 2,4-D (1-2 lb ae). Amine is preferred in spring or early summer when growing conditions are good. Use ester forms for less favorable conditions. A 10-day interval between application and planting winter grain is suggested.

2-4 pt dicamba 4L (1-2 lb ae). Allow an application to planting interval of 45 days during which soil is not frozen for each pint of dicamba before planting wheat, oats, barley, or soybeans.

1-4 pt dicamba 4L + 1 lb ae 2,4-D (0.5-2 + 1 lb ae). Especially promising for Canada thistle. Follow crop rotation guidelines as for dicamba alone.

1-2 pt dicamba 4L + 1-2 qt glyphosate 3 lb ae (0.5-1 + 0.75-1.5 lb ae). A good choice for late fall application on Canada thistle or field bindweed. Note crop rotation guidelines for dicamba alone.

0.5 pt dicamba 4L + 1 pt glyphosate 3 lb ae (0.25 + 0.38 lb ae). Intended for field bindweed and Canada thistle suppression in an annual control program.

1-4 qt glyphosate 3 lb ae (0.75-3 lb ae). Lower rates give more variable results. No restriction on labeled rotational crops.

1-2 qt glyphosate 3 lb ae + 0.5-1 lb ae 2,4-D (0.75-1.5 + 0.5-1 lb ae). Especially useful for spot treating for Canada thistle or field bindweed.

1 pt glyphosate 3 lb ae + 0.5 lb ae 2,4-D (0.38 + 0.5 lb ae). Intended for suppression in annual control program in fallow and postharvest.

4 pt Curtail 2.38L (0.19 + 1 lb ae). Curtail is intended for Canada thistle. Crop rotation the following season is limited to corn, wheat, barley, oats, or grasses. Labeled crops should not be planted for 30 days after application.

SMALL GRAIN (planted with alfalfa)

MCPA AMINE Site of Action: 4 **($1.55-1.80)**

0.25 lb ae MCPA amine 4L (0.25 lb ae)

TARGET WEEDS: LAMBSQUARTERS, MUSTARD, RAGWEED, PIGWEED
Emergency treatment for heavy weed growth. Apply when companion crop is in tillered to boot stage and legume seedlings are 2 to 3 inches tall. Not for vetch or clover. Crop and/or weed canopy reduces risk of crop injury. Check product label.

BROMOXYNIL PRODUCTS *(bromoxynil)* Site of Action: 6 **($5.90-11.35)**

1-1.5 pt bromoxynil 2L (0.25-0.38 lb ae)

TARGET WEEDS: BROADLEAVES
Apply when alfalfa seedlings have 4 trifoliate leaves. Annual broadleaf weeds should not exceed 4 leaves or 2 inches. Control of sunflower, cocklebur, wild buckwheat, and kochia is very good. Overwintered mustards are not controlled. Temporary alfalfa leaf burn is noted in warm, humid weather. Temperature should not exceed 70º or 80°F for 3 days after application. Do not graze or harvest forage for 30 days after application.

WEED RESPONSE TO HERBICIDES

WEED RESPONSE. Weed control ratings are intended as a guide for comparing alternatives. Ratings are estimated based on favorable conditions. E = Excellent; G = Good; F = Fair; M = Marginal; P = Poor.

CROP RESPONSE. Crop response is based on visual symptoms. Early-season symptoms do not necessarily cause yield losses. N = None; VS = Very slight; S = Slight; M = Moderate; H = High; + = usually high part of range.

	WEED RESPONSE											CROP RESPONSE			
Herbicides	**Green foxtail**	**Yellow foxtail**	**Wild oats**	**Gen. Broadleaves**	**Wild buckwheat**	**Prickly lettuce**	**Kochia (ALS)**	**Com. ragweed**	**Mustard**	**Canada thistle***	**Field bindweed***	**Oats**	**Barley**	**Wheat**	**Proso millet**
Broadleaf Herbicides															
Aim	P	P	P	G	F+	F	G+	F	M	P	F	M	M	M	M
Amber	P	P	F+	G+	F+	F+	P	G+	E	M	P	--	VS	VS	--
Affinity BroadSpec	P	P	P	G+	E	F+	P	M	E	F	P	M	VS	VS	--
Affinity TankMix	P	P	P	G	E	F+	P	M	E	M	P	M	VS	VS	--
Ally	P	P	P	G+	G+	F+	P	M	E	M	P	--	S	VS	--
Ally Extra	P	P	P	E	E	F+	P	M	E	F	P	--	VS	VS	--
Bromoxynil	P	P	P	F+	E	G	G	G+	F	P	P	M	VS	VS	--
Bromoxynil+MCPA	P	P	P	G+	E	G+	G+	E	G+	F	P	S	VS	VS	--
Curtail	P	P	P	G	G	E	G	E	G+	E	M	--	S	S	--
Dicamba+ 2,4-D or MCPA	P	P	P	G+	E	E	G+	E	G	G	F+	--	H	M+	M+
Express	P	P	P	G	F	F+	P	M	E	F+	P	--	S	VS	--
Finesse	P	P	P	G+	G+	F+	P	M	E	F	P	--	--	VS	--
Glean	P	P	P	G	F	F+	P	M	E	F	P	S	S	VS	--
Harmony SG	P	P	P	G	E	F+	P	P	E	F	P	M	S	VS	--
Harmony Extra	P	P	P	G+	G	F+	P	M	E	F	P	M	VS	VS	--
Huskie	P	P	P	E	G	G	E	E	E	F	F	--	VS	VS	--
MCPA ester	P	P	P	F	M	G+	P	F	E	G	M	VS	VS	VS	--
MCPA amine	P	P	P	F	M	G	P	F	E	G	M	VS	VS	VS	--
Orion	P	P	P	F	G	G	P	G	E	M	P	S	S	VS	--
Peak	P	P	P	G+	G	F+	P	G	E	F	P	S	VS	VS	S
Sharpen	P	P	P	F	F	G	F	F	G	P	P	VS	VS	VS	S
Starane Ultra	P	P	P	M	F	F	E	G	F	M	M	VS	VS	VS	S
Starane NXT	P	P	P	G	E	G	E	E	F+	M	P	S	VS	VS	--
Stinger	P	P	P	M	F	G	P	G	P	E	P	VS	VS	VS	--
Talinor	P	P	P	G+	E	G	G+	E	G+	F	P	--	VS	VS	--
WideMatch	P	P	P	E	G	G	E	G	F	E	M	S	VS	VS	--
2,4-D amine	P	P	P	G	F	E	M	G	E	G	F	S	S	S	M
2,4-D ester	P	P	P	G	F+	E	F	G	E	G	F	H	S+	S+	--
Grass Herbicides															
Axial	E	G+	E	P	P	P	P	P	P	P	P	--	S	VS	--
Discover	G+	F	E	P	P	P	P	P	P	P	P	--	--	VS	--
Everest 3.0	E	G	G+	M	F	P	P	P	G	P	P	--	--	VS	--
Far-go	P	P	G	P	P	P	P	P	P	P	P	--	VS	S	--
Olympus	P	P	F	F+	M	P	P	P	E	P	P	--	--	VS	--
Outrider	P	P	F+	F+	M	P	P	P	E	P	P	--	--	VS	--
Osprey	M	P	E	P	P	P	P	P	E	P	P	--	--	S	--

Herbicides	WEED RESPONSE											CROP RESPONSE			
	Green foxtail	Yellow foxtail	Wild oats	Gen. Broadleaves	Wild buckwheat	Prickly lettuce	Kochia (ALS)	Com. ragweed	Mustard	Canada thistle*	Field bindweed*	Oats	Barley	Wheat	Proso millet
Power Flex HL	F	G	G	F+	M	P	P	P	E	P	P	--	--	VS	--
Pre-Pare	G	G	G	P	P	P	P	P	G	P	P	--	--	VS	--
Tacoma	E	F	E	P	P	P	P	P	P	P	P	--	S	VS	--
Rimfire Max	M	P	E	F	P	P	P	P	E	P	P	--	--	VS	--
Trifluralin	G	F+	M	P	P	P	P	P	P	P	P	--	VS	VS	--
Varro	G	G	E	P	F	P	P	P	G	P	P	--	--	VS	--
Grass and Broadleaf															
GoldSky	F	G	E	G	G	E	E	G	E	P	P	--	--	VS	--
PerfectMatch	F	G	E	G+	E	G	E	G+	E	G+	M	--	--	VS	--
Raze	E	M	G+	M	F	F	E	F	F	M	M	--	--	VS	--
Wolverine Adv.	E	F	E	E	G	G	E	E	E	F	F	--	VS	VS	--
Clearfield Wheat															
Beyond	G	M	F+	G+	F	P	P	G+	E	M	P	--	--	VS	--

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Foliar Insecticides in Wheat

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There are several insect pests that may potentially reduce yield of spring and winter wheat in South Dakota. Aphids are the most common of these pests, including bird cherry-oat aphids, English grain aphids, and greenbugs. Other insects that can be sporadic pests of wheat include army cutworm, pale western cutworm, fall armyworm, true armyworm, and grasshoppers. When determining if insecticide management is necessary, always scout wheat fields and follow recommendations provided by SDSU Extension.

A major concern associated with the routine application of insecticides is the development of resistance in the targeted insect populations. To reduce the probability of insecticide resistance development, management plans should include insecticides with different modes of action. This can be achieved by 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 populations. 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 in order to purchase and apply these products. General use products are marked with an asterisk (*). When applying insecticides, be sure to follow insecticide labels carefully and wear the appropriate personal protective equipment at all times to reduce personal exposure. Remember, the label is law and any deviations from it are considered unlawful. Do not apply insecticides for insects that are not presented 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 required 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.

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 (http://www2.epa.gov/pesticide-worker-safety/restricted-use-products-rup-report)
- 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
4D	butenolides
5	spinosyns
15	benzoylureas
28	diamide

Check list of insects managed by each foliar insecticide for wheat

Product Name	Army cutworm	Pale western cutworm	Fall armyworm	True armyworm	Bird cherry oat aphid	English grain aphid	Greenbug	Russian wheat aphid	Grasshopper	Hessian fly	Brown wheat mite	Stink bug
Alpha-cypermethrin *(Fastac CS, Fastac EC)*	+	+	+	+	+	+	+	+	+	+	-	+
Beta-cyfluthrin *(Baythroid XL, Sultrus)*	+	+	+	+	+	+	-	+	+	-	-	+
Chlorantraniliprole *(Coragen, Prevathon)*	-	-	+	+	-	-	-	-	+	-	-	-
Chlorpyrifos *(Chlorpyrifos 4E, Chlorpyrifos 4E AG, Chlorpyrifos 4E-AG, CPF 4E, Eraser, Govern 4E, Pilot 4E, Vesper, Vulcan, Warhawk, Warhawk ClearForm, Whirlwind, Yuma 4E)*	+	+	-	-	+	+	+	+	+	-	+	-
Chlorpyrifos + Gamma-cyhalothrin *(Bolton)*	+	+	+	+	+	+	+	+	+	-	+	+
Cyfluthrin *(Tombstone, Tombstone Helios)*	+	+	+	+	+	+	-	+	+	-	-	-
Diflubenzuron *(Cavalier 2L, Diflumax 2L, Dimilin 2L, Durant 2L IGR, Unforgiven)*	-	-	-	-	-	-	-	-	+	-	-	-
Dimethoate *(Dimate 4E, Dimethoate 4 E, Dimethoate 400, Dimethoate 400 EC, Dimethoate 4EC, Dimethoate LV-4)*	-	-	-	-	+	+	+	+	+	-	+	-
Flupyradifurone *(Sivanto HL, Sivanto 200 SL, Sivanto Prime)*	-	-	-	-	+	+	+	+	-	-	-	-
Gamma-cyhalothrin *(Declare, Proaxis)*	+	+	+	+	+	+	+	+	+	+	+	+
Lambda-cyhalothrin *(Cavalry II, Crossover, Crossover Pro, Firestone, Grizzly Too, Kendo, Kendo 22.8 CS, L-C Insecticide, Lambda T, Lambda T-2, Lambda-Cy AG, Lambda-Cy EC, Lambda-Cyhalothrin 1 EC, LambdaStar, LambdaStar Plus, LambdaStar 1CS, Lamcap II, Paradigm, Paradigm VC, Province, Province II, Ravage, Serpent 1 EC, Silencer, Silencer VXN, Warrior II, Willowood Lambda 1EC, Willowood Lambda-Cy 1EC)*	+	+	+	+	+	+	+	+	+	+	+	-
Lambda-cyhalothrin + Chlorantraniliprole *(Besiege)*	+	+	+	+	+	+	-	+	+	+	+	+
Malathion *(Fyfanon EW, Fyfanon ULV AG, Fyfanon, Fyfanon 57% EC, Malathion 5, Malathion 5EC, Malathion 57 EC, Malathion 57%, Malathion 8, Malathion 8 Aquamul, Malathion ULV)*	-	-	-	-	-	+	+	-	+	-	-	-
Methomyl *(Corrida 29 SL, Corrida 90 WSP, Lannate LV, Lannate SP, Nudrin LV, Nudrin SP)*	-	-	+	+	+	+	+	+	-	-	-	-
Spinetoram *(Radiant SC)*	-	-	+	+	-	-	-	-	+	-	-	-
Spinosad *(Blackhawk, Entrust, Entrust SC, SpinTor 2SC, Tracer)*	-	-	+	+	-	-	-	-	+	-	-	-
Zeta-cypermethrin + Chlorpyrifos *(Stallion)*	+	+	+	+	+	+	+	+	+	-	-	-
Zeta-cypermethrin *(Mustang, Mustang Maxx)*	+	+	+	+	+	+	+	+	+	-	-	-

"+" = provides protection
"-" = Does not provide protection

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

Application Rate: 1.0-2.4 fl oz/A or 0.008-0.019 lb ai/A

Re-Entry Interval (REI): 12 hours

Pre-Harvest Interval (PHI):30 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, stink bug nymphs and adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.019 lb ai/A in a single application. Do not reapply within 3 days. Do not apply more than 0.038 lb ai/A in a single season. Do not graze or feed as forage within 3 days of Baythroid XL and Sultrus application.

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

Application Rate: 5.0-10.0 fl oz/A

REI: 24 hours

PHI: 30 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, stink bug nymphs and adults, grasshopper nymphs and adults, and emerging Hessian fly adults.

Restrictions: Do not apply more than 10.0 fl oz/A of Besiege in a single application, and do not reapply within 7 days. Do not apply more than 18.0 fl oz/A of Besiege in a season. Do not graze livestock in treated areas or harvest and feed treated forage to meat or dairy animals. Do not feed treated straw to meet or dairy animals within 30 days of last Besiege application.

Blackhawk, Entrust, Entrust SC, SpinTor 2SC, Tracer *(spinosad)* Mode of Action: 5 (spinosyns)

Application Rate: 1.0-6.0 fl oz/A

REI: 4 hours
PHI: 3 days for forage and hay

PHI: 21 days for grain and straw

Targeted Insects: Fall armyworm caterpillars, true armyworm caterpillars, and grasshopper nymphs and adults.

Restrictions: Do not reapply within four days. Do not make more than three applications in a single season. Do not apply more than 5.6 fl oz/A or 12.4 fl oz/A for Blackhawk in a single season. Do not allow cattle to graze treated area until spray has dried.

Bolton *(chlorpyrifos+gamma-cyhalothrin)* Mode of Action: 1B (organophosphates) and 3A (pyrethroids)

Application Rate: 5.0-25.0 fl oz/A

REI: 24 hours
PHI: 30 days for straw

PHI: 7 days for grazing or harvest

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, brown wheat mite nymphs and adults, grasshopper nymphs and adults, and stink bug nymphs and adults.

Restrictions: Do not apply more than 18.0 fl oz/A of Bolton in a single application. Do not apply more than two applications in a single season. Do not make more than two applications of Cobalt or another product containing chlorpyrifos in a single season. Do not apply more than 25 fl oz/A of Cobalt in a single application. Do not apply more than 51 fl oz/A of Cobalt in a single season.

Cavalier 2L, Diflumax 2L, Dimilin 2L, Durant 2L IGR, Unforgiven *(diflubenzuron)* Mode of Action: 15 (benzoylureas)

Application Rate: 1.0-2.0 fl oz/A

REI: 48 hours

PHI: 50 days for grain and straw
PHI: 3 days for forage
PHI: 15 days for hay

Targeted Insects: Grasshopper nymphs and adults.

Restrictions: Do not apply more than 4 fl oz/A or more than 1 application in a single season. Do not apply after the boot growth stage.

Cavalry II, Crossover, Crossover Pro, Firestone, Grizzly Too, Grizzly Z, Karate, Kendo, Kendo 22.8 CS, L-C Insecticide, Lambda T, Lambda T-2, Lambda-Cy AG, Lambda-Cy EC, Lambda-Cyhalothrin 1 EC, LambdaStar, LambdaStar Plus, LambdaStar 1 CS, Lamcap II, Paradigm, Paradigm VC, Ravage, Serpent 1 EC, Silencer, Silencer VXN, Warrior II, Willowood Lambda 1EC, Willowood Lambda-Cy 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 fl oz/A
Crossover Pro Application Rate: 2-4 fl oz/A

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

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, emerging Hessian fly adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.03 lb ai/A in a single application. Do not reapply within 5 days. Do not apply more than 0.06 lb ai/A in a single season. Do not allow livestock to graze in treated areas or feed treated wheat forage to meat or dairy animals within 7 days of treatment. Do not feed treated wheat straw to meat or dairy animals within 30 days of last application.

Chlorpyrifos 4E, Chlorpyrifos 4E AG, Chlorpyrifos 4E-AG, CPF 4E, Eraser, Govern 4E,Pilot 4E, Vesper, Vulcan, Warhawk, Warhawk ClearForm, Whirlwind, Yuma 4E *(chlorpyrifos)* Mode of Action: 1B (organophosphates)

Application Rate: 0.5-1.0 pt/A or 0.25-0.5 lb ai/A

REI: 24 **PHI:** 28 days for harvest (21 days for CPF 4E)
PHI: 14 days for grazing

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, brown wheat mite, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.5 lb ai/A in a single application. Do not make more than 2 applications of products containing chlorpyrifos in a single season. Do not apply more than 1.0 lb ai/A of chlorpyrifos in a single season.

Army cutworm, pale western cutworm. Successful management may be reduced when temperatures are high, soil is dry, or if caterpillars are greater than ½ inch long.

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

Application Rate: 2.0-20 fl oz/A

REI: 4 hours **PHI:** 1 day

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, and grasshopper nymphs and adults.

Restrictions: Do not apply more than four applications during a season. Do not apply more than 15.4 fl oz/A of Coragen or 60 fl oz/A Prevathon in a single season.

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

Application Rate: 0.25-1.5 pts/A

REI: 48 hours **PHI:** 7 days

Targeted Insects: Fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphids, English grain aphids, greenbugs, and Russian wheat aphids.

Restrictions: Do not apply more than 6 pts/A per crop. Do not make more than 4 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:** 30 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, Hessian fly adults, brown wheat mite nymphs and adults, stink bug nymphs and adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.015 lb ai/A in a single application. Do not reapply within 5 days. Do not apply more than 0.03 lb ai/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: 6.1-14.3 fl oz/A or 0.5-1.13 pt/A or 0.25-0.375 lb ai/A

REI: 48 hours **PHI:** 35 days for grain
PHI: 14 days for grazing

Targeted Insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, brown wheat mite nymphs and adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.5 lb ai/A in a single application or 0.5 lb ai/A in a single season.

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

Application Rate: 1.3-3.9 fl oz/A

REI: 12 hours **PHI:** 14 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, grasshopper nymphs and adults, and stink bug nymphs and adults.

Restrictions: Do not reapply within 14 days. Do not apply more than 11.4 fl oz/A per season. Do not exceed the maximum allowable rate.

Fayfanon EW, Fyfanon ULV AG, Fyfanon, Fyfanon 57% EC, Malathion 5, Malathion 5EC, Malathion 57 EC, Malathion 57%, Malathion 8, Malathion 8-E, Malathion 8 Aquamul, Malathion ULV *(malathion)* Mode of Action: 1B (organophosphates)

Fyfanon, Fyfanon 57% EC, Malathion 5, Malathion 57 EC, Malathion 57%, Malathion 8 Aquamul Application Rate: 1.0-1.6 pints/A
Fyfanon ULV AG, Fyfanon ULV AG, Malathion ULV Application Rate: 4.0-8.0 fl oz/A

REI: 12 hours **PHI:** 7 days

Targeted Insects: English grain aphid nymphs, greenbug nymphs and adults, and grasshopper nymphs.

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:** 14 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.05 lb ai/A of Mustang or 0.025 lb ai/A of Mustang Maxx in a single application. Do not reapply within 14 days. Do not apply more than 0.25 lb ai/A of Mustang or 0.125 lb ai/A of Mustang Maxx in a single season.

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

Application Rate: 2.0-6.0 fl oz/A

REI: 4 hours

PHI: 21 days for grain and straw
PHI: 3 days for forage and hay

Targeted Insects: Fall armyworm caterpillars, true armyworm caterpillars, and grasshopper nymphs and adults.

Restrictions: Do not reapply within four days. Do not make more than three applications in a single season. Do not apply more than 18 fl oz/A in a single season.

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

Application Rate: 7.0-14.0 fl oz/A

REI: 4 hours

PHI: 21 days for grain and straw
PHI: 7 days for forage

Targeted Insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, and Russian wheat aphid nymphs and adults.

Restrictions: Do not apply more than 11.75 fl oz/A in a single application. Do not reapply within 7 days. Do not apply more than 28 fl oz/A in a single season.

Stallion *(zeta-cypermethrin+chlorpyrifos)* Mode of Action: 3A (pyrethroids) and 1B (organophosphates)

Application Rate: 3.75-11.75 fl oz/A

REI: 24 hours

PHI: 28 days

Targeted Insects: Army cutworm, pale western cutworm, fall armyworm, and true armyworm caterpillars. It can also be used to manage bird cherry oat aphid, English grain aphid, greenbug, Russian wheat aphid, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 11.75 fl oz/A in a single application. Do not reapply within 14 days. Do not apply more than 35.25 fl oz/A in a single season.

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

Application Rate: 1.0-2.4 fl oz/A or 0.016-0.038 lb ai/A

REI: 12 hours

PHI: 30 days

Targeted Insects: Army cutworm caterpillars, pale western cutworm caterpillars, fall armyworm caterpillars, true armyworm caterpillars, bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, Russian wheat aphid nymphs and adults, and grasshopper nymphs and adults.

Restrictions: Do not apply more than 0.038 lb ai/A in a single application. Do not reapply within 3 days. Do not apply more than 0.076 lb ai/A in a single season.

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Wheat Seed Treatments

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Wheat, especially winter wheat, can benefit from seed treatments. Seed treatment products are useful tools in promoting stand establishment and seedling vigor. Seed treatments may also help preserve yield potential and prevent quality losses in grain by preventing the development of seed and soil-borne diseases and damage from seed and seedling pests. The seed treatments addressed in this guide consist of fungicides, fungicides in combination with insecticides or insecticides alone for use in managing pests.

Not every wheat field requires treated seed. Some fields have a high risk for seed and seedling rots to develop. A field that has had a history of seedling diseases and poor stand establishment, will be planted relatively early, has wheat stubble, or a field with heavy clay soil and poor drainage is likely to benefit from fungicide seed treatments. Other factors such as if the wheat crop is for seed production, field will be no-till or minimum till, a lower population will be used and the seed lot has lower germination rate should be considered before deciding on seed treatments.

In general, fungicidal or insecticidal seed treatments are used to control:

- Soil-borne fungal disease organisms such as those causing seed rots, damping-off, or seedling blights as well as the agents of root rot complex, smuts, bunts, or downy mildews.
- Diseases caused by seed surface-borne fungal pathogens (e. g., covered smuts of barley and oats, bunt of wheat).
- Diseases caused by seed-borne fungi, such as loose smut of cereals.
- Insects that feed on the seed or seedling or will feed and transmit pathogens early in the season

Integrated Disease Management

Disease management in agricultural crops requires a multi-faceted approach as part of an integrated pest management (IPM) program. This reduces overdependence on pesticides as the only tool for pest management and avoids or delays pests developing resistance to pesticides. Effective components of an integrated plant disease management program includes crop rotation, residue and volunteer plants management, use of high quality disease-free seed, careful selection of well-adapted resistant cultivars, planting in a clean, well-drained seed bed, and judicious use of pesticides only when warranted.

Effectiveness of seed treatments will vary with seed treatment product, rate, environmental conditions, and pests present. Seed treatments may provide some level of control for early season diseases in addition to controlling seedling blights and seed or soil-borne diseases. Seed treatment products last 2-3 weeks, some root rots that can develop later in the season such as Fusarium root rot may still develop on plants. Fungicide seed treatments are not effective against bacterial pathogens or viral diseases.

Newly Opened Land- A Special Consideration

Newly opened land, such as CRP ground being returned to crop production, may present a special consideration and most certainly will be a situation where seed treatments should be considered. Small grains planted into these areas can be at high risk for the development of diseases and insect pests. Diseases such as root and crown rots, as well as seedling blights, can often be more severe when small grain crops are planted into these high-residue situations. Also, insect pressure on newly cultivated lands may differ from a typical cropping situation.

Proper Application and Use Precautions

Fungicide seed treatment products vary in formulation type, packaging, and use requirements. Products may be dry or liquid and in 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. Caution should be used when handling or working with seed treatment products and treated seed. Fungicide and insecticide seed treatments can be highly poisonous, and many are irritants, so proper handling precautions must be taken when handling seed treatment chemicals, and producers or applicators must strictly adhere to all label directions regarding safe handling, mixing, storage, and disposal. Using personal protection equipment, including an approved chemical respirator, goggles, and pesticide resistant gloves, is recommended even if not specifically required by the label. Follow label rates, as over-application may result in unintentional damage to the seed, and under-application may reduce the effectiveness of products. Use caution when considering planter-applied (planter-box, hopper) seed treatments. Good disease control depends on uniform product 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.

Following below are the seed treatments fungicide/insecticide combinations, fungicides, and insecticides currently labeled for use on wheat in South Dakota. The list is dynamic and prone to frequent modifications. Always check the list of products currently registered with the South Dakota Department of Agriculture for legality of use in the state.

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)
M3	Dithiocarbamate
M4	Pthalimide

Insecticide Modes of Action

Mode of Action Group Number	Insecticide Class
4A	Neonicotinoid

Fungicide/Insecticide products

Apprise FI, Lancaster LnI, NipsIt Suite Cereals of Seed Protectant *(Metconazole + Metalaxyl + Clothianidin)* 53
CruiserMaxx Cereals *(Mefenoxam + Difenoconazole + Thiamethoxam)* 53
CruiserMaxx Vibrance Cereals, Warden Cereals 360 *(Mefenoxam + Difenoconazole + Sedaxane + Thiamethoxam)* . .53
Cruiser Vibrance Quattro, Warden Cereals WR II, Seed Shield Cereals, Seed Shield Max Cereals *(Difenoconazole + Sedaxane + Mefenoxam + Fludioxonil + Thiamethoxam)* 53
Dyna-Shield Foothold Extra, Gaucho XT Flowable, Raxil MD W, Sativa IM MAX, Sativa IM RTU, Tebustar IM ST *(Tebuconazole + Metalaxyl + Imidacloprid)* 53
Enhance AW *(Captan + Carboxin + Imidacloprid)* 54
Rancona Crest, Rancona Crest WR, Warden Cereals HR, Warden Cereals WR *(Ipconazole + Metalaxyl + Imidacloprid)* 54
Raxil MD Extra W *(Tebuconazole + Metalaxyl + Imazalil + Imidacloprid)* 54
Sativa IMF Max, Sativa IMF RTU *(Metalaxyl + Tebuconazole + Fludioxonil + Imidacloprid)* 54

Fungicide products

42-S THIRAM, Signet 480 FS, Thiram 480 DP *(Thiram)* 55
Acquire, Allegiance FL, Belmont 2.7 Fs, Dyna-Shield Metalaxyl, Dyna-Shield Metalaxyl 318 FS, Metalaxyl 265 ST, Metalaxyl 4.0 ST, Sebring 318 FS, Sebring 480 FS *(Metalaxyl)* 55
Apron XL *(Mefenoxam)* 55
Azoxy 2 SC Prime *(Azoxystrobin)* 55
Champ Formula 2 Flowable *(Copper Hydroxide)* 55
Captan 4L ST *(Captan 4L) (Captan)* 55
Dithane M-45, Penncozeb 75DF, Penncozeb 80WP *(Mancozeb)* 55
Dividend Extreme, Dividend XL RTA *(Difenoconazole + Mefenoxam)* 55
Dynasty *(Azoxystrobin)* 56
Dyna-Shield Foothold, Dyna-Shield Small Grains Fungicide, Raxil MD, Sativa M RTU *(Tebuconazole + Mealaxyl)* 56
Enhance *(Captan + Carboxin)* 56
Evergol Energy SB *(Prothioconazole + Metalaxyl + Penflufen)* 56
Manzate Flowable, Manzate Pro-Stick *(Mancozeb + Surfactant)* 56
Maxim 4FS, Spirato 480 FS *(Fludioxonil)* 56
Maxim XL *(Mefenoxam + Fludioxonil)* 56
Mertect 340-F *(Thiabendazole)* 56
Metlock *(Metconazole)* 56
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Rancona CTS, Rancona Pinnacle, Rancona Summit, Warden Cereals *(Ipconazole + Metalaxyl)* 57
Rancona V RTU FS *(Carboxin + Metalaxyl + Ipconazole)* 57
Rancona V100 PROS FS *(Carboxin + Ipconazole)* 57
Raxil 2.6F, Tebustar 250 ST, Sativa 309 FS *(Tebuconazole)* 57
Raxil MD Extra *(Tebuconazole + Metalaxyl + Imazalil)* 57
Raxil Pro MD *(Metalaxyl + Prothioconazole + Tebuconazole)* 57
Redigo 480 *(Prothioconazole)* 58
Relenya *(Mefentrifluconazole)* 58
Stamina *(Pyraclostrobin)* 58
Stamina F3 Cereals, Stamina F3 HL *(Fluxapyroxad + Pyraclostrobin + Triticonazole + Metalaxyl)* 58
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Systiva XS *(Systiva XS Xemiun) (Fluxapyroxad)* 58
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Vibrance *(Sedaxane)* 58
Vibrance Extreme *(Difenoconazole + Mefenoxam + Sedaxane)* 59
Vibrance Quattro *(Difenoconazole + Sedaxane + Mefenoxam + Fludioxonil)* 59
Vitavax - 34 *(Carboxin)* 59

Insecticide products

Attendant 480 FS, Attendant 600 FS, Axcess, Dyna-Shield Imidacloprid 5, Gaucho 480, Gaucho 600, Macho 480 ST, Macho 600 ST, Nitro Shield IV, Resonate 480 ST, Resonate 600 ST, Senator 600 FS, Sharda Imidacloprid 5SC, STartUP IMIDA *(Imidacloprid)* 59
Cruiser 5FS *(Thiamethoxam)* 59

Check list of pests controlled by seed treatment products.

Product Name	Common bunt / covered smut	Loose smut	Seed and seedling rots	Fusarium root diseases	Common root rot	Rhizoctonia root diseases	Insects
Fungicide/insecticide products							
Apprise FI, etc.	+	+	+	+	(+)	+	+
CruiserMaxx Cereals	+	+	+	+	-	-	+
CruiserMaxx Vibrance Cereals, etc.	+	+	+	+	-	+	+
Cruiser Vibrance Quattro, etc.	+	+	+	+	-	+	+
Dyna-Shield Foothold Extra, etc.	+	+	+	+	(+)	+	+
Enhance AW	+	+	+	+	+	+	+
Rancona Crest, etc.	+	+	+	+	-	+	+
Raxil MD EXTRA W	+	+	+	+	(+)	+	+
Sativa IMF MAX, etc.	+	+	+	+	(+)	+	+
Fungicide products							
42-S Thiram, etc.	+	-	+	-	-	-	NA
Acquire, Allegiance, etc.	-	-	+	-	-	-	NA
Apron XL	-	-	+	-	-	-	NA
Azoxy 2SC	+	-	+	-	-	-	NA
Champ Formula 2 Flowable	+	-	+	-	-	-	NA
Captain 4L ST (Captan 4L)	-	-	+	-	-	-	NA
Dithane M-45, etc.	+	-	+	-	-	-	NA
Dividend Extreme, etc.	+	+	+	+	(+)	+	NA
Dynasty	+	-	+	-	-	+	NA
Dyna-Shield Foothold, etc.	+	+	+	+	(+)	+	NA
Enhance	+	+	+	-	-	-	NA
Evergol Energy SB	+	+	+	+	(+)	+	NA
Manzate Flowable, etc.	+	-	+	-	-	-	NA
Maxim 4FS	-	-	+	+	-	+	NA
Maxim XL	+	+	+	+	-	+	NA
Mertect 340-F	+	-	-	-	-	-	NA
Metlock	+	+	+	+	(+)	+	NA
Rancona 3.8 FS	+	+	+	+	-	+	NA
Rancona CTS, etc.	+	+	+	+	-	+	NA
Rancona V RTU FS	+	+	+	+	-	+	NA
Rancona V100 PROS FS	+	+	+	+	-	+	NA
Raxil 2.6F, etc.	+	+	+	+	(+)	+	NA
Raxil MD EXTRA	+	+	+	+	(+)	+	NA
Raxil PRO MD	+	+	+	+	-	-	NA
Redigo 480	+	+	+	+	(+)	-	NA
Relenya	+	-	+	+	+	+	
Stamina	+	+	+	+	-	+	NA
Stamina F3 Cereals, etc.	+	+	+	+	+	+	NA
Stamina F4 Cereals	+	+	+		+	+	NA
Systiva XS	-	-	+	+	-	+	NA
Trilex Flowable	-	-	+	+	-	+	NA
Vibrance	-	-	+	-	-	+	NA
Vibrance Extreme	+	+	+	+	(+)	+	NA
Vibrance Quattro	+	+	+	+	(+)	+	NA
Vitavax - 34	+	+	-	-	-	-	NA
Insecticide products							
Cruiser 5FS	NA	NA	NA	NA	NA	NA	+
Attendant 480 FS, etc.	NA	NA	NA	NA	NA	NA	+

+ = product provides control
(+) = product provides early season suppression only
- = product does not provide control
NA = Not Applicable

Fungicide/Insecticide products

APPRISE FI, LANCASTER LNI, NIPSLT SUITE CEREALS OF SEED PROTECTANT *(Metconazole + Metalaxyl + Clothianidin)* Fungicide Mode of Action: 3, 4 (DMI, PA); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5.0 - 7.5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Targeted insects: Wireworm larvae.

CRUISERMAXX CEREALS *(Mefenoxam + Difenoconazole + Thiamethoxam)* Fungicide Mode of Action: 4, 3 (PA, DMI); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots and Fusarium root diseases. Suppression only: Common root rot, Take-all, Fusarium crown and food rot.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, grasshopper nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

CRUISERMAXX VIBRANCE CEREALS, WARDEN CEREALS 360 *(Sedaxane + Difenoconazole + Mefenoxam + Thiamethoxam)* Fungicide Mode of Action: 7, 3, 4 (SDHI, DMI, PA); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5 - 10 fl oz/cw.

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases. Suppression only: Common root rot, Take-all, Fusarium crown and food rot.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, grasshopper nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

CRUISER VIBRANCE QUATTRO, WARDEN CEREALS WR II, SEED SHIELD CEREALS, SEED SHIELD MAX CEREALS *(Difenoconazole + Mefenoxam + Fludioxonil + Sedaxane + Thiamethoxam)* Fungicide Mode of Action: 3, 4, 12, 7 (DMI, PA, PP, SDHI); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases. Suppression only: Common root rot, Take-all, Fusarium crown and food rot.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, grasshopper nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

DYNA-SHIELD FOOTHOLD EXTRA, GAUCHO XT FLOWABLE, RAXIL MD W, SATIVA IM MAX, SATIVA IM RTU, TEBUSTAR IM ST *(Tebuconazole + Metalaxyl + Imidacloprid)* Fungicide Mode of Action: 3, 4 (DMI, PA); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rates:
Dyna-Shield Foothold Extra, Sativa IM Max: 3.4-5 fl oz/cwt
Gaucho XT Flowable: 3.4-4.5 fl oz/cwt
Raxil MD W, Sativa IM RTU, Tebustar IM ST: 5 fl oz/cwt

Sativa IM Max: 3.4-5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Targeted Insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

ENHANCE AW *(Captan + Carboxin + Imidacloprid)* Fungicide Mode of Action: M4, 7 (multi-site contact, SDHI); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 4 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, Seed and seedling rots. Common Root Rot, Fusarium root diseases, Rhizoctonia root diseases.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

RANCONA CREST, RANCONA CREST WR, WARDEN CEREALS HR, WARDEN CEREALS WR *(Ipconazole + Metalaxyl + Imidacloprid)* Fungicide Mode of Action: 3, 4 (DMI, PA); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5 - 8.33 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases. Suppression only: Common root rot, crown and foot rot.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, Hessian fly larvae, and wireworm larvae.

Use higher rate when disease pressure will be high or if there is a history of high disease levels in the field.

RAXIL MD EXTRA W *(Tebuconazole + Metalaxyl + Imazalil + Imidacloprid)* Fungicide Mode of Action: 3, 4 (DMI, PA); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rate: 5.14 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Targeted insects: Wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

SATIVA IMF MAX, SATIVA IMF RTU *(Metalaxyl + Tebuconazole + Fludioxonil + Imidacloprid)* Fungicide Mode of Action: 4, 3, 7 (PA, DMI, SDHI); Insecticide Mode of Action: 4A (neonicotinoids)

Application Rates:
Sativa IMF Max: 3.4 - 5.0 fl oz/cwt
Sativa IMF RTU: 5.0 fl oz/cwt

Targeted diseases: Loose Smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

Fungicide products

42-S THIRAM, SIGNET 480 FS, THIRAM 480 DP *(Thiram)* Mode of action: M3 (multi-site contact)

Application Rates:
42-S Thiram, Signet 480 FS: 2 fl oz/bu
Thiram 480 DP: 3.3 fl oz/cwt

Targeted diseases: Common bunt/covered smut and seed and seedling rots.

Restrictions: Plant wheat seeds a minimum of 1 inch deep.

ACQUIRE, ALLEGIANCE FL, BELMONT 2.7 FS, DYNA-SHIELD METALAXYL, DYNA-SHIELD, METALAXYL 318 FS, METALAXYL 265 ST, METALAXYL 4.0 ST, SEBRING 318FS, SEBRING 480 FS *(Metalaxyl)* Mode of action: 4 (PA)

Application Rates:
Acquire: 0.75 fl oz/cwt
Allegiance Dry: 1 .5 - 2 .0 oz/cwt
Belmont 2.7 FS: 0.75 fl oz/cwt
Dyna-Shield Metalaxyl: 0.75 fl oz/cwt
Dyna-Shield Metalaxyl 318 FS: 0.75 fl oz/cwt
Metalaxyl 265 ST: 0.75 fl oz/cwt
Metalaxyl 4.0 ST: 0.50 fl oz/cwt
Sebring 318FS: 0.75 fl oz/cwt
Sebring 480 FS: 0.50 fl oz/cwt

Targeted diseases: Seed and seedling rot. This fungicide is for controlling Pythium damping-off only.

APRON XL *(Mefenoxam)* Mode of action: 4 (PA)

Application Rate: 0.32 - 0.64 fl oz/cwt

Targeted diseases: Seed and seedling rots caused by Pythium spp. Use the higher rate when the disease pressure is expected to be high.

AZOXY 2SC *(Azoxystrobin)* Mode of action: 11 (QoI)

Application Rate: 0.25-1.5 fl oz/cwt

Target diseases: Seed-borne diseases, common bunt

CHAMP FORMULA 2 FLOWABLE *(Copper Hydroxide)* Mode of action: M1 (inorganic)

Application Rate: 2 fl oz/cwt

Targeted diseases: Bacterial leaf blight, bacterial leaf streak, common bunt Dilute with equal parts of water before application.

CAPTAN 4L ST *(Captan)* Mode of action: M4 (multi-site contact)

Application Rates: 2 fl oz/cwt

Targeted diseases: Seed and seedling rots.

DITHANE M45, PENNCOZEB 75DF, PENNCOZEB 80WP *(Mancozeb)* Mode of action: M3 (multi-site contact)

Application Rates:
Dithane M45, Penncozeb 80WP: 2.2 - 3.3 oz/cwt
Penncozeb 75DF: 2.3 - 3.5 oz/cwt

Targeted diseases: Common bunt/Covered smut, seed and seedling rots.

DIVIDEND EXTREME, DIVIDEND XL RTA *(Difenoconazole + Mefenoxam)* Mode of action: 3,4 (DMI, PA)

Application Rate: 1 - 4 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Green wheat forage may not be grazed until 55 days after planting. Do not plant any crop other than wheat or barley within 30 days to fields in which treated seeds were planted.

DYNASTY *(Azoxystrobin)* Mode of action: 11 (QoI)

Application Rate: 0.153 - 0.382 fl oz/cwt

Targeted diseases: Common Bunt/Covered Smut, Seed and Seedling Rots, Rhizoctonia root diseases.

DYNA-SHIELD FOOTHOLD, DYNA-SHIELD SMALL GRAINS FUNGICIDE, RAXIL MD, SATIVA M RTU *(Tebuconazole + Metalaxyl)* Mode of action: 3, 4 (DMI, PA)

Application Rate: 5 - 6.5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Wheat forage may not be grazed or harvested for hay until 31 days after seeding.

ENHANCE *(Captan + Carboxin)* Mode of action: M4, 7 (multi-site contact, SDHI)

Application Rate: 4 oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots. Do not graze or feed livestock on treated areas for 42 days after planting.

EVERGOL ENERGY SB *(Prothioconazole + Metalaxyl + Penflufen)* Mode of action: 3, 4, 7 (DMI, PA, SDHI)

Application Rate: 1 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

MANZATE FLOWABLE, MANZATE PRO-STICK *(Mancozeb + Surfactant)* Mode of action: M3 (multi-site contact)

Application Rates:
Manzate Flowable: 3.5 - 5.2 fl oz/cwt
Manzate Pro-Stick: 2.2 - 3.3 oz/cwt

Targeted diseases: Common bunt/Covered smut, seed and seedling rots.

MAXIM 4FS, SPIRATO 480 FS *(Fludioxonil)* Mode of action: 12 (PP)

Application Rate: 0.08 - 0.16 fl oz/cwt

Targeted diseases: Seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

MAXIM XL *(Fludioxonil + Mefenoxam)* Mode of action: 12, 4 (PP, PA)

Application Rate: 0.167 - 0.334 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

MERTECT 340-F *(Thiabendazole)* Mode of action: 1 (MBC)

Application Rate: 1.3 fl oz/cwt for seedborne common bunt or 2.6 fl oz/cwt for soilborne common bunt. For seed having high infection levels of seedborne Fusarium scab use 0.17 fl oz/cwt

Targeted diseases: Common bunt/covered smut, Fusarium seed scab.

Mertect 340-F should be used in combination with Raxil or Vitavax based fungicides to help with protection against seed and seedling diseases.

METLOCK *(Metconazole)* Mode of action: 3 (DMI)

Application Rate: 0.045 - 0.09 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

RANCONA 3.8 FS *(Ipconazole)* Mode of action: 3 (DMI)

Application Rates: 0.051 - 0.085 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

RANCONA CTS, RANCONA PINNACLE, RANCONA SUMMIT, WARDEN CEREALS *(Ipconazole + Metalaxyl)* Mode of action: 3, 4 (DMI, PA)

Application Rates:
Rancona CTS: 0.92 - 1.53 fl oz/cwt
Rancona Pinnacle, Warden Cereals: 5 - 8.33 fl oz/cwt
Rancona Summit: 2.5 - 4 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Use higher rate when disease pressure will be high or if there is a history of high disease levels in the field (Rancona Pinnacle, Warden Cereals).

RANCONA V RTU FS *(Carboxin + Metalaxyl + Ipconazole)* Mode of action: 7, 4, 3 (SDHI, PA, DMI)

Application Rate: 4.6 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not graze or feed livestock on treated areas for 6 weeks after planting.

RANCONA V100 PROS FS *(Carboxin + Ipconazole)* Mode of action: 7, 3 (SDHI, DMI)

Application Rate: 0.9 - 1.5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not graze or feed livestock on treated areas.

RAXIL 2.6F, TEBUSTAR 250 ST, SATIVA 309 FS *(Tebuconazole)* Mode of action: 3 (DMI)

Application Rates:
Raxil 2.6F, TebuStar 250 ST: 0.1 fl oz/cwt
Sativa 309 FS: 0.08-0.1 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Wheat forage may be grazed or harvested for hay 31 days after seeding.

RAXIL MD EXTRA *(Tebuconazole + Metalaxyl + Imazalil)* Mode of action: 3, 4, 3 (DMI, PA, DMI)

Application Rate: 5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not graze or feed livestock on treated areas for 6 weeks after planting.

RAXIL PRO MD *(Metalaxyl + Prothioconazole + Tebuconazole)* Mode of action: 4, 3 (PA, DMI)

Application Rate: 5 - 7.5 fl oz/cwt

Targeted diseases: Stinking smut, flag smut, loose smut, covered smut, early season Septoria disease complex, general seed-rot, damping off, early season root rot, seed-borne Fusarium scab, early season Fusarium root rot, early season suppression of powdery mildew (at 7.5 oz/cwt rate only).

Restrictions: Do not harvest or graze crop for 31 days after seeding.

REDIGO 480 *(Prothioconazole)* Mode of action 3 (DMI)

Application Rate: 0.16 - 0.8 fl oz/cwt

Targeted diseases: Stinking smut, flag smut, loose smut, covered smut, early season Septoria disease complex, general seed-rot, damping off, early season root rot, seed-borne Fusarium scab. Early season suppression only for common root rot, foot rot, and crown rot.

Restrictions: Do not enter treated area until after 12 hours.

RELENYA *(mefentrfluconazole)* Mode of Action: 3 (DMI)

Application rate: 0.2 - 0.4 fl oz/cwt

Targeted diseases: Common root rot, Common bunt, Dwarf bunt, 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.

STAMINA *(Pyraclostrobin)* Mode of action: 11 (QoI)

Application Rate: 0.4 - 0.8 fl oz/cwt

Targeted diseases: Common bunt/covered smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

STAMINA F3 CEREALS, STAMINA F3 HL *(Pyraclostrobin + Triticonazole + Metalaxyl)* Mode of action: 11, 3, 4 (QoI, DMI, PA)

Application Rates:
Stamina F3 Cereals: 4.6 fl oz/cwt
Stamina F3 HL: 1.0 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not plant any crop not listed on Stamina F3 Cereals or Stamina F3 HL labels within 30 days after planting.

STAMINA F4 Cereals *(Fluxapyroxad + Pyraclostrobin + Triticonazole + Metalaxyl)* Mode of action: 3, 11, 3, 4 (DMI, QoI, DMI, PA)

Application Rates: 300 ml /cwt

Targeted diseases: Common bunt/covered smut, loose smut, Flag smut, seed and seedling rots, common root rot, Rhizoctonia root rot, Pythium damping off,

Suppression only: Fusarium crown rot, Fusarium root rot.

Restrictions: Do not plant crops within 12 months after planting Stamina F4 Cereals treated seed unless permitted according to the seed container labeling.

SYSTIVA XS *(Fluxapyroxad)* Mode of action: 7 (SDHI)

Application Rate: 0.24 - 0.47 fl oz/cwt

Targeted diseases: Seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

TRILEX FLOWABLE *(Trifloxystrobin)* Mode of action: 11 (QoI)

Application Rate: 0.32 - 0.64 fl oz/cwt.

Targeted diseases: Seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: Do not plant any crop without trifloxystrobin tolerances until 30 days after planting treated seed.

VIBRANCE *(Sedaxane)* Mode of action: 7 (SDHI)

Application Rate: 0.08 - 0.16 fl oz/cwt

Targeted diseases: Loose smut, seed and seedling rots and Rhizoctonia root diseases.

VIBRANCE EXTREME *(Difenoconazole + Mefenoxam + Sedaxane)* Mode of action: 3, 4, 7 (DMI, PA, SDHI)

Application Rate: 2.8 - 5.6 fl oz/cwt plus suppression of common root rot and take-all

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, common root rot, Fusarium root diseases and Rhizoctonia root diseases.

Restrictions: In an event of a crop failure, the field may be replanted immediately to canola, soybean and cereal grains such as barley, oats, rye and wheat. All other crops may not be planted within 30 days to fields in which treated seeds were planted.

VIBRANCE QUATTRO *(Difenoconazole + Sedaxane + Mefenoxam + Fludioxonil)* Mode of action: 3, 7, 4, 12 (DMI, SDHI, PA, PP)

Application Rate: 5 fl oz/cwt

Targeted diseases: Common bunt/covered smut, loose smut, seed and seedling rots, Fusarium root diseases and Rhizoctonia root diseases.

Green wheat forage may not be grazed until 55 days after planting.

VITAVAX - 34 *(Carboxin)* Mode of action: 7 (SDHI)

Application Rate: 2 - 3 oz/cwt

Targeted diseases: Common bunt/covered smut and loose smut.

Restrictions: Do not graze or feed livestock on treated areas for 6 weeks after planting.

Insecticide products

ATTENDANT 480 FS, ATTENDANT 600 FS, AXCESS, DYNA-SHIELD IMIDACLOPRID 5, GAUCHO 480, GAUCHO 600, MACHO 480 ST, MACHO 600 ST, NITRO SHIELD IV, RESONATE 480 ST, RESONATE 600 ST, SENATOR 600 FS, SHARDA IMIDACLOPRID 5SC, STARTUP IMIDA *(Imidacloprid)* Mode of Action: 4A (neonicotinoids)

Application Rates:

Attendant 480 FS, GAUCHO 480, Macho 600 ST, Nitro Shield IV, Resonate 480 ST, Resonate Imida ST: 0.16 - 3 fl oz/cwt

Attendant 600 FS, Axcess, GAUCHO 600, Macho 480 ST, Nitro Shield, Resonate 600 ST, Senator 600 FS, Sharda Imidacloprid 5SC, STartUP IMIDA: 0.8 - 2.4 fl oz/cwt

REI: 12 hours

Targeted Insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, grasshopper nymphs and adults, Hessian fly larvae, and wireworm larvae.

Restrictions: Do not graze or feed livestock on treated areas for 45 days after planting.

CRUISER 5FS *(Thiamethoxam)* Mode of Action: 4A (neonicotinoids)

Application Rate: 0.75 - 1.33 fl oz/cwt

REI: 12 hours

Targeted insects: Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, greenbug nymphs and adults, Russian wheat aphid nymphs and adults, Hessian fly larvae, and wireworm larvae.

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Foliar Fungicides in Wheat

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Wheat is susceptible to several fungal pathogens. These include tan spot, Septoria/Stagonospora blotch, Fusarium head blight, powdery mildew, stem/black rust, stripe/yellow rust, and leaf/orange rust. Other than the rusts, the rest of the fungal pathogens that infect wheat in South Dakota are residue-borne.

Fungicides are an excellent tool for fungal disease management in wheat. However, the question usually asked when deciding on fungicide application is, when is it profitable to apply the fungicide. Depending on the location in the state, wheat consistently shows a profitable response to fungicide application at flag leaf/heading or at flowering (Feekes 10.5.1.). One of the factors driving plant disease development is warm and humid weather. Several studies done at SDSU and in the region indicate that a return on investment (ROI) when foliar fungicides are applied varies from season to season but chances of obtaining ROI increase in seasons with higher moisture, especially in the second half of the wheat growing season.

Other factors to consider when deciding on foliar fungicide treatment include: the growth stage of wheat when the disease starts to develop (e. g. stripe rust at tillering requires an early fungicide at herbicide timing), susceptibility of the cultivar planted, and yield potential (low yielding environments give low response to fungicides).

The next question then is what is the minimum disease threshold to necessitate a fungicide? Although little research has been done on the threshold for fungicide application in wheat, the level of disease developing in the lower leaves has been used as an indicator for the need of fungicide application. Because the flag leaf is the most important contributor to grain yield, its protection from fungal infection is important. If wheat is between flag leaf emergence and boot and 1-3 lesions are seen on the second leaf below the flag leaf, a fungicide application would be beneficial. If no disease is present at this time, scout again 3 days prior to flowering and consult the small grains disease forecasting website (http://climate.sdstate.edu/smallgrains/) to decide on fungicide application for foliar diseases as well as for Fusarium head blight (scab) management at the flowering stage (50% plants flowering).

Early application of fungicides tank-mixed with an herbicide at tillering are not uncommon in South Dakota. However, at this growth stage, wheat has minimal disease severity to impact yield except if wheat is planted into wheat stubble or stripe rust is detected early. A fungicide with the same mode of action as one applied at tillering should not be used at flag leaf or at flowering timing to avoid chances of fungicide resistance development.

Timing is crucial for fungicides applied for Fusarium head blight (FHB) management. The window for applying the fungicide is flowering. Fungicide applied before 50% of plants have flowered, or > 4 days after flowering, may not provide sufficient protection against FHB. During the growing season, growers should consult the foliar disease and scab prediction tool (http://climate.sdstate.edu/smallgrains/ or www.wheatscab.psu.edu) to determine the likelihood of FHB development that would necessitate a fungicide application.

It should be noted that fungicide application alone is not the most effective and sustainable fungal disease management strategy. Therefore, an integration of several management practices including, crop rotation, residue management, planting clean seed, and cultivar selection, and then applying a fungicide when warranted, is the most effective disease management strategy.

A word on fungicide resistance

Fungicide resistance is when a fungicide, which is used to control a given fungal pathogen, no longer provides any protection against the same fungus. Fungicide resistance may arise because of several factors including: using the same class of a fungicide more than once in a season or every season, high genetic variability within the pathogen (such as rust pathogens), high reproduction capacity of the pathogen, and using low fungicide application rates or off-label products.

Some ways to reduce chances of fungicide resistance from developing are:

- Scout to determine the type of disease and the need for fungicide
- Rotate between different classes of fungicides within a season and between seasons.
- 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 the label directions to determine the rates, growth stage of the crop, compatibility with other pesticides, and safety handling information.

Once the decision is made to apply a fungicide, it is important to ensure that the sprayer is calibrated to deliver the recommended rates (as per the fungicide label), and that the weather conditions are not too windy (>10 mph) or too hot and there is at least a two hour period free of rain/dew.

Several fungicide products are available on the market that are effective against fungal pathogens on wheat. However, some are more effective against certain pathogens than others. Also, most of the fungicides available are preventive in nature, that is, they stop the fungus from infecting or advancing within the plant. Therefore, timing of a fungicide treatment is crucial to obtain maximum benefit. If fungicides are applied when the severity is already too high, the benefit will be limited. Always read and follow label directions for approved uses of these products and safety handling of pesticides.

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Fungicide FRAC Codes and Group Names

FRAC Code	Group Name
1	Methyl benzimidazole carbamates (MBC)
3	Demethylation inhibitor (DMI)
7	Succinate dehydrogenase inhibitor (SDHI)
11	Quinone outside inhibitor (QoI)
M1	Inorganic (copper salts)
M3	Dithiocarbamates and relatives

Check list of diseases managed by each foliar fungicide.

Product Name	Leaf rust	Stem rust	Stripe rust	Tan spot	Septoria leaf and glume blotch	Stagonospora blotch	Powdery mildew	Black point	Fusarium head blight (FHB, scab)	Fusarium head blight (FHB, scab) suppression only	Bacterial leaf streak
Absolute Maxx	+	+	+	+	+	+	+	-	-	-	-
Aframe, Azoxystar, Azoxy 2sc, Quadris Flowable, Satori, Tetraban, Trevo	+	+	+	+	+	-	+	-	-	-	-
Aframe Plus, Avaris, Cover XL, Quilt, Quilt Xcel, Trivapro B	+	+	+	+	+	+	+	-	-	-	-
Alto 100 SL	+	+	+	+	+	+	+	-	-	-	-
Aryista Propiconazole, Bumper 41.8EC, Fitness, Propicure 3.6F, Propimax EC, Propi-Star EC, Shar-Shield PPZ, Tilt, Topaz, Tide Propiconazole 41.8% EC	+	+	+	+	+	+	+	-	-	+	-
Aproach	+	+	+	+	+	+	+	+	-	+	-
Aproach Prima	+	+	+	+	+	+	+	+	-	+	-
Azure Xtra	+	+	+	+	+	+	+	-	-	-	-
Badge SC	-	+	-	-	+	+	+	-	-	+	-
Bumper 41.8 EC, Muscle, Onset 3.6L, Orius 3.6F, Tebuconazole 3.6F, Tebu-Crop 3.6F, Tebucure 3.6, Tebuzol 3.6F, Toledo 3.6F	+	+	+	-	-	-	-	-	+	-	-
Caramba	+	+	+	+	+	+	+	+	-	+	-
Custodia	+	+	+	+	+	+	+	-	-	+	-
Dithane F-45 Rainshield	+	-	-	+	+	+	-	-	-	-	-
Dithane M-45, Koverall, Manzate Pro Stick, Penncozeb 4FL, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield	+	-	-	+	+	+	-	-	+	-	-
Evito 480 SC, Aftershock	+	+	+	+	+	+	-	-	-	-	-
Fortix, Preemptor SC	+	+	+	+	+	+	+		-	-	-
Headline, Headline SC	+	+	+	+	+	+	+	+	-	-	-
Lucento	+	+	+	+	+	+	+				
Microthiol Disperss, Super Six	-	-	-	-	-	-	+	-	-	-	-
Miravis Ace	+	+	+	+	+	+	+	+	+	-	-
Nexicor	+	+	+	+	+	+	+	+	-	-	-
Priaxor	+	+	+	+	+	+	+	+	-	-	-
Proline	+	+	+	+	+	+	+	-	-	+	-
Prosaro 421 SC	+	+	+	+	+	+	+	-	+	-	-
Serenade ASO, Serenade MAX	+	+	+	-	-	-	+	-	-	-	+
Sonata	+	+	+	-	-	-	+	-	-	-	-
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Stratego YLD	+	+	+	+	+	+	+	-	-	-	-
Trivapro	+	+	+	+	+	+	+	-	-	-	-
Topguard	+	+	+	-	+	-	+	-	-	+	-
Topguard EQ	+	+	+	+	+	+	+	-	-	-	-
Trivapro	+	+	+	+	+	+	+	-	-	-	-
Twinline	+	+	+	+	+	-	+	-	-	-	-
Vertisan	+	+	+	+	+	+	+	-	-	+	-
Viathon	+	+	+	+	+	+	+	-	-	+	-

+ = provides protection
- = Does not provide protection

ABSOLUTE MAXX *(tebuconazole + trifloxystrobin)* Mode of action: 3, 11 (DMI, QoI)

Application rate: 3-4 fl oz/A early season suppression

Application rate: 5.0 fl oz/A

Targeted diseases: Glume blotch (Stagonospora nodorum), Leaf blight (Septoria tritici), Powdery mildew (Blumeria graminis f. sp. Tritici), Rusts (Puccinia spp.), Tan spot (Pyrenophora tritici-repentis)

Restrictions: Begin applications preventatively when conditions are favorable for disease development.

For early season leaf disease suppression, apply 3-4 fl oz/A for suppression of Tan Spot, Leaf Blight, and Powdery Mildew. Absolute Maxx may be applied by ground, aerial or chemigation. Do not apply more than 5 fl oz of ABSOLUTE Maxx per season. Do not apply within 35 days of harvest. Do not allow livestock to graze within the treated area within 30 days after application, and do not harvest the treated crop for forage within 30 days after application or for hay and wheat straw within 45 days after application. Restricted-entry interval (REI) = 12 hours

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AFRAME, AZOXYSTAR, AZOXY 2SC, QUADRIS FLOWABLE, SATORI, TETRABAN *(azoxystrobin)* Mode of Action: 11 (QoI)

Application rate: 4-12 fl oz/A

Application rate: 7.5-11 fl oz/A for powdery mildew

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf and glume blotch (Septoria nodorum, S. tritici), Powdery mildew (Erysiphe graminis)

Restrictions: Apply prior to disease development up to late head emergence (Feekes growth stage 10.5).

Do not apply within 14 days of grazing. Do not apply within 7 days for harvest of forage and hay. A crop oil concentrate adjuvant may be added at 1.0% V/V to optimize efficacy (Quadris, Aframe and Azoxy 2SC). Do not apply after Feekes growth stage 10.54 (Quadris, Aframe and Azoxy 2SC). An adjuvant such as Liberate or Franchise may be added with Satori to enhance consistency and performance.

Pathogen resistance management: Do not apply more than 24 fl oz of product/A per season. Do not make more than two applications of strobilurin fungicides in one year to minimize resistance issues. Do not apply more than 0.40 lb ai/A/year of azoxystrobin-containing products.

AFRAME PLUS, AVARIS, Cover XL, QUILT, QUILT XCEL, TRIVAPRO B *(azoxystrobin + propiconazole)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 7-14 fl oz/A early season suppression

Application rate: 10.5-14 fl oz/A control of leaf diseases

Trivapro B: 10.5 fl oz/A

Targeted diseases: Glume blotch (Stagonospora tritici), Leaf blight (Septoria tritici), Powdery mildew (Blumeria spp., Erysiphe spp.), Tan spot (Pyrenophora tritici-repentis), Helminthosporium leaf blight (Drechslera tritici-repentis), Rust (Puccinia spp.), Spot blotch (Bipolaris sorokiniana)

Restrictions: For early suppression of Glume blotch, Leaf blight, Powdery mildew, and Tan spot, apply in the spring and follow up with a second application for full season control. Flecking and burning is possible when mixed with herbicides and fertilizers at this time.

Highest yields are normally obtained when applied when the flag leaf is 50% fully emerged. Applications may be made no closer than a 14-day interval. Can be applied through full head emergence (Feekes growth stage 10.54). Do not apply after this stage.

For control of Foot rot/Eyespot, apply full rate plus half the rate specified on other EPA-registered fungicides. Apply at tillering and before elongation has occurred.

ALTO 100SL *(cyproconazole)* Mode of action: 3 (DMI)

Application rate: 1.5-5.5 fl oz/A early season suppression (apply at Feekes 5)

Application rate: 3-5.5 fl oz/A control of leaf diseases

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis), leaf blight (Septoria tritici), Helminthosporium leaf blight (Drechslera tritici-repentis), Spot blotch (Bipolaris sorokiniana)

Restrictions: Apply between Feekes 8 and Feekes 10.5.1 for the best results. 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 harvest forage or hay within 21 days of application. Do not apply within 30 days of harvest. Allow at least 14 days between applications. Do not apply more than 5.5 fl oz/A per season. Alto 100SL may be applied by ground, air or chemigation.

ARYISTA PROPICONAZOLE, BUMPER 41.8EC, FITNESS, PROPICURE 3.6F, PROPIMAX EC, PROPI-STAR EC, SHAR-SHIELD PPZ, TILT, TOPAZ, TIDE PROPICONAZOLE 41.8% EC *(propiconazole)* Mode of action: 3 (DMI)

Application rate: 2-4 fl oz/A early suppression

Application rate: 4 fl oz/A control of leaf diseases and suppression of Fusarium head blight

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis), leaf blight (Septoria tritici), Helminthosporium blight (Dreschslera tritici-repentis), net blotch (Pyrenophora teres). Suppression only: Fusarium head blight (scab) (Fusarium graminearum).

Restrictions: Apply up to Feekes growth stage 10.5 (heading) (Amtide Propiconazole, PropiMax EC, Bumper 41.8 EC, Bumper ES, Fitness, Propicure 3.6F, Propicon 3.6EC, Propi-Star EC, Shar-Shield PPZ, Topaz and Vigil). Apply up to Feekes growth stage 10.5.4 (Tilt).

Do not apply within 30 days of harvest for forage, 40 days before harvest for grain and straw and 45 days before harvest for hay (AmTide Propiconazole and Shar-Shield PPZ). Do not apply within 30 days of harvest for forage or hay (PropiMax EC, Bumper 41.8 EC, Bumper ES, Fitness, Propicon 3.6EC, Propicure 3.6F, Propi-Star EC, Topaz and Vigil). Do not apply within 7 days of harvest for forage or hay (Tilt).

Do not apply PropiMax EC, Bumper 41.8 EC, Bumper ES, Fitness, Propicon 3.6EC, Propi-Star EC, Topaz and Vigil after Feekes growth stage 10.5 (heading) to avoid possible illegal residues. Do not apply Tilt after Feekes growth stage 10.5.4 (Tilt).

May be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air or 10 gal/A ground. Do not apply more than 4 fl oz/A per season if forage or hay will be harvested. Do not apply more than 8 fl oz of product/A per season.

APROACH *(picoxystrobin)* Mode of action: 11 (QoI)

Application rate: 3-12 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Alternaria spp., Helminthosporim spp.), Powdery mildew (Erysiphe graminis). Suppression only: Fusarium head blight (scab) (Fusarium graminearum).

Restrictions: Apply prior to disease presence. Minimum retreatment interval is 14 days. Apply immediately at flag leaf emergence (Feekes growth stage 9) for optimum results. Use the higher rate and shorter interval when disease pressure is high.

Do not apply within 45 days of harvest for grain or 21 days for forage and hay. Do not apply more than two sequential applications without alternating with another fungicide chemistry.

Aproach may be applied by ground, air or chemigation. Do not apply more than 6.8 fl oz of product/A per season.

APROACH PRIMA *(picoxystrobin + cyproconazole)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 3.4-6.8 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Alternaria spp., Helminthosporim spp.), Powdery mildew (Erysiphe graminis)m, Spot blotch (Cochliobolus sativus). Suppression only: Fusarium head blight (scab) (Fusarium graminearum)

Restrictions: Apply prior to disease. Minimum retreatment interval is 14 days. Apply immediately at flag leaf emergence (Feekes growth stage 9) for optimum results. Use the higher rate and shorter interval when disease pressure is high.

Do not apply with 45 days of harvest for grain or 21 days for forage and hay. Do not apply more than two sequential applications without alternating with another fungicide chemistry.

Aproach Prima may be applied by ground, air or chemigation. Do not apply more than 6.8 fl oz of product/A per season.

AZURE XTRA *(azoxystrobin + cyproconazole)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 3.5 fl oz/A early season suppression
Application rate: 5-6.8 fl oz/A control of leaf diseases

Target diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis), Leaf blight (Septoria tritici), Helminthosporium leaf blight (Drechslera tritici-repentis)

Restrictions: Apply this product in the spring at approximately Feekes Stage 5 for early season disease suppression. Apply this product between Feekes Stage 8 and 10.5.1 to protect the flag leaf which is important for maximizing yield potential.

Do not apply more than 6.8 fl oz/a of this product per season. Do not harvest wheat within 30 days of application. Do not harvest for hay within 21 days of application. Do not apply more than 0.036 lb ai/A/season cyproconazole containing products. Do not apply more than 0.4 lb ai/A/year azoxystrobin containing products.

BADGE SC *(copper oxychloride + copper Hydroxide)* Mode of action: M3 (Multi-site contact activity)

Application rate: 0.5-1.8 pints/A

Target diseases: Glume blotch (Stagonospora nodorum), Helminthosporium leaf blight (Drechslera tritici-repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), stem rust (Puccinia graminis f tsp. tritici), Fusarium head blight (Fusarium graminearum) suppression, Powdery mildew (Erysiphe graminis) suppression.

Restrictions: Apply Badge SC for early season disease control and again at early heading then followed with another application 10 days later. Use higher rates when conditions favor disease development.

BUMPER 41.8 EC, MUSCLE, ONSET 3.6L, ORIUS 3.6F, TEBUCONAZOLE 3.6F, TEBU-CROP 3.6F, TEBUCURE 3.6, TEBUZOL 3.6F, TOLEDO 3.6F *(tebuconazole)* Mode of action: 3 (DMI)

Application rate: 2-4 fl oz/A early suppression
Application rate: 4 fl oz/A

Targeted diseases: Rusts: leaf, stem, and stripe (Puccinia spp.), Head blight or scab (Fusarium spp.)

Restrictions: Apply in the spring. Make a second application up to Feekes growth stage 10.5 for season-long control. Applications may be made no closer than at 14-day intervals. A maximum of 4 fl oz/A may be applied per acre per crop season. Do not apply within 30 days of harvest. Straw may be fed or used for bedding. Do not allow livestock to graze or feed green forage to livestock prior to 6 days after treatment. Apply in a minimum of 10 gallons of spray solution per acre by ground, or in a minimum of 5 gallons of spray solution per acre by air.

Rusts: Apply at the earliest sign of rust pustules on foliage.

Fusarium head blight: Optimal timing of application for suppression is the beginning of flowering on main stem heads, or Feekes 10.51.

CARAMBA *(metconazole)* Mode of action: 3 (DMI)

Application rate: 10-14 fl oz/A
Application rate for Fusarium head blight suppression: 13.5-17 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Powdery mildew (Erysiphe graminis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Alternaria spp., Cochliobolus sativus), Spot blotch (Cochliobolus sativus). Suppression only: Fusarium head blight (scab) (Fusarium graminearum)

Restrictions: Apply prior to disease development. Apply immediately after flag leaf emergence (Feekes growth stage 9) for optimum results.

Maximum of two applications. Do not apply within 30 days of harvest. Do not apply more than 34 fl oz/A/Season.

CUSTODIA *(azoxystrobin + tebuconazole)* Mode of Action: 11, 3 (QoI, DMI)

Application rate: 6.4-8.6 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis). Suppression of Fusarium head blight (scab) (Fusarium spp).

Restrictions: Begin application when disease first appears.

Do not make more than one application/A per year. Do not apply to wheat after Feekes growth stage 10.5. Do not apply within 14 days of harvest for forage and hay and 45 days for grain and straw. Apply a minimum of 5 gal/A by air or 10 gal/A by ground. Do not apply more than 8.6 fl oz/A per season.

DITHANE F-45 RAINSHIELD *(manganese, zinc, ethylene bisdithiocarbamate ion)* Mode of action: M3 (multi-site contact)

Application rate:1.6 qt/A

Targeted diseases: Helminthosporium leaf spot (Drechslera tritici-repentis), Leaf rust (Puccinia triticina), Glume blotch (Stagonospora nodorum), Septoria leaf spot (Septoria nodorum, S. tritici), Tan spot (Pyrenophora tritici repentis)

Restrictions: Start application at onset of disease or when plants are in the tillering to jointing stage and repeat at 7-10 day intervals. The addition of Latron CS-7 to spray solutions will improve performance.

Do not make more than three applications during the season. Do not apply after Feekes Growth Stage 10.5 (typically 35-45 days) but no less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest. Maximum seasonal application rate is 4.8 quarts product per acre.

DITHANE M-45, KOVERALL, MANZATE PRO-STICK, PENNCOZEB 75 DF, PENNCOZEB 80 WP, ROPER DF RAINSHIELD *(mancozeb)* Mode of action: M3 (multi-site contact)

Dithane M-45, Koverall application rate: 2 lbs/A
Penncozeb 75 DF, Penncozeb 80 WP application rate: 1-2 lbs/A
Manzate Pro Stick, Roper DF Rainshield application rate: 2 lbs/A

Targeted diseases: Leaf rust (Puccinia triticina), Tan spot (Pyrenophora tritici repentis), Helminthosporium leaf blight (Drechslera tritici-repentis), Glume blotch (Stagonospora nodorum)

Restrictions: Start applications at disease onset or when crop is in the tillering to jointing stage and repeat at 7-10 day intervals.

Do not make more than three applications during the season. Do not apply after Feekes growth stage 10.5 or heading, and not less than 26 days before harvest. Do not graze livestock in treated areas prior to harvest. Do not apply more than 4.8 qts (Manzate Flowable), 6 lbs (Fortuna 75 WDG, Koverall, Penncozeb 80WP), or 6.4 lbs (Penncozeb 75DF) of product per acre per season. Do not apply more than 12 qts (Penncozeb 4FL), 15 lbs (Penncozeb 80WP), or 16 lbs (Penncozeb 75 DF) of product per acre per season.

Mancozeb products are not specifically labeled for stripe rust or stem rust, only for leaf rust. Low rates are intended for use at the tillering stage when the crop canopy volume is relatively small.

EVITO 480 SC, AFTERSHOCK *(fluoxastrobin)* Mode of action: 11 (QoI)

Application rate: 2-4 fl oz/A
Application rate: 2.5-4 fl oz/A for Stagonospora blotch and Powdery mildew

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis).

Restrictions: Begin preventative applications when conditions favor disease development (from Feekes growth stage 5 up to Feekes growth stage 10.5 (heading)) and repeat at a 14-21 day interval if conditions remain favorable for disease development. Use the higher rate and shorter interval when disease pressure is high.

Do not apply more than 8 fl oz/A/season. Do not apply after full head emergence (Feekes growth stage 10.5). Do not apply within 40 days of harvest for grain and straw. Do not apply within 7 days of harvest for forage and hay. Do not make more than one application prior to harvest of wheat forage.

Evito 480 SC or Aftershock may by applied by ground, air or chemigation. Apply a minimum of 5 gal/A by air or 10 gal/A by ground. Do not apply more than two sequential applications without alternating with another fungicide chemistry. 1-2 fl oz/A of Evito 480 SC is for early season control of leaf rust, stripe rust and stem rust.

FORTIX, PREEMPTOR SC *(fluoxastrobin + flutriafol)* Mode of action: 11, 3 (QoI, DMI)

Application rate: 2-6 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Blumeria gramininis tritici)

Restrictions: Apply 2-3 fl oz/A early season for suppression of Septoria, tan spot, and powdery mildew and rust. A second application after 14 days may be made if needed. Apply 4-6 fl oz/A when the flag leaf is 50% to fully emerged.

Do not apply more than 12 fl oz/A per year. Do not apply more than 2 applications per year. Do not apply within 40 days of harvest of grain or straw. Do not apply within 15 days of harvest for hay or within 7 days of harvest for forage. Do not apply past Feekes 10.5.

HEADLINE, HEADLINE SC *(pyraclostrobin)* Mode of Action: 11 (QoI)

Application rate: 6-9 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis), Black point (Alternaria spp., Helminthosporium spp.)

Restrictions: Maximum of two applications. Do not harvest wheat hay or feed green chopped wheat within 14 days after application. Apply no later than the beginning of flowering (Feekes growth stage 10.5). Do not apply more than 18 fl oz/A per season.

LUCENTO *(bixafen + flutriafol)* Mode of action: 7, 3 (SDHI, DMI)

Application rate: 3-5.5 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Blumeria gramininis tritici)

Restrictions: Maximum 2 applications per year. Do not apply more than 11 fl oz of product/A/season. Do not apply within 30 days of harvest.

MICROTHIOL DISPERSS, SUPER SIX *(sulphur)* Mode of action: M4 (inorganic-multi site contact activity)

Microthiol disperss: 8-15 lbs/A
Super six: 1-4 qt/acre

Targeted diseases: Powdery mildew

Restrictions: Apply when symptoms first appear and repeat applications as necessary.

MIRAVIS ACE *(pydiflumetofen + propiconazole)* Mode of action: 7, 3 (SDHI, DMI)

Application rate for early season suppression: 10-13.7 fl oz/A
Application rate: 10-13.7 fl oz/A

Targeted diseases: Fusarium head blgght (Fusarium graminearum), Tan spot (Pyrenophora tritici repentis), Powdery mildew (Blumeria graminis f. sp. Tritici), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Chochliobolus sativus, Alternaria spp.), Spot blotch (Cochliobolus sativus), rusts (Puccinia spp).

Restrictions: For early season suppression, apply prior to disease development after first tiller visible to 2-6 node stage (Feekes 2-7).

For hay and forage: do not apply more than one application and do not apply more than 13.7 fl oz/A. For grain: do not make more than 2 applications at the maximum rate per year (13.7 fl oz/A) and do not apply more than 27.4 fl oz/Acre/ year total.

Repeat applications must be at a minimum of 14 days apart. Apply between Feekes growth stage 10.3 (head emerging) and Feekes 10.5.2 (mid-flowering) for Fusairum head blight. Do not apply Miravis Ace after full head emergence for grain. For forage and hay do not apply within 7 days of harvesting.

Resistance Management: Do not make more than two applications of Miravis Ace or other Group 7 and 3 fungicides before alternation with a fungicide that is not in Group 7 or 3 management.

NEXICOR *(fluxapyroxad + pyraclostrobin + propiconazole)* Mode of action: 7, 11, 3 (SDHI, QoI, DMI)

Application rate: 7-13 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Powdery mildew (Blumeria graminis f. sp. Tritici), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Chochliobolus sativus, Alternaria spp.), Spot blotch (Cochliobolus sativus).

Restrictions: Apply prior to disease development. Apply immediately after flag leaf emergence (Feekes growth stage 9) for optimum results. For early season control of leaf diseases, apply 3.5-7 fl oz/A with herbicide application or when conditions favor disease development.

Maximum of two applications. Do not harvest wheat hay or feed green-chopped wheat within 7 days of application. Do not apply more than two sequential applications without alternating with another fungicide chemistry.

Apply no later than the beginning of flowering (Feekes growth stage 10.5). Do not apply more than 13 fl oz/A per season if forage or hay will be harvested.

PRIAXOR *(fluxapyroxad + pyraclostrobin)* Mode of action: 7, 11 (SDHI, QoI)

Application rate: 4-8 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Powdery mildew (Blumeria graminis f. sp. Tritici), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Black point (Chochliobolus sativus, Alternaria spp.), Spot blotch (Cochliobolus sativus).

Restrictions: Apply prior to disease development. Apply immediately after flag leaf emergence (Feekes growth stage 9) for optimum results.

Maximum of two applications. Do not harvest wheat hay or feed green-chopped wheat until 14 days after last application. Do not apply more than two sequential applications without alternating with another fungicide chemistry.

Apply no later than the beginning of flowering (Feekes growth stage 10.5). Do not apply more than 16 fl oz/A per season.

PROLINE *(prothioconazole)* Mode of Action: 3 (DMI)

Application rate: 4.3-5.7 fl oz/A
Application rate for suppression of Fusarium Head Blight: 5-5.7 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Stagonospora blotch (Stagonosopra nodorum), Powdery mildew (Erysiphe graminis). Suppression only: Fusarium head blight (scab) (Fusarium graminearum).

Restrictions: Start applications at disease onset and repeat at a 14-day interval if conditions remain favorable for disease development. Apply up to 2 applications per year. Do not apply more than 9.37 fl oz/A/season. Do not apply within 30 days of harvest. For optimum disease control, use a spray surfactant at the lowest specified rate.

Proline may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air if applied prior to early flowering or 5 gal/A by air if applied at the early flower growth stage (Feekes growth stage 10.51) or 10 gal/A ground. Chemigation is only allowed when applications are made prior to early flower.

PROSARO 421 SC *(prothioconazole + tebuconazole)* Mode of Action: 3 (DMI)

Application rate: 6.5-8.2 fl oz/A

Targeted diseases: Fusarium head blight (scab) (Fusarium graminearum), Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Stagonospora blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis).

Restrictions: Start applications at disease onset development.

Do not apply more than 8.2 fl oz/A/season. Do not allow livestock to graze or feed green forage to livestock until 6 days after treatment. Straw cut after harvest may be fed or used for bedding. Do not apply within 30 days of harvest.

Prosaro 421 SC may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air or 10 gal/A ground. For optimum disease control, use a spray surfactant at the lowest specified rate.

SERENADE ASO, SERENADE MAX *(Bacillus subtilis strain QST 713)* Mode of Action: 44 (inducing host resistance)

Serenade ASO application rate: 0.5-2 quarts/A
Serenade MAX application rate: 1-3 lbs/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Powdery mildew (Erysiphe graminis), Bacterial blight and streak (Xanthomonas spp)

Restrictions: Begin applications when conditions favor disease development and repeat at a 7-10 day interval if conditions remain favorable for disease development. Use the higher rates and shorter intervals when disease pressure is high.

Serenade ASO, Serenade Max has a 0 day preharvest interval. Serenade ASO, Serenade Max may be applied by ground, air or chemigation.

SONATA *(Bacillus pumilus strain QST 2808)* Mode of Action: 44 (inducing host resistance)

Application rate: 1-4 qt/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Powdery mildew (Erysiphe graminis)

Restrictions: Begin applications when conditions favor disease development and repeat at 7–14 day interval as needed. Use the higher rates and shorter intervals when disease pressure is high.

Sonata has a 0 day pre-harvest interval. Sonata may be applied by ground, air or chemigation.

STRATEGO *(propiconazole + trifloxystrobin)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 4-8 fl oz/A for early season disease suppression of rusts
Application rate: 10 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria blotch (Septoria tritici), Stagonospora glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis).

Restrictions: Begin preventative applications when conditions favor disease development. Reapply in 14 days if disease persists or if weather conditions favor continued disease. If 20 fl oz/A are applied (two applications), do not graze and do not cut for forage or hay. If one application (10 fl oz/A), do not graze or feed livestock treated forage for 30 days or harvest for hay 45 days after application.

Do not apply more than two applications of strobilurin fungicides in one year. Do not apply after full head emergence (Feekes growth stage 10.5). Stratego may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air or 10 gal/A ground. Do not apply within 35 days of harvest. Do not apply more than 20 fl oz of product per acre per season.

STRATEGO YLD *(prothioconazole + trifloxystrobin)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 4 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria blotch (Septoria tritici), Stagonospora glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis).

Restrictions: Begin preventative applications when conditions favor disease development. Reapply after 14 days if disease persists or if weather conditions favor continued disease. For early season disease suppression of rusts use 2-4 fl oz/A.

If greater than 4 fl oz/A are applied, do not graze and do not cut for forage or hay.

If up to 4 fl oz/A are used, do not graze or feed livestock treated forage for 30 days or harvest for hay within 45 days after application. Do not apply after full head emergence (Feekes growth stage 10.5).

Stratego YLD may be applied by ground, air or chemigation. Apply a minimum of 2 gal/A by air or 10 gal/A ground. Do not apply within 35 days of harvest. Maximum of two applications.

TOPGUARD *(flutrialfol)* Mode of action: 3 (DMI)

Application rate: 10-14 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Septoria leaf and glume blotch (Septoria spp), Powdery mildew (Erysiphe graminis). Suppression only: Fusarium head blight (Fusarium spp).

Restrictions: Apply preventively or when conditions are favorable for disease development. Repeat as necessary if conditions are favorable for disease development. For Fusarium head blight suppression, apply at anthesis (10.5.1). Use a minimum of 2 gallons of spray solution.

Do not apply more than 28 fl oz/A per season. Do not apply more than two times in a year. Do not apply within 30 days of harvest when wheat is for grain, 15 days for hay.

TOPGUARD EQ *(flutrialfol + azoxystrobin)* Mode of action: 3, 11 (DMI, QoI)

Application rate: 4-7 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Septoria leaf and glume blotch (Septoria spp), Powdery mildew (Erysiphe graminis), Tan spot (Pyrenophora tritici repentis).

Restrictions: Apply preventively or when conditions are favorable for disease development. Repeat as necessary if conditions are favorable for disease development. Do not apply past Feekes 10.54.

Do not apply more than 7fl oz/A per application. Do not apply more than two times in a year. Do not apply within 30 days of harvest when wheat is for grain, 15 days for hay, or 7 days for forage. Restricted entry interval is 12 hours.

TRIVAPRO *(benzovindiflupyr + azoxystrobin + propiconazole)* Mode of Action: 7, 11, 3 (SDHI, QoI, DMI)

Application rate: 9.4-13.7 fl oz/A

Target diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf blotch (Septoria nodorum, S. tritici), Glume blotch (Stagonospora nodorum), Powdery mildew (Erysiphe graminis), Black point (Cochliobolus sativus, Alternaria spp), Spot blotch (Cochliobolus sativus).

Restrictions: Begin application prior to disease onset when conditions are conducive for disease. Apply Trivapro no closer than a 14 day schedule. Apply 4 oz/A in a tank mix with a labeled rate of a registered fungicide containing FRAC groups 3 and 11.

Do not apply more than 13.7 fl oz/year. Do not apply after Feekes 10.5.4 (watery ripe). Do not apply within 7 days of harvest for forage and hay.

TWINLINE *(pyraclostrobin + metconazole)* Mode of Action: 3, 11 (DMI, QoI)

Application rate: 7-9 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf and glume blotch (Septoria spp.), Spot blotch (Cochliobolus sativus), Powdery mildew (Erysiphe graminis).

Restrictions: For early season disease suppression use 6-9 fl oz/A along with an herbicide or when conditions favor disease development. Use the higher rate and shorter interval when disease pressure is high.

Maximum of two applications. The minimum retreatment interval is 6 days after the first application. Apply no later than the beginning of flowering (Feekes 10.5). Do not apply more than 18 fl oz/A per season.

VERTISAN *(Penthiopyrad)* Mode of action: 7 (SDHI)

Application rate: 10-24 fl oz/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis), Tan spot (Pyrenophora tritici repentis), Septoria leaf and glume blotch (Septoria spp.), Spot blotch (Cochliobolus sativus) Suppression only: Fusarium head blight (scab) (Fusarium graminearum, Powdery mildew (Erysiphe graminis)

Restrictions: Apply prior to disease and repeat at a 7-14 day interval. Apply immediately after flag leaf emergence (Feekes growth stage 9) for optimum results. Use the higher rate and shorter interval when disease pressure is high.

Do not apply after flowering (Feekes growth stage 10.51). Do not apply more than two sequential applications without alternating with another fungicide chemistry. Do not apply within 21 days of harvest. There is no pre-harvest interval for the harvest of forage and hay.

Apply a minimum of 2 gal/A by air or 15 gal/A by conventional ground sprayer or 10 gal/A by air-assisted ground sprayer. Do not apply more than 48 fl oz/A per season.

VIATHON *(tebuconazole + potassium phosphite)* Mode of Action: 3, not classified (DMI, unknown)

Application rate: 2 pts/A

Targeted diseases: Leaf rust (Puccinia triticina), Stem rust (Puccinia graminis f tsp. tritici), Stripe rust (Puccinia striformis, Tan spot (Pyrenophora tritici repentis), Septoria leaf and glume blotch (Septoria spp.), Powdery mildew (Erysiphe graminis). Suppression only: Fusarium head blight (Fusarium graminearum).

Restrictions: Start applications at disease onset.

Do not apply more than 2 pts/A/season. Do not apply within 30 days of harvest. Do not allow livestock to graze or feed green forage until 6 days after treatment.