

2026

South Dakota Pest Management Guide

# Corn

*A guide to managing weeds, insects and diseases.*



**SOUTH DAKOTA STATE  
UNIVERSITY EXTENSION**

## Pesticide Recertification Information

The South Dakota Department of Agriculture and Natural Resources (DANR) is the lead agency administering the pesticide certification program required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). SDSU Extension partners with DANR to offer training programs. Those who apply pesticides for hire or as an employee that applies pesticides while performing work duties, must have a commercial applicator license. Existing applicators may complete recertification online.

**Commercial Applicator Information:** <https://extension.sdstate.edu/south-dakota-commercial-pesticide-applicator-certification-testing>

**Private Applicator Information:** <https://extension.sdstate.edu/applicator-training-pesticides>

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### Safety First

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

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

### Poison Control Center – 1-800-222-1222

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

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

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

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## ABBREVIATIONS

ae = acid equivalent  
ai = active ingredient  
gal = gallon  
gpa = gallon per acre  
in = inch  
lb = pound  
lb/gal = pound per gallon  
fl oz/a = fluid ounce per acre  
mo = month  
oz = ounce  
psi = pounds per square inch pressure  
pt = pint  
qt = quart  
%v/v = percent volume per volume  
AMS = ammonium sulfate  
CF = Clearfield corn

COC = crop oil concentrate  
G = granule  
L = liquid, flowable or EC  
LL = Liberty Link corn  
MSO = methylated seed oil  
N = liquid nitrogen fertilizer  
NIS = non-ionic surfactant  
PHI = pre-harvest interval  
REI = restricted entry interval  
OM = organic matter  
RR = Roundup Ready corn  
SG, DF, WDG = dry flowable, water dispersible granule  
(spray)  
UAN = urea + ammonium nitrate liquid fertilizer  
WSP = water soluble packet

# Weed Control in Corn

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## **Herbicide suggestions**

Information in this publication is based on South Dakota Agricultural Experiment Station research and other research or observations. An herbicide is included only after it is registered by the Environmental Protection Agency (EPA) as to residue tolerances in crops used for food or feed. Information in this book provides a summary of label information but is not intended as a label replacement. Labels change regularly. Always verify information on current product labels prior to application. Users are responsible for following all label directions and precautions.

## **Rates**

Rates for most products are listed as product per acre. Product rates for glyphosate and 2,4-D are based on acid equivalent (ae). Refer to accompanying tables to determine the amount for the specific product used.

## **Tank-mixes and Combinations**

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

## **Herbicide Cost**

The cost per acre for low and high rates is listed. Cost of additives is not included. Prices do not reflect special marketing programs. Consult your dealer for actual price.

## **Resistance Management**

Refer to the table on page 4 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 weed populations toward weed species that are difficult or costly to control. Maintaining the efficacy of herbicide chemistries through herbicide rotations may be an effective long-term strategy to reduce weed control costs as herbicide patents expire and weed control technology becomes less expensive. To facilitate proper herbicide rotation, the herbicide site of action number is listed next to the herbicide products in this publication.

## **Buffers**

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

## **Glyphosate-resistant Weeds**

Glyphosate-resistant weeds are becoming more common in South Dakota. The following list includes weed species that are known or suspected to be glyphosate-resistant. Early detection of resistance will greatly improve your ability to manage the resistant population. The best solution is to minimize selection for resistant weed species, which may be done by diversifying herbicide programs (using preemergence herbicides and tank-mix partners), rotating different crop species (wheat, sunflowers, alfalfa, etc.), or crop varieties such as Liberty Link or conventional.

### **Kochia**

Several locations in central SD. In no-till, effective burndown applications are critical. 2,4-D may not be effective. Atrazine may have some foliar activity for suppression and residual activity to control later emerging plants. Lumax, which contains atrazine and mesotrione (Callisto), would likely have sufficient foliar and residual activity. To control escapes postemergence, tank-mix partners with glyphosate may include a bleacher herbicide (Callisto, Laudis, Impact, Realm Q, etc.), dicamba (Clarity, DiFlexx, Status, etc.), or a bromoxynil product. To prevent selection for resistance to additional herbicides, consider rotating modes of action in a growing season by using different herbicides for the burndown and postemergence applications. Apply tank mixtures of different herbicides at each application (burndown, preemergence, postemergence) as well. Glufosinate (Liberty, Cheetah, etc.) will control small (less than 6 inches) glyphosate-resistant kochia in Liberty Link corn.

### **Common ragweed**

Some reports and a few confirmed locations in eastern SD. Apply a preemergence herbicide such as atrazine, saflufenacil (Sharpen, Verdict), or isoxaflutole (Balance or Corvus). Tank-mix partners with glyphosate may include a bleacher herbicide (Callisto, Laudis, Impact, Realm Q, etc.), dicamba (Clarity, DiFlexx, Status, etc.), or a bromoxynil product. Glufosinate (Liberty, Cheetah, etc.) will control glyphosate-resistant common ragweed in Liberty Link corn.

**Horseweed (marestail)**

Several reports in southeastern and northcentral SD. In the burndown application, tank mix glyphosate with 2,4-D ester or saflufenacil (Sharpen, Verdict). Atrazine may provide good residual control but would likely have less foliar activity than saflufenacil. Atrazine (1 qt) + 2,4-D (1 pt) has worked well for foliar and residual control in some SDSU trials. For postemergence applications, make applications while the horseweed is still small (less than 6 inches) and tank mix glyphosate with a dicamba product (Clarity, DiFlexx, Status, etc.). Glufosinate (Liberty, Cheetah, etc.) will control glyphosate-resistant horseweed in Liberty Link corn.

**Common lambsquarters**

Can be tolerant during adverse conditions. Apply a pre-emergence herbicide such as atrazine, saflufenacil (Sharpen, Verdict), or isoxaflutole (Balance or Corvus). Tank-mix partners with glyphosate may include a bleacher herbicide (Callisto, Laudis, Capreno, Impact, Realm Q, etc.), dicamba (Clarity, DiFlexx, Status, etc.), thifensulfuron (Harmony), or a bromoxynil product. Glufosinate (Liberty, Cheetah, etc.) will control lambsquarters in Liberty Link corn.

**Common waterhemp**

Several reports in eastern SD. Apply a preemergence herbicide such as atrazine, saflufenacil (Sharpen, Verdict), acetochlor (Harness, Surpass, etc.), or isoxaflutole (Balance or Corvus). Tank-mix partners with glyphosate may include a bleacher herbicide (Callisto, Laudis, Impact, Realm Q, etc.) or dicamba (Clarity, DiFlexx, Status, etc.). Glufosinate (Liberty, Cheetah, etc.) will control glyphosate-resistant waterhemp in Liberty Link corn.

**DEFINITIONS**

- EPPS**     **EARLY PREPLANT SURFACE:** Usually applied 2 to 6 weeks before planting in no-till.  
**PPS**       **PREPLANT SURFACE:** Prior to planting.  
**PPI**       **PREPLANT INCORPORATED:** Before the crop is planted, incorporate as directed.  
**SPPI**      **SHALLOW PREPLANT INCORPORATED:** Preplant incorporated, but herbicide usually restricted to the top 2 inches of soil with single-pass incorporation.  
**PRE**       **PREEMERGENCE:** After planting, but before crop or weeds emerge.  
**EPOST**    **EARLY POSTEMERGENCE:** After initial emergence or crop and weeds.  
**POST**     **POSTEMERGENCE:** After the crop or weeds have emerged.

**Group Numbers Associated with Herbicide Sites or Modes of Action**

<b>WSSA Group Number</b>	<b>Site or Mode of Action</b>	<b>Examples</b>
2	ALS inhibitor	nicosulfuron, rimsulfuron, flumetsulam
3	Microtubule inhibitor	pendimethalin, trifluralin
4	Growth regulator	2,4-D, dicamba, clopyralid
5	Photosynthesis inhibitor (triazine, triazinone)	atrazine, metribuzin
6	Photosynthesis inhibitor (contact)	bentazon, bromoxynil
8	Lipid synthesis inhibitor (thiocarbamates)	EPTC
9	EPSP inhibitor	glyphosate
10	Glutamine synthase inhibitor	glufosinate
14	Cell membrane disrupter (PPO inhibitor)	carfentrazone, flumiclorac, saflufenacil, tiafenacil
15	Seedling shoot inhibitor	acetochlor, metolachlor
19	Auxin transport inhibitor	diflufenzopyr
22	Cell membrane disrupter (PSI inhibitor)	paraquat
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# CORN HERBICIDES

**ATRAZINE (*atrazine*)** Site of Action: 5 **Restricted Use Pesticide**

**(\$5.75-17.70)**

**1-2 qt atrazine 4L (1-2 lb ai)**

**1.1-2.2 lb atrazine 90DF**

**1.6-3.2 pt Atra-5 5L**

Excellent control of several small-seeded annual broadleaves. High rate provides fair control of several large-seeded broadleaves. Annual grass control erratic. Good late-season control. Excellent crop tolerance. Atrazine at 2 qt of 4L or 2.2 lb of 90DF per acre has been satisfactory.

The maximum atrazine rate is 2 lb ai per acre for soil applications. The maximum rate is reduced to 1.6 lb ai per acre on fields designated as "highly erodible soil" (HEL) if there is less than 30% residue. A 66-foot buffer setback is required on HEL land. Atrazine cannot be applied within 66 feet of points where surface water enters streams, rivers, within 200 feet of lakes or reservoirs, or loaded or applied within 50 feet of a well or sinkhole.

Carryover may damage soybeans, sunflowers, small grain, and legume/grass seedings the following year. Corn and sorghum are tolerant. Risk of carryover is greatest on high pH, low-organic matter soils or eroded knolls. Soybeans and flax usually tolerate carryover rates up to 1 lb ai per acre. Minimum carrier for ground application is 10 gpa. For aerial preplant or preemergence application, minimum carrier is 1 qt for each quart of 4L or 1 gallon for each pound of dry formulation. Minimum carrier is 2 gpa for postemergence aerial application.

**FALL:** 1-2 qt (4L), 1.6-3.2 pt (5L) or 1.1-2.2 lb (90DF) Labeling allows fall application in wheat stubble in a wheat-corn-fallow rotation. Rates of 1 to 1.25 lb ai per acre have been used in SDSU tests as late fall application in no-till systems. Do not exceed 1.5 lb ai per acre on soils with a pH over 7.5. Results have been favorable if a follow-up herbicide is used to improve grass control.

**EPSPS:** 1.6-2 qt (4L), 2.5-3.2 pt (5L) or 1.8-2.2 lb (90DF) Apply up to 45 days before planting. Do not apply more than 2 weeks before planting on sandy soil.

**SPPI:** 1.6-2 qt (4L), 2.5-3.2 pt (5L) or 1.8-2.2 lb (90DF) Incorporate into the top 2 inches within 2 weeks of planting. Most consistent application. Provides best large-seeded broadleaf control.

**PRE:** 1.6-2 qt (4L), 2.5-3.2 pt (5L) or 1.8-2.2 lb (90DF) Requires 0.75-1-inch rain within one week after application. Less consistent.

**EPOST:** 1.25-2 qt (4L), 1.9-3.2 pt (5L) or 1.3-2.2 lb (90DF) With or without crop oil. Crop oil strongly preferred. Intended for annual broadleaves only. Weeds should be less than 1.5 inches high. Corn should not exceed 12 inches. Rainfall, high humidity, and dew improve results. Grass control is fair to poor. Some crop yellowing or leaf tip burn may occur under extremely cold, wet conditions. Use COC at the rate of 1 qt for ground or 1-2 pt per acre for air. Do not add 2,4-D or dicamba. Do not use liquid fertilizer carrier.

**TANK-MIXES:** Atrazine may be used in several preemergence tank-mixes. Gramoxone and glyphosate may be used for burndown. Atrazine is included in numerous tank-mixes on other herbicide labels.

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**METRIBUZIN PRODUCTS (*metribuzin*)** Site of Action: 5

**(\$1.40-6.60)**

**1.6-5.33 oz Dimetric EXT, Glory, Metribuzin, MetriCor, or TriCor 75DF (0.075-0.25 lb ai)**

**1.7-5.67 oz Metrixx 70DF**

**2.4-8 oz Glory, MetriCor, Metrixx SC, Me-Try-Buzin or TriCor 4F 3.2-10.72 oz Dimetric 3L**

Provides control of cocklebur, sunflower, kochia, pigweed, and smartweed. Fits where carryover from other herbicides must be avoided. Leaf yellowing may be noted in cool weather. Metribuzin is usually tank-mixed with other grass and broadleaf herbicides. Do not use additives unless specified. Rotation interval is 4 months for alfalfa and forage grasses; 8 months for barley, wheat, peas and lentils; 12 months for potatoes; and 18 months for most other crops. Do not harvest for grain or forage for 60 days.

Do not apply on coarse texture soils with less than 1.5% organic matter (O.M.) or soils with a pH greater than 7.0. Do not apply more than 4 oz DF, 6 oz 4F, or 8 oz 3L on soils with less than 2% O.M. Corn seed should be planted at least 1.5 inches deep. Do not apply more than 0.25 lb ai/A per season.

**PPS, PRE:** Apply 3-8 fl oz/A 4F, 4-10.72 fl oz/A 3L, 2.14-5.67 oz/A 70DF, or 2-5.33 oz/A 75DF. Apply up to 30 days prior to planting or preemergence. Use metribuzin with 2,4-D LV ester, Gramoxone, or glyphosate product to control emerged weeds.

**POST:** Apply 2.4-3 fl oz/A 4F, 3.2-6 fl oz/A 3L, 1.7-2.1 oz/A 70DF or 1.6-2 oz/A 75DF tank-mixed with herbicides including 2,4-D (0.12-0.25 lb ae), dicamba 4L (0.5-1 pt), Basagran (1 pt) per acre. Bromoxynil (1-1.5 pt) may be tank-mixed as a rescue treatment using drop nozzles. May also be tank-mixed with the following broadleaf herbicides: atrazine, bromoxynil, Pursuit (IMI corn only), and Resource. Apply after crop emergence to just prior to tasseling. Refer to label of tank-mix partner for specific directions and restrictions.

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**SHARPEN (*safllufenacil*)** Site of Action: 14

**(\$8.25-28.80)**

**1-3.5 oz Sharpen 2.85L (0.02-0.078 lb ai)**

Rate range is 2-3.5 fl oz/A depending on soil texture. May use 1 oz to improve burndown with limited residual control. Foliar and residual control of broadleaf weed species such as wild buckwheat, common lambsquarters, waterhemp, pigweed, mustard species, Russian thistle, horseweed (marestail), cocklebur, kochia, and several others. After application, at least 0.5 inches of rain is needed to activate the herbicide. Do not apply in fields where organophosphate or carbamate insecticides are applied at planting. Do not apply more than 6 fl oz/A per growing season.

For foliar activity, add MSO (1% v/v or minimum of 1 pt/A with low volume applications) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). The minimum carrier volume is 5 gpa (15-20 gpa is suggested for emerged weeds) for ground applications or 3 gpa for aerial applications. May be impregnated onto dry granular fertilizer.

More flexible rotation options than atrazine. At the 2 oz/A rate, rotation intervals are 1 month for sweet corn, edible beans/peas, and lentils; 1-1.5 months for soybeans; 2 months for cover crops; 5 months for sunflowers and most other crops. Corn, sorghum, small grains, chickpeas, and field peas can be planted anytime. See label for rotation intervals at higher rates.

**PPS or SPPI:** For applications up to 14 days prior to corn planting. May also apply up to 30 days prior to planting, but this is not recommended for coarse soils.

**PRE:** Do not apply after corn begins to emerge.

**TANK-MIXES:** May tank-mix with glyphosate, atrazine, Outlook, Clarity, Status, Harness, or other herbicides for control of grass and additional broadleaf weed species.

#### PREMIXES

**VERDICT, CORSICAN or TESTIFY (*safflufenacil* + *dimethenamid*)** Site of Action: 14 + 15 **(\$21.45-38.60)**

**10-18 oz Verdict, Corsican or Testify 5.57L (0.044-0.08 + 0.39-0.7 lb ai)**

Rate range is 10-18 fl oz/A depending on soil texture. The 13 oz rate for medium-textured soils is equivalent to 2.6 fl oz/A Sharpen + 10.8 fl oz/A Outlook. Intended for use in two-pass programs that will include a postemergence application. Provides foliar and residual control of several annual broadleaf weed species and grass species such as foxtail, crabgrass, and barnyardgrass. After application, at least 0.5 inches of rain is needed to activate the herbicide. Crop injury may occur during stressful conditions such as extreme hot or cold conditions, excessive moisture or drought, high soil pH, or disease injury.

Label prohibits application on specific soil types classified as sand, where O.M. is 3% or less, and the water table is less than 30 feet below the soil surface. Do not apply in fields where organophosphate or carbamate insecticides are applied at planting.

For foliar activity, add MSO (1% v/v) and either AMS (8.5-17 lb per 100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier volume is 3 gpa (15-20 gpa is suggested for emerged weeds) for ground or aerial applications. Rotation intervals for soybeans range from 0-4 months after application depending on rate applied, soil texture, and organic matter. If 10-12 oz/A is applied on coarse soils with  $\leq$  2% O.M. soybeans may be planted after 1.5 months or after 1 month on all other soils. Replant corn and grain sorghum anytime. Wheat may be planted 4 months after application and any crop may be planted one year after application.

**PPS or SPPI:** For applications up to 14 days prior to corn planting. May also apply up to 30 days prior to planting, but this is not recommended for coarse soils.

**PRE:** Do not apply after corn begins to emerge.

**FORTITRI (*safflufenacil* + *dimethenamid* + *pyroxasulfone*)** Site of Action: 14 + 15 + 15

**11-21 oz FortiTRI 3.83L (0.043-0.08 + 0.25-0.48 + 0.035-0.067 lb ai)**

Rate range is 11-21 oz depending on soil texture. Provides residual control of annual grasses, annual broadleaves and sedges. After application, at least 0.5 inches of rain is needed to activate the herbicide. Crop injury may occur during stressful conditions such as extreme hot or cold conditions, excessive moisture or drought, high soil pH, or disease injury.

Do not apply in fields where organophosphate or carbamate insecticides are applied at planting.

For burndown activity add MSO (1% v/v) and either AMS (8.5-17 lb/100 gallons) or UAN (1.25-2.5% v/v). Minimum carrier is 3 gpa for ground or aerial applications. Rotation interval depending on rate (11-21 oz) applied is 1-4 months for soybean; 4 months for lentil, field pea and wheat; 4-6 months for sorghum; 5-7 months for sunflower; 6-11 months for small grains other than wheat; and 9-12 months for canola. See label for other crops.

**FALL:** Apply 21-28 oz to medium or fine texture soils with more than 2.5% O.M. Apply after October 1 when soil temperature at 4 inches is less than 55 degrees and before the ground freezes.

**EPPS:** Apply within 15-30 days of planting. Use the highest rate for the soil texture. Not recommended for coarse soils.

**PPS or PPI:** Apply within 14 days of planting.

**PRE:** Apply before crop emergence.

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**REVITON (*tiafenacil*)** Site of Action: 14 **(\$6.05-18.15)**

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

Reviton is a non-selective herbicide that controls many broadleaf and grass weeds and is labeled for preemergence burndown activity up to crop emergence. Severe injury to crop loss will occur when applications are made to emerged corn stands. Foliar control of broadleaf weed species such as wild buckwheat, common lambsquarters, common and giant ragweed, waterhemp (PPO-inhibiting herbicide-susceptible biotypes), mustard species, Russian thistle, cocklebur, and several others. Control and suppression of grass species has been reported in many studies but not observed in SDSU trials. Do not apply more than 6 fl oz/A per growing season.

For foliar activity, add MSO (1% v/v or minimum of 1 pt/A with low volume applications). The minimum carrier volume is 10 gpa (15-20 gpa is suggested for best results or in heavy weed pressure) for ground applications.

More flexible rotation options than atrazine. At the 1-3 fl oz/A the rotation interval is 0 days for corn (field, seed, and silage), wheat; 0 or 7 days for soybean (depending on rate, soil type and O.M.); and 120-180 days for all other crops not listed on the label.

**BURNDOWN EPP/PRE:** Do not apply after corn begins to emerge. Limited preemergence activity.

**TANK-MIXES:** May tank-mix with glyphosate, glufosinate, atrazine, acetochlor, metolachlor, dicamba or any other herbicides for broader spectrum and residual control of grass and broadleaf weeds.

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**ELEVORE (*halauxifen*)** Site of Action: 4 **(\$7.90)**

**1 oz Elevore 0.572L (0.0045 lb ai)**

Elevore is labeled for preplant burndown and controls several annual broadleaf weeds such as horseweed (marestail), lambsquarters, redroot pigweed, common ragweed and others. Apply to emerged actively growing weeds.

Add COC or MSO at 1% v/v. The minimum carrier volume is 8 gpa for ground and 5 gpa for aerial applications. Use medium to very coarse nozzles. Apply when wind is between 2 to 15 mph. May be tank mixed with most other labeled herbicides. See [ElvoroTankMix.com](#) for a list of prohibited tankmixes.

Rotation interval is 14 days for soybeans, canola, millet, oat, sorghum, sunflower, barley, triticale and wheat; 9 months for alfalfa dry beans, peas, flax, and safflower; and 15 months for most other crops.

**BURNDOWN EPP:** Corn may be planted 3 days after application if corn is planted at least 1.5 inches deep and the furrow is completely covered. Otherwise wait 14 days before planting corn.

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**FLUMIOXAZIN PRODUCTS (*flumioxazin*)** Site of Action: 14 **(\$6.20-21.85)**

**2-4 oz Valor SX, Flumi 51WDG, or Flumi SX51WDG (0.06-0.125 lb ai)**

**2-4 oz Valor EZ, Panther SC, or Tuscany SC 4L (0.06-0.125 lb ai)**

Flumioxazin controls broadleaf weeds and suppresses some annual grasses. Can be applied as a burndown in fall or early preplant in the spring. May use a lower rate of 1 oz with glyphosate to increase burndown with limited residual control.

Minimum spray volume is 15 gpa for ground and 7 gpa for aerial application. Do not apply more than 3 oz/acre per growing season.

At rates up to 2 oz/acre, corn (conventional tillage), sorghum, sunflower, and wheat 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; lentils after 6 months; and most other crops are 4 months (if tilled) or 8 months (no-till) and a successful soil bioassay. Consult label for rates greater than 2 oz/acre. Soybeans may be planted immediately.

**FALL:** Apply 2-4 oz in the fall. Do not apply to frozen or snow-covered ground. Do not till after application or residual weed control will be reduced.

**EPPS:** Use only on no-till or minimum tillage fields where crop residue has not been incorporated into the soil. Apply 3.0 oz/acre 14-30 days prior to corn planting. Use 2.0 oz/acre 7-30 days before planting with a minimum of 25% residue cover and at least 0.25 inch rainfall between application and planting. After application do not irrigate from emergence to 2-leaf corn.

**TANK-MIXES:** Tank mix partners include atrazine, 2,4-D LVE, dicamba, Express, glyphosate, metribuzin, paraquat, and others. Use COC or MSO at 1-2 pt/acre or NIS at 0.25% v/v in tank-mixes applied to control emerged weeds. AMS at 2-2.5 lbs/acre or UAN at 1-2 qt/acre may also be added. Tank-mixing with metolachlor (Dual etc.), dimethenamid (Outlook etc.), acetochlor (Surpass, Harness etc.) products is not recommended.

**PREMIXES**

**FIERCE (*flumioxazin* + *pyroxasulfone*)** Site of Action: 14 + 15 **(\$29.40-44.05)**

**3-4.5 oz Fierce 76WDG (0.063-0.094 + 0.08-0.12 lb ai)**

**6-9 oz Fierce EZ 3.04SC (0.063-0.094+0.08+0.12 lb ai)**

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

Rates vary depending on soil type, organic matter and application timing. An activating rainfall is required before planting on soils with less than 1% O.M. Can be applied as a burndown in fall or early preplant in the spring. Minimum spray volume is 15 gpa for ground and 7 gpa for aerial application.

Do not apply more than 3 oz/A Fierce or 6 oz/A Fierce EZ per year to field corn. At the 6 oz/A rate of Fierce EZ, the rotation interval is 7 days for minimum or no-till corn; 1 month for wheat and conventional till corn; 2 months for field peas; 4 months for sunflower; 6 months for lentil and sorghum; 9 months for edible peas and edible beans; 10 months for alfalfa; 11 months for other small grains; and 18 months for most other crops. Consult label for rates greater than 6 oz/A. Soybeans may be planted immediately.

**FALL:** Apply 3-4.5 oz Fierce or 6-9 oz Fierce EZ in the fall. Do not apply to frozen or snow-covered ground. Do not till after application or residual weed control will be reduced.

**EPPS:** Apply 3 oz Fierce or 6 oz Fierce EZ 7-30 days before planting. Use only on no-till or minimum tillage fields where crop residue has not been incorporated. An activating rainfall or irrigation of 0.5 inch or more is required before planting on soils with less than 1% O.M.

**TANK-MIXES:** Tank mix partners include 2,4-D LVE, atrazine, dicamba, Express, glyphosate, paraquat, and others. Use COC or MSO at 1-2 pt/acre or NIS at 0.25% v/v in tank-mixes applied to control emerged weeds. AMS at 2-2.5 lbs/acre or UAN at 1-2 qt/acre may also be added. Tank-mixing with metolachlor (Dual, etc.), dimethenamid (Outlook, etc.), acetochlor (Surpass, Harness, etc.) products is not recommended.

**FIERCE MTZ (*flumioxazin* + *pyroxasulfone* + *metribuzin*)** Site of Action: 14 + 15 + 5 **(\$30.20-51.40)**

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

Premix containing 0.5 lb flumioxazin, 0.64 lb pyroxasulfone and 1.5 lb metribuzin per gallon formulated as a suspension concentrate. Flumioxazin controls broadleaf weeds and suppresses some annual grasses. Addition of pyroxasulfone and metribuzin provides residual control of many grasses and increases broadleaf weed control. Rates vary depending on soil type, organic matter and application timing. Can be applied as a burndown in fall or early preplant in the spring. Minimum spray volume is 15 gpa for ground and 7 gpa for aerial application. Do not apply more than 1.5 pt per acre per year to field corn. Do not use on popcorn, sweet corn, or corn grown for seed. Do not apply on coarse textured soils with less than 1.5% O.M. Do not apply on soils having a pH 7 or greater.

At the 1 pt/A use rate, the rotation interval is 7 days for minimum or no-till corn, 1 month for conventional till corn; 2 months for field peas; 4 months for sweet corn; 6 months for lentil; 8 months for wheat (4 if following peas, lentils, or soybean); 9 months for edible peas, edible beans, and potato; 10 months for alfalfa; 11 months for small grains (other than wheat); 12 months to dry bean and sunflower

**FALL:** Apply 1-1.5 pt/A in the fall. Do not apply to frozen or snow-covered ground. Do not till after application or residual weed control will be reduced.

**EPPS:** Apply 1-1.5 pt/A 7-30 days before planting. Use only on no-till or minimum tillage fields where crop residue has not been incorporated. An activating rainfall or irrigation of 0.5 inch or more water is required before planting on soils with less than 1% O.M.

**TANK-MIXES:** Tank mix partners include 2,4-D LVE, atrazine, clopyralid, dicamba, Express, glyphosate, paraquat, and others. Use COC or MSO at 1-2 pt/acre or NIS at 0.25% v/v in tank-mixes applied to control emerged weeds. AMS at 2-2.5 lbs/acre or UAN at 1-2 qt/acre may also be added.

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**ZIDUA (pyroxasulfone)** Site of Action: 15

**(\$13.05-48.40)**

**1 – 3 oz Zidua 85WG (0.053-0.213 lb ai)**

**1.75 – 6.5 oz Zidua SC 4.17L (0.057-0.212 lb ai)**

Zidua is an acetamide herbicide that provides residual control of many annual grasses and broadleaf weeds. Controls broadleaf weeds such as pigweed, waterhemp, nightshade, and provides suppression of several other broadleaf weeds. May be more persistent on the soil surface and can provide more consistent weed control than other soil applied grass herbicides. After application, at least 0.5 inches of rain is required for activation.

Rates vary from 1-4 oz/A (WG) or 1.75-6.5 oz (SC) for EPOST and 1.5-4 oz/A (WG) or 2.5-6.5 oz (SC) for other timings depending on soil texture. Do not apply more than 2.75 oz/A (WG) or 4.5 oz/A (SC) on coarse soils or more than 5 oz/A (WG) or 8.25 oz/A (SC) on medium and fine soils per season. Minimum carrier is 5 gpa for ground or 3 gpa for air.

With an application rate of <3 oz/A (WG) or <5 oz/A (SC) the rotation interval is soybeans anytime, 1 month for field pea, 2 months for lentil, 3 months for safflower and sunflower, 4 months for wheat, 10 months for alfalfa, 11 months for edible peas, edible dry bean and other small grain, and 18 months for most other crops.

**FALL:** Do not apply if soil is frozen or snow-covered.

**EPPS:** Apply 15-45 days before planting using highest application rate depending on soil texture.

**PPI:** Incorporate into upper 1-2 inches of soil up to 14 days before planting.

**PRE:** Apply after planting and before crop emergence.

**EPOST:** Apply to corn from spiking up to V-4 stage. Do not use adjuvants. Provides residual control of weeds germinating after application.

**TANK-MIXES/SEQUENTIAL:** May be tank mixed or applied sequentially with, but not limited to, Outlook, Prowl H2O, Sharpen, Status, Verdict, atrazine, and glyphosate.

**PREMIXES**

**MAVERICK (pyroxasulfone + mesotrione + clopyralid)** Site of Action: 15 + 27 + 4

**14-32 oz Maverick 2.2 SC (0.08-0.17 + 0.09-0.21 + 0.06-0.13 lb ai)**

Premix containing 0.693 lb pyroxasulfone (Zidua), 0.829 lb mesotrione (Callisto) and 0.693 lb clopyralid (Stinger) per gallon. Provides broad spectrum preemergence and postemergence weed control.

For PPS, SPPI, PRE applications, the maximum use rate on coarse soils is 18 fl oz/A, medium soils is 24 fl oz/A, and fine soils is 32 fl oz/A. Sequential applications may only be made to fine soils. DO NOT use nitrogen-based adjuvants (AMS or UAN) or methylated seed oil (MSO) with Maverick applied to emerged corn except for inclusion of AMS to glyphosate or glufosinate tank mixes. For postemergence applications, use 0.25% v/v NIS or COC at 1-2 pt/A. Minimum carrier is 10 gpa for ground and 2 gpa for aerial applications. Rainfast 6 hours after application.

Do not graze sooner than 45 days after application. PHI is 30 days for ears and forage and 60 days for stover. See label precautions when using organophosphate soil applied insecticides.

The rotation interval is 8 months for flax, 10.5 months for soybean and sunflower, 4 months for wheat (up to 24 oz), 6 months for wheat (32 oz/A), and 18 months for all other crops. See label for rainfall and soil requirements.

**PPS:** Apply 18-32 oz/A in combination with labeled burndown herbicides to help control emerged weeds prior to crop emergence. Maximum use rate dependent on soil type.

**SPPI:** Uniformly incorporate into the upper 2 inches of the soil within 14 days prior to planting. Maximum use rate dependent on soil type.

**PRE:** Apply 18-32 oz/A. Maximum use rate dependent on soil type.

**POST:** Apply 14 oz/A up to 18 inch height or V6 stage of corn, whichever occurs first.

**PERPETUO (pyroxasulfone + flumiclorac)** Site of Action: 15 + 14

**(\$19.40-32.30)**

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

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

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

Do not make more than one application per year. Do not apply more than 10 oz/A per year.

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

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

**POST:** Apply 6-10 oz/A from the V2 to V6 stage of corn.

**ANTHEM MAXX (pyroxasulfone + fluthiacet methyl)** Site of Action: 15 + 14

**(\$16.90-54.85)**

**2-6.5 oz Anthem Maxx 4.3L (0.08-0.21 + 0.002-0.006 lb ai)**

Premix containing 4.174 lb ai pyroxasulfone (Zidua) and 0.126 lb ai fluthiacet methyl (Cadet) per gallon. Preemergence application provides residual control of most grasses and several broadleaf species including pigweed, waterhemp, and nightshade. Moisture required for activation. Early post applications control many broadleaf weeds up to 2-4 inches. A tank-mix partner is required to control emerged grasses and broadleaves larger than the maximum listed height. Use 2.5-6.5 fl oz/ acre when applied preplant or preemergence or 2-6 fl oz/acre applied postemergence depending on soil texture and organic matter. Can be tank-mixed with Cadet for improved postemergence performance; however, do not exceed a total of 0.009 lb ai fluthiacet per acre per year.

For burndown and post application, may use NIS (0.25% v/v), COC or MSO (1-2 pt/acre but not to exceed 2.5% v/v). May also use a silicone-based surfactant at 0.25% v/v or as listed on the adjuvant label. Can add UAN at 1-2 qts/acre or AMS at recommended rates. When tank mixing with other herbicides, use the adjuvant directions of the tank-mix partner and follow all restrictions and precautions. Minimum carrier is 5 gpa for ground application or 3 gpa for aerial application. For postemergence application use 10-40 gallons of spray solution per acre.

Avoid application when corn foliage is wet and shortly before or after rainfall as temporary crop response can occur. Do not apply postemergence if corn plants are severely stressed. Do not tank mix post emergence with any insecticide containing chlorpyrifos. If herbicides containing the same active ingredients as Anthem Maxx are used, do not exceed the maximum allowable use rates for pyroxasulfone and fluthiacet methyl. Do not apply more than 4.5 oz/acre of Anthem Maxx on coarse soils or 8.15 oz/acre on medium and fine soils per cropping season. Do not harvest forage for 30 days or grain or stover for 70 days. Corn and soybeans can be planted anytime. Rotation interval for 4.875 oz/A or less is 4 months for wheat and sunflower, 6 months for lentils and peas, 10 months for alfalfa and grain sorghum, 11 months for edible beans, edible dry beans and other small grains, 15 months for canola and 18 months for most other crops. See label for rotation interval with higher use rates.

**PPS:** Apply up to 45 days before planting.

**PPI:** Incorporate into the top 1-2 inches of soil up to 14 days before planting.

**PRE:** Apply at or after planting, but prior to crop or weed emergence.

**EPOST:** Apply 2-6 oz from crop emergence through V4 stage of corn.

**ANTHEM ATZ (pyroxasulfone + fluthiacet methyl + atrazine)** Site of Action: 15 + 14 + 5 **Restricted Use Pesticide**

**1.5-4 pt Anthem ATZ 4.5L (0.09-0.24 + 0.003-0.007 + 0.75-2 lb ai)**

Premix containing 0.485 lb ai pyroxasulfone (Zidua), 0.014 lb ai fluthiacet methyl (Cadet), and 4.006 lb ai atrazine per gallon. Addition of atrazine improves residual and post emergence weed control. Moisture required for activation. Early post applications control many broadleaf weeds up to 2-4 inches. A tank mix partner is required to control emerged grasses and broadleaves larger than the maximum listed height. Use 1.75-4 pt/acre when applied preplant or preemergence depending on soil texture and organic matter. Apply postemergence at 1.5-3 pt/acre depending on soil texture.

For burndown and post application, may use NIS (0.25% v/v), COC or MSO (1-2 pt/acre but not to exceed 2.5% v/v). May also use a silicone-based surfactant at 0.25% v/v or as listed on the adjuvant label. Can add UAN at 1-2 qts/acre or AMS at recommended rates. When tank mixing with other herbicides, use the adjuvant directions of the tank mix partner and follow all restrictions and precautions. Minimum carrier is 5 gpa for ground application. Not labeled for aerial application. For postemergence application use 10-40 gallons of spray solution per acre.

Avoid application when corn foliage is wet and shortly before or after rainfall as temporary crop response can occur. Do not apply postemergence if corn plants are severely stressed. Do not tank-mix post emergence with any insecticide containing chlorpyrifos.

If herbicides containing the same active ingredients as Anthem ATZ are used, do not exceed the maximum allowable use rates for pyroxasulfone and fluthiacet methyl. Do not apply more than 39 oz/acre of Anthem ATZ on coarse soils or 70.5 oz/acre on medium and fine soils per cropping season. Corn can be planted anytime. In eastern parts of South Dakota, soybeans may be planted the following year for rates less than 4 pt/A (2 lb ai atrazine); however, injury may occur on calcareous soils. Rotation interval for most other crops is 18 months.

**PPS:** Apply up to 45 days before planting.

**PPI:** Incorporate into the top 1-2 inches of soil up to 14 days before planting.

**PRE:** Apply at or after planting, but prior to crop or weed emergence.

**EPOST:** Apply 1.5-3 pt from crop emergence through V4 stage of corn.

**ANTHEM FLEX (pyroxasulfone + carfentrazone)** Site of Action: 15 + 14

**(\$17.70-46.90)**

**2.75-7.28 oz Anthem Flex 4L (0.08-0.21 + 0.006-0.015 lb ai)**

Premix containing 3.733 lb pyroxasulfone (Zidua) and 0.267 lb carfentrazone (Aim) per gallon. Controls annual grasses and some broadleaf weeds; including waterhemp and pigweed species. Rates vary based on soil texture and organic matter. Use the higher recommended rate for early preplant, reduced tillage, or heavy weed pressure. Plant corn at least 1.5 inches deep to avoid risk of crop response. For burndown applications add NIS (0.25% v/v), or COC/MSO (1-2 pt/A). For control of emerged weeds include a tank-mix such as 2,4-D, dicamba, glyphosate or atrazine. Minimum carrier is 5 gpa for ground or 3 gpa for aerial applications.

Do not apply more than 5 oz/A on coarse soils or 9.12 oz/A on medium or fine soils per cropping season. Rotation intervals vary with the rate used. For the 7.28 oz rate rotation interval is 4 months for soybean and sunflowers; 6 months for wheat; 8 months for lentils and dry field peas; 10 months for alfalfa; 11 months for dry beans; 12 months for grain sorghum; and 18 months for canola, small grains other than wheat, and most other crops.

**EPP:** Apply 3.5-7.28 oz 15-45 days before planting.

**PPS or PRE:** Apply 2.75-7.28 oz.

**SURTAIN (pyroxasulfone + saflufenacil) Site of Action: 15 +14**

**9.2-17 oz Surtain (0.072-0.133 + 0.045-0.083) lb ai**

Controls annual broadleaf and grass weeds. Use rate is dependent on soil texture. Use 9.2-11 oz on coarse soil, 11-14 oz on medium soil, and 11-17 oz on fine soil. No additives needed when applied alone but if tank-mixing with a herbicide, do use MSO or UAN. Early postemergence applications may cause short-lived spot burning; injury can be increased by the use of an adjuvant. Use 3 or more GPA for aerial and ground applications. Surtain will not control emerged weeds. May be tank mixed with other herbicides. Refer to specific labels for restriction. Tank-mixing with glufosinate (Liberty) is not advised as injury may occur.

Do not apply more than 17.0 oz/A in a single application. Do not apply more than 27.0 oz/A total from sequential applications in a single year (0.211 lb ai pyroxasulfone and 0.132 lb ai saflufenacil). Sequential applications should be made 14 days apart. Only two applications can be made per year. If using other herbicides containing pyroxasulfone and/or saflufenacil, do not exceed the

maximum allowable rates. Do not apply to popcorn or sweet corn. Do not apply with organophosphate or carbamate insecticide at planting or injury can occur. Exceptions are Aztec 4.67 G and Smartchoice 5G applied at planting as a band, T-band or in furrow.

Rotation intervals vary with the rate used. No preharvest interval for preplant or preemergence applications. No preharvest or grazing interval between early postemergence application if made at V4 or earlier. Forage and stover may be fed to livestock after harvest.

**PPS:** Apply within 15 to 30 days of planting.

**PPI:** Apply within 14 days of planting.

**PRE:** Apply after planting and before crop emergence.

**EPOST:** Apply 11.0 to 14.0 oz. from spiking to V3

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

**(\$8.15-25.95)**

**1-2 pt Dual II Magnum, Brawl II, Charger Max, Hamper II, Medal II, Moccasin II Plus, StreliaS II 7.64L**

**1-2 pt Dual Magnum, Brawl, Charger Basic, EverpreX or Medal 7.62L**

**1.2-2.4 pt Dual II Magnum SI 6.3L**

**6-12 lb Dual II G Magnum 16G (0.95-1.9 lb ai)**

Very good to excellent control of several annual grasses. Fair control of pigweed with high rates. Weak on lambsquarters. Consistent on annual grasses when rainfall or soil moisture requirements are met. Poor control on large-seeded broadleaf weeds. Rates of 1.67-2 pt/A Dual II Magnum or 10-12 lb/A 16G per acre (broadcast) have been satisfactory in most SDSU tests. Labeling includes higher rates for special grass problems. Very good crop tolerance.

Minimum carrier is 5 or 10 gpa for ground depending on equipment and 2 gpa for air. No carryover. Labeled for field, silage, and sweet corn. S-metolachlor products contain the resolved form of metolachlor. Dual II Magnum SI is labeled for use on dry fertilizer only. No fertilizer driers are needed with this product. Use comparable rates(ai) as for Dual II Magnum. Do not apply more than 3.9 pt/A per crop year depending on soil texture.

**FALL:** Apply after September 30 when soil temperature is 55°F and falling but before soil freezes. For soil having greater than 2.5% O.M. Use 1.67-2 pt/A Dual II Magnum on medium soils. Use the high rate on fine textured soil. Performs best in early, dry spring seasons and where grass pressure is light to moderate.

**EPPS:** Apply up to 14 days before planting on coarse soils and up to 30 days before planting on medium and fine soils.

**SPPI:** Incorporate into top 2 inches within 14 days. Better results than preemergence when rain is very limited but gives slightly less control than preemergence with adequate rain. May be more consistent in low rainfall areas. Heavy rain reduces effectiveness. Proper incorporation may be difficult with trashy, lumpy seedbed. Deeper incorporation reduces control. Use maximum rate for soil type.

**PRE:** Requires 0.5-0.75 inch rain within one week after application. Rate depends on soil texture and organic matter.

**POST:** Apply up to 2 pt postemergence until corn reaches 40 inches. Less consistent. Use with a tank-mix partner that controls emerged weeds.

**TANK-MIXES:** Labeling includes preemergence or burndown mixes with Gramoxone, glyphosate, 2-4-D, or dicamba. Postemergence mixes include glyphosate, Liberty and atrazine. Refer to label restrictions or the section for each herbicide.

**STALWART C, HELMET, METALICA, or PARALLEL 7.8L**  
**(0.98-2 lb ai) (metolachlor)**

**(\$11.20-22.45)**

Apply 1-2 pt/A as for s-metolachlor. Products contain metolachlor. EPA has limited the rate to the same amount of product as for Dual II Magnum containing s-metolachlor. Higher rates are included for certain grassy weed problems.

**METOLACHLOR + ATRAZINE PREMIXES** Site of Action: 15 + 5 **Restricted Use Pesticides**

Herbicides	Metolachlor + atrazine lb/ gal	s-metolachlor + atrazine lb/ gal	product/A qt	Equivalent atrazine/A lb ai	Rate qt/A			POST
					EPP	PPS, PPI, PRE		
						<3% O.M.	≥3% O.M.	
Bicep II Magnum 5.5L, Brawl II ATZ, Medal II ATZ	—	2.4+3.1	1.3-2.6	1-2	2.1-2.6	1.3-2.1	1.6-2.6	1.6-2.6
Bicep Lite II Magnum 6L, Charger Max ATZ Lite, 6L	—	3.3+2.7	0.9-2.2	0.6-1.5	1.5-2.2	0.9-1.5	1.1-2.2	1.1-1.9
Stalwart Xtra 5.5L	2.4+3.1	—	1.3-2.6	1-2	2.1-2.6	1.3-2.1	1.6-2.6	1.6-2.6
Parallel Plus	2.7+2.8	—	1.4-2.83	1-2	1.9-2.83	1.4-2.29	1.48-2.83	1.9-2.83

**EPP, PPS, PPI, PRE, or POST:** Rates vary by soil texture. Maximum atrazine rate is 1.6 lb ai per acre on highly erodible land with less than 30% residue. Apply to corn up to 12 inches when tank-mixed with glyphosate.

**PREMIX**

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

**(\$22.10-35.40)**

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

Rates vary from 2.5-4 pt/A depending on weed height at the time of application. Intended to control emerged weeds and provide residual control of several annual grass weed species. Each pint of Sequence contains the equivalent of 0.4 pt Dual Magnum.

**PPS and PRE:** Do not apply more than 3.5 pt/A on coarse soils or 4 pt/A on medium- or fine-textured soils.

**EPOST:** Apply only to glyphosate-tolerant (e. g. Roundup Ready) corn from emergence to the V-8 stage or until 30 inches tall. Do not exceed 2.5 pt/A in a single application or a total of 5 pt/A per season. Do not exceed 1.5 lb ae/A glyphosate per season (each pint of Sequence contains approximately 0.3 lb ae). Do not apply to corn stressed from weather, insects, disease, or cultivation injury. Do not graze or feed treated forage until 30 days or harvest for 50 days after application. May be tank mixed with atrazine, dicamba, 2,4-D, Callisto, or others (see label).

**ACETOCHLOR PRODUCTS** Site of Action: 15

**(\$12.75-54.05)**

**1.25-3 pt Arrest Plus, Cadence NXT, Confidence, Fearless, Harness, OverTime NXT, Surpass NXT, Tremor NXT, or Volley NXT 7L**  
**6-12 lb Harness 20G (1.2-2.4 lb ai)**

Products contain acetochlor plus safener. General labeling and precautions are similar. Annual grass control has been very good to excellent. Gives fair to good control of waterhemp/pigweed, but often less control of other broadleaf weed species (especially large-seeded species). Crop tolerance is very good. Approved rotational crops include wheat (4 months); soybeans and milo the following year.

Several environmental restrictions are intended to reduce the risk of groundwater contamination. Mixing and loading pads are required if within 50 feet of a well. Application is prohibited on sandy soil with less than 3% O.M. if groundwater is within 30 feet of the surface. In addition, loamy sands with less than 2% O.M. or sandy loams with less than 1% O.M. should not be treated if groundwater is within 30 feet. Minimum carrier is 10 gpa. Acetochlor is not approved for aerial application.

**FALL:** Several acetochlor products are registered for fall application after soybean harvest. Apply after October 15, but before the soil freezes. For medium and fine textured soils with greater than 2.5% O.M. Best suited for fields where light or moderate grass pressure is anticipated. Do not incorporate more than 2 inches deep if tilled after application.

**EPPS:** For no-till or reduced tillage systems on medium or fine soils. Apply within 30 days of planting. High rates are suggested if applied more than 10 days before planting. Incorporated applications should be made within 10 days of planting. Some products may be used as a split application if applied within 45 days of planting. Slightly higher rates are used for early preplant applications. Performance is best in early, dry spring seasons.

**SPPI:** Apply within 14 days of planting. Incorporate shallowly into the top 1-2 inches.

**PRE:** Apply within 5 days of the last tillage. At 0.25 inches of rainfall required for activation.

**POST:** Apply postemergence until corn reaches 11 inches. Do not use fluid fertilizer carrier. Use with tank-mix partner that controls emerged weeds.

**WARRANT, ENVERSA or ARREST CS (acetochlor)** Site of Action: 15

**(\$17.55-35.10)**

**1.5-3 qt Warrant, Enversa or Arrest CS 3L (1.12 - 2.25 lb ai)**

Encapsulated acetochlor products increase crop safety. Use with tank-mix partner to control emerged weeds.

Rates vary depending on soil texture and organic matter (O.M.). For Warrant on soils with more than 3% O.M., apply 2 qt/A on coarse soil, 2-2.75 qt/A on medium or 2.75-3 qt/A on fine-textured soil. Do not use on sweet corn.

**POST:** May be applied from corn emergence until corn is 30 inches tall. For better coverage, use drop nozzles for corn 24-30 inches tall. Do not use liquid fertilizer as the carrier with postemergence applications.

**ACETOCHLOR + ATRAZINE PREMIXES** Site of Action: 15 + 5 **Restricted Use Pesticides**

Herbicides	Acetochlor + atrazine lb/gal	Encapsulated acetochlor + atrazine lb/gal	Rate (qt/A)		
			Coarse soil	Medium soil	Fine soil
Harness Xtra 5.6L, Cadence ATZ NXT, Electra 5.6L, Fearless XTRA 5.6L, Confidence Xtra 5.6L, Keystone NXT, OverTime ATZ NXT, Tremor ATZ NXT, Volley ATZ NXT	3.1 + 2.5	—	1.4-1.7	1.7-2.6	2.3-3
Harness Xtra 6L, Cadence LA NXT, Confidence Xtra, Electra Plus, Fearless XTRA, Keystone LA NXT, OverTime ATZ Lite NXT, Tremor ATZ Lite NXT, Volley ATZ Lite NXT	4.3 + 1.7	—	1.8	1.8-2.3	2.0-2.3
Degree Xtra, Fulltime NXT	—	2.7 + 1.34	1.5-2.9	1.5-3.7	1.5-3.7

**EPP, PPI, PRE, or EPOST:** Apply to corn up to 11 inches. Most rates vary by O.M. within each soil texture classification. Slightly greater rates required for EPP (more than 14 days prior to planting) or no-till applications. See restrictions for acetochlor products.

**HARNESS MAX or DOUBLE HEADER (acetochlor + mesotrione)** Site of Action: 15+27 **(\$27.75-61.05)**

**40-88 oz Harness Max 3.85L (1.1-2.42 + 0.103-0.227 lb ai)**  
**1.4-2.4 qt Double Header 3.58L (1.12-1.92 + 0.133-0.228 lb ai)**

Harness Max is a premix containing 3.52 lb acetochlor + 0.33 lb mesotrione per gallon. Double Header contains 3.2 lb acetochlor + 0.38 lb mesotrione per gallon. Controls many annual grasses and broadleaf weeds. Rates vary based on soil texture and organic matter. Minimum carrier is 10 gpa for ground. Do not apply by air. For post applications add NIS (0.25% v/v) or COC (1% v/v). Use COC for more consistent weed control however temporary crop injury may occur. May also add AMS or UAN with Harness Max (do not add with Double Header). Do not use MSO.

Do not make more than 2 applications per year. Do not make a second application within 14 days. Do not apply more than 95 oz/A Harness Max or 2.4 qt/A Double Header per year. Do not harvest forage, grain, or stover for 60 days. Do not tank-mix with or apply within 7 days of an organophosphate or carbamate insecticide postemergence. Severe crop injury may result if applied postemergence following an at-planting organophosphate insecticide application.

Rotation interval is 4 months for wheat, 10 months for alfalfa, and soybeans, the following spring for barley, rye, oats, and millet, and 18 months for dry beans, peas, and other crops.

**PPS, PPI, or PRE:** Apply 55 to 88 oz/A Harness Max. Make preplant surface applications less than 30 days before planting and before weed emergence. May be shallow incorporated (upper 1 inch) within 14 days of planting.

**POST:** Apply 40-75 oz/A Harness Max to corn up to 11 inches tall. Apply to actively growing weeds up to 3 inches tall. Requires precipitation or overhead irrigation after application to control weeds that have not emerged. If a product containing mesotrione was applied preemergence only the 40 oz rate may be used postemergence.

**RESICORE REV or RECITE (acetochlor + mesotrione + clopyralid)** Site of Action: 15+27+4 **(\$27.65-64.20)**

**1.4-3.25 qt Resicore REV (0.98-2.3 + 0.095-0.22 + 0.066-0.15 lb ai)**  
**1.25-3 qt Resicore or Recite 3.29 SE (0.88-2.1 + 0.09-0.23 + 0.06-0.14 lb ai)**

Premix containing 2.8 lb acetochlor + 0.27 lb (0.3 lb Recite and Resicore) mesotrione + 0.19 lb clopyralid per gallon. May be applied pre-emergence at 2.25- 3 qt/A depending on soil organic matter and texture, but 2 qt/A (1.8 qt Recite or Resicore) may be applied if additional herbicides will be applied post-emergence, weed densities are low to moderate, and weeds are not herbicide resistant. Resicore REV may be applied post-emergence at rates as low as 1.4 qt/A when tank mixed with glyphosate or glufosinate. Resicore REV at 1.4 qt/A provides equivalent active ingredients as 1.1 qt/A Surpass NXT, 3 oz/A Callisto, and 2.8 oz/A Stinger. Provides excellent residual grass control and residual and foliar broadleaf weed control. Contains multiple modes of action for resistance management and increased spectrum of control. The clopyralid component provides added activity on several weeds, such as common and giant ragweed and wild buckwheat, compared to mesotrione alone.

Minimum carrier is 10 gpa for ground applications. Do not apply by air. Do not over agitate. For post-emergence applications, only AMS at 8.5 lbs/100 gal may be needed if a "loaded" or surfactant-containing glyphosate is added. Otherwise, AMS plus NIS at 0.25% v/v may be added. Do not add UAN, COC, or MSO as unacceptable corn leaf burn may result. COC and other additives listed may be used pre-emergence to improve burndown.

Avoid post-emergence applications within 7 days before or after organophosphate or carbamate insecticide applications. See label restrictions when using organophosphate soil applied insecticides. Rotation interval is 4 months for wheat; 10.5 months for alfalfa, sunflowers, soybeans, sorghum, millet, barley, and oats; and 18 months for most other crops. Do not graze or feed forage for 45 days. Pre-harvest interval is 60 days for grain or silage. Do not use over 3.25 qt/A per year, or 0.24 lb ai/A mesotrione per year.

**EPP:** May be applied up to 28 days prior to planting.

**PRE:** Broadcast applications. Incorporation desirable within 7 days after application with rainfall (0.25 in), irrigation, or shallow tillage or inconsistent weed control may result.

**EPOST:** May be applied post-emergence in water after corn is emerged and up to 24 inches (Resicore REV) or 11 inches (Recite and Resicore) in height. Apply to small broadleaf weeds (<3 inches).

**TANK-MIXES:** May be tank-mixed early post-emergence with atrazine, Accent Q, Basis products, Steadfast Q, or glyphosate. Follow label directions for adjuvant recommendations.

**KYRO (acetochlor + topramezone + clopyralid)** Site of Action: 15+27+4

**35-60 oz Kyro (0.76-1.3 + 0.013-0.022 + 0.07-0.12 lb ai)**

Premix containing 2.78 lb acetochlor + 0.046 lb topramezone + 0.247 lb clopyralid per gallon.

Minimum carrier is 10 gpa for ground applications. Do not apply by air. When applied alone, add COC or MSO at 0.5-1% v/v. When applied in a tank-mix use NIS at 0.25-0.5% v/v. Do not apply within 45 days of harvest (ears/forage) or within 60 days of harvest for stover. Crop rotation restriction is 4 months for wheat; 10.5 months for alfalfa, barley, oats, rye, sorghum; 10.5 months for soybean and sunflower with greater than 2% soil organic matter and at least 15 inches rainfall after application; and 18 months for most other crops.

**POST:** Apply to corn after emergence up to 24 inches. Suggested use rate is 45 oz when tank-mixed with glyphosate or 60 oz/A when used in conventional corn. Most effective when applied to weeds 4 inches or less.

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**SURESTART II, SMACKDOWN, STAUNCH II, TRIPLEFLEX II, or THREESIDUAL**  
**(acetochlor + flumetsulam + clopyralid)** Site of Action: 15 + 2 + 4

**(\$13.95-45.30)**

**1.5-3 pt Surestart II, Smackdown, Staunch II, Tripleflex II, or Threesidual 4.16L (0.7-1.4 + 0.023-0.045 + 0.054- 0.109 lb ai)**

Rate is 1.5-3 pt/A depending on soil texture and O.M. or use higher rates (2-3 pt/A) for fall or spring early preplant applications. Lower rates are intended for limited residual control that will be followed by a postemergence herbicide application. It is recommended to apply just prior to weed germination. Minimum carrier is 10 gpa for ground. Not labeled for aerial application.

Provides control or suppression of several annual grass and broadleaf weed species. SureStart II contains 3.75 lb acetochlor + 0.12 lb flumetsulam + 0.29 lb clopyralid per gallon. SureStart II at 2 pt/A is equivalent to 1.1 pt/A Surpass NXT + 0.6 oz wt/A Python + 4 fl oz/A Stinger.

Crop rotation restriction is 4 months for wheat, the spring following application for barley, oats, alfalfa, dry beans, and soybeans, 12 months for sorghum, 18 months for sunflowers, and 26 months for canola. Rotation restrictions increase to 18 months for soybeans, alfalfa, and dry beans if annual rainfall is less than 15 inches on soils with less than 2% organic matter. Do not apply to sweet corn or popcorn.

Corn tolerance is greater when applied early postemergence (prior to 11-inch-tall corn) than preemergence. Preemergence injury has not been seen in SDSU research; however, in cool wet conditions cases of injury have been observed in grower fields. For preemergence applications, corn must be planted at least 1.5 inches deep. Do not apply preemergence to soils with a pH >7.8. Do not apply preemergence to soils with less than 1.5% organic matter (unless risk of crop injury is acceptable).

Do not use Counter or Thimet insecticide and do not apply other organophosphate insecticides in furrow. Do not tank mix with organophosphate insecticides when making postemergence applications. Where the water table is less than 30 feet below the soil surface, do not apply within 50 feet of a well if the soil is a sand with less than 3% organic matter (O.M.), loamy sand with less than 2% O.M., or sandy loam with less than 1% O.M. Do not mix or load within 50 feet of a well unless it is done on a properly constructed impervious pad.

**FALL:** May be applied at 2-3 pt in the fall after October 15 when the soil temperature falls below 50°F at 4 inches but before the ground freezes.

**EPPS:** Apply 2-3 pt more than 21 days prior to planting in spring on medium and fine textured soils.

**PPI:** Incorporate into the top 1-2 inches of soil up to 14 days before planting.

**PRE:** Apply after planting. 0.25 inches of rainfall required for activation.

**EPOST:** Apply to corn up to 11 inches tall.

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

**(\$11.80-30.95)**

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

Chloroacetamide herbicide. Very good to excellent control of several annual grasses. Sandbur and wild proso millet are partially controlled. Fair to good control of certain annual broadleaf weeds such as pigweed, waterhemp, or black nightshade. Crop tolerance is adequate.

Do not apply to coarse soil (sand) with less than 3% O.M. and where groundwater is 30 feet or less below surface. A supplemental label for SD lists specific soil series where application is prohibited. Rates of 14-16 oz Outlook 6L per acre suggested for most situations. Minimum carrier is 5 gpa for ground and 2 gpa air. There are no rotational crop restrictions for the next season. Winter wheat can be planted after 4 months. Do not graze or feed corn for 40 days after application.

**FALL:** Apply after October 1 when soil temperature at 4 inches is less than 55°F but before soil freezes. Use up to 21 oz per acre for medium- and fine-textured soil with >2.5% O.M.

**EPPS:** For reduced or no-till systems. Apply up to 45 days before planting. A split application (2/3 early and 1/3 at planting) is preferred if applying more than 30 days before planting. Burndown herbicide may be added for emerged weeds.

**SPPI:** Apply within 2 weeks of planting and incorporate into the top 1-2 inches. Avoid deep incorporation. Better results than with preemergence if rain is very limited.

**PRE:** Requires rain prior to weed emergence. Use a rotary hoe or harrow if weeds emerge before it rains.

**POST:** May be applied early postemergence on corn up to 12 inches. Emerged weeds are not controlled. Preemergence preferred.

**TANK-MIXES/SEQUENTIAL:** Labeling lists tank mix or sequential applications preemergence with atrazine, Armezon, Callisto, Clarity, Prowl, Sharpen, Verdict, Zidua, glyphosate, gramoxone, and 2,4-D. May be tank-mixed postemergence with glyphosate. Consult label for other tank-mix options. Refer to label restrictions for each herbicide and follow the most restrictive label.

**PREMIX**

**SLIDER ATZ LITE (*dimethenamid-p* + *atrazine*)** Site of Action: 15 + 5 **Restricted Use Pesticide**

**2-3.5 pt Slider ATZ Lite 5L (0.56-0.98 + 0.69-1.2 lb ai)**

**EPDS, PPI, PRE, and POST:** Premix containing 2.25 lb dimethenamid-p (Outlook) + 2.75 lb atrazine per gallon. Preemergence preferred. COC may be added to early post timing. The 3 pt rate provides the equivalent of 18 oz Outlook plus 1 lb atrazine per acre. Do not graze or feed corn forage for 60 days after application.

**BALANCE FLEXX (*isoxaflutole*)** Site of Action: 27 **Restricted Use Pesticide**

**(\$18.55-37.10)**

**3-6 oz Balance Flexx 2L (0.05-0.09 lb ai)**

Balance Flexx is a soil-applied herbicide with root and shoot uptake. Isoxaflutole is an HPPD-inhibiting herbicide that inhibits pigment production causing leaves to turn white. Contains the safener cyprosulfamide that allows early postemergence applications. Controls annual broadleaf weed species such as pigweed, waterhemp, velvetleaf, lambsquarters, kochia, common ragweed, black nightshade, and others. May also control some annual grass weed species, such as green foxtail, barnyardgrass, and field sandbur. May only suppress yellow foxtail and wild buckwheat. Rainfall is required for incorporation and uptake.

Rates vary from 3-6 fl oz/A depending on application timing, soil organic matter, and soil texture. For coarse textured soils, apply 3 oz/A if organic matter is less than 1.5% or 4 oz/A if O.M. is greater than 1.5%. For medium textured soils, apply 5 oz/A if O.M. is less than 1.5% or 6 oz/A if O.M. is greater than 1.5%. For fine-textured soils, apply 6 oz/A. Minimum carrier rate is 10 gpa. Do not apply using aerial equipment. The potential for corn injury increases in soils with low O.M., coarse texture, or high soil pH.

If the water table is less than 25 feet below the soil surface, do not apply to sandy, sandy loam, or loamy sand soils or subsoils where the average organic matter in the upper 12 inches is less than 2% by weight. Plant corn at least 1.5 inches deep and make sure the seed is adequately covered. Do not exceed 6 oz/A per year. Off-site movement may occur if applied in areas that receive less than 15 inches annual precipitation. Do not mix or load within 50 feet of wells, sinkholes, streams, rivers, lakes, or reservoirs.

Rotation interval is 4 months for wheat, rye and triticale; 6 months for soybeans, sweet corn, barley, grain sorghum, and sunflower; 10 months for alfalfa (with 15 inches annual precipitation); and 18 months for most other crops (with 15 inches annual precipitation). Cover crops may be planted 90-120 days after application however, some injury may occur. Do not graze or harvest cover crops for livestock feed.

Do not apply tank mixes of carbamate or organophosphate insecticides with Balance Flexx on emerged corn. Foliar applications of these insecticides should not be made within 7 days after applying Balance Flexx or crop injury can occur.

**BURNDOWN:** If weeds have emerged at time of application prior to corn emergence, mixing a COC or MSO may aid in foliar activity of weeds less than 3 inches tall (use NIS rather than MSO or COC when tank-mixing with certain glyphosate formulations (non-loaded) or mixing with liquid nitrogen). Tank mix an additional herbicide, such as Gramoxone, glyphosate, or 2,4-D if weeds are greater than 3 inches tall or weed species are present that may not be controlled by Balance Flexx. Tank-mixing atrazine may improve control of emerged giant ragweed, common cocklebur, or Pennsylvania smartweed.

**PPS:** Apply up to 21 days prior to planting or up to 30 days prior to planting if a postemergence herbicide application is also planned.

**PPI:** Apply up to 21 days prior to planting or up to 30 days prior to planting if a postemergence herbicide application is also planned. Incorporate less than 2 inches below the soil surface.

**PRE:** Apply after planting but prior to crop emergence. Failure to properly close the seed furrow could result in crop injury.

**EPOST:** Apply from corn spiking to the V2 growth stage (2 leaf collars). May not provide control of weeds larger than the 1st true leaf growth stage. Do not use liquid fertilizers, COC or MSO, or a loaded glyphosate when applying to emerged corn. Do not harvest corn forage until 45 days after application.

**TANK-MIXES:** Balance Flexx may be tank-mixed with herbicides to improve burndown or mixed with other preemergence herbicides, including atrazine, Dual, Harness, Prowl, Surpass, Outlook, Bicep, Harness Xtra, and Degree Xtra. Additional 2(ee) labels allow postemergence tank-mixes with glyphosate, atrazine+glyphosate, and atrazine+dicamba. See individual labels for restrictions.

**PREMIXES**

**CORVUS (*isoxaflutole* + *thiencarbazone*)** Site of Action: 27 + 2 **Restricted Use Pesticide**

**(\$31.80-53.95)**

**3.3-5.6 oz Corvus 2.63L (0.048-0.082 + 0.019-0.033 lb ai)**

Rates depend on soil texture and organic matter. The addition of thiencarbazone may increase grass control relative to Balance Flexx. Controls many common annual grass and broadleaf weed species. Add atrazine to control wild buckwheat and increase broadleaf weed control. Laudis may be applied post-emergence if Corvus is applied pre-emergence, but it is best to diversify herbicide mode of actions to prevent selection for resistance and carryover.

Minimum carrier rate is 10 gpa for ground applications. Do not apply with aerial equipment. Rotation restriction is 4 months for wheat, rye, and triticale; 9 months for soybeans, sweet corn, popcorn, and barley (with 15 inches precipitation); and 17 months for alfalfa, dry beans, oats, sorghum, sunflower, canola, and most others (with 30 inches precipitation). Intervals may be much longer on soils with a pH greater than 7.5. Cover crops may be planted 90-120 days after application however, some injury may occur. Do not graze or harvest cover crops for livestock feed.

Do not apply in areas where the water table is less than 25 feet deep, soil texture is coarse (sandy loam, loamy sand, or sand), subsoil texture is loamy sand or sand, and the O.M. in upper 12 inches is less than 2%. Do not apply more than 5.6 fl oz/A in a growing season. Do not harvest for forage within 45 days of application. Do not soil apply certain carbamate or organophosphate insecticides and Corvus together in the same season; see label for details. Do not apply tank mixes of carbamate or organophosphate insecticides with Corvus on emerged corn. Foliar applications of these insecticides should not be made within 7 days after applying Corvus or crop injury can occur.

**BURNDOWN:** To increase foliar activity, add COC or MSO. May use NIS if mixing with a loaded glyphosate product.

**PPS, PPI:** Apply up to 21 days prior to corn planting or 30 days if planning additional herbicide applications. Do not incorporate deeper than 2 inches below the soil surface.

**PRE:** Make sure furrows are closed to prevent seedling injury.

**EPOST:** Do not add adjuvants for postemergence applications. Additional 2(ee) labels for SD allow tank-mixes with atrazine and glyphosate or atrazine and dicamba for post-emergence applications up to 2-leaf collar corn. Do not add foliar insecticides.

**TRIVOLT (isoxaflutole + flufenacet + thiencazabone)** Site of Action: 27 + 15 + 2

**(\$28.10-56.15)**

**Restricted Use Pesticide**

**10-20 oz TriVolt 3.65L**

TriVolt contains 0.57 lb isoxaflutole + 2.85 lb flufenacet + 0.23 lb thiencazabone per gallon. Provides broadleaf and grass control. Rate depends on soil texture and organic matter.

Minimum carrier is 10 gpa for ground application. Do not apply with aerial equipment. Do not use liquid fertilizer as carrier for early post applications. Rotation interval is 4 months for wheat or triticale; 9 months for soybean; 12 months for barley and rye; 17 months for alfalfa, oats, sorghum, sunflower, canola; and 17 months with a field bioassay for most other crops.

Do not apply in areas where the water table is less than 25 feet deep and all three of the following criteria are met. The soil texture is coarse (sandy loam, loamy sand, or sand), the subsoil texture is loamy sand or sand, and the O.M. in upper 12 inches is less than 2%. Do not make more than one application per year. Do not apply more than 20 oz/A per year. Do not use certain soil applied organophosphate or carbamate insecticides in the same season with Trivolt (see label).

**PPS, PPI:** May be applied up to 21 days before planting. May be applied up to 30 days before planting in a planned two pass program. Uniformly incorporate into the top 2 inches of soil.

**PRE:** Apply during or after planting but before weeds emerge. Failure to properly close the seed furrow could result in crop injury.

**EPOST:** Can be applied in a tank mix with atrazine from corn spiking to the V2 growth stage (2 leaf collars). Do not use COC or MSO. Do not tank mix with organophosphate or carbamate insecticides. Do not make foliar applications of organophosphate or carbamate insecticides within 7 days of Trivolt application.

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**MESOTRIONE PRODUCTS (mesotrione)** Site of Action: 27

**(\$3.75-22.60)**

**3-7.7 oz Callisto, Argos, Cavallo, Explorer, Incinerate, Meso, Meso Star, Mesotrione, MesoTryOne or Motif 4L (0.09-0.24 lb ai)**

Callisto is a systemic preemergence or postemergence HPPD-inhibiting herbicide that can cause "bleaching" injury symptoms on weeds. Callisto gives very good to excellent control of annual broadleaves including pigweed, waterhemp, lambsquarters, ragweed, buffalobur, velvetleaf, nightshade, and smartweed. Sunflower and cocklebur are controlled with postemergence applications. Atrazine improves control of kochia, wild buckwheat, and waterhemp; results in SDSU tests have been very good. Callisto is used in programs with preemergence or postemergence grass herbicides. Do not tank mix with emulsifiable concentrate grass herbicides.

Note rates for preemergence or postemergence. Crop tolerance has been satisfactory in SDSU tests. Consider avoiding application on fields treated with Counter or Lorsban. Do not tank mix postemergence applications with an organophosphate or carbamate insecticide or apply these insecticides 7 days before or after a Callisto application. Do not cultivate 7 days before or after application. Do not harvest forage, grain, or stover for 45 days after application.

Minimum carrier is 10 gpa for ground application or 2 gpa for aerial application. For postemergence application use COC at 1 gal/100 gal and 28% N at 2.5 gal/100 gal or AMS at 8.5 lb/100 gal. NIS at 1 qt/100 gal may be used instead of COC but control may be reduced. Do not use MSO. If mixing with glyphosate, AMS and perhaps a NIS may be added if necessary but do not add UAN, COC, or MSO.

Sorghum, flax, and oats may be planted any time after application. Rotation interval is 4 months for other small grains; 10 months for alfalfa, canola, soybeans, and sunflowers; and 18 months for most other crops.

**PRE:** Rate is 6-7.7 oz/A. Rain required. May be applied with liquid fertilizer.

**POST:** Apply 3 oz/A from emergence to 30 inches or up to the 8-leaf stage.

**TANK-MIXES:** Callisto at 5.3-7.7 oz/A may be tank-mixed preemergence with several other herbicides. Callisto may be mixed with Gramoxone, glyphosate, dicamba, and 2,4-D for burndown. Several postemergence tank mixes are allowed including atrazine, glyphosate, glufosinate and others.

**PREMIXES**

**CALLISTO XTRA (mesotrione + atrazine)** Site of Action: 27 + 5 **Restricted Use Pesticide**

**(\$9.70-11.65)**

**20-24 oz Callisto Xtra 3.7L (0.078-0.094 + 0.5-0.6 lb ai)**

For added foliar and residual control of wild buckwheat and other common broadleaf species. Apply 20 fl oz/A on susceptible weeds less than 5 inches tall or 24 fl oz/A for weeds 5-10 inches tall or for added residual control. Do not apply more than 24 fl oz per year. Callisto Xtra at 20-24 fl oz/A is equivalent to 2.5-3 oz Callisto and 0.5-0.6 qt atrazine 4L.

Add NIS (0.25% v/v) or COC (1% v/v). Choosing COC may result in more consistent weed control, but the risk of crop injury will be greater relative to NIS. In addition, UAN (28%N, 2.5% v/v spray solution) or AMS (8.5-17 lb/100 gal spray solution) may be added. Adding MSO may result in severe crop injury. If tank-mixing with a fully loaded glyphosate product for Roundup Ready corn or Liberty for Liberty Link corn, only add AMS. NIS may be added if needed for the glyphosate product. Do not add UAN when mixing with glyphosate. See label restrictions when using organophosphate soil insecticides or postemergence organophosphate and carbamate insecticides as corn injury may occur. Crop injury may occur if Callisto Xtra is tank-mixed postemergence with emulsifiable concentrate grass herbicides.

**EPOST:** Apply to corn less than 12 inches tall.

**MESOCORE (*mesotrione + clopyralid*)** Site of Action: 27 + 4

**18-24 oz MesoCore 1.96L (0.169-0.225 + 0.107-0.143 lb ai)**

Premix containing 1.2 lb mesotrione + 0.76 lb clopyralid per gallon. Provides excellent residual and foliar broadleaf control. Contains two modes of action for resistance management. The clopyralid component provides added activity on several weeds, such as common and giant ragweed and wild buckwheat, compared to mesotrione alone.

Rate depends on soil type and organic matter. Minimum carrier is 10 gpa for ground applications. For post-emergence applications add NIS at 0.25% v/v. COC may be added at 1% v/v however, temporary crop injury may occur. Do not add UAN, AMS, or MSO as unacceptable corn leaf burn may result. COC and other additives listed may be used pre-emergence to improve burndown.

Avoid post-emergence applications with organophosphate or carbamate insecticide applications. See label restrictions when using organophosphate soil applied insecticides. Rotation interval is 4 months for wheat; 10.5 months for alfalfa, sunflowers, soybeans, sorghum, millet, rye barley, and oats; and 18 months for most other crops. Do not graze or feed forage for 45 days. Pre-harvest interval is 60 days for grain or silage.

**EPP:** Apply up to 28 days before planting.

**PPI:** Apply up to 14 days before planting and incorporate into top 2 inches of soil.

**PRE:** Apply before corn emergence. At least 0.25 inch of precipitation/irrigation is required for activation.

**EPOST:** May be applied postemergence in water only after corn is emerged and up to 11 inches in height. Apply to small broadleaf weeds (<3 inches). May use reduced rates of 10 or 15 oz when tank-mixed with glyphosate or glufosinate, respectively.

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**HALEX GT or MES-O-SATE (*s-metolachlor + glyphosate + mesotrione*)** Site of Action: 15 + 9 + 27 **(\$33.55-37.25)**

**3.6-4 pt Halex GT or Mes-O-Sate 4.39L (0.94-1.05 + 0.94-1.05 + 0.094-0.105 lb ai)**

**EPOST:** For glyphosate-tolerant corn only. Mes-O-Sate contains metolachlor. Add NIS at 1-2 qt/100 gal water and AMS at 8.5- 17 lb/100 gal water. Using UAN rather than AMS could result in crop injury. See label restrictions when using organophosphate soil insecticides or postemergence organophosphate and carbamate insecticides as corn injury may occur. Crop injury may occur if Halex GT is tank-mixed postemergence with emulsifiable concentrate grass herbicides. Minimum carrier is 10 gpa for ground applications. An application of 3.6 pt/A will be equivalent to 3 oz/A Callisto, 0.99 pt/A Dual Magnum, and 24 oz/A Touchdown HiTech.

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**STOREN (*s-metolachlor + mesotrione + pyroxasulfone + bicyclopyrone*)** Site of Action: 15+27+15+27

**2.1-2.4 qt Storen 3.225L (1.41-1.61 + 0.16-0.19 + 0.079-0.09 + 0.039-0.045 lb ai)**

Premix containing 2.69 lb s-metolachlor + 0.31 lb mesotrione + 0.15 lb pyroxasulfone + 0.075 lb bicyclopyrone per gallon. Rate is 2.1 qt for soils with less than 3% O.M. or 2.4 qt for soils with greater than or equal to 3% O.M.

Minimum carrier is 10 gpa for ground applications. Do not apply by air. For postemergence applications add NIS at 0.25% v/v. COC may cause temporary crop injury. May also add AMS at 8.5-17 lb/100 gal. Do not use MSO or UAN when applied alone to emerged corn.

Do not use on coarse textured soils. Do not graze or feed forage for 45 days. Preharvest interval is 45 days. Maximum rate is 2.4 qt/A per year. Avoid post-emergence applications with organophosphate or carbamate insecticide applications. See label restrictions when using organophosphate soil applied insecticides. Rotation interval is 4.5 months for wheat; 10 or 18 months for alfalfa (depending on rate, soil pH and rainfall); 10 months for soybean and sorghum; 11 months for barley, oats and rye; and 18 months for most other crops.

**EPP:** May be applied up to 28 days prior to planting.

**PRE:** Preemergence may be applied broadcast or banded.

**EPOST:** May be applied up to V8 corn. Apply to small weeds (broadleaves <3 inches/grasses <2 inches).

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**ACURON (*s-metolachlor + atrazine + mesotrione + bicyclopyrone*)** Site of Action: 15 + 5 + 27 + 27 **(\$56.85-68.25)**  
**Restricted Use Pesticide**

**2.5-3 qt Acuron 3.44L (1.35-1.6 + 0.635-0.75 +0.15-0.18 + 0.038-0.045 lb ai)**

Premix containing 2.14 lb s-metolachlor + 1 lb atrazine + 0.24 lb mesotrione + 0.06 lb bicyclopyrone per gallon. Rate is 2.5 qt for soils with less than 3 % O.M. or 3 qt for soils with greater than or equal to 3% O.M. Provides grass and excellent broadleaf control. Provides multiple modes of action for resistance management and increased spectrum of control. Has performed well in SDSU tests.

Minimum carrier is 10 gpa for ground applications. Do not apply by air. For postemergence applications add NIS at 0.25 % v/v. COC up to 1% v/v (maximum 1 qt/A) may be used if temporary crop injury is acceptable. Do not add MSO, AMS, or UAN postemergence. Other additives may be used preemergence to improve burndown.

Do not apply postemergence if Counter insecticide was used at planting. Some injury may occur if applied postemergence where other organophosphate insecticides were used at planting. Crop injury may occur if an organophosphate or carbamate insecticide is applied postemergence within 7 days before or after Acuron. Rotation interval is anytime corn, 4 months for wheat, barley, and rye; 10 months for dry beans, soybeans, and sorghum; and 18 months for most other crops. Do not graze or feed forage for 45 days. Preharvest interval is 60 days for postemergence applications. Do not use over 3 qt/A per year.

**EPP:** May be applied up to 28 days prior to planting.

**PRE:** Preemergence may be applied broadcast or banded.

**EPOST:** May be applied postemergence in water only after corn is emerged and up to 12 inches in height. Apply to small broadleaf weeds (<3 inches).

**TANK-MIXES:** May be tank-mixed early postemergence with atrazine, Accent Q, Basis products, Status, Steadfast Q, or glyphosate. Follow label directions for adjuvant recommendations.

**ACURON FLEXI (s-metolachlor + mesotrione + bicyclopyrone)** Site of Action: 15 + 27 + 27**(\$54.55-61.40)****2-2.25 qt Acuron Flexi 3.26L (1.43-1.6 + 0.16-0.18 + 0.04-0.045 lb ai)**

Premix containing 2.86 lb s-metolachlor + 0.32 lb mesotrione + 0.08 lb bicyclopyrone per gallon. Rate is 2 qt for soils with less than 3 % O.M. or 2.25 qt for soils with greater than or equal to 3% O.M. Provides grass and broadleaf control. Provides multiple modes of action for resistance management and increased spectrum of control. May be an alternative to Acuron in areas where less or no atrazine is desired.

Minimum carrier is 10 gpa for ground applications. Do not apply by air. For postemergence applications add NIS at 0.25 % v/v. COC up to 1% v/v (maximum 1 qt/A) may be used if temporary crop injury is acceptable. Do not add MSO, AMS, or UAN postemergence. Other additives may be used preemergence to improve burndown.

Do not make more than one postemergence application or more than two total applications per year. Allow 14 days between applications. Do not use over 2.25 qt/A per year. Do not apply postemergence if Counter insecticide was used at planting.

Some injury may occur if applied postemergence where other organophosphate insecticides were used at planting. Crop injury may occur if an organophosphate or carbamate insecticide is applied postemergence within 7 days before or after Acuron Flexi. Rotation interval is anytime corn, 4 months for wheat, barley, and rye; 10 months for dry beans, soybeans, and sorghum; and 18 months for most other crops. Do not graze or feed forage for 45 days. Do not harvest forage, grain, or stover for 60 days after postemergence.

**EPP, PRE:** May be applied up to 28 days prior to planting.

**EPOST:** Apply after emergence until 30 inches or until corn reaches 8-leaf stage.

**TANK-MIXES:** May be tank-mixed early postemergence with atrazine, Accent Q, Basis Blend, Resolve Q, Status, Steadfast Q, or glyphosate. Follow label directions for adjuvant recommendations.

**ACURON GT (glyphosate + s-metolachlor + mesotrione + bicyclopyrone)** Site of Action: 9 + 15 + 27 + 27**(\$42.05)****3.75 pt Acuron GT 4.29L (0.94 + 0.94 + 0.094 + 0.045 lb ai)**

For glyphosate-tolerant corn only. Premix containing 2.0 lb ae glyphosate, 2.0 lb s-metolachlor, 0.20 lb mesotrione and 0.095 lb bicyclopyrone per gallon. Apply postemergence before weeds exceed 4 inches for optimum weed control. Several postemergence tank mixes are approved for additional weed control. Acuron GT can be used in a planned pre and postemergence two-pass weed control program.

Carrier volume should be 10-30 gpa for ground. Not labeled for aerial application. Use NIS at 0.25-0.5% v/v and AMS at 8.5-17 lb/100 gallons. COC may increase the risk of crop injury. Do not use MSO or UAN.

See label restrictions when using organophosphate soil insecticides or postemergence organophosphate and carbamate insecticides as corn injury may occur. Crop injury may occur if Acuron GT is tank-mixed postemergence with emulsifiable concentrate formulation products. When using other products do not apply more than 3.7 lb ai/acre s-metolachlor, 0.24 lb ai/acre mesotrione or 0.045 lb ai/acre bicyclopyrone per year. Make only one application per year.

Corn may be planted anytime after application. Rotation interval is 4.5 months for wheat, barley, rye and oats; 10 months for alfalfa, soybean, or sorghum; and 18 months for most other crops. Do not graze, feed forage or harvest treated crop for 45 days after application.

**EPOST:** May be applied after corn emergence to corn plants less than 30 inches tall or the V8 growth stage.

**LUMAX EZ (s-metolachlor + mesotrione + atrazine)** Site of Action: 15 + 27 + 5**(\$52.50-63.25)****Restricted Use Pesticide****.7-3.25 qt Lumax EZ 3.67L (1.68-2.0 + 0.17-0.2 + 0.63-0.76 lb ai)**

Lumax EZ is a premix containing 2.49 lb s-metolachlor (Dual II Magnum) + 0.249 lb mesotrione (Callisto) + 0.935 lb ai atrazine per gal. The low rate is for soils with less than 3% OM; use the high rate for soils with more than 3% O.M.

**Equivalent Product Rates in Lumax EZ**

<b>Lumax EZ</b>	<b>Dual II Magnum</b>	<b>Callisto</b>	<b>Atrazine (ai)</b>
2.7 qt	1.8 pt	5.4 oz	0.60 lb
3.25 qt	2.1 pt	6.5 oz	0.75 lb

Lumax EZ provides good to excellent control of foxtails and very good to excellent control of annual broadleaf weeds including velvetleaf, lambsquarters, pigweed, waterhemp, common ragweed, smartweed, nightshade, buffalobur, and kochia. Crop tolerance has been good in SDSU tests. Note corn insecticide and other restrictions as for Callisto. Rotation interval for winter wheat is 4.5 months. Do not rotate to crops other than corn, barley, rye, wheat, soybeans, or sorghum the following year.

Rotate only to corn or sorghum if applied after June 1. Do not graze or harvest forage or grain for 45 days after application. Minimum carrier is 10 gpa for ground applications. Do not apply with aerial equipment.

**EPP, PRE:** Apply up to 14 days before planting to the soil surface. If weeds are emerged and foliar activity is desired, include COC (1% v/v).

**EPOST:** Lumax EZ may be applied to corn less than 12 inches tall. Does not control emerged grasses. A NIS (0.25% v/v) or COC (1% v/v) may be used but avoid using nitrogen-based adjuvants (AMS or UAN). Temporary injury may occur if COC is used. AMS may be used with Liberty in Liberty Link corn, but then no other adjuvant may be used for that application.

**RIXA or TRIZMAX (metolachlor + mesotrione + atrazine)** Site of Action: 15 + 27 + 5

**(\$15.95-19.10)**

**Restricted Use Pesticide**

**2.5-3 qt Rixa 3.87L**

**2.5-3 qt TrizMax 3.95L**

Apply as for Lumax EZ above. Products contain metolachlor as compared to s-metolachlor in Lumax EZ. Rixa contains 2.63 lb metolachlor + 0.263 lb mesotrione + 0.98 lb atrazine per gallon. TrizMax contains 2.68 lb metolachlor + 0.268 lb mesotrione + 1 lb atrazine per gallon.

**CALIBRA, COYOTE or PALACE (s-metolachlor + mesotrione)**

**(\$34.40-40.15)**

**VILLAIN (metolachlor + mesotrione)** Site of Action: 15 + 27

**2.4-2.8 qt Calibra or Palace II 3.1L (1.7-2.0 + 0.17-0.2 lb ai)**

**2-2.4 qt Coyote 3.67L (1.67-2.0 + 0.17-0.2 lb ai)**

**2-2.4 qt Villain 3.59L (1.63-1.96 + 0.17-0.2 lb ai)**

Calibra and Palace II are premixes containing 2.82 lb ai s-metolachlor (Dual II Magnum) and 0.28 lb ai mesotrione (Callisto) per gallon. Coyote is a premix containing 3.34 lb ai s-metolachlor and 0.33 lb ai mesotrione per gallon. Villain contains 3.26 lb ai metolachlor and 0.33 lb ai mesotrione. The low rate is for soils with less than 3% O.M. May be an alternative to Lumax EZ (s-metolachlor + mesotrione + atrazine) in areas where atrazine is not desired. Lower rates (1-1.6 qt/acre or 1.4-1.9 qt Calibra) may be used as part of a planned two pass program.

Carrier volume should be 10-80 gpa for preemergence applications or 10-30 gpa for postemergence applications (20 gpa in dense canopy). Not labeled for aerial application. For postemergence applications, use NIS at 0.25% v/v (1 qt/100 gallons) or COC at 1% v/v. COC may provide more consistent weed control but may result in temporary crop injury. AMS or UAN may be added to increase consistency of control but will increase risk of temporary crop injury. Only use AMS if tank-mixing with surfactant loaded glyphosate or Liberty postemergence. Do not use MSO or use liquid fertilizer as a carrier when applied to emerged corn.

Do not apply organophosphate or carbamate insecticides 7 days before or after product application. Product applied postemergence to corn that received an at planting application of an organophosphate insecticide can result in crop injury.

Do not rotate to crops other than corn, soybean, sorghum, wheat, barley, oats, rye or potatoes. Do not graze or harvest forage or grain for 45 days after application. For Calibra do not feed or harvest forage for 45 days and do not harvest grain for 60 days.

**EPP, PRE:** Apply to soil surface up to 14 days (28 days for Calibra) before planting.

**EPOST:** May be applied after corn emergence to corn plants less than 30 inches tall or the V8 growth stage. Does not control emerged grasses but controls most small broadleaf weeds less than 3 inches tall.

**IMPACT or ARMEZON (topramezone)** Site of Action: 27

**(\$12.35-49.70)**

**0.5-2 oz Impact 2.8SC (0.011-0.044 lb ai)**

**0.5-1 oz Armezon 2.8SC (0.011-0.022 lb ai)**

Impact and Armezon inhibit pigment production causing leaves to turn white. Controls several broadleaf weed species and suppress some common annual grass weed species (crabgrass, foxtail species, etc). Add atrazine at 0.25-1.5 lb ai/A to improve control. Lower atrazine rates may improve burndown and higher rates may provide residual control. Apply to small weeds 3-8 inches tall, depending on the species.

Many tank-mix options with broadleaf or grass herbicides. Follow adjuvant recommendations for specific tank-mixes. Do not apply with other herbicides that have a similar site of action, such as Callisto, Lumax, Laudis, or Capreno.

Add adjuvant and nitrogen. Adjuvants include COC or MSO at a rate of 1-1.5% v/v. Preferred adjuvant is MSO, particularly in conditions of moisture and temperature stress and to improve grass control. Nitrogen fertilizers include 28 or 34% UAN or ammonium phosphate (10-34-0) at 1.25-2.5% v/v, or AMS at 8.5-17 lb per 100 gallons. Minimum water carrier volume is 15 gpa for ground equipment or 3 gpa for aerial applications. Rainfast 1 hour after application.

Rotation interval is 3 months for cereal crops; 9 months for alfalfa, sorghum, soybean, sunflower, and peas; and 18 months for dry beans, snap beans and most other crops.

**POST:** May be applied up to V8 or 45 days prior to harvest (whichever comes first) for Armezon and 45 days prior to harvest for Impact (which includes harvesting for forage). Use drop nozzles if crop canopy inhibits herbicide contact to weeds.

**PREMIXES**

**ARMEZON PRO (topramezone + dimethenamid-p)** Site of Action: 27 + 15

**(\$21.80-37.35)**

**14-24 oz Armezon Pro 5.35L (0.011-0.019 + 0.57-0.98 lb ai)**

Armezon Pro is a premix containing 0.1 lb topramezone and 5.25 lb dimethenamid-p per gallon. Premix improves control of grass and some small-seeded broadleaves. Rate varies depending on soil texture and organic matter. Do not apply to sand soil with less than 3% O.M. where ground water is 30 feet or less from the surface. Minimum water carrier volume is 10 gpa for ground and 2 gpa for air. Use higher volume when dense vegetation is present. Add MSO or COC at 0.5-1% v/v when applied alone or NIS at 0.25-0.5% v/v is preferred when applied in a tank-mix. Risk of crop injury is increased with MSO. Also add UAN at 1.25-2.5% v/v or AMS at 8.5-17 lb per 100 gallons of water. Do not apply more than 28 oz/A per year. Do not exceed 0.022 lb ai topramezone or 1.125 lb ai dimethenamid-p per acre per season.

Rotation interval is 4 months for cereal grains; 9 months for alfalfa, grain sorghum, soybean or sunflower; 9-18 months (depending on rate) for canola, dry beans or peas; and 18 months for most other crops. Do not apply within 45 days of grazing or harvest (feed, forage or grain).

**PRE:** Apply appropriate rate for soil texture and organic matter.

**POST:** Apply from emergence to V8 or 30-inch corn. Use drop nozzles if corn is over 12 inches tall for optimum coverage. Do not use fluid fertilizer as a carrier.

**IMPACTZ (topramezone + atrazine) Site of Action: 27 + 5 Restricted Use Pesticide (\$15.10-20.25)**

**8-10.7 oz ImpactZ 4.26L (0.016-0.022 + 0.25-0.334 lb ai)**

Premix containing 0.26 lb topramezone and 4 lb atrazine per gallon. Minimum carrier is 10 gpa for ground (15 gpa preferred) and 3 gpa for aerial application. Add MSO (1-1.5%) and UAN (1.25-2.5%) or AMS (8.5-17 lb/100 gal).

Do not apply more than 10.7 oz/A per year. Do not apply within 45 days of harvest. Do not graze or feed for 60 days. Rotation interval is 9 months for alfalfa, barley, rye, sorghum, soybean, sunflower, and wheat; 9 months (8 oz) or 18 months (10.7 oz) for canola and flax; and 18 months for most other crops.

**POST:** Apply to emerged weeds in up to 12 inches tall corn.

**IMPACT CORE (topramezone + acetochlor) Site of Action: 27 + 15 (\$18.45-36.90)**

**20-40 oz Impact Core 7.15L (0.011-0.022 + 1.11-2.21 lb ai)**

Premix containing 0.071 lb topramezone and 7.08 lb acetochlor per gallon. Rates vary by soil texture and organic matter. Minimum carrier is 10 gpa (15 gpa for larger weeds) for ground applications. Do not apply by air. Add MSO (0.25-0.5%) when used alone. Add NIS (0.25%) when used in a tank mix. Also add AMS (1.5-2.5 lb/A) or UAN (1.25-2.5%).

Do not apply more than 40 oz/A per year. May make up to 2 sequential applications with at least 14 days between applications. Do not apply within 45 days of harvest. Rotation interval is 4 months for wheat; 9 months for barley, oat, rye, millet, alfalfa, and sorghum; 10 months for soybean and sunflower; and 18 months for most other crops.

**POST:** Apply 20-40 oz to corn from spike stage up to 11 inches. Recommended rate is 24-30 oz. Target 1-4" weeds. Tank mix with atrazine for enhanced control.

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**LAUDIS (tembotrione) Site of Action: 27 (\$11.65)**

**2 oz Laudis 3.5L (0.08 lb ai)**

Laudis inhibit pigment production causing leaves to turn white similar to Callisto and Armezon/Impact. Controls several annual broadleaf weed species and some annual grass weed species, such as barnyardgrass, crabgrass, and yellow foxtail. Suppresses green foxtail and field sandbur. Apply to broadleaf weeds less than 6 inches tall or grasses less than 4 inches tall. Add atrazine to improve weed control.

Add a surfactant and nitrogen fertilizer. Add MSO at 1% v/v or COC at 1% v/v. MSO is preferred where permitted. Also add UAN at 1.5 qt/A or AMS at 1.5 lb/A (8.5 lb/100 gal). UAN may be preferred during dry conditions. Minimum carrier is 10 gpa for ground applications. Special 24(c) label allows for aerial application in South Dakota with minimum carrier of 7 gpa. Refer to label for approved insecticides for tank mixed applications.

Laudis may be rainfast after 1 hour. Control may be reduced if applied during heavy dew or drought conditions. Apply when weeds are actively growing. Do not harvest corn forage prior to 45 days after application. Rotation interval is 4 months for small grains; 8 months for soybeans; 10 months for sorghum, peas, canola, dry beans, sunflowers and alfalfa; or 18 months for most other crops.

**POST:** Apply up to the V8 corn growth stage.

**TANK-MIXES:** Tank-mix partners may include atrazine, Liberty, glyphosate, Accent, Steadfast, and bromoxynil products. Add atrazine at 0.5 lb ai/A to increase broadleaf and grass weed control or increase control of weeds greater than 6 inches tall. With atrazine, it is recommended to use COC at 1% v/v + UAN at 1.5 qt/A or AMS at 8.5 lb/100 gal but may use MSO at 1% v/v + UAN at 1.5 qt/A in dry conditions. Do not use MSO or COC when tank-mixing with glyphosate or Liberty. With Liberty, Laudis may be applied at 2-3 oz/A and add AMS at 8.5 lb/100 gal (1.5 lb/A). With bromoxynil products, it is recommended to use COC rather than MSO.

**PREMIX**

**CAPRENO (tembotrione + thien carbazone) Site of Action: 27 + 2 (\$20.30)**

**3 oz Capreno 3.45L (0.068+ 0.013 lb ai)**

Capreno is a premix containing Laudis (tembotrione + safener) and thien carbazone, an ALS-inhibiting herbicide that primarily improves grass control but also has activity on some broadleaf weed species. Capreno controls broadleaf weed species such as lambsquarters, pigweed, kochia, ragweeds, velvetleaf, Russian thistle, waterhemp, and others. Controls grass weed species such as foxtail (green, giant, yellow), barnyardgrass, crabgrass, wild oat, field sandbur, and others.

Add COC at 1% v/v or a minimum of 1.25 pt/A and a nitrogen fertilizer such as UAN at 1.5 qt/A or AMS at 1.5 lb/A or 8.5 lb per 100-gal spray solution. High surfactant oil concentrate (HSOC) may be used in place of COC to minimize adjuvant antagonism with glyphosate. Use of NIS may result in inconsistent and incomplete weed control.

Minimum carrier rate is 10 gpa for ground applications. Special 24(c) label allows for aerial application in South Dakota. Rainfall within 1 hour after application may reduce weed control. Applications to wet foliage may reduce control. Do not apply Capreno in the same year as Lorsban, Counter, Dyfonate, or Thimet. Do not graze or harvest for forage within 45 days after application.

Rotation interval is 4 months for wheat and triticale; 10 months for barley, soybeans, sweet corn, and sorghum (with 15 inches of precipitation); 18 months for alfalfa, oats, sunflower, canola and most other crops (with 30 inches of precipitation). If soil pH is greater than 7.5, increase rotation restrictions to the next higher interval or 24 months for crops in the 18-month interval.

**POST:** Apply 3 oz from V1 (1 leaf collar) up to V7 or 20-inch corn (whichever occurs first). Best results if applied to young, actively growing weeds.

**TANK-MIXES**

**Atrazine:** Tank-mixing atrazine at 0.5 lb ai/A may increase the spectrum and consistency of weed control. Do not use atrazine on corn greater than 12 inches tall.

**Liberty:** For corn designated as Liberty Link only. Capreno may be used at 2 fl oz/A when tank-mixing with Liberty at 22 fl oz/A. Only use AMS and avoid the use of COC or MSO/ESO.

**Glyphosate:** (e.g. Roundup): For use on glyphosate-tolerant corn. Capreno may be used at 3 fl oz/A when tank-mixing with a glyphosate product. It is recommended to use glyphosate compatible HSOC rather than COC with loaded glyphosate products, and HSOC is required with non-loaded glyphosate products. Use AMS at recommended rates.

**Bromoxynil:** Capreno may be used at 3 fl oz/A with bromoxynil up to 6 fl oz/A to aid in control of difficult broadleaf weeds such as common ragweed. Bromoxynil may be used in place of atrazine in corn greater than 12 inches tall. Use of COC and N fertilizer is recommended.

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**SHIELDEX 400SC (*tolpyralate*)** Site of Action: 27

**1-1.35 oz Shieldex 400SC 3.33L (0.026-0.035 lb ai)**

Controls select grass and small seeded broadleaf weeds. Apply to actively growing weeds less than 5 inches tall. For ground application only with a minimum carrier of 10 gpa. Allow 14 days between applications. Addition of MSO (0.5% v/v) is recommended. COC (1% v/v) or NIS (0.25% v/v) may be used but may be less effective. Add UAN (2.5% v/v) or AMS (8.5 lb/100 gal).

Do not apply more than 2 applications or 2.7 oz/A per year. Do not graze or feed forage or silage for 21 days or harvest grain for 45 days. Rotation interval is 3 months for wheat, barley, oats, and rye; 9 months for alfalfa, dry bean, canola, peas, sorghum, soybean, and sunflower; and 12 months for most other crops.

**POST:** Apply to corn up to 20 inches tall or the V6 growth stage (whichever occurs first). Best results when corn is less than 12 inches tall.

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**KATAGON (*nicosulfuron + tolpyralate*)** Site of Action: 2 + 27

**2.3-3.4 fl oz Katagon 2 lb (0.018-0.027 + 0.018-0.027 lb ai)**

Controls grass and small-seeded broadleaf weeds. Apply to actively growing weeds less than 5 inches tall. For ground application only with a minimum carrier of 10 gpa. Allow 14 days between applications. Addition of MSO (0.5% v/v) is recommended. COC (1% v/v) or NIS (0.25% v/v) may be used but may be less effective. Add UAN (2.5% v/v) or AMS (8.5 lb/100 gal).

Do not apply more than 2 applications or 6.8 fl oz/A per year. Do not apply if corn was treated with terbufos insecticide. Do not graze or feed forage or silage for 45 days or harvest grain for 70 days. Rotation interval is 4 months for winter wheat, barley, oats and rye; 8 months for spring wheat, barley, oats, and rye; 9 months for soybeans; 10 months dry bean, peas, snap peas, and pop and sweet corn. 12 months for alfalfa and clover; 18 months for all other crops.

**POST:** Apply to corn up to 20 inches tall or the V5 growth stage (whichever occurs first).

**TANK-MIXES:** Best results occur when tank-mixing with a minimum 0.5 lb a.i./A of atrazine. Also consider tank-mixtures with acetochlor or metolachlor products, dicamba, or any other herbicides for increased spectrum and residual control of grass and broadleaf weeds. Do not tankmix with bentazon or 2,4-D.

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**RESTRAINT (*tolpyralate + acetochlor*)** Site of Action: 27 + 15

**30-48 oz Restraint 6.5L (0.022-0.035 + 1.5-2.4 lb ai)**

Controls select grasses and small-seeded broadleaf weeds such as waterhemp, redroot pigweed, and common ragweed. Apply preemergence or to actively growing weeds less than 5 inches tall. For ground application only with 10-30 gpa carrier. Allow 14 days between sequential applications. For postemergence weed control always use COC (1% v/v). NIS (0.25% v/v) may be used but may be less effective. May be tank mixed with atrazine and other labeled corn herbicides.

Do not apply more than 2 applications or 60 oz/A per year. Do not graze or feed forage or silage for 21 days or harvest grain for 45 days. See well head setback restrictions for acetochlor. Rotation interval is 4 months for wheat; 9 months for alfalfa or sorghum; 10 months for soybean, sunflower, dry beans, and peas; and 12 months for most other crops.

**EPP, PRE:** Apply up to 30 days before planting. Rate depends on soil texture and O.M. At least 0.5-inch precipitation is required for activation.

**POST:** Apply to corn up to 11 inches tall or the V6 growth stage (whichever occurs first). Use higher rates for dense weed infestations.

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**EMPYROS (*s-metolachlor + tolpyralate*)** Site of Action: 15 + 27

**1.4 qt Empyros 3.82L (1.3 + 0.035 lb ai)**

Controls annual grass and broadleaf weeds. Apply preemergence or early post to actively growing weeds 3 inches or less. For ground application only with a minimum carrier of 10 gpa. For postemergence weed control add NIS (0.25% v/v) or COC (1%v/v). May also add AMS or UAN to increase weed control however risk of crop injury is increased. Do not use MSO.

Do not apply postemergence if corn was treated at planting with terbufos or other organophosphate insecticide. Do not apply postemergence within 7 days of any organophosphate or carbamate insecticide. Do not apply more than 2 applications or 2 qt/A per year. Do not graze or feed forage/silage for 45 days. Do not harvest forage, grain, or stover for 45 days. Rotation interval is 4.5 months for barley, oats, rye and wheat; 9 months for sorghum, and soybeans; and 18 months for most other crops.

**EPP, PRE:** Apply up to 14 days before planting.

**EPOST:** Apply to corn up to 20 inches or the V6 growth stage. Best results when corn is less than 12 inches tall.

**PYTHON, ACCOLADE, or REPTILE (*flumetsulam*)** Site of Action: 2**(\$17.45-29.00)****0.8-1.33 oz Python, Accolade or Reptile 80WDG (0.04-0.067 lb ai)**

Broadleaf herbicide with residual activity. Use 0.8-0.89 oz on coarse soils and 0.89-1 oz on medium to fine soils for kochia, Russian thistle, common lambsquarters, Venice mallow, wild mustard, redroot pigweed, smooth pigweed, velvetleaf, and common waterhemp, including triazine resistance biotypes of these weeds. Will not control weeds resistant to ALS-inhibiting herbicides. Use the higher rate on soils with greater than 3% OM. Do not apply these rates more than 14 days before planting. Use 0.89-1 oz on coarse soils and 1.14-1.33 oz per acre on medium to fine soils for marehail, ladythumb, black nightshade, and wild sunflower. Giant ragweed is partially controlled, and cocklebur, common ragweed, and jimsonweed are partially to variably controlled. Use the higher rate on soils with greater than 3% O.M. and/or when applications are made 14-30 days before planting.

Do not exceed 1.4 oz per acre in a single crop year. Do not exceed 0.07 lb ai cumulative flumetsulam per acre if using sequential or tank-mix applications. Do not apply more than 30 days before planting or less than 85 days before harvest. Do not apply on soils that have a pH greater than 7.8 or contain greater than 5% O.M. and the pH is less than 5.9. Applications on soils with less than 1.5% O.M. may cause crop injury. Approved for ground or aerial application.

Applications made under adverse (dry or cold) conditions result in less effective weed control. Do not apply under conditions which favor runoff or erosion of soil. Corn must be planted at least 1.5 inches deep. Do not use on corn treated with Counter or Thimet insecticides. Other insecticides should be applied in T-band or band. Organophosphate insecticides including Counter or Thimet can be applied to IR, IMR or Clearfield hybrids. IR, IMR or Clearfield hybrids may reduce injury to corn from Python on soils with less than 1.5% OM or pH greater than 7.8.

Follow crop rotation guidelines. Alfalfa, dry beans, peas, and small grains may be planted after 4 months; grain sorghum after 12 months; sunflower after 18 months; and canola after 26 months plus field bioassay. Soybeans can be planted anytime.

**FALL:** Apply in late fall when soil temperature has dropped below 50°F.

**PPI:** Incorporate 2-3 inches deep up to 30 days prior to planting.

**PPS:** Use in reduced and no-till systems. May be applied up to 30 days prior to planting. PRE. Apply at planting or after planting, but prior to weed emergence. Rainfall required. PRE-SPIKE. Use water carrier if corn is emerged and up to 2 inches.

**TANK-MIXES/SEQUENTIAL:** Tank-mixes of Python for burndown include Gramoxone, glyphosate products, and 2,4-D. Tank-mixes of a reduced Python rate (0.8-0.9 oz) in preemergence application include Bicep, and Harness Xtra. Sequential applications of postemergence treatments include Hornet at reduced rate; Banvel, Clarity, 2,4-D, bromoxynil, or Beacon.

**PREMIX****HORNET or STANZA (*flumetsulam* + *clopyralid*)** Site of Action: 2 + 4**(\$11.20-27.95)****2-5 oz Hornet or Stanza 78.5 WDG (0.023-0.058 + 0.063-0.156 lb ai)**

Hornet contains 0.185 lb flumetsulam (Python) plus 0.5 lb clopyralid acid (Stinger) per pound of product. Hornet provides residual control of many broadleaf weeds and controls emerged Canada thistle. Use a tank-mix or sequential program for grass control.

For preplant and preemergence applications use 4-5 oz on coarse soil and 5-6 oz for medium and fine soil. The high rates are for soil over 3% O.M. or if applying 14-30 days before planting. Most widely used as a postemergence herbicide for broadleaf weeds.

Rates for postemergence application are 2-5 oz per acre. The 3 oz rate is used for most annual broadleaf weeds. Good Canada thistle activity. Use higher rates to control heavy infestations, larger weeds, or when a longer period of residual control is desired. All postemergence applications must include NIS at 1 qt/100 gal or COC or MSO at 1 gal/100 gal. Do not use liquid fertilizer as the total carrier as crop injury may occur. Do not cultivate for 10 days before or after application. Rainfast in 2 hours. Use a minimum spray volume of 5 gpa for air and 10 gpa for ground application.

Refer to the section for Python for soil restrictions for preemergence applications and for restrictions to prevent insecticide interaction with Hornet applied to the soil or postemergence.

Follow crop rotation guidelines to avoid carryover. Small grain can be planted after 4 months; alfalfa, dry beans, peas, soybeans after 10.5 months; grain sorghum after 12 months; sunflower, sweet corn after 18 months; canola after 26 months and field bioassay.

**PPS:** Hornet may be applied up to 30 days before planting.

**PPI:** Incorporate into the top 2-3 inches within 30 days prior to planting.

**PRE:** Apply at or after planting, but prior to crop or weed emergence.

**PRE-SPIKE:** Apply from corn emergence to before corn is 2 inches. Established broadleaf weeds at time of application may be controlled; rainfall is required for those weeds not emerged.

**POST:** Apply from crop emergence (spike) stage to corn through V6 stage (six visible leaf collars) or 20 inches tall, whichever occurs first. For best control, apply when broadleaf weeds are less than 8 inches tall.

**TANK-MIXES:** Hornet may be tank-mixed with Gramoxone or glyphosate products for burndown in no-till. Tank-mixes with soil-applied grass herbicides or certain postemergence herbicides add weed spectrum. Do not tank-mix with Basagran.

**PENDIMETHALIN PRODUCTS (*pendimethalin*)** Site of Action: 3**(\$10.80-32.35)****1.8-4.8 pt Prowl, Acumen, Framework, Pendimethalin, Pin-Dee or Stealth 3.3L (0.75-2 lb ai)****1.7-4.5 pt Satellite Flex 3.5L****2-4 pt Prowl H2O or Satellite HydroCap 3.8L**

Good control of several annual grasses and fair control of certain small-seeded broadleaves. Early-season weed control less consistent than for some other treatments. Rates vary depending on soil texture and organic matter. The 3.6 pt of 3.3L per acre rate has been used in most SDSU tests. Prowl H2O is a water-based formulation that has improved performance in high residue and is preferred when tank-mixing post application in corn. Crop tolerance is adequate if the seed furrow is completely closed and seed

planted at least 1.5 inches deep. Do not incorporate. Plant before applying herbicide. Minimum carrier is 10 gpa for ground or 5 gpa for air. Use 20 gpa for minimum-till systems or when using fertilizer carrier preemergence. Do not graze or feed forage from treated corn for 21 days after application. No label restrictions for crops the following year.

**PRE:** Apply after planting. Rain critical for good results. Do not harrow before crop emergence. However, if crusting or early weed emergence requires cultivation, use shallow tillage such as a rotary hoe.

**POST:** Apply until corn is 30 inches or has 8 leaf collars. Do not apply in liquid fertilizer.

**POST INCORPORATED:** Use 1.8-3.6 pt (3.3L) 1.7-3.4 pt (3.5L) or 2-3 pt (3.8L). Culti-spray application. Intended for late-season annual weeds. Apply from 4-inch crop until layby cultivation. Cultivate to move untreated soil over the corn root zone before application. Incorporate with cultivation unless there is sufficient rain or irrigation before weed emergence.

**TANK-MIXES:** Tank-mixes include atrazine, Bicep, bromoxynil, Bullet, Dual, Outlook, Harness Xtra, Hornet, Python, or Surpass. Refer to label restrictions or the section for each herbicide.

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

**(\$3.10-13.55)**

**0.75-2 pt Treflan, Trifluralin, Triflurex or Trust 4E (0.38-1 lb ai)**

Trifluralin is available in several brand name products. Formulation and use may vary. Follow label for product used.

**POST INCORPORATED:** Intended to control late-season grasses. Apply to corn from V2 up to 30 inches and incorporate with row cultivator. Cultivate before application to remove emerged weeds and to move untreated soil over corn root zone. Not labeled for preplant or preemergence use as injury can be severe. Not for seed fields. Has limited potential as a general weed program. Do not apply within 6 weeks of forage, fodder or silage harvest.

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**HARMONY SG, TREATY, or VOLTA (*thifensulfuron*)** Site of Action: 2

**(\$6.05-43.45)**

**0.125-0.9 oz Harmony 50SG (0.004-0.028 lb ai)**

**0.083-0.6 oz Treaty or Volta 75DF (0.004-0.028 lb ai)**

**BURNDOWN:** Apply Harmony SG at 0.45-0.9 oz/A or 75DF product at 0.3-0.6 oz/A prior to planting or after planting but prior to corn emergence. May be tank-mixed with glyphosate to improve control of difficult weeds such as wild buckwheat, mustards, lambsquarters, or grass weeds. Add NIS at 0.25% v/v and AMS at 2-4 lb/A.

**POST:** Apply Harmony SG at 0.125 (1/8) oz/A or 75DF product at 0.083 (1/12) oz/A in field corn with 2-6 leaves or 1-5 leaf collars or up to 16 inches tall. Do not make more than one application per season. Add NIS (0.25% v/v) or COC (1% v/v) plus either AMS (2-4 lb/A) or UAN (28% N, 2-4 qt/A). Only apply to corn with a relative maturity of 88 days or more. May provide control or suppression of velvetleaf, lambsquarters, pigweed, smartweed, and mustards.

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**GRAPPLE, HINGE, INFLICT, PRUVIN, SOLIDA, or TETRIS (*rimsulfuron*)** Site of Action: 2

**0.5-2 oz Grapple, Hinge, Inflict, Pruvín, Solida, or Tetris 25DF (0.008-0.03 lb ai)**

Pre or early postemergence application in corn to control some grass weed species such as foxtail, wild oats, and barnyardgrass and several broadleaf weed species such as lambsquarters, pigweed, mustard, and others.

Label recommends 1 oz/A for most situations and suggests tank-mixing with glyphosate for added residual control in Roundup Ready corn. Do not apply more than 0.03 lb a.i./A (Pruvin) or 0.0625 lb a.i./A (Grapple, Hinge, Solida) of rimsulfuron per year. Recommended carrier volume 15 gpa for most circumstances or 10 gpa for low weed densities. Minimum carrier volume is 5 gpa for aerial applications. Adequate soil moisture for plant growth will enhance herbicide activity. Rimsulfuron is absorbed by weed roots, so sprinkler irrigation (>0.5 in) or rain within 5-7 days of application is necessary for adequate control. If this activating precipitation is not received, follow with cultivation or a postemergence herbicide application as needed.

Postemergence applications should include a NIS (0.25% v/v) and nitrogen fertilizer (either AMS at 2 lb/A or UAN (28% or 32% N) at 2 qt/A). Adjuvants are not needed if rimsulfuron is tank-mixed with glyphosate or glufosinate herbicides that contain premixed adjuvants. For burndown applications prior to corn emergence, COC (1% v/v) or MSO (0.5% v/v) may be added in place of NIS. Do not tank mix post emergence with Basagran or organophosphate insecticides. See label for precautions and restrictions when using soil or foliar applied organophosphate insecticides.

**PPS or PRE:** Will provide residual control of weeds that are not emerged. Add an adjuvant if weeds are emerged.

**POST:** May be applied in corn up to 12 inches tall or less than 6 leaf collars.

**TANK-MIXES:** May be tank-mixed with glyphosate (Roundup Ready corn) or glufosinate (Liberty Link corn). Greater broadleaf control may be achieved by tank-mixing with dicamba. Tank-mixtures with 2,4-D will result in severe grass control antagonism.

**PREMIXES**

**RESOLVE Q or STRINGENT (*rimsulfuron* + *thifensulfuron*)** Site of Action: 2 + 2

**(\$13.30-26.60)**

**1.25-2.5 oz Resolve Q or Stringent 22.4DF (0.014-0.029 + 0.003-0.006 lb ai)**

Controls or suppresses several grass weed species, such as foxtail, barnyardgrass, woolly cupgrass, and others, and broadleaf weed species such as pigweed, kochia, velvetleaf, mustards, small dandelion, and others. Provides control of emerged weeds (1-3 inches tall) with limited residual control. Resolve Q at 1.25 oz/A provides the similar amount of active ingredient as rimsulfuron 25DF at 1 oz/A and Harmony 50SG at 0.1 oz/A. This is a greater amount of rimsulfuron, and less amount of Harmony compared to Basis Blend, so Resolve Q may have slightly greater grass activity. Do not apply more than 0.03 lb a.i. rimsulfuron per acre per year. Rainfall within 5-7 days after application may improve residual weed control. May be tank-mixed with glyphosate (Roundup) or glufosinate (Liberty) herbicides.

Follow adjuvant recommendations and carrier volumes as described for rimsulfuron 25 DF. Do not tank mix post emergence with Basagran or organophosphate insecticides. See label for precautions and restrictions when using soil or foliar applied organophosphate insecticides.

**PPS or PRE:** Apply 1.25-2.5 oz wt/A prior to corn emergence. Do not apply pre-emergence on coarse texture soils with less than 1% O.M. Do not apply more than 1.25 oz/A if planning to use another rimsulfuron containing product POST.

**POST:** Apply 1.25 oz to corn up to 20 inches tall or less than 7 leaf collars.

**BASIS BLEND (rimsulfuron + thifensulfuron)** Site of Action: 2 + 2

**(\$7.65-23.25)**

**0.825-2.5 oz Basis Blend 30SG (0.01-0.03 + 0.005-0.015 lb ai)**

Basis is intended for early postemergence grass control. It provides good to excellent control of green, bristly, yellow, and giant foxtail, barnyardgrass, and fall panicum. Basis also controls early flushes of smartweed, lambsquarters, mustard, and pigweed. Basis may be tank-mixed for additional broadleaf control. Wild oat, quackgrass, woolly cupgrass, wild proso millet, and smooth crabgrass are not controlled adequately. Basis Blend contains 20% rimsulfuron and 10% thifensulfuron. The post-emergence rate of Basis Blend is 0.825 oz/A. Do not apply more than 0.0625 lb ai. rimsulfuron per acre per year.

Early-season weed control has been satisfactory in SDSU tests; late flushes require cultivation 10-15 days after application. Applications should be made when grasses are 1-2 inches and actively growing. Crop tolerance has been good in SDSU tests. Avoid late application. Apply to hybrids with a relative maturity rating of 88 days or more. Consult your seed supplier before applying to specialty corn or hybrids less than 88 days relative maturity.

Do not apply Basis to corn treated with Counter 15G or 20CR; Basis may be applied to corn treated with Fortress, Force, or Aztec insecticide. Applications made to corn treated with other soil insecticides may cause unacceptable crop injury. There are no restrictions for Basis in "IR" corn previously treated with any insecticide. Basis should not be tank-mixed with foliar applied organophosphate insecticides, Basagran, Beacon, or other ALS herbicides. To avoid antagonism or crop injury, apply these products 7 days prior to or 3 days after Basis applications. Add COC at 1-2 gal/100 gal plus 28% N at 2-4 qt or AMS at 2-4 lb per acre. Minimum carrier is 15 gpa for ground or 5 gpa for air.

Soybeans may be planted 15 days after treatment with the low rate (0.33 or 0.825 oz); winter cereals after 4 months; spring cereals after 8 months; alfalfa, grain sorghum and sunflower after 10 months. Applying tank-mixes with dicamba to small corn (V-3 stage or smaller) during stress conditions may increase the chance of rattail after the V-11 stage of growth.

**BURNDOWN:** Apply Basis Blend (0.825-2.5 oz wt/A) as a fall treatment prior to ground freezing or in the spring prior to corn planting. Rates above 1.25 oz for Basis Blend increase weed spectrum and can lengthen residual control. Refer to tank-mix partner label for rates and precaution information.

**POST:** Apply Basis Blend (0.825 oz wt/A) as a broadcast or banded treatment on field corn that is spike to 4-leaf (2 collar) growth stage, prior to emergence of the third collar and/or less than 6 inches tall.

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**ALLUVEX (rimsulfuron + thifensulfuron)** Site of Action: 2 + 2

**1.5 oz Alluvex 33.4DF (0.016 + 0.016 lb ai)**

Premix of rimsulfuron and thifensulfuron (Harmony). Controls emerged weeds and provides limited residual. Add COC or MSO at 1% v/v or NIS at 0.25% v/v. May also add UAN (2 qt/A) or AMS (2 lb/A). Additional 2(ee) label allows for tank-mix with dicamba burndown before corn for control of ALS-inhibiting herbicide-resistant kochia. Corn may be planted anytime. Rotation interval is 3 months for winter cereals; 9 months for spring cereals; 10 months for flax, peas, sorghum, dry beans, soybean, and sunflowers; and 18 months for alfalfa, canola, and most other crops. Do not apply more than 0.0625 lb ai. Rimsulfuron per acre per year to field corn. Do not apply preemergence on coarse soils with less than 1% O.M. See label for precautions and restrictions when using soil or foliar applied organophosphate insecticides.

**BURNDOWN, PPS, PRE:** May be applied anytime before corn emergence. May be tank-mixed with several preplant/ preemergence herbicides to increase residual weed control.

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**INSTIGATE (rimsulfuron + mesotrione)** Site of Action: 2 + 27

**5.25-7 oz Instigate 45.84DF (0.014-0.018 + 0.14-0.18 lb ai)**

Instigate is a premix containing 4.17% rimsulfuron and 41.67% mesotrione (Callisto). Intended for preplant or preemergence application. Provides burndown and residual control of many grass and broadleaf weeds. May be tank-mixed with several preemergence corn herbicides. A 6 oz/acre use rate is suggested for most soil applications. Use higher rates for fine soils and more than 3% OM. Do not use preemergence on coarse soils with less than 1% OM.

For preplant burndown applications add COC or MSO and UAN or AMS for control of labeled weeds less than 3 inches. Substitute NIS for COC/MSO when mixing with glyphosate. Check label guidelines for appropriate adjuvants when tank-mixing other herbicides.

Do not tank mix post emergence with Basagran or organophosphate insecticides. See label for precautions and restrictions when using soil or foliar applied organophosphate insecticides. Do not use another postemergence HPPD inhibitor (Callisto, Impact, Laudis) with Instigate in the same season. When using other products containing mesotrione or rimsulfuron, do not apply more than 0.24 lb ai/acre mesotrione or 0.0625 lb ai/acre rimsulfuron per year.

Rotation interval is 4 months for winter cereals, 9 months for spring cereals, 10 months for alfalfa, canola, flax, potatoes, sorghum, soybeans, and sunflower. Rotation interval for most other crops is 18 months. Do not graze, feed forage, grain, or stover for 45 days after application.

**PPS:** Apply up to 14 days before planting.

**PPI:** Incorporate less than 2 inches up to 14 days before planting.

**PRE:** Apply during or after planting before crop emergence. Check that seed furrow is thoroughly closed.

**EPOST:** Apply 5.25-6 oz/acre up through V2 corn.

**REALM Q (rimsulfuron + mesotrione) Site of Action: 2 + 27****(\$19.50)****4 oz Realm Q 38.75DF (0.019 + 0.078 lb ai)**

Standard rate is 4 oz which provides the similar active ingredients as rimsulfuron 25DF at 1.2 oz/A and Callisto at 2.5 oz/A. Best results if applied to small (1-2-inch grasses or broadleaves less than 5 inches), actively growing weeds. Do not apply to field corn grown for seed. Do not apply more than 4 oz Realm Q per growing season. When using other products containing mesotrione or rimsulfuron, do not apply more than 0.24 lb ai/acre mesotrione or 0.0625 lb ai/acre rimsulfuron per year.

Thoroughly clean the application equipment immediately after use.

Minimum carrier volume is 10 gpa for ground applications or 2 gpa for aerial applications. Preferred adjuvants are COC + AMS. Apply COC at 1% v/v or 2% v/v during dry conditions. Also add AMS at 2 lb/A or UAN (28 or 32% N) at 2 qt/A. Instead of COC, NIS (0.25% v/v) may be added. Do not use MSO. Do not add adjuvants that significantly alter the solution pH. Do not tank mix post emergence with Basagran or organophosphate and carbamate insecticides. See label for precautions and restrictions when using soil or foliar applied organophosphate insecticides.

Rotation restriction is 4 months for winter wheat; 9 months for spring wheat, oats, and barley; 10 months for soybeans, sunflowers, sorghum, alfalfa, flax and canola; and 18 months for most other crops.

**POST:** It is best to apply when corn is less than 12 inches tall but may apply to corn up to 20 inches tall or 6 leaf collars.

**TANK-MIXES:** May tank-mix with glyphosate (Roundup), glufosinate (Liberty), dicamba, and several other herbicides. Check label guidelines for appropriate adjuvants when tank mixing other herbicides. Use only NIS (no AMS or UAN) if tank mixing s-metolachlor (or similar herbicides) postemergence or leaf burn may result.

**ACCENT Q or PRIMERO (nicosulfuron) Site of Action: 2****(\$21.80)****0.9 oz Accent Q 54.5 WDG (0.031 lb ai) 0.67 oz Primero 75 WDG (0.031 lb ai)**

Excellent control of shattercane and good to excellent control of green and giant foxtail. Accent Q also controls barnyardgrass, yellow foxtail, sandbur, woolly cupgrass, and quackgrass. Pigweed and smartweed are controlled.

Foxtail, wild oat, sandbur, and woolly cupgrass should not exceed 2-3 inches, shattercane 4-12 inches, and quackgrass 4-10 inches. Results are more variable if grasses such as yellow foxtail or barnyardgrass are present. Corn tolerance has appeared good in SDSU tests. Cultivation 10-14 days after application will control late weed flushes.

Weeds stop growth soon after treatment but yellowing or stunting is not apparent for several days. Results are best when weeds are actively growing and free of stress. Thorough coverage is important. Always add COC at 1 gal/100 gal or NIS at 1-2 qt/100 gal. Use 28% N at 2-4 qt or AMS at 2-4 lb per acre. Rainfall within 4 hours of application will reduce effectiveness. Minimum carrier is 10 gpa for ground or 3 gpa for air. Increase the carrier to 15 gpa for ground or 5 gpa for air under less favorable conditions. Avoid concentrating spray into plant whorl. Two-nozzle units are suggested for banding.

Do not apply Accent Q to corn that was treated with Counter 15G or 20 CR at planting. To avoid crop injury or antagonism, apply Basagran, 2,4-D, or organophosphate insecticides such as Lorsban, Malathion, etc., at least 7 days before or 3 days after application of Accent Q. Fortress, Aztec, and other non-organophosphate insecticide treated fields can be treated with Accent Q. Corn may develop rat-tailing after the V-11 stage of growth when Accent Q is tank-mixed with products containing dicamba and applied to small corn (V3 stage or smaller) under stress conditions.

**POST:** Apply on corn up to 20 inches or up to and including 6 collars, whichever is most restrictive. Early application is important, especially in heavy infestations. Late applications to control escaped grasses or as a rescue treatment may be made using drop nozzles for 20-36-inch corn. Do not apply after corn is 36 inches or has 10 or more collars.

**TANK-MIXES/SEQUENTIAL:** May be tank-mixed or applied sequentially with many corn herbicides. Some options include atrazine, dicamba, Callisto, Impact, Lumax, Prowl, Surpass, Dual, Outlook and others. Refer to labels for rates and restrictions.

**PREMIXES****REVULIN Q (nicosulfuron + mesotrione) Site of Action: 2 + 27****(\$22.60-26.60)****3.4-4 oz Revulin Q 51.2DF (0.03-0.036 + 0.078-0.092 lb ai)**

Revulin Q is a premix of 14.4 % nicosulfuron (Accent) and 36.8 % mesotrione (Callisto). Provides postemergence grass and broadleaf control.

Minimum carrier is 10 gpa, increase to 15 gpa for heavy weed stands. Do not apply by air. Water only carrier. Add COC (1 % v/v) or HSOC (0.5 % v/v) plus UAN (2 qt/A) or AMS (2 lb/A). NIS (0.25%) may be used but weed control is not as consistent. MSO is not recommended.

Do not tank-mix with Basagran. If a foliar applied organophosphate insecticide is used, apply 7 days before or 3 days after Revulin Q. Do not apply within 45 days of crop emergence where terbufos (Counter) insecticide was used. Crop injury may occur if Revulin Q is applied where other organophosphate insecticides were previously applied. Do not harvest grain for 70 days or feed or forage for 45 days. Do not apply more than 1 oz ai nicosulfuron or 3.85 oz ai mesotrione per acre per year.

Rotation interval is 4 months for winter cereals; 8 months for spring cereals; 10 months for alfalfa, canola, flax, sorghum, soybeans, and sunflower; and 18 months for most other crops. Canola and alfalfa increase to 18 months with less than 15 inches precipitation.

**POST:** Apply up to 20 inch or 6 leaf collar corn, whichever comes first. Apply with drop nozzles for 20 to 30 inch or 8 leaf collar corn, whichever comes first.

**STEADFAST Q (nicosulfuron + rimsulfuron) Site of Action: 2 + 2****(\$22.05)****1.5 oz Steadfast Q 37.7WDG (0.023 + 0.012 lb ai)**

Steadfast Q 37.7WDG at 1.5 oz/A is equivalent to 0.5 oz Accent + 0.75 oz rimsulfuron 25DF. Weed height should not exceed 4 inches for barnyardgrass, foxtail, wild proso millet, common sunflower, and pigweeds; 3 inches for woolly cupgrass and smartweed; 2 inches for volunteer cereals, sandbur, and wild oat.

Consult your seed supplier before applying Steadfast Q to specialty corn or hybrids with 77-88 days relative maturity.

Adequate soil moisture is required. Rainfall within 5 days will enhance residual activity. Rainfast in 4 hours. Applications must include either COC at 1 gal/100 gal or NIS at 1-2 qt/100 gal + AMS or 28% N. Minimum carrier is 15 gpa for ground or 5 gpa for air. Do not graze or feed forage, hay, or straw from treated areas to livestock within 30 days of application.

Do not tank-mix Steadfast Q with Basagran. 2,4-D may cause grass control antagonism. Do not tank-mix with foliar applied organophosphate insecticides such as Lorsban, or malathion. Apply these products at least 7 days before or 3 days after application of Steadfast Q. May be tank-mixed with Asana XL or Lannate insecticides.

Soybeans may be planted after 15 days; winter small grain 4 months; spring wheat, barley, oats, or rye 8 months; dry beans, peas 10 months; alfalfa, canola, flax, and sunflower 10 months (18 months if drought conditions after application); sorghum 10 months if pH is 7.5 or less; and 18 months for most other crops.

**POST:** Apply to corn up to 20 inches or up to and including 6 collars, whichever is most restrictive.

**TANK-MIXES/SEQUENTIAL:** Tank-mix Steadfast Q 37.7WDG with full or reduced rates of preemergence grass herbicide to be applied early postemergence. Preemergence grass herbicides include Prowl, and Dual. Rate for preemergence herbicide is 2/3 of full rate. If preemergence herbicide contains atrazine use less than 1.0 lb ai atrazine in tank-mix. If Prowl is used as tank-mix EPOST on small grass use NIS in place of COC. Provides residual grass control. Refer to the label or section for each herbicide alone.

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**AUTUMN SUPER (*iodosulfuron + thienencarbazone*)** Site of Action: 2 + 2 **(\$8.95-14.90)**

**0.3-0.5 oz Autumn Super 51WDG (0.0011-0.0019 + 0.0084-0.014 lb ai)**

Controls several mustard species, marehail, chickweed, alfalfa, and other broadleaf weed species. Apply while weeds are actively growing. May provide short-term residual control of some small-seeded broadleaf weeds. The addition of thienencarbazone increases suppression of grasses, such as foxtail barley and downy brome (cheatgrass). Rotation interval is 1 month for corn, 2 months for soybeans, 3 months for wheat, and 9 months for barley with a minimum of 15 inches precipitation, and 18 months for most other crops with a minimum of 30 inches of precipitation. Minimum carrier is 10 gpa. Add COC or MSO at 1% v/v and UAN at 1.5-2 qts/A or AMS at 1.5-3 lb/A.

**EPSPS:** 0.3-0.5 oz/A The 0.3 oz rate is only for soils with a pH between 7.0-8.0. Apply in fall to small weeds (less than 3 inches) at least 30 days prior to corn planting. Do not apply to frozen ground. Do not graze for 45 days after application.

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**DICAMBA PRODUCTS (*dicamba*)** Site of Action: 4 **Restricted Use Pesticide** **(\$3.50-34.75)**

**0.5-1 pt dicamba 4L (0.25-0.5 lb ae)**

**0.5-1 pt DiFlexx 4L**

Dicamba is available in several brand name products including **Banvel, Clarifier, Clarity, Clash, Detonate, Diablo, Dicamba, DiFlexx, Disha DMA, Opti-DGA, Oracle, Rifle, Sterling Blue (DGA), Strut, Vision,** and others. Formulation and use may vary. Follow label for product use.

Good to very good control of several small-seeded annual and perennial broadleaf weeds. Does not control mustard. Better crop tolerance than 2,4-D. Very good tolerance up to 8 inches. May cause brittleness, lodging, or breakage associated with greensnap problems. Risk of injury greatest during periods of rapid growth, especially if crop is beyond suggested crop stage. DiFlexx contains a safener to reduce the potential for crop injury.

Banvel and Sterling are formulated as a dimethylamine salt; Clarity, Strut and DiFlexx are formulated as a diglycolamine salt. Clarity, Strut and DiFlexx have less temperature or humidity restrictions than dimethylamine formulations for application near sensitive crops. Weed control has been similar for these products. Minimum carrier for Clarity, Strut and DiFlexx is 3 gpa for ground and 1 gpa for air. Minimum carrier for other dicamba 4L is 5 gpa for ground or 3 gpa for air except when sensitive crops may be affected.

May make up to 2 applications per season with at least 2 weeks between sequential applications. Sunflowers become more sensitive after they are beyond the 6-leaf stage. Do not harvest for dairy cattle prior to milk stage or kernel fill. Rates vary according to time of application.

Use precautions to reduce risk of droplet drift. Do not apply if wind is gusty or in excess of 5 mph and moving toward sensitive crops or if expected high temperature is over 85°F. Slight wind moving away from sensitive crops is preferred over calm conditions. Use less than 20 psi pressure and at least 20 gpa. Use drop nozzles if corn is over 8 inches. Do not apply dicamba when soybeans are nearby if corn is over 24 inches tall or soybeans are over 10 inches or are starting to bloom. A June 20 cut-off date for dicamba is suggested if soybeans are planted at normal dates.

**DICAMBA PRODUCTS (excluding DiFlexx):**

**PPS, PRE:** Apply 1 pt/A on medium and fine soils with more than 2.5% organic matter (O.M.). PPS applications are for no-till only; apply 0.5 pt/A if soils have coarse texture or less than 2.5% O.M. Do not make PRE applications on coarse texture soils or soils with less than 2.5% O.M.

**EPOST:** Apply 1 pt/A when corn is spike to 5-leaf or up to 8 inches (whichever occurs first). For coarse soils, use 8 oz. Useful for Canada thistle in seasons where weeds emerge ahead of corn. Some crop effects noted if heavy rain is received soon after application. Consider patch treatments.

**POST:** Apply 0.5 pt/A as a directed spray to 8-36-inch-tall corn or not later than 15 days before tassel (whichever occurs first).

**TANK-MIXES/SEQUENTIAL:** Dicamba 4L may be tank-mixed or applied sequentially with many herbicides; some examples include atrazine, acetochlor, Outlook, glyphosate, paraquat, metolachlor, and pendimethalin. Refer to label restrictions for each herbicide.

**DIFLEXX ONLY:**

DiFlexx contains a safener to reduce the potential for crop injury. May add NIS (0.25% v/v), COC (1% v/v), or MSO (1% v/v) plus UAN (2-4 qt/A) or AMS (8.5-17 lb/100 gal) for emerged weeds, especially with dry conditions. Do not apply more than 16 oz per application or 24 oz per year. Do not harvest for forage for 45 days. Corn grain and stover may be harvested once crop reaches milk stage.

**PPS, PRE:** Apply 8-16 oz/A in all tillage systems. Use higher rate range for soils with higher O.M. PPS application can be made up to 14 days before planting. Plant corn at 1.5 inches deep and ensure furrow is closed. COC or MSO preferred for increased burndown activity.

**POST:** Apply 6-16 oz/A when corn is spike to V10 or 36 inches (whichever occurs first). Control results are best when applied to weeds less than 3 inches.

**TANK-MIXES/SEQUENTIAL:** DiFlexx tank-mixes include Balance Flexx, Capreno, Corvus, glyphosate, Laudis, Liberty and others. Refer to label restrictions for each herbicide.

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**DISTINCT (*dicamba + diflufenzopyr*)** Site of Action: 4 + 19 **(\$13.00-19.50)**

**4-6 oz Distinct 70WDG (0.125-0.18 + 0.05-0.075 lb ae)**

Distinct contains 50% dicamba ae + 20% diflufenzopyr ae. Use NIS at 0.25% v/v with UAN or AMS. Minimum carrier is 3 gpa for ground applications. Do not apply aerially. Do not apply if wind is more than 10 mph. Do not apply additional products with dicamba in the same spring season. Do not cut for forage for 32 days after application. Do not harvest grain or stover for 72 days after application.

**PPS:** Apply preplant in reduced or no-till corn up to 7 days before planting.

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**STATUS (*dicamba + diflufenzopyr*)** Site of Action: 4 + 19 **(\$14.00-56.00)**

**2.5-10 oz Status 56DF (0.06-0.25 + 0.025-0.1 lb ae)**

Status is a postemergence, translocated herbicide containing 40% dicamba ae + 16% diflufenzopyr ae + safener. Diflufenzopyr is an auxin transport inhibitor that blocks movement of natural auxins and growth regulators from active meristematic regions in the stem and roots. The safener in Status reduces the potential for corn injury. These herbicides give very good to excellent control of many annual broadleaves including waterhemp and kochia. They also control perennials such as Canada thistle and field bindweed.

When tank mixing with glyphosate or glufosinate, Status may be used at 2.5 oz/A for increased broadleaf weed control or 5 oz/A for perennial weeds or weeds taller than 6 inches. Early application is suggested.

Minimum carrier is 3 gpa for ground equipment. For Status, add a surfactant such as NIS (0.25% v/v), COC (1-2 pt/A), or MSO (1-2 pt/A) with a nitrogen fertilizer such as UAN (1.25% v/v) or AMS (5-17 lb/100 gallons). Do not plant any crop within 120 days after application unless 1 inch of rainfall is received after Status applied at less than 5 oz/A. Forage may be harvested 32 days and grain harvested 72 days after application.

**POST:** Apply 5-10 oz/A on corn 4-36 inches tall (V2-V8 growth stage) or 2.5-10 oz/A when tank-mixed with glyphosate or glufosinate.

**TANK-MIXES/SEQUENTIAL:** May be applied sequentially or tank-mixed with other registered corn herbicides. Do not tank-mix with other growth regulator herbicides (site of action 4), such as dicamba, 2,4-D, or clopyralid, or apply one of these herbicides within 15 days of applying Status. Do not tank-mix with emulsifiable concentrate chloroacetamide herbicides such as Dual II Magnum, Harness, Outlook, or Surpass. Follow crop size and carrier requirements for tank-mix or combination partners.

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**DIFLEXX DUO (*dicamba + tembotrione*)** Site of Action: 4 + 27 **(\$22.75-37.95)**

**24-40 oz DiFlexx Duo 1.53L (0.24-0.39 + 0.05-0.08)**

DiFlexx Duo is a mixture of dicamba (DiFlexx) and tembotrione (Laudis). Good to very good control of most annual broadleaf weeds and some perennial broadleaf weeds. Provides some grass control; marginal on green foxtail.

Minimum carrier is 10 gpa ground. Not labeled for air. Apply no more than 15 inches above the canopy. MSO or COC at 1% v/v is recommended and add UAN at 1.5 qt/A or AMS at 8.5-17 lbs per 100 gal. UAN is preferred with dry conditions. Rotation interval is 4 months for small grains; 8 months for soybeans; 10 months for sorghum, peas, canola, alfalfa, and sunflower; 10 months for dry beans with 20 inches precipitation; and 18 months for most other crops. Do not apply over 78 oz per season. Rain fast in 4 hours. Do not graze or harvest forage for 45 days.

**PPS, PRE:** Apply 32-40 oz. Requires a tank-mix partner or a planned postemergence for full season weed control. Plant corn at 1.5 inches deep and ensure furrow is closed.

**POST:** Apply 24-40 oz from emergence to 36 inches but before the V7-stage; whichever comes first. Do not apply with liquid fertilizer as the main carrier.

**TANK-MIXES:** May be tank-mixed with atrazine, Liberty, glyphosate and other herbicides. Refer to label restrictions for each herbicide.

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

**1.25-1.5 pt Scorch 4.77L (0.16-0.19 + 0.47-0.57 + 0.12-0.14 lb ae)**

Scorch is a premix containing 1 lb dicamba, 3.02 lb 2,4-D and 0.75 lb fluroxypyr per gallon. Controls annual broadleaf weed species such as wild buckwheat, lambsquarters, pigweed, kochia, Russian thistle, and others. Minimum carrier is 3 gpa for air and 5 gpa for ground. Check label for adjuvant recommendations. Do not graze or harvest for livestock feed for 47 days. Preharvest interval is 90 days for grain or stover.

**PPS:** Apply 1.25-1.5 pts to actively growing weeds 7-14 days before planting.

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**SPITFIRE or RIFLE-D (*dicamba + 2,4-D*)** Site of Action: 4 + 4 **(\$8.10-16.20)**

**1.25-2.5 pt Spitfire 3.57L (0.078-0.156 + 0.48-0.96 lb ae)**

**1.25-2.5 pt Rifle-D 3.88L (0.156-0.313 + 0.45-0.9 lb ae)**

Good burndown for most broadleaf weeds. Add 0.25-0.5% NIS and 2-4 qt UAN or 1 qt COC to improve burndown. Minimum carrier is 3 gpa for air and 5 gpa for ground. Plant corn at least 1.5 inches deep. Do not harvest or graze until corn has reached the milk stage or later.

**PPS:** Apply 1.25-2.5 pt 7-14 days before planting. Do not apply more than 2 pt/A on soil that has less than 2% O.M.

**PRE:** Apply 2-2.5 pt 3 to 5 days after planting but before corn emerges. Do not use this product preemergence if soil has less than 2% OM.

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**AIM, ANTIK or LONGBOW (carfentrazone)** Site of Action: 14

**(\$3.90-7.80)**

**0.5-1.0 oz Aim EC, Antik or Longbow 2L (0.008-0.016 lb ai)**

Aim is a contact herbicide for broadleaf weeds with minimal residual activity. It controls kochia including glyphosate and ALS resistant. Velvetleaf control is excellent; it also controls black nightshade, kochia redroot pigweed, and lambsquarters.

Ragweed and sunflower are less sensitive and require a tank-mix partner. Atrazine tank-mix adds control of weeds such as buffalobur, cocklebur, Venice mallow, and waterhemp. Performance on velvetleaf and waterhemp has been very good in SDSU tests. Crop tolerance is adequate.

Apply when weeds are 1-4 inches. Larger weeds may not be completely controlled. Warm, humid conditions favor activity. Activity on weeds is rapid. Minimum carrier is 10 gpa for ground or 3 gpa for aerial equipment. Add NIS at 2 pt/100 gal; COC at 1% may be used under very dry conditions but crop response (speckling) may be noted. Avoid concentration into leaf whorl. Avoid application within 8 hours of rain before or after application. There are no crop rotation restrictions for the following season.

**BURNDOWN:** For emerged weeds in no-till. Maximum rate is 2.0 oz/A total for preplant and in-crop use. Use COC additive. Additional burndown herbicide may be required for grass and large weeds.

**POST:** Postemergence up to 14 collars. For corn greater than V8, Aim can be applied with drop nozzles or as a directed spray at rates up to 2.0 oz per acre.

**TANK-MIXES:** May be tank-mixed with other labeled herbicides including 2,4-D amine, atrazine, dicamba, and glyphosate. Do not mix Aim with emulsifiable concentrate formulations, fertilizer, or additives other than given on label. Add Aim to the tank first. Refer to the label or section for each herbicide alone.

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

**(\$4.15-9.30)**

**0.4-0.9 oz Cadet 0.91L (0.003-0.009 lb ai)**

Cadet is a PPO-inhibiting herbicide with the same mechanism of action as Aim. The standard rate range is 0.6-0.9 fl oz/A depending on the size of the weeds. Use 0.4 oz/A when tank mixing with a glyphosate product. Controls some common broadleaf weed species, such as pigweed, waterhemp, lambsquarters, velvetleaf, and nightshade. Generally, controls broadleaf weeds 2-6 inches tall, but may control velvetleaf up to 36 inches tall. Controls or injures weeds within 48 hours. Control may decline if weeds are large or not actively growing. May be tank mixed with several broadleaf or grass herbicides.

Thorough coverage is important to optimize control. Minimum carrier is 15 gpa for ground applications or 5 gpa for aerial applications. Use up to 40 gpa if canopy is dense. May use NIS (0.25% v/v), COC up to 2.5% v/v (recommended during dry conditions), or a silicone-based surfactant (0.25% v/v). May also add UAN at 1-2 qt/A or AMS. Do not irrigate or apply within 4 hours of precipitation. Do not harvest or feed forage until 30 days after application or harvest grain until 90 days after application. Do not mix or load within 50 feet of a well, sink holes, streams, rivers, lakes, or reservoirs.

**POST:** Apply to corn up to 48 inches tall or prior to tasseling, whichever comes first.

**PREMIX**

**SOLSTICE (fluthiacet-methyl + mesotrione)** Site of Action: 14 + 27

**2.5-3.15 oz Solstice 4L (0.004-0.005 + 0.074-0.093 lb ai)**

Premix containing 0.216 lb fluthiacet (Cadet) and 3.784 lb mesotrione (Callisto) intended for postemergence broadleaf control. May be tank-mixed with several postemergence herbicides.

COC at 0.5-1% v/v is the preferred adjuvant. NIS at 0.25% v/v can be used but control may be reduced. Also add UAN at 2.5% v/v or AMS at 8.5 lb/100 gal. Severe crop injury may result if MSO is used. Minimum carrier is 10 gpa ground or 15 gpa with dense cover. Do not apply aerially. Do not apply more than 5.25 oz/A per year. Do not feed forage for 45 days or harvest grain or stover for 70 days.

Corn may be planted any time after application. Sorghum, flax, millet, and oats may be planted immediately after corn harvest.

Rotation interval is 4 months for wheat, barley, and rye; 10 months for canola, soybeans, and sunflowers; and 18 months for drybeans and most other crops.

**POST:** Apply up to the V8 growth stage. Performance is best when weeds are small.

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**RESOURCE (flumiclorac)** Site of Action: 14

**(\$9.05-18.05)**

**4-8 oz Resource 0.86L (0.027-0.054 lb ai)**

Resource is a contact herbicide used to control certain annual broadleaf weeds. Apply from the 2-leaf through 10-leaf crop stage. Count leaves with visible leaf collars. Velvetleaf is the most sensitive weed. Control has been very good in SDSU tests. Lambsquarters and ragweed also labeled for Resource alone. Frequently used in a tank-mix.

Resource activity is enhanced by COC adjuvants. COC is added for Resource alone and in some tank-mixes. Addition of 28% N at 2 gal/100 gal or AMS at 2.5 lb per acre improves activity.

Minimum carrier is 15 gpa for ground and 7 gpa for aerial applications. Do not apply if rain is expected in 1 hour. Do not graze or use forage for 28 days after treatments. There are no crop rotation restrictions for the next season.

**POST:** Rates are 4-6 fl oz per acre. Use COC at 1 pt per acre. Rates up to 8 fl oz may be used with COC at 1 qt per acre applied with drop nozzles. Labeling includes velvetleaf up to 10-leaf stage.

**TANK-MIXES:** Tank-mixes include Accent, Basis, Beacon, Bromoxynil, dicamba, glyphosate (RR corn), Hornet, Liberty (LL Corn), Permit, Stinger and 2,4-D. Refer to label restrictions or the section for each herbicide.

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**BASAGRAN, BASHAZON, BENTAZON 4, or BROADLOOM (*bentazon*)** Site of Action: 6 **(\$10.60-21.25)**

**1-2 pt Basagran, BashAzon, Bentazon 4, or Broadloom 4L (0.5-1 lb ai)**  
**1.2-1.6 pt Basagran 5L (0.75-1 lb ai)**

Excellent control of cocklebur. Very good control of sunflower and velvetleaf. Control is best on actively growing, small weeds. The 1.5 pt/A (4L) or 1.2 pt/A (5L) rate is for cocklebur under 6 inches, velvetleaf under 2 inches, and sunflower under 5 inches. Use the 2 pt/A (4L) or 1.6 pt/A (5L) rate for cocklebur up to 10 inches, velvetleaf to 5 inches, and sunflower to 8 inches. Suppresses Canada thistle, use high rate and retreat if necessary.

Use COC at 1 qt in minimum of 10-20 gpa carrier with minimum of 40 psi pressure for ground and 1 pt COC per acre in minimum of 5 gpa at 40 psi for air. Velvetleaf control is improved with 28% N at 2 qt per acre as part of the carrier. Primarily for special situations where maximum crop safety is important. Drift to adjacent crops such as soybeans, small grain, or forage legumes does not cause visual harm. Do not graze for 12 days after application.

**POST:** Corn is usually at the 1- to 5-leaf stage when treated.

**TANK-MIXES:** Tank-mix Basagran with one of the following herbicides to expand weed spectrum: atrazine, Clarity, Outlook, Status, or Roundup (RR corn). Refer to label restrictions and directions for each herbicide.

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**BROMOXYNIL PRODUCTS (*bromoxynil*)** Site of Action: 6 **(\$6.00-18.25)**

**0.75-2 pt bromoxynil 2L (0.18-0.5 lb ae)**

Bromoxynil is available in several products, examples include **Broclean, Brox, Maestro, Moxy** and others.

Contact herbicide. Excellent for kochia, sunflower, and cocklebur. Velvetleaf control is variable; plants must be under 3-4 inches. Gives top growth burn on Canada thistle. Not intended as a rescue treatment for large weeds. No soil residual. Control is reduced if plants are under stress. Bromoxynil does not cause brittleness or lodging. Some crop leaf burn is frequently noted. Symptoms disappear as new growth develops. Wet foliage and high temperature at time of spraying increases the risk of crop injury.

Bromoxynil alone is used at 1-2 pt per acre. Apply before weeds exceed the most susceptible stage; cocklebur (8 inches), sunflower (6 inches), wild buckwheat (6 inches), and nightshade (6 inches). Less susceptible weeds like pigweed, velvetleaf, and wild mustard require the higher rates and must be treated before they reach 2-4 inches, depending on species. Good coverage is important. Suggested carrier is 5 gpa for air or 10 gpa with ground equipment. Spray additives or liquid fertilizer may cause excessive crop leaf burn.

**PRE:** May be applied before planting to emerged weeds. Rate is 1-1.5 pt per acre.

**POST:** Optimum stage is 4- to 8-leaf. Bromoxynil at 1-1.5 pt per acre may be used from emergence to tassel. Rates of 1.5-2 pt per acre can be used after corn reaches the 4-leaf stage.

**TANK-MIXES:** Tank-mix combinations include atrazine, Accent, dicamba, Stinger and 2,4-D. Refer to other sections or product label. Refer to label for specific bromoxynil product for tank-mix and rate directions for that product.

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**DEADBOLT (*bromoxynil* + 2,4-D)** Site of Action: 6 + 4

**0.6-1.6 pt Deadbolt 5.625L (0.188-0.5 + 0.23-0.625 lb ai)**

Premix containing 2.5 lb bromoxynil and 3.125 lb 2,4-D ester per gallon. Do not graze or cut for feed within 45 days. Preharvest interval is 7 days. Avoid cultivation for 2 weeks after application. Do not use on light sandy soils.

**PPS:** Apply 0.8-1.6 pt/A 7-14 days before planting.

**PRE:** Apply 0.8-1.2 pt/A 3-5 days after planting but before crop emerges, plant corn as deep as practical.

**POST:** Apply 0.6 pt/A from emergence to before tassel. May apply 0.9 pt/A after the 4-leaf stage. Use drop nozzles for corn that is greater than 8 inches tall.

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**TOUGH 5EC (*pyridate*)** Site of Action: 6 **(\$33.10)**

**24 oz Tough 5EC 5L (0.94 lb ai)**

Tough has a similar mode of action as Basagran or bromoxynil. Controls several broadleaf weed species such as common waterhemp, cocklebur, kochia, lambsquarters, redroot pigweed, sunflower, and others. Tough at 8-24 oz/A may be tank mixed with atrazine and other herbicides listed on the label to broaden the spectrum of weed control. Follow adjuvant recommendations for specific tank mixes.

Add COC at 1-4 pt/A (do not exceed 2.5% v/v) or NIS at 0.25% v/v. May also add UAN at 2-4 qt/A or AMS at 2-4 lb/A.

Minimum water carrier volume is 15 gpa (20-30 gpa recommended) for ground equipment. Do not apply aerially. Do not apply more than 24 oz per year.

Corn and chickpeas may be replanted anytime. There are no rotation restrictions for other crops following a normal grain harvest.

**POST:** Apply up to V8 corn or 68 days prior to harvest (whichever comes first). Apply to small weeds (< 4-leaf stage).

**PERMIT, HALOMAX, HERBIVORE, PROFINE, PROMOTE or SANDEA (halosulfuron)****(\$16.30-50.75)**

Site of Action: 2

**0.67-1.33 oz Permit, Halomax, Herbivore, Profine 75, Promote or Sandea 75WSG (0.032-0.063 lb ai)**

Permit is a sulfonyle-urea herbicide that controls annual broadleaf weeds. Permit provides very good to excellent control of cocklebur, sunflower, pigweed, velvetleaf, and common ragweed. Labeling also includes kochia (will not control ALS-inhibiting herbicide-resistant populations), Venice mallow, and smartweed. The higher rates control larger weeds, yellow nutsedge and suppresses common milkweed. Control has been generally consistent in SDSU tests. There is no activity on annual grass.

Use the low rate for kochia, pigweed, and Venice mallow up to 3 inches; cocklebur, common ragweed, and velvetleaf up to 9 inches, and sunflower to 12 inches. Control is more consistent if weeds are treated at early stages. Crop tolerance has been satisfactory.

Use NIS at 1-2 qt or COC at 1 gal per 100 gal per acre. Addition of 28% N at 4 gal/100 gal is allowed if required by a tank-mix partner. Minimum carrier is 10 gpa for ground or 3 gpa for air.

Treated fields may be rotated the next season to milo, field corn, winter or spring wheat. Allow 9 months for soybeans or alfalfa or 2 months for small grain or millet. Do not graze or harvest forage for 30 days after application. Do not make more than 2 applications or more than 2 2/3 oz/A per year.

**PRE:** Apply 1.33-2 oz/A as a soil application. Plant only IR hybrids.

**POST:** Apply 0.67-1.33 oz/A from spike through layby stage. Use drop nozzles for canopied corn.

**TANK-MIXES:** Can be tank-mixed with dicamba, bromoxynil, atrazine, Accent, and others. Refer to label restrictions or the section for each herbicide.

**PREMIX****YUKON (halosulfuron + dicamba) Site of Action: 2 + 4****(\$16.65-33.25)****4-8 oz Yukon 67.5 WSG (0.031-0.063 + 0.138-0.275 lb ai)**

Yukon contains 12.5% halosulfuron (Permit) plus 55% dicamba. Yukon can be tank-mixed with atrazine, Accent, Armezon, bromoxynil, Callisto, glyphosate, Impact or Laudis. Minimum carrier is 10 gpa for ground or 5 gpa for air. Always add NIS at 0.25-0.5% v/v. COC or MSO at 1% v/v may be used instead of NIS however NIS is preferred to reduce crop response. AMS at 2-4 lb/A or UAN at 2-4 qt/A may also be added. Do not graze or harvest forage or silage for 30 days.

**POST:** Apply from spike to 36-inch corn. Drop nozzles recommended for corn 20 inches or taller.

**2,4-D Site of Action: 4****(\$0.80-9.40)****0.12- 1 lb ae 2,4-D amine or ester**

Less risk of vapor drift with amine formulations. Reduce risk of droplet drift by using less than 20 psi pressure and using at least 20 gpa carrier. Soybeans will be susceptible to off-target movement at the bloom stage. Sunflowers are more susceptible to off-target movement as plant size increases. Windstorms may cause corn lodging or breakage. Hybrids vary in tolerance; however, hybrid susceptibility is also affected by growing conditions. Drop nozzles reduce risk of injury. Avoid cultivation for 7 days after spraying. Do not use wetting agents or other additives. Slightly higher rates will improve perennial weed control, but risk of crop injury increases.

**EPP:** May apply up to 0.5 lb ae/A at least 7 days prior to planting or 0.5-1 lb ae/A at least 14 days prior to planting.

**PRE:** May apply up to 1 lb ae/A after corn planting but prior to corn emergence in tilled fields. Seed furrow must be completely closed prior to application to avoid corn injury. Check labels for guidelines as labels may vary.

**POST:** Very good control of most emerged annual and perennial broadleaf weeds. Apply before crop is more than 4-5 inches tall for best tolerance. Corn tolerance has been acceptable with early postemergence applications in SDSU tests. Use drop nozzles if corn exceeds 8 inches (soil to tip of whorl leaf). Avoid application during the period of rapid elongation. Do not apply later than 1 week before silking. Risk of brittleness increases in cool and wet or hot and humid conditions.

**HARVEST AID:** Apply after silks are brown or after black-layer stage. Substantially reduces viability of cocklebur and sunflower seed if first flush was controlled in early season. Good retreatment for perennials. Excellent crop tolerance. Use 1 lb ae of ester or amine per acre with high-clearance sprayer. Check labels for aerial application. Do not harvest fodder or grain for 7 days following application.

**2,4-D Rate Product Per Acre**

**Rates for 2,4-D are stated as acid equivalent (ae) per acre. The amount of product varies according to the formulation.**

Lb/A ae Required	Formulation			
	3.8L	5.7L	80% WSP	90% WSP
0.12	0.25 pt	0.17 pt	0.17 lb	0.15 lb
0.25	0.5 pt	0.33 pt	0.33 lb	0.3 lb
0.5	1 pt	0.66 pt	0.66 lb	0.6 lb
1	2 pt	1.33 pt	1.25 lb	1.1 lb

**STINGER, BITE, CLEAN SLATE, SPUR, or STIGMATA (clopyralid) Site of Action: 4****(\$4.40-13.25)****0.25-0.66 pt Stinger, Bite, Clean Slate, Spur or Stigmata 3L (0.094-0.25 lb ae)****0.15-0.4 pt Stinger HL 5L (0.094-0.25 lb ae)**

Stinger is especially effective where Canada thistle is a major weed problem. Lower rate provides seasonal suppression; 0.5-0.66 pt/A (0.2-0.4 pt/A Stinger HL) has been more effective and provides thistle stand reduction. Also controls ragweed, sunflower, and cocklebur. Crop tolerance is excellent. Apply in a minimum of 10 gpa carrier for ground equipment. Do not apply by aircraft.

Barley, canola, corn, flax, oats, turnip, and wheat can be planted anytime. Rotation interval is 10.5 months for alfalfa, safflower, and grain sorghum; 10.5 months for dry beans, soybeans, and sunflower for soil with greater than 2% O.M. and more than 15 inches precipitation in the preceding 12-month period; and 18 months for most other crops. Avoid drift to sensitive crops. Do not allow livestock to graze treated fields or harvest grain or silage within 40 days after treatment.

**POST:** Apply from crop emergence to 24 inches. Use drop nozzles to direct spray in larger corn. Thistles should be at least 4 inches but not at bud stage.

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**STARANE ULTRA, COMET, FANCY, FLAGSTAFF or OBTAIN EC (*fluroxypyr*)** Site of Action: 4 **(\$7.15-12.40)**

**0.66 pt Comet 1.5L (0.12 lb ae)**

**0.66 pt Fancy 1.6L (0.13 lb ae)**

**0.4 pt Starane Ultra, Flagstaff or Obtain EC 2.8L (0.14 lb ae)**

Starane Ultra is a translocated postemergence herbicide used to control certain broadleaf weeds. Fluroxypyr provides an alternative mode of action to control ALS-inhibiting herbicide-resistant kochia biotypes. Labeling also includes cocklebur, sunflower, common ragweed, and Venice mallow. Mustard, Russian thistle, pennycress, wild buckwheat, and other broadleaves require combination treatments.

Weeds should be actively growing. Temperature below 45° and above 85° may result in reduced activity. Minimum carrier is 8 gpa for ground equipment. May also be applied by air. Do not graze or harvest forage for 47 days or harvest grain or stover for 90 days after application.

**BURNDOWN:** For no-till, may be tank-mixed with other herbicides for use prior to planting. Adjuvants are not usually used but may be added under dry conditions.

**POST:** Apply from emergence through 5-leaf collar stage.

**TANK-MIXES:** Starane Ultra or Comet may be applied in tank-mix combination with other herbicides registered for postemergence application in field corn.

**PREMIXES**

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**WIDEMATCH, COLT AS, FAR REACH or TRUSLATE (*clopyralid + fluroxypyr*)** Site of Action: 4 + 4 **(\$15.45)**

**1.33 pt Widematch, Colt AS, Far Reach or Truslate 1.5L (0.125 + 0.125 lb ai)**

**POST:** WideMatch contains 0.75 lb clopyralid (Stinger) plus 0.75 lb fluroxypyr (Starane) per gal. The 1.33 pt rate provides the equivalent of 0.33 pt Stinger plus 0.66 pt Starane. Apply from crop emergence through 5-collar stage. Refer to Stinger and Starane sections for application information and restrictions.

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**TRUMP CARD (*fluroxypyr + 2,4-D*)** Site of Action: 4 + 4

**1.3 pt Trump Card 3.31L (0.083-0.248 + 0.33-1 lb ai)**

Premix containing 0.66 lb ae fluroxypyr (Starane) and 2.65 lb ae 2,4-D per gallon. Use 1.5-3 pt/A preplant or preemergence depending on soil texture and organic matter. Apply 1-2 pt/A postemergence. NIS at 0.25% v/v may be used if required by post emergence tank mix partner. Adjuvants increase risk of crop injury.

Do not apply with liquid fertilizer. Use a minimum 3 gpa spray solution for aerial and 10-40 gpa for ground application. Allow a minimum of 3 weeks between a preplant or preemergence and a postemergence application of Trump Card. Do not apply more than 3 pt/A per growing season. Do not graze or forage for 47 days. Do not harvest for 90 days after application.

**PPS:** Apply 14 days before planting to control small broadleaves or cover crops.

**PRE:** Apply 3-5 days after planting, but prior to crop or weed emergence.

**POST:** Apply 1-2 pt when weeds are small and to corn up to the V5 stage. After the V-5 crop stage, use drop nozzles and keep spray off corn foliage.

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**KOCHIAVORE (*2,4-D + bromoxynil + fluroxypyr*)** Site of Action: 4 + 6 + 4 **(\$11.50-17.25)**

**1-1.5 pt Kochiavore 4L (0.21-0.31 + 0.21-0.31 + 0.084-0.126 lb ai)**

Premix containing 1.67 lb 2,4-D, 1.67 lb bromoxynil, and 0.67 lb fluroxypyr per gallon. Provides control of several broadleaf weeds. Minimum carrier is 8 gpa for ground application.

Make only one preplant or preemergence application and only one postemergence application per season. Do not apply more than 1.5 pt/A per application or more than 3 pt/A per season. Do not apply on sandy soils. Do not harvest for 90 days following application. Do not graze or forage for 47 days.

**PPS:** Apply at least 7 days before planting. Do not till for at least 7 days.

**PRE:** Apply after planting but before corn emergence. Ensure seed furrow is closed.

**POST:** Apply from the V3 to V5 growth stage. Do not tank-mix with atrazine, crop oil or other adjuvants.

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**STARANE NXT (*fluroxypyr + bromoxynil*)** Site of Action: 4 + 6 **(\$12.15-23.80)**

**14-27.4 oz Starane NXT 2.9L (0.063-0.125 + 0.25-0.5 lb ai)**

Premix containing 0.58 lb fluroxypyr (Starane) and 2.33 lb bromoxynil per gallon. Apply from preplant to the V5 growth stage. The addition of additives may result in excessive crop response. Do not apply more than 0.5 lb bromoxynil or more than 0.25 lb fluroxypyr per season; which is equivalent to the full labelled rate. Do not graze or cut for feed or fodder for 45 days. Do not rotate to labeled crops for 1 month or other crops for 4 months.

**PPS or PRE:** Apply 14-21 oz from before planting to before emergence.

**POST:** Apply 14 oz from emergence up to and including V5 or 21-27.4 oz from V4-V5.

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

Vida is a non-residual treatment for emerged weeds prior to planting corn or epost as a tank-mix partner. It has activity on broadleaf weeds including cocklebur, sunflower, lambsquarters, pigweed, Russian thistle, wild buckwheat, and wild mustard. Vida is used primarily in a tank-mix with glyphosate. Results used alone have been variable; especially for kochia. Minimum carrier is 10 gpa for ground or 5 gpa for air. Labeled crops (corn, wheat, soybeans) may be planted immediately; allow 30 days for other food crops. Do not harvest for silage for 50 days or harvest for grain or stover for 90 days after application.

**BURNDOWN:** Apply 0.5-2 oz/A. Tank-mix with other labeled herbicides for larger weeds.

**EPOST:** Apply 0.5-1 oz from VE-V4 corn. Do not use COC. Do not apply more than 1 oz/A per crop season. May cause some initial crop response.

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

**1.3-2.7 pt Devour, Gramoxone SL 3.0, Helmquat, Paraquat, or Para-Shot 3.0 3L (0.5-1 lb ai)**

**(\$7.40 – 20.80)**

**BURNDOWN:** Paraquat is a non-selective, non-residual, contact herbicide used at planting to control emerged grasses and broadleaves and topgrowth of perennials. Rates of 1.3-1.7 pt/A (3L) are adequate for most small weeds; high rate is for larger weeds (over 6 inches) or dense stands. Apply in a minimum of 10 gpa for ground or 5 gpa for air. NIS is important. Most mixtures with atrazine require surfactant at 1 pt/100 gal. Use 2 pt/100 gal with most combinations if nitrogen fertilizer carrier is used. Liquid fertilizer containing phosphorus will reduce paraquat activity. Paraquat is highly toxic when ingested; follow handling and safety precautions..

**TANK-MIXES:** Gramoxone may be tank-mixed in burndown treatments with postemergence and preemergence residual herbicides labeled for corn.

**0.7-1.3 pt Devour, Gramoxone SL 3.0, Helmquat, Paraquat, or Para-Shot 3.0 3L (0.25-0.5 lb ai)**

**(\$4.00 – 10.05)**

**POST DIRECTED:** Use paraquat as a directed spray. Provides a salvage option when weeds cannot be controlled with cultivation. Apply when corn is at least 10 inches. Arrange nozzles to spray no higher than the lower three inches of the corn stalk. Coverage is especially important for dense or tall weeds.

**GLYPHOSATE PRODUCTS (CONVENTIONAL CORN)** Site of Action: 9

**(\$3.90-14.50)**

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

Glyphosate Concentration	Rate for 0.38-3.75 lb ae/A
3 lb ae	16 oz-5 qt
4 lb ae	12 oz-3.75 qt
4.5 lb ae	11 oz-3.3 qt

Glyphosate is a non-selective translocated herbicide with no soil residual weed activity. Controls both grasses and broadleaf species. Some products contain adequate surfactant, others require NIS. AMS at 8.5-17 lb/100 gal is required, especially if poor water quality, cool weather, or moisture stress may reduce control. Check crop use and application directions on the product being used. Refer to section for Herbicide Resistant Corn for in-crop use. Glyphosate rates in this section are listed for products having 3 lb acid equivalent (4 lb ai). Use the chart below to adjust for other concentrations.

**Glyphosate Products-Equivalent Rates Amount of product (oz) for equivalent lb ae**

Formulation	0.38 ae	0.75 ae	1.5 ae	3 ae
3 lb ae (4 lb ai)	16	32	64	128
4 lb ae (5.4 lb ai)	12	24	48	96
4.5 lb ae (5.5 lb ai)	11	21	43	85
4.8 lb ae (5.88 lb ai)	10	20	40	80

**BURNDOWN:** Weeds should be growing actively. Water having more than 500 ppm combined calcium, magnesium, or iron may reduce activity: especially at high carrier volumes. Add AMS at 8.5-17 lb/100 gal if carrier water is at or exceeds 500 ppm of these minerals. Daytime temperatures below 55°F may also reduce activity. Avoid tillage for one day after treating annuals: 3-7 days for perennials. Carrier is 3-40 gpa for ground and 3-15 gpa for air. Maximum rate for air is 1 qt of 3 lb product. Use caution to avoid droplet drift to non-target crops. Follow cleanup procedures to avoid crop damage from equipment contamination.

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 for glyphosate 3 lb ae product is 16 oz for most small annuals; 12 oz per acre may be adequate for some situations. Use 20-24 oz per acre for larger or more tolerant annuals. Rates of 32-48 oz is for perennials.

**SPOT TREATMENT:** Use 2-4 qt of 3 lb ae per acre to control small patches of perennial weeds such as quackgrass or Canada thistle. It is usually applied with hand-held equipment. Crop contacted by spray or drift will be damaged or killed.

**PREHARVEST:** Several glyphosate products are labeled for preharvest use. Applications must be made 7 days prior to harvest and when grain moisture is 35% or less or corn has reached physiological maturity and maximum kernel fill is complete.

Ground or aerial applications. Do not apply preharvest to corn grown for seed.

**TANK-MIXES:** Glyphosate products are frequently used in tank-mix or premix combinations as preemergence soil-applied burndown treatments in no-till systems. Refer to specific glyphosate or tank-mix partner product label for approved herbicide combinations. For improved burndown, glyphosate may be tank-mixed with 2,4-D or dicamba and applied at least 7 days prior to planting.

# HERBICIDE RESISTANT CORN

Herbicides for use only on herbicide resistant corn hybrids are listed in this section. Herbicides listed for standard corn may also be used in weed control programs for herbicide resistant corn.

## GLYPHOSATE TOLERANT CORN

**GLYPHOSATE PRODUCTS** Site of Action: 9

**(\$7.80-14.50)**

**ROUNDUP READY, ROUNDUP READY 2, or GLYPHOSATE TOLERANT CORN**

Glyphosate is a non-selective, translocated herbicide with no soil residual weed activity. Glyphosate controls most annual grasses and broadleaves; it is especially useful for perennial weeds. Control of Canada thistle, field bindweed, and milkweed has been very good. Weed control in SDSU tests has been very good. Crop canopy and crop residue help reduce late weed flushes. Programs should provide early grass control and adequate control of late emerging weeds. Consider using residual planting-time herbicide, split postemergence, or cultivation. Heavy foxtail densities should be controlled early (3-4 weeks after planting).

Only glyphosate products licensed and labeled for use with Roundup Ready (RR/GT) or Roundup Ready 2 (RR2) hybrids may be used. Check labels to ensure the corn you are planting and the postemergence glyphosate product you are using can be used together. Some glyphosate products are only labeled for use on RR2 corn. RR2 hybrids allow for higher use rates not labeled for RR corn which may cause injury. Products having different formulations and different amounts (lb) of acid equivalent (ae) and active ingredient (ai) are listed below.

Glyphosate Concentration	Trade Names	Rate for (0.5-0.75 lb ae/A)
3 ae, 4 ai	Buccaneer (Plus), Cornerstone Plus, Credit 41 Extra, Eraser A/P, Four Power Plus, Glyphosate 4 Plus, Gly Star Original, GlySupreme Plus, Honcho Plus, Mad Dog (Plus), Makaze (Yield Pro), Showdown, Sunphosate 41%, Tomahawk 4, Top Dog Glycel 41% Plus	24-32 oz
4 ae	Buccaneer 5 Extra, Cinco, Cornerstone 5 Plus, Credit 5.4 Extra, Duramax, Glyphosate 5.4, Gly Star 5 Extra, Mad Dog 5.4, Tomahawk 5	18-24 oz
4.5 ae, 5.5 ai	Bullseye, Gly Star K-Plus, Honcho K6, Mad Dog K6, Roundup PowerMax, Roundup WeatherMax, RT 3	16-21 oz
4.5 ae, 5.8 ai	Credit Xtreme	16-21 oz
4.8 ae, 5.88 ai	Roundup PowerMax 3	13.3-20 oz

**POST:** Apply to Roundup Ready (RR) or Roundup Ready 2 (RR2) corn from emergence through the V8 stage (8 leaves with collars) or until corn height reaches 30 inches, whichever comes first. The “event” used in developing RR2 hybrids provides a resistance level that allows higher glyphosate rates if required. Avoid drift. Extreme care must be taken to prevent injury to desirable and non-target plants and crops that do not contain genetic tolerance to glyphosate. Follow cleanup procedures to avoid crop damage from equipment contamination.

For Roundup Ready 2 (RR2) only. Drop nozzles suggested when corn height is 24-30 inches. Drop nozzles required when corn is 30-48 inches. Do not make a preharvest application if a combined total of 1.5 lb ae has previously been applied over the top or with drop nozzles.

Carrier is 5-20 gpa for ground and 3-15 gpa for air. Add 8.5-17 lb AMS/100 gal. Allow at least 50 days between application and harvest of corn forage and 7 days between application and harvest of corn grain. Allow a minimum of 10 days between in-crop applications.

Sequential in-crop application of glyphosate can be applied according to the maximum rates shown below.

**Maximum Glyphosate Rates – Roundup Ready Corn  
Use the chart below to adjust for concentrations.**

Formulation	In-Crop Maximum/ Application		In-Crop Total		Preplant	Preharvest	Total/ Season
	RR	RR2	RR	RR2			
3 lb ae products	32 oz	48 oz	64 oz	96 oz	5 qt	32 oz	8 qt
4 lb ae products	24 oz	36 oz	48 oz	72 oz	3.75 qt	24 oz	6 qt
4.5 lb ae products	21 oz	32 oz	43 oz	64 oz	3.3 qt	22 oz	5.3 qt
4.8 lb ae products	20 oz	30 oz	40 oz	60 oz	3.1 qt	20 oz	5 qt

**TANK-MIXES – RR/RR2**

**PRE:** Glyphosate products list several preemergence tank-mixes. Labeling for many preemergence residual or postemergence burndown products used prior to crop emergence includes tank-mixes with glyphosate.

**POST:** Glyphosate products and potential tank-mix partners include labeling for several postemergence tank-mixes. Product labels vary considerably. Labeling may be on the glyphosate product or the tank-mix partner. Tank-mixes listed include herbicides that provide preemergence residual or postemergence activity in tank-mixes with glyphosate, acetochlor (Harness, Surpass, Keystone etc.) products, metolachlor (Dual, etc) products, Aim, Armezon, Basis, Cadet, Callisto, Capreno, Clarity, dicamba, Hornet, Impact, Instigate, Laudis, Lumax EZ, Outlook, Permit, Realm Q, Resource, Status, Stinger, and 2,4-D. Consult your product label or supplemental labels that may apply.

# LIBERTY LINK CORN

**GLUFOSINATE PRODUCTS (*glufosinate*) (*LibertyLink Corn*)** Site of Action: 10

**(\$17.60-28.80)**

**29-43 oz Autonomy, Cheetah, Fever, Forfeit 280, Glufosinate 280SL, Interline, Liberty, Noventa, Nullify A/P, Reckon 280SL, or Total SL 2.34L (0.53-0.79 lb ai)**

**19-29 oz Liberty ULTRA (0.26-0.40 lb ai)**

**14.5-21.5 oz Surmise 5 (0.53-0.79 lb ai)**

Liberty 280 (glufosinate) may only be applied postemergence to Liberty Link corn. Glufosinate product use directions may vary. Follow directions for product used. Provides broad spectrum grass and broadleaf weed control. Use higher rates or tank-mix partners to control field sandbur, marehail, common waterhemp and Russian thistle. Weed control from Liberty may be reduced by adverse weather conditions, such as drought or cool temperatures. Coverage is important for Liberty. Minimum carrier rate is 15 gpa for ground or 10 gpa for aerial applications. For heavy weed or crop canopies increase carrier to 20 gpa. Do not use nitrogen solutions as spray carriers. Do not use nozzles or pressures that result in coarse spray droplets. Add AMS at 3 lb/A (17 lb/100 gallons). Reduce AMS rate to 1.5 lb/A (8.5 lb/100 gallons) when temperatures exceed 85°F. Additional surfactants or crop oils may increase the chance of corn injury.

Applying a preemergence herbicide is recommended to reduce weed competition. For Liberty and Liberty ULTRA and most other glufosinate products, 1 burndown and 2 in-crop applications can be made per growing season up to a maximum of 87 oz/A (58 oz/A for Liberty ULTRA; 43.5 oz/A for Surmise 5). Do not apply to corn stressed from weather conditions, such as drought, excessive rainfall, etc. For best results, apply when weeds are actively growing to small weeds ( $\leq 3$  inches). Heavy dew or fog may reduce efficacy. Rainfast within 4 hours after application. Apply between dawn and 2 hours before sunset to avoid reduced control of common lambsquarters and velvetleaf. Do not apply within 60 days of harvesting corn for forage or within 70 days of harvesting for grain. Corn, soybeans and canola may be planted anytime. Rotational interval is 70 days for barley, oats, rye, triticale and wheat, and 180 days for most other crops.

Several tank-mix options, such as atrazine, residual grass herbicides (pendimethalin, acetochlor, metolachlor), growth regulator herbicides (2,4-D, Status), HPPD-inhibiting or "bleacher" herbicides (Laudis, Impact, Callisto), ALS-inhibiting herbicides (nicosulfuron, Python, Permit, Yukon), and others (see label).

**PPS:** May be applied prior to planting conventional or transgenic corn. Apply 29-43 oz/A (Autonomy, Glufosinate 280, Liberty, Noventa 32-43 oz/A)..

**POST:** Apply from emergence up to V6 corn. Can apply most products with drop nozzles to corn up to 36 inches. May apply a second application-follow individual label for rates. Wait 7 days (10 days Cheetah) between applications. Use 29-43 oz/A (22 oz/A for Liberty, Autonomy, Glufosinate 280, Noventa) with tank-mix partners. No additional surfactant is required for tank-mixes.

## PREMIX

**SINATE (*glufosinate* + *topramezone*)** Site of Action: 10 + 27

**(\$30.85-41.15)**

**21-28 oz Sinate 2.48L (0.41-0.54 + 0.016-0.022 lb ai)**

Premix containing 2.47 lb glufosinate and 0.1 lb topramezone per gallon. Minimum carrier is 15 gpa for ground and 10 gpa for aerial application. Add MSO (1%) and AMS (3 lb/A). COC (1%) may be used in place of MSO.

Do not apply more than 28 oz/A per year. Do not harvest forage for 60 days. Do not harvest grain or fodder for 70 days. Rotation interval for 28 oz/A is 3 months for small grains (wheat, barley, oats, rye); 9 months for alfalfa, sorghum, soybean and sunflower; and 18 months for canola, dry bean, flax, pea and most other crops.

**POST:** Apply 21-28 oz from emergence up to 24 inches tall or V7 growth stage (whichever occurs first). Recommended rate is 24-28 oz. Tank mix with atrazine for enhanced control. Apply to small weeds (<3-4").

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# ENLIST CORN

**ENLIST DUO (*glyphosate* + *2,4-D choline*)** Site of Action: 9 + 4

**(\$23.75-32.25)**

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

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

Follow nozzle and buffer zone requirements to minimize off-target movement. Make applications a minimum of 48 hours before predicted rainfall that may result in runoff. Follow the directions in the "Mitigation Measures" table of the label to reduce runoff potential. Check [epa.gov/espp/](http://epa.gov/espp/) less than 6 months before application for endangered species bulletins that may have additional directions for product use.

Use a minimum of 10 gpa for ground application. Not labeled for aerial application. Burndown treatments in non-Enlist corn not recommended for light sandy soils. Do not apply more than 4.75 pt/A per application or more than 9.5 pt/A per season (for burndown in non-Enlist corn) or 14.25 pt/A per season (Enlist corn). Only tank-mix with products listed on [Enlist.com/TankMix](http://Enlist.com/TankMix).

**PPS:** (Enlist corn) Apply any time before planting.  
(Non-Enlist corn) Apply 7-14 days before planting.

**PRE:** (Enlist corn) Apply any time after planting but before emergence.  
(Non-Enlist corn) Apply 3-5 days after planting but before corn emergence.

**POST:** Apply 4.75 pt to Enlist corn up to the V8 growth stage or 30 inches tall. May apply with drop nozzles to 30-48-inch corn. Do not make more than 2 postemergence applications with at least 12 days between applications.

**ENLIST ONE (2,4-D choline)** Site of Action: 4

**(\$12.80-17.05)**

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

Provides flexible tank mix options with glyphosate or glufosinate products (see [EnlistTankMix.com](http://EnlistTankMix.com) for complete list of approved tank mix partners) for applications in Enlist corn. Contains "Colest-D Technology" to reduce drift.

Follow nozzle and buffer zone requirements to minimize off-target movement. Make applications a minimum of 48 hours before predicted rainfall that may result in runoff. Follow the directions in the "Mitigation Measures" table of the label to reduce runoff potential. Check [epa.gov/espp/](http://epa.gov/espp/) less than 6 months before application for endangered species bulletins that may have additional directions for product use.

Apply with water carrier at 10-15 gallons per acre. Not labeled for aerial applications. Only tank-mix with products listed on [Enlist.com/TankMix](http://Enlist.com/TankMix).

**PPS: (Non-Enlist/Enlist corn).** Apply 1.5-2 pt/A prior to corn emergence. Do not apply more than one PPS application per season. For best results, do not apply to light sandy soils in non-Enlist corn.

**POST: (Enlist corn).** Apply 2 pt/A when weeds are small (less than 6 inches) and not after the V8 corn growth stage or 30-inch-tall corn (whichever comes first). Later applications in 30-48 inches tall corn require drop nozzles. Do not apply more than 2 POST applications per season with at least 12 days between applications. Do not apply more than 2 pt/A per application. See label for additional restrictions.

**ASSURE II (quizalofop)** Site of Action: 1

**(\$4.15-9.90)**

**5-12 oz Assure II 0.88L (0.03-0.08 lb ai)**

For use in Enlist corn only. Provides control of annual and perennial grasses. Also controls volunteer corn without the Enlist trait. Add COC (1%) or NIS (0.25%). May be tank mixed with other herbicides; consult website ([EnlistTankMix.com/ASSUREII](http://EnlistTankMix.com/ASSUREII)) for approved options.

Maintain a 36 foot downwind buffer. Do not apply more than 2 applications or 12 oz/A per year. Do not graze for 30 days. Do not harvest forage for 30 days. Do not harvest grain or stover for 79 days. May rotate to Enlist corn and other labeled crops anytime. Do not rotate to unlabeled crops for 120 days.

**POST:** Apply to Enlist corn from the V2 to V6 stage. Apply to actively growing weeds.

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## CLEARFIELD CORN

**THUNDER (imazethapyr) ("CLEARFIELD" CORN)** Site of Action: 2

**4 oz Thunder 2L (0.06 lb ai)**

For use only on Clearfield corn hybrids. Thunder provides very good to excellent control of emerged weeds and has extended soil residual. Controls foxtail, sunflower, velvetleaf, cocklebur, kochia (ALS-inhibiting herbicide-susceptible), wild buckwheat, nightshade, and other annuals. Dicamba, atrazine, or other broadleaf herbicide is required for more consistent lambsquarters, common waterhemp, ALS-inhibiting herbicide-resistant kochia, waterhemp, or common ragweed control.

Minimum carrier is 10 gpa for ground or 5 gpa for air. Add MSO at 1% v/v or COC at 1.25% v/v or NIS at 0.25% v/v. Add 28% N at 1.25-2.5% v/v or AMS at 12-15 lbs/100 gal. Refer to additive limitations that apply to tank-mix partners. Do not use liquid fertilizer as the carrier. See label for precautions and restrictions when using corn insecticides. Do not make more than one application per year.

Rotation restrictions are 4 months for alfalfa, edible beans, peas, rye and wheat; 8.5 months for non-Clearfield corn; 9.5 months for barley; 18 months for oats, sorghum, safflower, sunflower, sweet corn; 26 months for flax and potatoes; and 40 months for crops not listed on the label.

**EPP, PPI or PRE:** Apply 4 oz/A..

**POST:** Results are best on small weeds, usually 2-3 inches. Allow 45 days before grazing or harvesting silage, forage or grain.

**TANK-MIX/SEQUENTIAL:** For heavy grass pressure, Thunder may be used following soil applied herbicides such as Harness, Prowl, Dual, or Outlook. Thunder may be tank-mixed with other herbicides, including 2,4-D, Accent, atrazine, Banvel, Basagran, bromoxynil, Clarity, Outlook, or Prowl. Consult the label or section for each product.

# WEED RESPONSE to CORN HERBICIDES

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

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

	Green foxtail	Yellow foxtail	Barnyardgrass	Field sandbur	Woolly cupgrass	Wild mustard	Wild buckwheat	Kochia (ALS-Resistant)	C. ragweed	Lambsquarters	Pigweed	Waterhemp	Smartweed	Nightshade	Cocklebur	Sunflower	Velvetleaf	Canada thistle
<b>Herbicide</b>																		
<b>PPI/PRE:</b>																		
Acetochlor	10	9	8	6	6	0	0	4	4	6	8	8	4	7	0	0	0	0
Acuron	10	8	8	6	7	10	9	9	10	10	10	9	9	10	8	7	9	4
Atrazine	6	5	5	5	4	10	10	10	9	10	10	9	10	9	6	7	8	4
Balance Flexx	8	6	8	6	7	9	2	8	8	9	9	8	7	8	5	6	9	0
Callisto	4	4	4	4	4	9	1	6	9	8	10	9	8	9	6	5	9	4
Corvus	9	8	9	6	7	9	3	8	8	9	9	8	7	8	5	6	9	0
Calibra/Coyote	9	8	7	6	6	9	8	8	9	9	9	9	8	9	6	5	9	3
Instigate	8	7	7	5	6	10	4	6	8	9	10	7	8	9	7	8	9	5
Lumax	9	7	7	5	6	10	9	9	10	10	9	9	9	10	7	6	9	4
Maverick	9	9	8	6	6	9	8	7	10	9	9	9	9	9	7	8	9	6
Metolachlor	9	8	7	5	6	0	0	4	4	4	7	7	4	7	0	0	0	0
Outlook	9	9	7	5	6	0	0	4	4	5	7	7	4	7	0	0	0	0
Python	0	0	0	0	0	9	2	4	7	8	9	8	8	6	6	7	8	0
Resicore	9	9	8	6	6	9	8	7	10	9	9	9	9	9	7	9	9	5
Rimsulfuron	7	6	6	5	5	7	0	0	4	7	7	5	5	5	4	5	5	4
Sharpen	0	0	0	0	0	9	9	6	8	8	8	8	9	8	8	8	8	0
Surestart II	9	9	8	6	6	9	8	6	10	9	9	9	8	9	7	8	8	5
Verdict	8	8	7	6	6	9	9	6	8	8	8	8	9	8	8	8	8	0
Zidua	9	8	8	6	6	3	6	6	6	7	8	8	5	8	4	2	5	0
<b>POST:</b>																		
Accent Q	9	7	7	8	8	9	2	0	4	4	7	5	7	4	5	4	4	5
Aim	0	0	0	0	0	8	4	8	6	9	9	8	6	9	6	6	10	4
Atrazine+oil	7	6	6	5	4	10	10	9	10	10	10	9	9	9	8	10	8	5
Basagran	0	0	0	0	0	9	8	6	7	6	4	4	9	6	9	7	8	7
Basis Blend	9	6	6	5	5	9	7	0	4	9	9	8	9	4	5	5	6	4
Bromoxynil	0	0	0	0	0	6	9	9	9	8	5	4	9	9	9	9	7	5
Cadet	0	0	0	0	0	5	5	4	5	6	6	5	4	6	5	4	9	0
Callisto	4	4	4	4	4	9	5	8	9	10	9	8	9	10	8	7	9	5
Capreno	7	7	7	7	7	9	8	8	9	10	9	8	9	10	7	8	9	5
Clarity/DiFlexx	0	0	0	0	0	5	9	9	10	9	9	8	10	6	7	8	6	8
Glyphosate	10	10	10	10	10	9	7	8	8	8	9	8	9	9	10	9	7	9
Hornet	0	0	0	0	0	9	7	4	8	6	8	6	8	6	9	9	8	8
Impact/Armezon	7	5	7	4	6	9	5	8	9	10	9	9	9	10	8	8	9	5
Laudis	5	7	7	4	7	9	5	8	9	10	9	9	9	10	8	8	9	5
Liberty/Cheetah	9	7	7	7	9	9	8	8	8	7	7	7	9	8	9	9	7	5
Maverick	4	4	4	4	4	9	8	8	10	10	9	8	8	10	10	9	10	8
Permit	0	0	0	0	0	10	4	4	8	4	8	7	7	4	9	8	8	4
Realm Q	9	7	8	6	7	9	6	8	8	10	9	7	9	10	8	8	9	5
Resicore	4	4	4	4	4	9	8	8	10	10	9	8	9	10	10	10	10	8
Resolve Q	7	7	7	5	5	9	7	0	4	8	8	6	6	4	6	6	7	5
Resource	0	0	0	0	0	4	5	4	6	6	6	5	4	4	4	4	9	0
Starane	0	0	0	0	0	4	6	9	8	2	2	2	2	5	6	6	7	4
Status	4	4	4	4	0	7	9	10	10	10	9	9	10	6	8	8	8	8
Steadfast Q	9	7	7	7	7	9	7	0	4	4	7	6	7	4	5	4	4	5
Stinger	0	0	0	0	0	2	7	4	8	5	4	2	8	8	9	8	4	9
WideMatch	0	0	0	0	0	4	8	8	8	7	7	7	6	6	9	6	7	8
2,4-D	0	0	0	0	0	9	6	5	9	8	8	8	6	6	9	7	7	6

# Foliar Insecticides for Corn

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In South Dakota, there are several insects that can reduce corn yields. Bt-corn hybrids are often an effective form of management. However, some minor or sporadic pests occasionally require additional treatment. As for all insect pests, insecticide management decisions should be based on scouting and the established economic threshold for insect pests.

A major concern associated with applying insecticides is the development of insecticide resistance by the targeted insect population. To reduce the probability of resistance development, insect management plans should include insecticides with different modes of action. This can involve 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, it is recommended to rotate crops periodically to a non-host crop for the targeted insect population. Crop rotation can reduce the need for insecticides to manage insect pests. The goal of these strategies is to reduce the selection pressure on the targeted insect populations and prevent the development of insecticide resistance.

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

When choosing an insecticide, refer to labels for precise rates based on observed pest insects. 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:

**Mode of action group number (insecticide class)**

**Active Ingredient(s):**

**Trade Name(s):**

Additional resources regarding insecticide safety include:

- IRAC Insecticide Resistance Action Committee (<http://www.iraac-online.org/modes-of-action/>)
- EPA United States Environmental Protection Agency (<https://www.epa.gov/pesticide-worker-safety>)
- South Dakota Department of Agriculture and Natural Resources (<https://danr.sd.gov/Agriculture/default.aspx>)
- Kelley Solutions (<https://www.kellysolutions.com/SD/searchbychem.asp>)

**Check list of insects managed by each foliar-applied insecticide.**

Mode of Action Group Number(s)	Active Ingredient(s)	Fall armyworm	True armyworm	Yellow striped armyworm	Black cutworm	Western bean cutworm	Common stalk borer	Corn earworm	European corn borer	Northern corn rootworm	Western corn rootworm	Flea beetle	Japanese beetle	Grasshopper	Bird cherry oat aphid	Corn leaf aphid	Stink bug	Two-spotted spider mite
1A	Carbaryl	+	+	+	+	+	-	+	+	+	+	+	-	-	-	-	-	-
1A	Methomyl	+	+	+	-	-	-	+	+	+	+	+	-	-	+	+	+	-
1B	Dimethoate	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	-	+
1B	Malathion	+	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-
3A	Alpha-cypermethrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A	Beta-cyfluthrin	+	+	+	+	+	+	+	+	-	-	-	-	+	-	-	+	-
3A	Bifenthrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3A	Cyfluthrin	+	+	+	+	+	+	+	+	+	+	-	+	+	-	-	+	-
3A	Deltamethrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A	Esfenvalerate	-	+	-	+	+	+	+	+	-	-	-	-	+	+	+	-	-
3A	Gamma-cyhalothrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A	Lambda-cyhalothrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A	Permethrin	+	+	+	+	+	+	+	+	-	-	+	-	-	-	-	-	-
3A	Zeta-cypermethrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A + 3A	Bifenthrin + Zeta-cypemethrin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3A + 5	Gamma-cyhalothrin + Spinosad	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
3A + 28	Bifenthrin + Chlorantraniliprole	+	+	+	-	+	+	+	+	-	-	+	+	+	+	+	+	+
3A + 28	Lambda-cyhalothrin + Chlorantraniliprole	+	+	+	+	+	-	+	+	-	-	-	-	+	+	+	+	-
4D	Flupyradifurone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-
5	Spinetoram	+	+	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-
5	Spinosad	+	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-
8D	Sodium Tetraborohydrate Decahydrate	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+
10A	Hexythiazox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
10B	Etoazole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
18	Methoxyfenozide	+	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-
23	Spiromesifen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
28	Chlorantraniliprole	+	+	-	-	+	-	+	+	-	-	-	-	+	-	-	-	-
NONE	Cinnamaldehyde	+	+	+	+	+	+	-	+	-	-	-	-	-	+	+	-	+

“+” = labeled for management in corn  
 “-” = not labeled for management in corn

**Check list of insects managed by each soil-applied insecticide.**

Mode of Action Group Number(s)	Active Ingredient(s)	Northern corn rootworm	Western corn rootworm	Grubs	Seedcorn beetle	Seedcorn maggot	Wireworm	Fall armyworm	True armyworm	Cutworm	Common stalk borer
1B	Phorate	+	+	+	+	+	+	-	-	-	-
1B	Terbufos	+	+	+	+	+	+	-	-	-	-
1B + 3A	Chlorethoxyfos + Bifenthrin	+	+	+	+	+	+	+	+	+	-
1B + 3A	Tebupirimphos + Cyfluthrin	+	+	+	+	+	+	-	-	+	-
3A	Alpha-cypermethrin	-	-	-	-	-	-	-	-	+	-
3A	Beta-cyfluthrin	-	-	+	-	+	+	-	-	-	-
3A	Bifenthrin	+	+	+	+	+	+	+	+	+	+
3A	Cyfluthrin	-	-	+	-	+	+	-	-	-	-
3A	Esfenvalerate	-	-	-	-	-	-	-	-	+	-
3A	Gamma-cyhalothrin	+	+	+	+	+	+	-	-	+	+
3A	Lambda-cyhalothrin	+	+	+	+	+	+	-	-	+	-
3A	Permethrin	-	-	-	-	+	+	+	+	+	-
3A	Tefluthrin	+	+	+	+	+	+	-	-	+	-
3A	Zeta-cypermethrin	-	-	-	-	-	-	-	-	+	-
3A + 3A	Bifenthrin + Zeta-cypermethrin	-	-	+	-	+	-	+	+	+	+
28	Chlorantraniliprole	-	-	-	-	-	-	+	+	+	+

“+” = labeled for management in corn

“-” = not labeled for management in corn

#### Insecticide Modes of Action

Mode of Action Group Number	Insecticide Class
1A	Carbamates
1B	Organophosphate
3A	Pyrethroids, Pyrethrins
4A	Neonicotinoids
4D	Butenolides
5	Spinosyns
8D	Borates
10A	Hexythiazox
10B	Etoxazole
18	Diacylhydrazines
23	Tetroic and Tetramic acid derivatives
28	Diamides
NONE: No code assigned	No class assigned

**Foliar-Applied Insecticides**

(1A) Carbaryl	44
(1A) Methomyl	44
(1B) Dimethoate	44
(1B) Malathion	44
(3A) Alpha-cypermethrin	44
(3A) Beta-cyfluthrin	44
(3A) Bifenthrin	44
(3A) Cyfluthrin	45
(3A) Deltamethrin	45
(3A) Esfenvalerate	45
(3A) Gamma-cyhalothrin	45
(3A) Lambda-cyhalothrin	45
(3A) Permethrin	46
(3A) Zeta-cypermethrin	46
(3A + 3A) Bifenthrin + Zeta-cypermethrin	46
(3A + 5) Gamma-cyhalothrin + Spinosad	46
(3A + 28) Bifenthrin + Chlorantraniliprole	46
(3A + 28) Lambda-cyhalothrin + Chlorantraniliprole	47
(4D) Flupyradifurone	47
(5) Spinetoram	47
(5) Spinosad	47
(8D) Sodium Tetraborohydrate Decahydrate	47
(10A) Hexythiazox	47
(10B) Etoxazole	48
(18) Methoxyfenozide	48
(23) Spiromesifen	48
(28) Chlorantraniliprole	48
(NONE) Cinnamaldehyde	48

**Soil-Applied Insecticides**

(1B) Phorate	49
(1B) Terbufos	49
(1B + 3A) Chlorethoxyfos + Bifenthrin	49
(1B + 3A) Tebupirimphos + Cyfluthrin	49
(3A) Alpha-cypermethrin	49
(3A) Beta-cyfluthrin	49
(3A) Bifenthrin	49
(3A) Cyfluthrin	50
(3A) Esfenvalerate	50
(3A) Gamma-cyhalothrin	50
(3A) Lambda-cyhalothrin	50
(3A) Permethrin	50
(3A) Tefluthrin	50
(3A) Zeta-cypermethrin	50
(3A + 3A) Bifenthrin + Zeta-cypermethrin	50
(28) Chlorantraniliprole	51

## Foliar-Applied Insecticides

### Mode of Action 1A (Carbamates)

**Active Ingredient:** Carbaryl

**Trade Names:** Carbaryl 4L, Sevin XLR Plus

**REI:** 24 hours, 21 days for detasseling corn

**PHI:** 48 days for grain or fodder, 14 days for forage or silage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, corn earworm caterpillars, European corn borer caterpillars, corn rootworm adults, Japanese beetle adults, and flea beetle adults.

**Restrictions:** Do not apply more than 8.0 quarts per acre in a single season. Avoid applying the product when crop or weeds are in bloom.

**Active Ingredient:** Methomyl

**Trade Names:** Lannate LV, Lannate SP, Nudrin LV, Nudrin SP

**REI:** 48 hours

**PHI:** 21 days, 3 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, corn rootworm adults and flea beetle adults.

**Restrictions:** Do not apply more than 5 lb ai/A in a single season. Do not make more than five applications/crop in a single season.

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### Mode of Action 1B (Organophosphates)

**Active Ingredient:** Dimethoate

**Trade Names:** Dimate 4E, Dimethoate 400, Dimethoate 400 EC, Dimethoate 4EC

**REI:** 48 hours

**PHI:** 28 days for grain, 14 days for forage

**Targeted Insects:** Corn leaf aphid nymphs and adults, bird cherry oat aphid nymphs and adults, northern corn rootworm adults, western corn rootworm adults, and two-spotted spider mite nymphs and adults.

**Restrictions:** Do not apply more than 1 pint/A in a single season. Do not apply this product to corn during the pollen shed period if pollinators are active.

**Active Ingredient:** Malathion

**Trade Names:** Fyfanon ULV-AG, Fyfanon, Fyfanon 57% EC, Malathion 5, Malathion 5 EC, Malathion 8 Aquamul, Malathion 57%, Malathion ULV

**REI:** 12 hours

**PHI:** 7 days

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, and corn earworm caterpillars.

**Restrictions:** Do not apply more than 1 lb ai/A during a single application. Do not apply more than 2 lb ai/A in a single season. Wait a minimum of seven days between applications.

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### Mode of Action 3A (Pyrethroids)

**Active Ingredient:** Alpha-cypermethrin

**Trade Name:** Fastac CS

**REI:** 12 hours

**PHI:** 30 days, 60 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.075 lb ai/A in a single season.

**Active Ingredient:** Beta-cyfluthrin

**Trade Names:** Baythroid XL, Cryptoid XL, Sultrus

**REI:** 12 hours

**PHI:** 21 days for grain or fodder, 0 days for green forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, grasshopper nymphs and adults, stink bug nymphs and adults, corn rootworm adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.088 lb ai/A in a single season. Do not make more than 4 applications per season. Forage may be harvested on the day of insecticide application. The retreatment interval is 7 days.

**Active Ingredient:** Bifenthrin

**Trade Names:** Alpine, Batallion 2 EC, Batallion LFC, Bi-Dash 2E, Bifen 2 AG Gold, Bifen 2EC Select, Bifender FC, Bifenthrin 2EC, Bifenture EC, Bifenture LFC, Brigade 2EC, Capture LFR, Discipline 2EC, Ethos XB, Fanfare EC, Fanfare ES, Lancer 2EC, Reveal, Reveal Endurx, Sniper, Sniper Helios, Sniper LFR, Strict, Tigris Bifenthrin LFC, Tundra EC, XPedient Plus V

**REI:** 12 hours

**PHI:** 230 days

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, corn leaf aphid nymphs and adults, bird cherry oat aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, two-spotted spider mite nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.3 lb ai/A in a single season. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of the last insecticide application. Do not apply if rainfall is imminent.

**European corn borer:** Apply at or shortly before egg hatch.

**Two-spotted spider mite:** To manage colonies, apply when colonies first form, and prior to leaf damage. Higher rates of insecticide may be required for large initial spider mite populations, or if the crop is under heat or drought stress.

**Active Ingredient:** Cyfluthrin

**Trade Names:** Tombstone, Tombstone Helios

**REI:** 12 hours

**PHI:** 21 days

**Targeted Insects:** Black cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, fall armyworm caterpillars, true armyworm caterpillars, western bean cutworm caterpillars, yellowstriped armyworm caterpillars, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, and Japanese beetle adults.

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

**Active Ingredient:** Deltamethrin

**Trade Names:** Delta Gold 1.5EC, Delta Gold 100

**REI:** 12 hours

**PHI:** 21 days, 12 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.095 lb ai/A in a single season. Do not make more than five applications in a single season. Allow 21 days between successive applications.

**Corn earworm and European corn borer:** Apply to early instar larvae prior to them boring into the ear or stalk.

**Active Ingredient:** Esfenvalerate

**Trade Names:** Asana XL, S-FenvalStar

**REI:** 12 hours

**PHI:** 21 days

**Targeted Insects:** True armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.25 lb ai/A in a single season.

**Common stalk borer and flea beetle:** Insecticides should be applied when or shortly before the caterpillars and beetles begin moving into corn from surrounding weeds and grasses. Insecticide must be applied before common stalk borer caterpillars enter the plant.

**European corn borer:** Apply insecticides when the eggs are in the blackhead stage, or before larvae enter the whorl.

**Grasshoppers:** An increased rate is required to manage grasshoppers larger than second instar.

**Active Ingredient:** Gamma-cyhalothrin

**Trade Names:** Declare, Proaxis

**REI:** 24 hours

**PHI:** 21 days, 1 day for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.06 lb ai/A in a single season. Do not apply more than 0.03 lb ai/A after silk initiation, or 0.015 lb ai/A after corn has reached the milk stage.

**Active Ingredient:** Lambda-cyhalothrin

**Trade Names:** Cavalry II, Crossover Pro, Crusader 1EC, Crusader 2ME, Drexel L-C, Grizzly Too, Kendo, Kendo 22.8 CS, L-C Insecticide, Lambda Select, Lambda T, Lambda T-2, Lambda-Cy AG, Lambda-Cy 1EC, Lambda-Cyhalothrin 1 EC, LambdaStar 1CS, LambdaStar, LambdaStar Plus, Lamcap II, Paradigm VC, Province II, Ravage, Ravage II, Roundhouse 1 EC, Serpent 1 EC, Silencer, Silencer VXN, Warrior II

**REI:** 24 hours

**PHI:** 21 days

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.12 lb ai/A in a single season. Do not apply more than 0.06 lb ai/A after silk initiation or 0.03 lb ai/A after corn reaches the milk stage.

**Common stalk borer, corn earworm, European corn borer, Western bean cutworm:** This insecticide is intended for management prior to the larvae boring into the stalk or ear.

**Fall armyworm, true armyworm, yellowstriped armyworm:** This insecticide is intended for management of only the first and second instar.

**Active Ingredient:** Permethrin

**Trade Names:** Arctic 3.2 EC, Permethrin, Perm-UP 3.2 EC, Perm-UP 25DF, PermaStar AG, Pounce 1.5G

**REI:** 12 hours

**PHI:** 30 days for grain or fodder

**Targeted Insects:** True armyworm caterpillars, fall armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, corn rootworm adults, and flea beetle adults.

**Restrictions:** Do not apply more than 0.6 lb ai/A in a single season. Forage may be harvested on the day of insecticide application. The retreatment interval is seven days.

**Common stalk borer:** Insecticides must be applied when or shortly before the stalk borer caterpillars begin moving into corn from surrounding weeds and grasses.

**Active Ingredient:** Zeta-cypermethrin

**Trade Names:** Cortes Maxx, Datsun, Mustang, Mustang Maxx

**REI:** 12 hours

**PHI:** 30 days, 60 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.20 lb ai/A of Mustang or 0.10 lb ai/A of Mustang Maxx in a single season.

**Common stalk borer, European corn borer:** These pests should be managed prior to them boring into the stalk or ear.

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#### **Mode of Action 3A + 3A (Pyrethroids)**

**Active Ingredients:** Bifenthrin + Zeta-cypermethrin

**Trade Name:** Consero

**REI:** 12 hours

**PHI:** 30 days, 60 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, bird cherry oat aphid nymphs and adults, corn leaf aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, two-spotted spider mite nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 0.4 lb ai/A in a single season. Use of ultra-low volume application is prohibited. Do not apply this insecticide if rain is imminent.

**Tw o-spotted spider mite:** Apply when colonies first begin to form prior to leaf damage.

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#### **Modes of Action 3A + 5 (Pyrethroids + Spinosyns)**

**Active Ingredients:** Gamma-cyhalothrin + Spinosad

**Trade Names:** Hero, Hero EW, Steed

**REI:** 24 hours

**PHI:** 28 days

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, corn earworm caterpillars, European corn borer caterpillars, corn leaf aphid nymphs and adults, bird cherry oat aphid nymphs and adults, grasshopper nymphs and adults, stinkbug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not apply more than 6 fl oz/A for spinosad and 6 fl oz/A for gamma-cyhalothrin in a single season.

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#### **Modes of Action 3A + 28 (Pyrethroids + Diamides)**

**Active Ingredients:** Bifenthrin + Chlorantraniliprole

**Trade Name:** Elevest

**REI:** 12 hours

**PHI:** 30 days

**Targeted Insects:** Fall armyworm, true armyworm, yellow stripped armyworm, western bean cutworm, common stalk borer, European corn borer, flea beetle, Japanese beetle, grasshoppers, bird cherry oat aphid, corn leaf aphid, stink bug, two-spotted spider mite.

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

**Active Ingredients:** Lambda-cyhalothrin + Chlorantraniliprole

**Trade Name:** Besiege

**REI:** 24 hours

**PHI:** 21 days, 1 day for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, yellowstriped armyworm caterpillars, black cutworm caterpillars, western bean cutworm caterpillars, corn earworm caterpillars, European corn borer caterpillars, corn leaf aphid nymphs and adults, bird cherry oat aphid nymphs and adults, grasshopper nymphs and adults, stink bug nymphs and adults, corn rootworm adults, flea beetle adults, and Japanese beetle adults.

**Restrictions:** Do not exceed 31.0 fl oz/A of Besiege in a single season or 0.12 lb ai/A of lambda-cyhalothrin or 0.2 lb ai/A of chlorantraniliprole.

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#### Mode of Action 4D (Butenolides)

**Active Ingredient:** Flupyradifurone

**Trade Names:** Sivanto HL, Sivanto 200 SL, Sivanto Prime

**REI:** 4 hours

**PHI:** 21 days

**Targeted Insects:** Bird cherry oat aphid nymphs and adults, English grain aphid nymphs and adults, and corn leaf aphid nymphs and adults.

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

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#### Mode of Action 5 (Spinosyns)

**Active Ingredient:** Spinetoram

**Trade Name:** Radiant SC

**REI:** 4 hours

**PHI:** 28 days, 3 days for forage

**Targeted Insects:** Fall armyworm, true armyworm, western bean cutworm, corn earworm, and European corn borer caterpillars.

**Restrictions:** Do not apply more than 0.125 lb ai/A in a single season. Do not make more than three applications in a single season.

**European corn borer:** Management of this pest should occur during periods of peak egg hatch.

**Active Ingredient:** Spinosad

**Trade Names:** Blackhawk, Entrust, Entrust SC, Spintor 2SC, Tracer

**REI:** 4 hours

**PHI:** 28 days for grain or fodder, 7 days for forage

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, western bean cutworm caterpillars, and European corn borer caterpillars.

**Restrictions:** Do not apply more than 0.189 lb ai/A of Blackhawk per year. Do not make more than three applications per calendar year.

**European corn borers and armyworm species:** Scout regularly and apply insecticide during peak egg hatch.

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#### Mode of Action 8D (Borates)

**Active Ingredient:** Sodium Tetraborohydrate Decahydrate

**Trade Name:** Prev-Am

**REI:** 24 hours

**Targeted Insects:** Beet armyworm, corn earworm, and mites.

**Restrictions:** Do not use between V10 and VT growth stages. Do not tank mix with other surfactant based adjuvants. Do not mix Prev-Am with a chemical containing copper in season. Do not apply Prev-Am in midday sun or during periods of drought when plants are subject to heat and moisture stress. Apply Prev-Am every 7-10 days for best results. The minimum retreatment interval is 7 days.

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#### Mode of Action 10A (Hexythiazox)

**Active Ingredient:** Hexythiazox

**Trade Names:** Hexy 1E, Onager Miticide, Onager Optek

**REI:** 12 hours

**PHI:** 30 days

**Targeted Insects:** Banks grass mite nymphs and adults and two-spotted spider mite nymphs and adults. **Restrictions:** Do not apply more than 24 fl oz/A in a single season. Do not make more than one application per year.

**Two-spotted spider mite:** Apply when colonies first begin to form prior to leaf damage.

**Mode of Action 10B (Etoazole)****Active Ingredient:** Etoazole**Trade Names:** Zeal Miticide-1, Zeal SC**REI:** 12 hours**PHI:** 21 days**Targeted Insects:** Banks grass mite nymphs and adults and two-spotted spider mite nymphs and adults.**Restrictions:** Do not apply more than 6 fl oz/A in a single season. Do not reapply within 14 days.**Two-spotted spider mite:** Apply when colonies first begin to form prior to leaf damage.

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**Mode of Action 18 (Diacylhydrazines)****Active Ingredient:** Methoxyfenozide**Trade Names:** Inspirato 2 F, Intrepid 2F, Invertid 2F, Vexer, Zylor**REI:** 4 hours**PHI:** 21 days**Targeted Insects:** True armyworm caterpillars, western bean cutworm caterpillars, and European corn borer caterpillars.**Restrictions:** Do not apply more than 1.0 lb ai/A in a single season.**European corn borer:** Apply at infestation levels after egg hatch. Direct application to the whorl of the plant.

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**Mode of Action 23 (Tetronic and Tetramic Acid Derivatives)****Active Ingredient:** Spiromesifen**Trade Name:** Oberon 2SC**REI:** 12 hours**PHI:** 30 days**Targeted Insects:** Banks grass mite nymphs and adults and two-spotted spider mite nymphs and adults.**Restrictions:** Do not apply more than 16.0 fl oz/A in a single application. Do not apply more than 17.0 fl oz/A in a single season. Do not make more than two applications per year.**Two-spotted spider mite:** Apply when colonies first begin to form prior to leaf damage.

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**Mode of Action 28 (Diamides)****Active Ingredient:** Chlorantraniliprole**Trade Names:** Coragen, Lumivia, Prevathon, Shenzi 400SC, Vantacor**REI:** 4 hours**PHI:** 14 days for grain or fodder**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, western bean cutworm caterpillars, corn earworm caterpillars, European corn borer caterpillars, and grasshopper nymphs and adults.**Restrictions:** Do not exceed 15.4 fl oz/A in a single season. Do not reapply within seven days. Do not make more than four applications per crop per season.

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**Mode of Action NONE (No mode of action assigned by IRAC)****Active Ingredient:** Cinnamaldehyde**Trade Name:** Seican**REI:** 4 hours**Targeted Insects:** Fall armyworm, true armyworm, yellow striped armyworm, black cutworm, western bean cutworm, European corn borer caterpillars, bird cherry oat aphid, corn leaf aphid, and mites.**Restrictions:** Apply Seican every 5-10 days for best results. The minimum retreatment interval is 5 days.

## Soil-Applied Insecticides

### Mode of Action 1B (Organophosphates)

**Active Ingredient:** Phorate

**Trade Names:** Thimet 20-G

**REI:** 48 hours, 72 hours in areas where average rainfall is less than 25 inches/year

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, and wireworm larvae. Early season suppression of soybean gall midge.

**Restrictions:** Do not use an in-furrow application technique. Do not apply more than 6.5 lb/A in a single application. Do not make more than one application in a single season. Crops on the label may be replanted immediately; all other crops may be replanted after 30 days.

Thimet 20-G is available in Lock'N Load, SmartBox and SmartCartridge closed containers.

**Active Ingredient:** Terbufos

**Trade Name:** Counter 20G

**REI:** 48 hours, 72 hours in areas where average rainfall is less than 25 inches/year

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, and wireworm larvae.

**Restrictions:** Do not exceed 6.5 lb/A during a single season.

Counter 20G is available in Lock'N Load, SmartBox and SmartCartridge closed containers.

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### Modes of Action 1B + 3A (Organophosphates + Pyrethroids)

**Active Ingredients:** Chlorethoxyfos + Bifenthrin

**Trade Names:** Index, SmartChoice HC

**REI:** 148 hours, 72 hours in areas where average rainfall is less than 25 inches/year

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn maggot larvae, seed corn beetle larvae, wireworm larvae, black cutworm caterpillars, and true armyworm caterpillars.

**Restrictions:** Do not make more than one application in a season. Do not apply more than 0.1 lb ai/A in a single season. SmartChoice HC is available in SmartBox and SmartCartridge closed containers.

**Active Ingredients:** Tebupirimphos + Cyfluthrin

**Trade Names:** Aztec 4.67G, Aztec HC, Defcon 4.67G

**REI:** 48 hours, 72 hours in areas where average rainfall is less than 25 inches/year

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, wireworm larvae, and black cutworm caterpillars.

**Restrictions:** Do not apply more than 0.15 lb ai/A in a single season. Corn may be replanted any time after application. All other crops may be planted 30 days after application. Cover or incorporate spills including end row spillage.

Aztec 4.67G is available in bags and SmartBox; Aztec HC in SmartBox and SmartCartridge closed containers.

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### Mode of Action 3A (Pyrethroids)

**Active Ingredient:** Alpha-cypermethrin

**Trade Name:** Fastac CS

**REI:** 12 hours

**Targeted Insects:** Cutworm caterpillars.

**Restrictions:** Do not apply more than 11.4 fl oz/A in a single season.

**Active Ingredient:** Beta-cyfluthrin

**Trade Names:** Baythroid XL, Cryptoid XL, Sultrus

**REI:** 12 hours

**Targeted Insects:** White grub larvae, seed corn maggot larvae, and wireworm larvae.

**Restrictions:** Do not apply more than 0.088 lb ai/A in a single season.

**Active Ingredient:** Bifenthrin

**Trade Names:** Alpine, Bi-Dash 2E, Bifen 2 AG Gold, Bifen 2EC Select, Bifender FC, Bifenthrin 2EC, Bifenture EC, Bifenture LFC, Brigade 2EC, Capture 3RIVE 3D, Capture LFR, Discipline 2EC, Ethos XB, Fanfare EC, Fanfare ES, Lancer 2EC, Nirvana RTU, Reveal, Reveal Endurx, Ruckus LFR, Sniper, Sniper Helios, Sniper LFR, Strict, Temitry LFR, Tepera Plus, Tigris Bifenthrin LFC, Tundra EC, Xpedient Plus V

**REI:** 12 hours

**Targeted Insects:** Northern corn rootworm larvae, western corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, wireworm larvae, fall armyworm caterpillars, true armyworm caterpillars, black cutworm caterpillars, and common stalk borer caterpillars.

**Restrictions:** Do not apply more than 0.2 lb ai/A in a single season for plant applications, and no more than 0.3 lb ai/A per season including other applications of these insecticides.

**Active Ingredient:** Cyfluthrin

**Trade Names:** Tombstone, Tombstone Helios

**REI:** 12 hours

**PHI:** 21 days

**Targeted Insects:** Seed corn maggot larvae, wireworm larvae, and white grub larvae.

**Restrictions:** Do not apply more than 2.8 fl oz/A or 0.044 lb ai/A in a single application. Do not reapply within seven days. Do not apply more than 11.2 fl oz/A or 0.175 lb ai/A in a single season.

**Active Ingredient:** Esfenvalerate

**Trade Name:** Asana XL

**REI:** 12 hours

**Targeted Insects:** Black cutworm caterpillars, and dingy cutworm caterpillars.

**Restrictions:** Do not apply more than 0.25 lb ai/A in a single season.

**Active Ingredient:** Gamma-cyhalothrin

**Trade Names:** Declare, Proaxis

**REI:** 24 hours

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, wireworm larvae, and black cutworm caterpillars.

**Restrictions:** Do not apply more than 0.06 lb ai/A in a single season.

**Active Ingredient:** Lambda-cyhalothrin

**Trade Names:** Cavalry II, Crusader 1EC, Crusader 2ME, Drexel L-C Insecticide, Grizzly Too, Kendo, Lambda-T, Lambda T-2, Lambda-Cy AG, Lambda 1EC, Lambda-Cy EC, Lambda-Cyhalothrin 1 EC, LambdaStar 1 CS, LambdaStar, LambdaStar Plus, Lamcap II, Paradigm VC, Province II, Ravage, Ravage II, Roundhouse 1 EC, Warrior II, Willowood Lambda 1EC

**REI:** 24 hours

**PHI:** 21 days

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, wireworm larvae, and black cutworm.

**Restrictions:** Do not apply more than 0.48 lb ai/A (30.72 fl oz/A) of lambda-cyhalothrin combined between at-plant and foliar applications. Do not apply more than 0.09 lb ai/A (5.76 fl oz/A) at-plant.

**Active Ingredient:** Permethrin

**Trade Names:** Arctic 3.2 EC, Permethrin, Perm-UP 3.2 EC, Perm-UP 25 DF, PermaStar AG, Pounce 1.5G

**REI:** 12 hours

**Targeted Insects:** Black cutworm caterpillars, dingy cutworm caterpillars, fall armyworm caterpillars, and true armyworm caterpillars. Arctic 3.2 EC also targets wireworms and seed corn maggots.

**Restrictions:** Do not apply more than 2 lb ai/A in a single season. Corn may be replanted any time after application. All other crops may be planted 60 days after application.

**Active Ingredient:** Tefluthrin

**Trade Names:** Force 3G, Force 6.5G, Force 10G HL, Force Evo, Precept

**REI:** 48 hours

**Targeted Insects:** Corn rootworm larvae, white grub larvae, seed corn beetle larvae, seed corn maggot larvae, wireworm larvae, and black cutworm caterpillars.

**Restrictions:** Do not use more than 5.5 lb/A for Force 3G, 5.0 lb/A for Force 6.5G, 3.27 lb/A for Force 10G HL in SmartBox and SmartCartridge containers, and 10 fl oz/A of Force CS and Evo in a season.

**Active Ingredient:** Zeta-cypermethrin

**Trade Names:** Cortes Maxx, Datsun, Mustang, Mustang Maxx

**REI:** 12 hours

**PHI:** 7 days

**Targeted Insects:** Black cutworm caterpillars and western bean cutworm caterpillars.

**Restrictions:** Do not apply more than 17.2 fl oz (Mustang) or 16 fl oz (Cortes Maxx, Mustang Maxx) per acre per season. Do not make more than 4 applications per year.

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### Mode of Action 3A + 3A (Pyrethroids)

**Active Ingredients:** Bifenthrin + Zeta-cypermethrin

**Trade Names:** Hero, Hero EW

**REI:** 12 hours

**Targeted Insects:** True armyworm caterpillars, fall armyworm caterpillars, common stalk borer caterpillars, cutworm caterpillars, seed corn maggots, root aphids, white grub larvae, and wireworm larvae.

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

**Mode of Action 28 (Diamides)**

**Active Ingredient:** Chlorantraniliprole

**Trade Name:** Vantacor

**REI:** 4 hours

**PHI:** 14 days for grain or fodder

**Targeted Insects:** Fall armyworm caterpillars, true armyworm caterpillars, western bean cutworm caterpillars, common stalk borer caterpillars, and grasshopper nymphs and adults.

**Restrictions:** Do not exceed 5.1 fl oz/A in a single season. Do not reapply within seven days. Do not make more than four applications per crop per season.

# Fungicide and Insecticide Seed Treatments for Corn

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Corn seed treatments promote good stand establishment and seedling vigor. Seed treatments may also help preserve yield potential and prevent quality loss in grain by preventing development of seed- and soil-borne diseases. Insecticide and nematicide seed treatments protect against feeding by nematodes and insects. The seed treatments addressed in this guide consist of fungicides, nematicides, insecticides or a combination of these products.

When deciding if seed treatments are necessary, consider on these factors: field history of seedling diseases/plant stand establishment problems, whether the crop is for seed production, if the field has poor drainage and if planting will be earlier than normal, if the field is no-till, non-rotated; the germination rate of the seed lot, and desired planting population (low planting population may require seed treatments to prevent any further loss of stand).

## **Integrated Disease Management**

Pest management requires a multi-faceted approach as part of an integrated disease management program in agriculture. Effective components of an integrated plant disease management program include: crop rotation, residue management to reduce residue-borne and overwintering pathogens, use of high quality disease free seed, careful hybrid selection for host resistance and adaptation to the growing region, proper plant health management (fertility program, planting population etc.) and judicious use of pesticides only when they are warranted.

Effectiveness of seed treatments varies with product, rate, environmental conditions, and pests present. Seed treatments may provide some level of control for early season diseases and insects as well as control seedling blights but will not last the entire season.

## **Newly Opened Land – a Special Consideration**

Newly opened land, such as conservation reserve program (CRP) being returned to crop production, may present a special consideration and most certainly will be a situation where seed treatments should be considered. Diseases such as root rots, as well as seedling blights, can often be more severe when certain crops such as cereal grains are planted into these high-residue fields. Also, insect pressure on newly cultivated lands may differ from land that has been under cultivation with the potential for increased pressure from insect pests such as white grubs and wireworms.

## **Classification of Seed Treatments**

Seed treatment fungicides are either contact or systemic. Fungicides used as protectants (contacts) are effective only on the seed surface, providing protection against seed surface-borne pathogens and providing some level of control of soil-borne pathogens. Generally, these products have a relatively short residual. Protectant fungicides such as captan, thiram or fludioxonil help control most types of soil-borne pathogens, with the exception of the root rotting organisms. Systemic seed treatment fungicides are absorbed into the emerging seedling and inhibit or kill the fungus inside host plant tissues. Systemic fungicides used for seed treatment include the following: azoxystrobin, carboxin, mefenoxam, metalaxyl, and various triazole fungicides. Mefenoxam and metalaxyl are primarily used to target the water mold fungi-like pathogens such as *Pythium*.

Insecticide seed treatments are systemic; however, they are most effective against insect pests that are feeding on plant tissue early in the season. Biological agents as seed treatments are also available and may provide some level of protectant activity. Not all fungicides are available as seed treatments for every crop, and not all fungicides have activity against the same range of organisms. Refer to the specific crop-pest combinations listed in the text for product-use recommendations. Always read and follow label directions.

## **Proper Application and Use Precautions**

Seed treatments can be poisonous, and many are irritants, so proper handling precautions must be followed when treating seed and handling treated seed. 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 when not specifically required by the fungicide label. Follow label rates, as over-application may result in unintentional damage to the seed, and under-application may reduce the effectiveness of products. Properly calibrate all application equipment to ensure uniform coverage. Uniform coverage of the seed is critical to optimize effectiveness of the seed treatment.

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 as per label directions. For more details on handling seed treatments, refer to the American Seed Trade Association guide on seed treatment stewardship [seed-treatment-guide.com](http://seed-treatment-guide.com). Do not use treated seed for food or feed.

This section includes the seed treatment fungicides, insecticides, nematicides, or fungicide/insecticide/nematicide combinations currently labeled for use on corn in South Dakota. The list is dynamic, so always check the list of products currently registered with the South Dakota Department of Agriculture and Natural Resources 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	Phenylamides (PA)
7	Succinate dehydrogenase inhibitor (SDHI)
11	Quinone outside inhibitor (QoI)
12	Phenylpyrroles (PP)
44	Microbial
M03	Dithiocarbamates
M04	Phthalimides
M07	Bis-guanidines
P05	Plant extract

## Insecticide Modes of Action

Mode of Action Group Number	Insecticide Class
3A	Pyrethroid
4A	Neonicotinoids
6	Avermectins
28	Diamides

### Insecticides/Fungicides/Nematicides

<b>Avicta Complete Corn 250, Avicta Complete Corn 500</b> ( <i>thiamethoxam + abamectin + thiabendazole + fludioxonil + mephenoxam + azoxystrobin</i> )	55
<b>Avicta Duo 250 Corn</b> ( <i>abamectin + thiamethoxam</i> )	55
<b>Manticor LFR, Temitry LFR</b> ( <i>bifenthrin + pyraclostrobin</i> )	55
<b>Poncho/Votivo</b> ( <i>clothianidin + Bacillus firmus I-1582</i> )	55
<b>Tepera Plus, Tepera Plus HD</b> ( <i>fluoxastrobin + bifenthrin</i> )	55
<b>Fungicides</b>	
<b>Abound Flowable, Atticus Acadia 2 SC, Aframe</b> ( <i>azoxystrobin</i> )	56
<b>Aftershock, Evito 480 SC</b> ( <i>fluxastrobin</i> )	56
<b>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</b> ( <i>metalaxyl</i> )	56
<b>Apron XL</b> ( <i>mefenoxam</i> )	56
<b>Azterknot</b> ( <i>azoxystrobin + extract of Reynoutria sachalinensis</i> )	56
<b>Azteroid FC 3.3</b> ( <i>azoxystrobin</i> )	56
<b>Bexford</b> ( <i>Bacillus amyloliquefaciens sp. plantarm strain FZB42</i> )	56
<b>Captan 4L ST</b> ( <i>captan</i> )	57
<b>Dithane F-45, Manzate Max, Manzate Pro-Stick, Penncozeb 75 DF, Penncozeb 80 WP</b> ( <i>mancozeb + surfactant</i> )	57
<b>DPX-YT669 250FS</b> ( <i>picoxystrobin</i> )	57
<b>Dyna-Shield Fludioxonil</b> ( <i>fludioxonil</i> )	57
<b>Dyna-Shield Tibet, Raxil 2.6 F, Sativa 309 FS, StartUp Tebuz, Teb ST, Vibe</b> ( <i>tebuconazole</i> )	57
<b>Dynasty</b> ( <i>azoxystrobin</i> )	57
<b>Evergol Energy</b> ( <i>penflufen + prothioconazole + metalaxyl</i> )	57
<b>Evergol Prime</b> ( <i>penflufen</i> )	57
<b>Maxim 4FS, Spirato 480 FS</b> ( <i>fludioxonil</i> )	57
<b>Maxim Quattro</b> ( <i>fludioxonil + azoxystrobin + mephenoxam + thiabendazole</i> )	57
<b>Metlock CT</b> ( <i>metconazole + metalaxyl</i> )	58
<b>Minuet</b> ( <i>Bacillus subtilis strain QST 713</i> )	58
<b>Propulse</b> ( <i>prothioconazole + fluopyram</i> )	58
<b>Rancona V 100 Pro FS</b> ( <i>ipiconazole + carboxin</i> )	58
<b>Redigo 480</b> ( <i>prothioconazole</i> )	58
<b>Serifel</b> ( <i>Bacillus amyloliquefaciens strain MBI 600</i> )	58
<b>Signet 480 FS, 42-S Thiram</b> ( <i>thiram</i> )	58
<b>Stamina</b> ( <i>pyraclostrobin</i> )	58
<b>Tebuzol 3.6F</b> ( <i>tebuconazole</i> )	58
<b>Tepera</b> ( <i>fluoxastrobin</i> )	59
<b>Trilex 2000</b> ( <i>tryfloxystrobin + metalaxyl</i> )	59
<b>Vibrance</b> ( <i>sedaxane</i> )	59
<b>Vibrance Cinco</b> ( <i>thiabendazole + mephenoxam + sedaxane + azoxystrobin + fludioxonil</i> )	59
<b>Vitavax-34</b> ( <i>carboxin</i> )	59
<b>Xyway 3D</b> ( <i>flutriafol</i> )	59
<b>Xyway LFR</b> ( <i>flutriafol</i> )	59
<b>Zironar</b> ( <i>Bacillus licheniformis strain FMCH001 + Bacillus subtilis strain FMCH002</i> )	59
<b>Insecticides</b>	
<b>Acceleron IC-609, Lumisure, Poncho 600</b> ( <i>clothianidin</i> )	60
<b>Acceleron IX-409, Attendant 600 FS, Dyna-Shield Imidacloprid 5, Gaucho 480, Gaucho 600, Nitro Shield IV, Resonate 480 ST, Resonate 600 ST, Revize IMIDA ST, Senator 600 FS, Sharda Imidacloprid 5SC, STartUP IMIDA</b> ( <i>imidacloprid</i> )	60
<b>Adage, Cruiser 5FS, Elliptica, Legend 5L ST, Phalanx</b> ( <i>thiamethoxam</i> )	60
<b>BioST Insecticide 100</b> ( <i>heat-killed Burkholderia spp. A396</i> )	60
<b>Lumivia</b> ( <i>chlorantraniliprole</i> )	60
<b>Nematicides</b>	
<b>BioST Nematicide 100</b> ( <i>Burkholderia spp. A396</i> )	60
<b>Trunemco Corn/Soy</b> ( <i>Bacillus amyloliquefaciens MBPI-600 + cis-jasmone</i> )	60

**Check list of pests controlled by seed treatment products.**

<b>Product Name(s)</b>	<b>Seed &amp; seedling rots</b>	<b>Fusarium root rot</b>	<b>Pythium root rot</b>	<b>Rhizoctonia root rot</b>	<b>Head smut</b>	<b>Insects</b>	<b>Corn nematodes</b>
<b>Fungicides/Insecticides/Nematicides</b>							
Avicta Complete Corn 250, Avicta Complete Corn 500	+	+ (500 only)	+ (500 only)	+ (500 only)	-	+	+
Avicta Duo 250 Corn	-	-	-	-	-	+	+
Manticor LFR, Temitry LFR	-	-	-	+	-	+	-
Poncho/Votivo	-	-	-	-	-	+	+
Tepera Plus, Tepera Plus HD	+	+	+	+	-	+	+
<b>Fungicides</b>							
Abound Flowable, Atticus Acadis 2 SC, Aframe	-	-	-	+	-	NA	NA
Aftershock, Evito 480 SC	-	-	-	+	-	NA	NA
Allegiance FL, Belmont 2.7 FS, etc.	+	-	-	-	-	NA	NA
Apron XL	-	-	+	-	-	NA	NA
Azterknot	-	-	-	+	-	NA	NA
Azteroid FC 3.3	-	-	-	+	-	NA	NA
Bexfond	+	+	-	+	-	NA	NA
Captan 4L ST	+	-	-	-	-	NA	NA
Dithane F-45, etc.	+	-	-	-	-	NA	NA
DPX-YT669 250FS	-	+	-	+	-	NA	NA
Dyna-shield fludioxonil	+	-	-	-	-	NA	NA
Dyna-Shield Tibet, Raxil 2.6 F, etc.	-	+	-	-	+	NA	NA
Dynasty	+	-	-	+	+	NA	NA
Evergol Energy	+	-	-	-	-	NA	NA
Evergol Prime	+	-	-	+	-	NA	NA
Maxim 4FS, Spirato 480 FS	+	+	-	+	+	NA	NA
Maxim Quattro	+	+	-	+	+	NA	NA
Metlock CT	+	+	-	+	+	NA	NA
Minuet	-	+	+	+	-	NA	NA
Propulse	-	-	-	+	-	NA	NA
Rancona V 100 Pro FS	+	+	+	+	-	NA	NA
Redigo 480	-	+	-	+	-	NA	NA
Serifel	+	+	+	+	+	NA	NA
Signet 480 FS, 42-S Thiram	+	-	-	-	-	NA	NA
Stamina	+	(+)	(+)	+	-	NA	NA
Tebuzol 3.6F	-	+	-	-	+	NA	NA
Tepera	-	-	-	+	-	NA	NA
Trilex 2000	+	+	-	+	+	NA	NA
Vibrance	+	-	-	+	+	NA	NA
Vibrance Cinco	+	-	+	+	+	NA	NA
Vitavax-34	+	-	-	+	+	NA	NA
Xyway 3D	-	-	-	-	+	NA	NA
Xyway LFR	+	+	-	-	+	NA	NA
Zironar	-	+	-	+	-	NA	+
<b>Insecticides</b>							
Acceleron IC-609, Lumisure, etc.	NA	NA	NA	NA	NA	+	NA
Acceleron IX-409, Attendant 600 FS, etc.	NA	NA	NA	NA	NA	+	NA
Adage, Cruiser 5FS, Elliptica, Legend 5L ST, etc.	NA	NA	NA	NA	NA	+	NA
BioST Insecticide 100	NA	NA	NA	NA	NA	+	NA
Lumivia	NA	NA	NA	NA	NA	+	NA
<b>Nematicides</b>							
BioST Nematicide 100	NA	NA	NA	NA	NA	NA	+
Trunemco Corn/Soy	NA	NA	NA	NA	NA	NA	+

"+" = product provides control

"-" = product does not provide control

"(+)" = product provides early season suppression only

"NA" = Not Applicable

## **Fungicides/Insecticides/Nematicides**

**Avicta Complete Corn 250, Avicta Complete Corn 500** (*thiamethoxam + abamectin + thiabendazole + fludioxonil + mephenoxam + azoxystrobin*) Insecticide Mode of Action: 4A (neonicotinoids) and 6 (avermectins), Fungicide Mode of Action: 1, 12, 4, 11 (MBC, PP, PA, QoI)

**Application Rates:**

**Avicta Complete Corn 250:** 11.6 fl oz/100 lb of seed

**Avicta Complete Corn 500:** 11.4 fl oz/ 100 lb seed

**REI:** 48 hours for Avicta Complete Corn 500

**Targeted diseases:** Seed and seedling rots, seed-borne head smut, seedling damping-off and corn nematodes.

**Targeted insects:** Black cutworm caterpillars, corn leaf aphid nymphs and adults, corn rootworm larvae, flea beetle larvae, seedcorn beetle larvae, seedcorn maggot larvae, white grub larvae, and wireworm larvae.

**Restrictions:** Treatment of highly mechanically scarred or damaged seed or seed known to be of low vigor and poor quality may result in reduced germination and/or reduction of seed and seedling vigor. Seed treated with this product must be visually identifiable from untreated seed by the use of an approved colorant or dye to prevent accidental use of treated seed as food for humans or feed for animals. Pre-harvest interval of 30 days.

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**Avicta Duo 250 CORN** (*abamectin + thiamethoxam*) Insecticide Mode of Action: 6 (avermectins) and 4A (neonicotinoids)

**Application Rate:** 4.3-5.374 fl oz/80,000 seeds

**REI:** N/A

**Targeted diseases:** Corn nematode

**Targeted insects:** Black cutworm caterpillars, corn leaf aphid nymphs and adults, corn rootworm larvae, flea beetle larvae, seedcorn beetle larvae, seedcorn maggot larvae, white grub larvae, and wireworm larvae.

**Restrictions:** Treatment of highly mechanically scarred or damaged seed or seed known to be of low vigor and poor quality may result in reduced germination and/or reduction of seed and seedling vigor. Seed treated with this product must be visually identifiable from untreated seed by the use of an approved colorant or dye to prevent accidental use of treated seed as food for humans or feed for animals.

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**Mantikor LFR, Temitry LFR** (*bifenthrin + pyraclostrobin*) Insecticide Mode of Action: 3A (pyrethroid), Fungicide Mode of Action: 11 (QoI)

**Application Rate:** 0.49-1.09 fl oz/1000 row ft

**REI:** 12 hours

**Targeted diseases:** Seed rots and dumping caused *Rhizoctonia solani*.

**Targeted insects:** army cutworm, armyworm species, billbug, corn flea beetle, chinch bug, corn rootworm larvae, cutworm species, garden symphylan, grape colaspis, grubs, imported fire ants, root aphids, seed corn beetle, seed corn maggot, southern corn leaf beetle, stalkborer, sugar cane beetle, thrips, true armyworm, and wireworm.

**Restrictions:** Do not apply Mantikor LFR more than 19 fl oz/ Acre/ Season.

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**Poncho/Votivo** (*clothianidin + Bacillus firmus strain I-1582*) Insecticide Mode of Action: 4A (neonicotinoids)

**Application Rate:** 1.35-2.7 fl oz/80,000 seed unit

**REI:** N/A

**Targeted diseases:** Corn nematode

**Targeted insects:** Black cutworm caterpillars, corn leaf aphid nymphs and adults, flea beetle larvae, seedcorn maggot larvae, white grub larvae, wireworm larvae, and corn rootworm larvae.

**Restrictions:** Do not apply more than 0.5 mg ai of clothianidin per seed through the application of PONCHO/VOTIVO. It is recommended that seed with existing populations of storage pests be fumigated prior to treating and bagging seed.

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**Tepera Plus, Tepera Plus HD** (*fluoxastrobin + bifenthrin*) Fungicide Mode of Action: 11 (QoI), Insecticide Mode of Action: 3A (pyrethroid)

**Application Rates:**

**Tepera Plus:** 0.5-1.1 fl oz/1000 row ft

**Tepera Plus HD:** 0.1-0.8 fl oz/1000 row ft

**REI:** 12 hours

**Targeted diseases:** *Rhizoctonia* root and stalk rot, charcoal rot, *Diplodia* deed rot and seedling blight, *Fusarium* stalk rot, seedling blight, and root rot, *Phyrenochaeta* stalk and root rot, *Phoma* spp., *Pythium* root rot, needle nematode, stubby root nematode, dagger nematode, stunt nematode, sting nematode, lesion nematode, lance nematode, and spiral nematode

**Targeted insects:** Corn rootworm larvae, wireworm, grape colaspis, grubs, seed corn maggot, root aphids, army cutworm, cutworm spp., true armyworm, armyworm spp., stalkborer, seed corn beetle, and sugarcane beetle.

**Restrictions:** Apply to the soil as a 5 to 7 inch band over an open furrow or in-furrow with the seed. Do not apply more than 27.8 fl oz per acre in a single application. Do not apply to soil where there is greater than 30% cover of crop residue remaining. Do not graze livestock in treated area or cut treated crops within 30 days of treatment.

## Fungicides

**Abound Flowable, Atticus Acadia 2 SC, Aframe** (*azoxystrobin*) Mode of Action: 11 (QoI)

**Application Rates:**

**Abound Flowable, Atticus Acadia 2 SC:** 0.4-0.8 fl oz/1000 row ft

**Aframe:** 0.4-2.3 fl oz/1000 row ft

**REI:** 4 hours

**Targeted diseases:** Rhizoctonia root and stalk rot

**Restrictions:** Apply to soil at planting. Do not apply more than 120 fl oz of product per year.

---

**Aftershock, Evito 480 SC** (*fluxastrobin*) Mode of Action: 11(QoI)

**Application Rates:**

**Aftershock:** 0.16-0.24 fl oz/1000 row ft

**Evito 480 SC:** 0.11-0.24 fl oz/1000 row ft

**REI:** 12 hours

**Targeted diseases:** Rhizoctonia root and stalk rot

**Restrictions:** Apply to soil at planting. Do not make more than 2 applications per year. Do not apply more than 11.4 fl oz/A per season (Evito 480 SC); 22.8 fl oz/acre/ season (Aftershock).

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**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*) Mode of Action: 4 (PA)

**Application Rates:**

**Allegiance FL:** 0.1 - 0.75 fl oz/cwt

**Belmont 2.7 FS:** 0.1- 0.75 fl oz/cwt

**Dyna-Shield Metalaxyl:** 0.1- 0.75 fl oz/cwt

**Dyna-Shield Metalaxyl 318 FS:** 0.1- 0.75-1.5 fl oz/cwt

**Metalaxyl 265 ST:** 0.1- 0.75 fl oz

**Metalaxyl 4.0 ST:** 0.5 fl oz/cwt

**Sebring 318 FS:** 0.75 oz/cwt

**Sebring 480 FS:** 0.50 - 1 fl oz/cwt

**REI:** 24 hours

**Targeted diseases:** Seed and seedling rots.

**Restrictions:** Do not use treated seed for food, feed or oil purposes. Store away from feed and foodstuffs. Do not apply this product through any type of irrigation system. Do not use treated seed for food or feed purposes or process for oil. Treat only those seeds needed for immediate use, minimizing the interval between treatment and planting. Do not store excess treated seeds beyond planting time.

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**Apron XL** (*mefenoxam*) Mode of Action: 4 (PA)

**Application Rate:** 0.0425-0.085 fl oz/cwt

**REI:** 48 hours

**Targeted diseases:** Seed rot and damping-off caused by Pythium.

---

**Azterknot** (*azoxystrobin* + *extract of Reynoutria sachalinensis*) Mode of Action: 11, P 05 (QoI, plant extract)

**Application Rate:** 0.0425-0.09 fl oz/cwt

**REI:** 4 hours

**Targeted diseases:** Rhizoctonia root and stalk rot

**Restrictions:** Apply to soil at planting. Do not exceed more than 147.1 fl oz/A in a single year.

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**Azteroid FC 3.3** (*azoxystrobin*) Mode of Action: 11 (QoI)

**Application Rate:** 0.24-0.48 fl oz/1000 row ft

**REI:** 4 hours

**Targeted diseases:** Rhizoctonia root and stalk rot

**Restrictions:** Apply to soil at planting. Do not apply more than 77.6 fl oz/A per year.

---

**Bexfond** (*Bacillus amyloliquefaciens* sp. *plantarm* strain FZB42) Mode of Action: BM 02 (microbial)

**Application Rate:** 7-14 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Rhizoctonia, Fusarium, Sclerotinia, Verticillium, Phytophthora

**Restrictions:** Apply to soil at planting

**Captan 4L ST** (*captan*) Mode of Action: M 04 (multi-site)

**Application Rate:** 2.2-4.0 fl oz/cwt

**REI:** N/A

**Targeted diseases:** Seed and seedling rots.

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**Dithane F-45, Manzate Max, Manzate Pro-Stick, Penncozeb 75 DF, Penncozeb 80 WP** (*mancozeb + surfactant*) Mode of Action: M 03 (multi-site)

**Application Rates:**

**Dithane F-45:** 4.3-8.6 fl oz/cwt

**Manzate Max:** 4.3-8.6 fl oz/cwt

**Manzate Pro-Stick, Penncozeb 80 WP:** 2.7-5.4 oz/cwt

**Penncozeb 75 DF:** 2.9-5.8 oz/cwt

**REI:** 24 hours

**Targeted diseases:** Seed and seedling rots.

**Restrictions:** Do not use for food, feed or oil purposes.

---

**DPX-YT669 250FS** (*picoxystrobin*) Mode of Action: 11 (QoI)

**Application Rate:** 0.03-0.061 fl oz/cwt

**REI:** 12 Hours

**Targeted diseases:** seed- and soil-borne *Rhizoctonia solani* and *Fusarium* spp. causing seed rots, seedling blights, or damping-off

---

**Dyna-Shield Fludioxonil** (*fludioxonil*) Mode of Action: 12 (PP)

**Application Rate:** 0.04-0.08 fl oz/cwt

**REI:** 12 Hours

**Targeted diseases:** Decay, damping-off and seedling blight caused by seed-borne and soil-borne fungi.

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**Dyna-Shield, Tibet, Raxil 2.6 F, Sativa 309 FS, Startup Tebuz, TEB ST, Vibe** (*tebuconazole*) Mode of Action: 3 (DMI)

**Application Rates:**

**Dyna-Shield Tibet, Raxil 2.6F, Sativa 309 FS, Teb ST:** 0.075-0.1

**Startup Tebuz, Vibe:** 0.071 fl oz/cwt

**REI:** 12 hours

**Targeted diseases:** soilborne and seed-borne *Fusarium* and head smut.

---

**Dynasty** (*azoxystrobin*) Mode of Action: 11 (QoI)

**Application Rate:** 0.153 fl oz/cwt

**REI:** 4 hours

**Targeted diseases:** Seed and seedling rots and damping-off caused by *Rhizoctonia* spp., *Penicillium* spp., *Pythium* spp.

---

**Evergol Energy** (*penflufen + prothioconazole + metalaxyl*) Mode of Action: 7, 3, 4 (SDHI, DMI, PA)

**Application Rate:** 0.5-2.0 fl oz/cwt

**REI:** N/A

**Targeted diseases:** Seed rot and damping-off caused by *Rhizoctonia*, *Fusarium* and *Pythium*, seed decay.

**Restrictions:** Do not exceed 12.3 lb metalaxyl per acre per calendar year.

---

**Evergol Prime** (*penflufen*) Mode of Action: 7 (SDHI)

**Application Rate:** 0.16-0.64 fl oz/cwt

**REI:** 12 hours

**Targeted diseases:** Seed rots and damping caused *Rhizoctonia solani*.

---

**Maxim 4FS, Spirato 480 FS** (*fludioxonil*) Mode of Action: 12 (PP)

**Application Rate:** 0.08-0.16 fl oz/cwt

**REI:** 12 hours

**Targeted diseases:** Seed decay, damping-off, and seedling blight.

**Restrictions:** Green forage may not be grazed until 30 days after planting.

---

**Maxim Quattro** (*fludioxonil + azoxystrobin + mephenoxam + thiabendazole*) Mode of Action: 12, 11, 4, 1 (PP, QoI, PA, MBC)

**Application Rate:** 0.39-0.53 fl oz/ 80,000 kernel count

**REI:** N/A

**Targeted diseases:** Seed-borne and soil-borne fungi causing decay, damping off, and seedling blight. Seed-borne head smut (*Sporisorium reilianum*). Seedling damping-off (*Rhizoctonia* spp., *Penicillium* spp., *Pythium* spp., *Fusarium* spp.).

**Restrictions:** Treated sweet corn should be planted and not carried over to the following year.

**Metlock CT** (*metconazole + metalaxyl*) Mode of Action: 3, 4 (DMI, PA)

**Application Rate:** 1-1.5 fl oz/cwt

**REI:** 24 hours

**Targeted diseases:** Fusarium and Pythium seed and seedling dieback, Rhizoctonia damping-off, seed decay fungi.

---

**Minuet** (*Bacillus subtilis strain QST 713*) Mode of Action: BM 02 (microbial)

**Application Rate:** 3-6 fl oz/A soil applied

**REI:** N/A

**Targeted diseases:** Early season seedling disease caused by Fusarium spp., Phytophthora spp., Pythium spp., Rhizoctonia spp., and Verticillium spp.

**Restrictions:** Apply to the soil at planting.

---

**Propulse** (*prothioconazole + fluopyram*) Mode of Action: 3, 7 (DMI, SDHI)

**Application Rate:** 13.6 fl oz/A

**REI:** 12 hours

**Targeted diseases:** For in-furrow Treatments: Rhizoctonia rots.

**Restrictions:** For an in-furrow treatment, spray on or just below the seed while planting. Do not apply more than 13.6 fl oz/A in a single application or 27.2 fl oz/A per year. Do not make more than 2 applications per year.

---

**Rancona V 100 Pro FS** (*ipiconazole + carboxin*) Mode of Action: 3, 7 (DMI, SDHI)

**Application Rate:** 1.5 fl /cwt

**REI:** 12 hours

**Targeted diseases:** Seedborne seed rots caused by Aspergillus spp., Penicillium spp., Fusarium spp., Cladosporium spp., Rhizopus spp. Seedling blight, seed rot, and damping-off caused by Fusarium spp. and Rhizoctonia solani.

**Restrictions:** Do not use treated seed for food, feed or oil purposes.

---

**Redigo 480** (*prothioconazole*) Mode of Action: 3 (DMI)

**Application Rate:** 0.08-0.8 fl oz/cwt

**REI:** N/A

**Targeted diseases:** Early season seedling disease caused by Fusarium spp. and Rhizoctonia solani

---

**Serifel** (*Bacillus amyloliquefaciens strain MBI 600*) Mode of Action: BM 02 (microbial)

**Application Rate:** 0.3-1.2 fl oz/1000 row ft

**REI:** 12 hours

**Target diseases:** Charcoal rot, Fusarium wilt, Phytophthora root rot, Pythium damping off, and Rhizoctonia root rot

**Restrictions:** Apply to the soil at planting.

---

**Signet 480 FS, 42-S Thiram** (*thiram*) Mode of Action: M 03 (multi-site)

**Application Rate:** 1.5 fl oz/bu

**REI:** 24 hours

**Targeted diseases:** Seed and seedling rots.

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**Stamina** (*pyraclostrobin*) Mode of Action: 11 (QoI)

**Application Rate:** 0.4-0.8 fl oz/cwt

**REI:** 12 hours

**Targeted diseases:** Seed and seedling diseases caused by Rhizoctonia solani, Penicillium oxalicum. Suppression only: Aspergillus sp., Fusarium sp., Pythium sp.

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**Tebuzol 3.6F** (*tebuconazole*) Mode of Action: 3 (DMI)

**Application Rate:** 0.071-0.54 fl oz/cwt

**REI:** 12 Hours

**Targeted diseases:** Soilborne and seed-borne Fusarium spp. and head smut

**Restrictions:** Uniform application is necessary to ensure seed safety and best disease protection. The seed used for treatment should be sound and well-cured before treatment.

**Tepera** (*fluoxastrobin*) Mode of Action: 11 (QoI)

**Application Rate:** 0.24-0.53 fl oz/1000 row ft

**REI:** 12 hours

**Targeted diseases:** Rhizoctonia root and stalk rot

**Restrictions:** Apply to the soil as a 5 to 7 inch band over an open furrow or in-furrow with the seed. Do not apply more than 12.6 fl oz per acre in a single application. Do not apply more than 2 times a year.

---

**Trilex 2000** (*trifloxystrobin + metalaxyl*) Mode of Action: 11, 4 (QoI, PA)

**Application Rate:** 0.5 fl oz/cwt

**REI:** N/A

**Targeted diseases:** Seed and seedling rots caused by *Alternaria* spp., *Aspergillus* spp., *Cladosporium* spp., *Penicillium* spp., *Rhizoctonia solani*, and *Fusarium* spp.

---

**Vibrance** (*sedaxane*) Mode of Action: 7 (SDHI)

**Application Rate:** 2.5-5 grams ai/100 kg; 20-40 grams ai/100kg for control of head smut

**REI:** 12 hours

**Targeted diseases:** Seed decay, seedling blight, and damping off caused by *Rhizoctonia solani* and head smut (*Sphacelotheca reiliana*)

**Restrictions:** Do not exceed two applications per year with a maximum of 12 g ai/A.

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**Vibrance Cinco** (*thiabendazole + mefenoxam + sedaxane + azoxystrobin + fludioxonil*) Mode of Action: 1, 4, 7, 11, 12 (MBC, PA, SDHI, QoI, PP)

**Application Rate:** 1.2- 2.7 fl oz/cwt (depending on use)

**REI:** 48 hours

**Targeted diseases:** Seed decay, seedling blight, and damping off caused by *Rhizoctonia*, *Penicillium*, *Pythium*, and *Rhizoctonia*, and head smut (*Sphacelotheca reiliana*)

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**Vitavax-34** (*carboxin*) Mode of Action: M 07 (multi-site)

**Application Rate:** 2-4 fl oz/cwt

**REI:** 12 hours

**Targeted diseases:** Seedborne head smut (*Sphacelotheca reiliana*) and root rot caused by *Rhizoctonia solani*.

**Restriction:** Do not graze or feed livestock on treated areas for six weeks after planting.

---

**Xyway 3D** (*flutriafol*) Mode of Action: 3 (DMI)

**Application Rate:** 0.17-0.96 fl oz/1000 row ft

**REI:** 12 hours

**Targeted diseases:** Gray leaf spot, southern corn leaf blight, northern corn leaf blight, common rust, and suppression only of head smut

**Restriction:** Apply to the soil at planting or while plants are young. Do not apply more than 11.8 fl oz per acre per year including any other foliar flutriafol products. Do not make more than 1 application per year.

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**Xyway LFR** (*flutriafol*) Mode of Action: 3 (DMI)

**Application Rate:** 0.44-0.87 fl oz/1000 row ft (30" spacing)

**REI:** 12 hours

**Targeted diseases:** Gray leaf spot, southern corn leaf blight, northern corn leaf blight, common rust, and suppression only of Anthracnose stalk rot, *Fusarium* stalk and crown rot, *Physoderma* brown spot, and head smut

**Restriction:** Apply to the soil at planting or while plants are young. Do not apply more than 15.2 fl oz per acre per year. Do not make more than 1 application per year.

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**Zironar** (*Bacillus licheniformis strain FMCH001 + Bacillus subtilis strain FMCH002*) Mode of Action: unknown (microbial)

**Application Rate:** 0.34-0.83 fl oz/1000 row ft

**REI:** 4 hours

**Targeted diseases:** Seedling blight caused by *Rhizoctonia solani* and *Fusarium* spp. Suppression of Root Knot Nematode and Lesion Nematode.

**Restriction:** Apply to the soil at planting.

## ***Insecticides***

**Acceleron IC-609, Lumisure, Nipsit Inside, Poncho 600** (*clothianidin*) Mode of Action: 4A (neonicotinoids)

**Application Rate:** 5.64 fl oz/80,000 seed unit

**REI:** 12 hours

**Targeted insects:** Black cutworm caterpillars, corn leaf aphid nymphs and adults, corn rootworm larvae, flea beetle larvae, thrips, seedcorn maggot larvae, white grub larvae, and wireworm larvae.

**Restrictions:** Do not apply more than 0.2 lb ai clothianidin per acre per year. It is recommended that seed with existing populations of storage pests be fumigated prior to treating and bagging seed.

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**Acceleron IX-409, Attendant 600 FS, Dyna-Shield Imidacloprid 5, Gaucho 480, Gaucho 600, Nitro Shield IV, Resonate 480 ST, Resonate 600 ST, Revize Imida ST, Senator 600 FS, Sharda Imidacloprid 5SC, Startup Imida** (*imidacloprid*) Mode of Action: 4A (neonicotinoids)

**Application Rates:**

**Acceleron IX-409:** 1.6-3.2 fl oz/ cwt

**Attendant 600 FS:** 6 fl oz/80,000 seeds

**Dyna-Shield Imidacloprid 5:** 13.5 fl oz/cwt

**Gaucho 480:** 7.6 fl oz/80,000 seeds

**Gaucho 600:** 6 fl oz/80,000 seeds

**Nitro shield IV:** 7.5 fl oz/80,000 seeds

**Senator 600 FS:** 13.5 fl oz/cwt

**Sharda Imidacloprid 5SC:** 6 fl oz/80,000 seeds

**Resonate 480 ST:** 7.5 fl oz/80,000 seeds

**Resonate 600 ST:** 6 fl oz/80,000 seeds

**Revize Imida:** 16.9 fl oz/cwt

**Startup Imida:** 6 fl oz/80,000 seeds

**REI:** 12 hours

**Targeted insects:** Black cutworm caterpillars, corn leaf aphid nymphs and adults, corn rootworm larvae, flea beetle larvae, seed corn maggot larvae, white grub larvae, and wireworm larvae.

---

**Adage, Cruiser 5FS, Elliptica, Legend 5L ST, Phalanx** (*thiamethoxam*) Mode of Action: 4A (neonicotinoids)

**Application Rate:** 0.125-1.25 milligrams/kernel

**REI:** 12 hours

**Targeted insects:** Black cutworm caterpillars, corn aphid nymphs and adults, corn rootworm larvae, flea beetle larvae, seedcorn beetle larvae, seedcorn maggot larvae, white grub larvae, and wireworm larvae.

**Restrictions:** For field, pop, seed and sweet corn, do not use a Cruiser rate that will result in more than 0.21 lb thiamethoxam per acre (93.75 grams ai/A). Do not apply more than 215 gallons per 8-hour day for seed treatments utilizing a closed system. Do not apply more than 38 gallons of Cruiser per 8-hour day for seed treatments utilizing an open system. If it is necessary to apply more than 38 gallons of Cruiser per 8-hour day, a closed system must be used.

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**BioSt Insecticide 100** (*Heat-killed Burkholderia spp. strain A396*) Mode of Action: Unknown (Biological agent)

**Application Rate:** 8 fl oz/cwt

**REI:** 4 hours

**Targeted nematodes:** cutworms, root and seed maggots, wireworms, seed corn beetle, corn rootworm larvae

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**Lumivia** (*chlorantraniliprole*) Mode of Action: 28 (diamides)

**Application Rate:** 0.25-0.75 mg/kernel

**REI:** N/A

**Targeted insects:** Black cutworm caterpillars, seed corn maggot larvae, white grub larvae, and wireworm larvae.

**Restrictions:** Do not exceed a maximum of 0.054 lb chlorantraniliprole per acre (25 grams ai/acre) regardless of field corn seeding density. Do not apply more than 0.2 lb ai of chlorantraniliprole-containing products per acre per year.

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## ***Nematicides***

**BioSt Nematicide 100** (*Heat-killed Burkholderia spp. strain A396*) Mode of Action: Unknown (Biological agent)

**Application Rate:** 6-8 fl oz/cwt

**REI:** 4 hours

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**Trunemco Corn/Soy** (*Bacillus amyloliquefaciens strain MBPI-600 + cis-Jasmone*) Mode of Action: Unknown (Biological agent)

**Application Rate:** 0.06-0.31 fl oz/cwt

**REI:** N/A

**Restrictions:** Do not use treated seed for food or feed.

# Foliar Fungicides for Corn

**Madalyn Shires, Assistant Professor and SDSU Extension Plant Pathologist**  
**Connie Strunk, SDSU Extension Plant Pathology Field Specialist**

There are several fungal pathogens that infect corn and cause significant yield loss in South Dakota. Emerging fungal diseases that are of concern but require careful scouting and monitoring to determine if fungicide is needed are tar spot and southern rust. These two diseases have been persistent issues over the last several growing seasons but usually come into South Dakota AFTER the window for fungicide applications closes. Other common fungal diseases found on corn include common rust, northern corn leaf blight, gray leaf spot, eye spot, anthracnose leaf blight and Physoderma brown spot. Apart from rusts and tar spot, which are spread by wind from the southern states to South Dakota, the rest of the fungal pathogens are residue-borne. Tar spot was noted to occur from residue in southern counties and resulted in earlier symptoms though the disease did not progress quickly. Residue management through crop rotation, bailing, and tillage (incorporated in the soil) can significantly reduce inoculum amounts for these pathogens, particularly early in the season. Fortunately, diseases such as gray leaf spot, northern corn leaf blight and others rarely reach economic injury levels in South Dakota, except under no-till corn-on-corn and irrigated corn conditions. However, where recommended cultural practices are not followed coupled with suitable conditions for disease proliferation, foliar fungal diseases can reach yield reducing levels. Under such circumstances, foliar fungicide application is necessary to protect corn against yield loss.

When deciding on foliar fungicide treatment, consider the level of disease developing on lower leaves, cultural practices (such as corn following corn), current and forecast weather conditions, corn growth stage (diseases appearing after corn is dented are likely not going to cause significant yield loss), susceptibility of the hybrids, and potential yield (low yield potential corn crop may not benefit from fungicide application).

## **Is it beneficial to apply a fungicide in the absence of disease or when disease pressure is minimal?**

Results from years of research at South Dakota State University and other research institutions in the region show that when a fungicide is applied in the absence of significant disease severity (>5% disease severity on ear leaf and above leaves), the probability of breaking even decreases.

Although some plant health benefits have been reported because of applying strobilurins, such as, keeping plants green longer, these benefits do not result in a significant increase in yield from untreated plots in the absence of fungal pathogens. If a corn plant remains greener after black layer, no additional photosynthates can go into the kernel. Keeping plants green is only helpful until black layer. This would be the case where fungicides help keep diseases in check to ensure leaves (ear leaf and above) remain green until physiological maturity (black layer). Growers should always scout the fields to determine if there is a need for fungicide application to avoid unnecessary fungicide application which can lead to loss of sensitivity (development of resistance) and added expenses.

## **Fungicide resistance**

Fungicide resistance is when a fungicide that used to control a fungal pathogen no longer offers any control on the same fungus. Fungicide resistance arises because of several factors including: using the same class of a fungicide more than recommended times in a season or every season, high variability within the pathogen, high reproduction capacity of the pathogen, and using low fungicide rates or off-label products.

To avoid the development of fungicide resistance, growers should monitor the performance of fungicides used in their fields. One way to do this, is to leave a strip of an untreated area and use this to compare with where spraying was done. If the two areas have comparable disease levels, this would mean that the fungicide did not work as it is supposed to and one of the reasons could be fungicide resistance. Leaving untreated strips can also help the producer to determine if it was profitable to apply a fungicide (more yield from treated area) or not (yield similar between treated and untreated areas).

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

- Rotate between the different classes of fungicides within a season and also between seasons.
- Use a mixture of fungicide classes. Several fungicide products are marketed as combos.
- Practice integrated disease management to reduce the disease pressure.
- Scout to determine the need for fungicide and avoid applying fungicide when it is not necessary or too late.
- Always follow the label to determine the rates, the growth stage of the crop, compatibility with other pesticides, and safe handling.

Once a fungicide application is determined to be necessary, growers should ensure 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 or it is likely to rain in the next two hours.

The best fungicide timing in corn is between tasseling and silking as several corn fungal diseases start to develop during this period. Care should be taken when using certain adjuvants and tank-mix partners during late vegetative stages prior to tasseling as these can cause injury to developing ears. The following is a list of fungicides labeled for use in South Dakota at the time of this publication. The list is dynamic and should not be considered as a substitute for label information.

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**Fungicide FRAC Codes and Group Names**

FRAC Code	Group Name
3	Demethylation inhibitor (DMI)
7	Succinate dehydrogenase inhibitor (SDHI)
11	Quinone outside inhibitor (QoI)
44	Microbial
M03	Dithiocarbamates
M05	Chloronitriles
P04	Natural compound
P05	Plant extract
P07	Phosphonates

**Check list of diseases managed by each foliar fungicide.**

Product Name(s)	Anthraxnose Leaf Blight	Common Rust	Eye spot	Gray leaf spot	Northern corn leaf blight	Northern corn leaf spot	Physoderma brown spot	Southern corn leaf blight	Southern rust	Tar spot	Curvularia Leaf Spot	Suppression only: Diplodia ear rot
<b>Abound, Acadia 2 SC, Aframe, Arius 250, A-Zox 25SC, Azoxy 2SC, Azoxystar, Azoxystrobin 22.9% SC, Cadera, Dexter SC, Quadris, Satori, Tetraban, Trevo</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>Absolute 500 SC, Absolute Maxx</b>	+	+	+	+	+	+	-	+	+	-	-	-
<b>Adastrio</b>	+	+	+	+	+	+	+	+	+	+	-	+
<b>Affiance, Trevo TRZ (*Affiance only)</b>	+	+	+	+	+	+	-	+	+	+	-	-
<b>Aframe Plus, Aquila XL, Avaris, Avaris 2XS, Azoxypropi, Cover XL, GCS Azoxprop, Microp, Propaz, Quilt Xcel, Trevo P</b>	+	+	+	+	+	+	+	+	+	-	-	+
<b>Aftershock, Evito 480 SC</b>	+	+	+	+	+	+	-	+	+	-	-	-
<b>Andiamo 230</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>Approach</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>Approach Prima</b>	+	+	+	+	+	+	+	+	+	+	-	-
<b>Aviv</b>	+	+	+	+	+	-	-	+	+	-	-	-
<b>Azterknot</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>AZteroid FC 3.3</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>Bravo Ultrex, Bravo Weather Stik, Echo 720, Echo 90 DF, Echo ZN, Eluvium, Equus 720 SST, Initiate 720, Initiate ZN, Oranil 6L, Praiz, Rialto 720F</b>	-	+	-	-	+	+	-	+	+	-	-	-
<b>Brixen</b>	+	+	+	+	+	+	-	+	+	+	-	-
<b>Bumper, Bumper 41.8 EC, Fitness, Tide Propiconazole 41.8% EC, Omni-Brand Propiconazole 41.7% EC, Propicon EC, Propimax EC, Propi-Star EC, Rustic, Shar-Shield PPZ, Tilt, Topaz, Vigil, Willowood Propicon 3.6EC</b>	-	+	+	+	+	+	-	+	+	-	-	-
<b>Caramba</b>	-	+	+	+	+	+	-	+	+	-	-	-
<b>Crossover Pro</b>	-	+	+	+	+	+	-	+	+	-	-	-
<b>Helmstar Plus SC, Tebaz</b>	+	+	+	+	+	+	+	+	+	-	-	-
<b>Delaro 325 SC</b>	+	+	+	+	+	+	+	+	+	+	-	-
<b>Delaro Complete</b>	+	+	+	+	+	+	+	+	+	+	-	-
<b>Dexter Max</b>	-	+	-	+	+	+	-	+	-	-	-	-
<b>Dithane F-45 Rainshield, Dithane M-45, Koverall, Manzate Max, Manzate Pro Stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield</b>	-	+	-	+	+	+	-	+	-	-	-	-
<b>Domark 230 ME</b>	+	+	+	+	+	+	+	+	+	+	-	-
<b>Double Nickel 55</b>	-	+	-	-	-	-	-	+	-	-	-	-
<b>Ellora, Prosaro 421 SC</b>	+	+	+	+	+	+	-	+	+	-	-	-
<b>Evito T</b>	+	+	+	+	+	+	-	+	+	-	-	-

"+" = product provides protection

"-" = product does not provide protection

Product Name(s)	Anthracnose Leaf Blight	Common Rust	Eye spot	Gray leaf spot	Northern corn leaf blight	Northern corn leaf spot	Physoderma brown spot	Southern corn leaf blight	Southern rust	Tar spot	Curvularia Leaf Spot	Suppression only: Diplodia ear rot
Everlon, Priaxor Xemium	+	+	+	+	+	+	+	+	+	-	-	-
Evito T	+	+	+	+	+	+	-	+	+	-	-	-
Felcura 3.6F, Monsoon, Orius 3.6F, Tebuconazole 3.6F, Teb 3.6SC, Tebu-Crop 3.6F, Tebustar 3.6L, Tebuzol 3.6F, Toledo 3.6F, Vibe	-	+	-	+	+	+	-	+	+	-	-	-
Fortix	+	+	+	+	+	+	-	+	+	-	-	-
Headline, Headline SC	+	+	+	+	+	+	+	+	+	-	-	-
Headline AMP	+	+	+	+	+	+	+	+	+	-	-	-
Innliven P	+	+	+	+	+	+	+	+	+	-	-	-
Innliven TRZ	+	+	+	+	+	+	+	+	+	+	-	-
Lucento	+	+	+	+	+	+	+	+	+	+	-	+
Magistrate	+	+	+	+	+	+	+	+	+	+	-	+
Milagrums Plus	+	+	+	+	+	-	-	+	+	-	-	-
Miravis Neo	+	+	+	+	+	+	+	+	+	+	+	+
Nu-Cop 50 DF (Suppression of Goss's wilt)	-	-	-	-	-	-	-	-	-	-	-	-
Odyssey	-	+	-	+	+	+	-	+	+	+	-	-
Phobos FC, Proline 480 SC, Prozio SC	+	+	+	+	+	+	-	+	+	-	-	-
Propulse	+	+	+	+	+	+	-	+	+	-	-	-
Prosaro Pro 400 SC	+	+	+	+	+	+	-	+	+	+	-	-
Protegam YLD, Stratego YLD	+	+	+	+	+	+	+	+	+	-	-	-
Revylok	+	+	-	+	+	-	-	+	+	+	-	-
Revytek	+	+	+	+	+	+	+	+	+	+	-	-
RustEase	-	+	+	+	+	+	-	+	+	-	-	-
Serifel	-	+	-	-	-	-	-	+	-	-	-	-
Serenade ASO, Serenade Max	-	+	-	-	-	-	-	+	-	-	-	-
Stratego, Tarian	+	+	+	+	+	+	-	+	+	-	-	-
Tepera	+	+	+	+	+	+	-	+	+	-	-	-
Tepera Plus	+	+	+	+	+	+	-	+	+	-	-	-
Tepera Plus HD	+	+	+	+	+	+	-	+	+	-	-	-
Topguard	+	+	+	+	+	+	-	+	+	-	-	-
Topguard EQ	+	+	+	+	+	+	-	+	+	-	-	-
Trivapro	+	+	+	+	+	+	+	+	+	+	+	+
Vacciplant	+	+	+	+	+	+	-	+	+	-	-	-
Veltyma	+	+	+	+	+	+	+	+	+	+	-	-
Vertisan	+	+	-	+	+	+	+	+	+	-	-	-
Viathon	-	+	-	+	+	+	-	+	+	-	-	-
Zolera FX	+	+	+	+	+	+	-	+	+	-	-	-

"+" = product provides protection

"-" = product does not provide protection

**Abound, Acadia 2 SC, Aframe, Arius 250, A-Zox 25SC, Azoxy 2SC, Azoxystar, Azoxystrobin 22.9% SC, Cadera, Dexter SC, Quadris, Satori, Tetraban, Trevo** (*azoxystrobin*) Mode of Action: 11 (QoI)

**Application rate:** 6-15.5 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, Physoderma brown spot, and southern corn leaf blight.

**Restrictions:** Apply 6-9 fl oz/A for rust; 6-15.5 fl oz/A for anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, physoderma brown spot, southern corn leaf blight, and southern rust; and use 6.0 fl oz/A for early application at V4-V8. Apply at the first sign of gray leaf spot symptoms. A second application may be required 14 days later. Do not apply within 7 days of harvest. Do not apply more than two sequential applications without alternating with another fungicide chemistry. Do not apply more than 2 applications of any strobilurin fungicides per acre per year. Applications can be made by ground, air or through chemigation. Do not apply more than 7 applications per year at the high rate (15.5 fl oz/A) or 20 applications per year at the low rate (6.0 fl oz/A). When applying 9.0 fl oz/A, do not apply more than 13 applications per year. Do not apply more than 120 fl oz of product/A per year.

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**Absolute Maxx** (*tebuconazole + trifloxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 5.0-6.0 fl oz/acre

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** Apply when disease first appears and continue on a 10-14 day interval if favorable conditions for disease development persist. Use of shorter spray intervals and higher rates are recommended when disease pressure is severe. Absolute Maxx may be applied by ground, air or chemigation. A minimum of 10 gallons of spray solution by ground sprayer or in a minimum of 2 gallons per acre by aircraft spray equipment should be applied. For optimal disease control, the lowest labeled rate of a spray surfactant may be tank mixed. Do not apply more than 12 fl oz/acre/season. Do not apply more than 2 applications per use season. Applications may be made up to 36 days before the harvest of grain and fodder. Do not apply within 21 days of harvest for forage. Do not apply more than two sequential applications. Limit the number of all Group-11 fungicide applications to no more than two per acre per crop.

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**Adastrio** (*azoxystrobin + fluindapyr + flutriafol*) Mode of Action: 3, 7, 11 (DMI, SDHI, QoI)

**Application rate:** 7-9 fl oz/A

**REI:** 12 hours; 14 days for detasseling corn grown for seed and for hand harvesting sweet corn

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, common rust, southern rust, northern corn leaf blight, southern corn leaf blight, northern corn leaf spot, Physoderma brown spot, Diplodia ear and stalk rot, and tar spot.

**Restrictions:** Adastrio may be applied by ground, air, or chemigation. Apply when disease appears through R4 (early dough stage) growth stage. A spray interval of every 10-14 days is recommended. When disease pressure is high, use a higher rate and shorter interval. Do not make more than 2 applications per year before alternating with another fungicide. Do not apply more than 18 fl oz/A per year. Do not use an adjuvant after V8 and prior to VT. Do not spray within 7 days of forage harvest, 30 days of grain harvest, and 14 days of sweet corn harvest.

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**Affiance, Trevo TRZ** (*tetraconazole + azoxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 10.0-17.0 fl oz/A

**REI:** 12 hours; 20 days for detasseling corn grown for seed

**Targeted diseases:** Gray leaf spot, common rust, southern rust, Anthracnose leaf blight, eyespot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight and tar spot.

**Restrictions:** Early applications can be made at stages V4-V8. A second application can be made at V8-R3 if disease pressure develops to provide season-long disease control if made 7 days after the first application. Apply prior to disease onset when conditions are favorable to disease development Do not apply more than 17.06 fl oz/acre per year. Do not make more than 2 applications per year. Do not apply within 7 days of grain harvest or within 21 days of silage harvest.

The azoxystrobin component of this product is extremely phytotoxic to certain apple cultivars. Do not spray where spray drift may reach apple trees. Do not spray when environmental conditions may result in drift to areas beyond the intended application area. Do not use spray equipment that has previously been used to spray apple trees. Even trace residual amounts may lead to unacceptable phytotoxicity to certain apple and crabapple cultivars.

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**Aframe Plus, Aquila XL, Avaris, Avaris 2XS, Azoxypropi, Cover XL, GCS Azoxyprop, Microp, Propaz, Quilt Xcel, Trevo P** (*propiconazole + azoxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rates:** 10.5 fl oz/A for early application (V4 to V8), 10.5-14 fl oz/A for later season application

**Application rates for Avaris:** 7-14 fl oz/A (northern corn leaf blight, northern corn leaf spot, southern corn leaf blight; 10.5-14 fl oz/A (anthracnose leaf blight, eye spot, gray leaf spot, rusts)

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern rust, southern corn leaf blight, and suppression only for Diplodia ear rot.

**Restrictions:** Early application (V4-V8) may be applied for early season disease control and plant performance benefits. Later season application for gray leaf spot, rusts, anthracnose, eye spot, and leaf blights apply when disease first appears. If conditions favorable for disease persist, continue to apply on a 14-day schedule. Do not use adjuvants or other additives after the V8 growth stage and prior to the VT growth stage, as use during these development times may impose stress on the plant that could inhibit proper kernel development. Apply no more than 2 applications of any Group 11 fungicide per year. Do not apply more than 38.5 fl oz/A/year (Aframe Plus, AzoxyPropi, GCS Azoxyprop, Quilt Xcel). Do not apply more than 56 fl oz/A/year (Aquila XL, Avaris, Avaris

2XS, Cover XL, MiCrop, Propaz, Trevi P). Do not apply more than 14 fl oz/A/application (Aframe Plus, AzoxyPropi, GCS Azoxyprop, Quilt Xcel, Trevi P). Do not apply more than 28 fl oz/A/year of field corn harvested for forage (Aframe Plus, Aquila XL, Avaris, Avaris 2XS, AzoxyPropi, Cover XL, GCS Azoxyprop, MiCrop, Propaz, Quilt Xcel, Trevi P). Do not apply within 30 days of harvest for forage, grain, or stover.

Do not spray where spray drift may reach apple trees. Do not spray when conditions favor drift beyond the area intended for application. Conditions that may contribute to drift include thermal inversion, wind speed, and direction, sprayer nozzle/pressure combinations, spray droplet size, etc. Do not use spray equipment which has been previously used to spray apple trees. Even trace amounts of product can cause unacceptable phytotoxicity to certain apple and crabapple varieties.

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#### **Aftershock, Evito 480 SC** (*fluxastrobin*) Mode of Action: 11 (QoI)

**Application rate:** 2.0-5.7 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, and southern corn leaf blight.

**Restrictions:** Do not apply more than 2 applications. Do not apply within 30 days of harvest. Do not apply after the R4 (early dough) growth stage. Do not apply more than 11.4 fl oz/A per season. Either product may be applied by ground, air or chemigation. Apply before disease occurs and at a 7-10 day interval. Use the higher rate and shorter interval when disease pressure is high. For Aftershock: Do not use the 0.24 fl per 1000 row feet rate on rows spaced narrower than 22 inches. Do not use the 0.16 fl per 1000 row feet rate on rows spaced less than 15 inches. For twin rows spaced 7.5 to 8 inches apart on 30 inch centers, use the 0.16 fl oz per 1000 row feet rate for 15" rows only.

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#### **Andiamo 230** (*tetraconazole*) Mode of Action: 3 (DMI)

**Application rate:** 4-6 fl oz/A

**REI:** 12 hours; 3 days for detasseling corn grown for seed

**Targeted diseases:** Gray leaf spot, common rust, southern rust, Anthracnose leaf blight, eye spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, and yellow leaf blight.

**Restrictions:** Apply between V4 and R3, prior to disease development. Apply as a curative application when incidence is less than 5% of plants. Apply as a foliar spray (minimum of 10 GPA by ground or a minimum of 2 GPA by air) or through chemigation. Do not apply more than 6 fl oz/A per year. Do not apply more than 1 application per year. Do not apply after R3 (brown silk/milk). Do not use adjuvants between V8 and VT. Do not apply after growth stage R3.

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#### **Approach** (*picoxystrobin*) Mode of Action: 11 (QoI)

**Application rates:** 3-6 fl oz/A for V4 to V7, 6-12 fl oz/A for VT to R3

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight and stalk rot, gray leaf spot, northern corn leaf spot, northern corn leaf blight, southern corn leaf blight, common rust, southern rust, leaf spots (*Alternaria* spp.), Physoderma brown spot, eye spot, and yellow leaf blight.

**Restrictions:** Apply before disease occurs and repeat applications of 6-12 fl oz on a 7-14 day intervals during VT to R3 for best results. Use a higher rate and shorter interval when disease pressure is high. For early season disease control/ suppression apply a single 3-6 fl oz/A application between V4-V7. Do not apply within 7 days of harvest for grain. Do not apply more than 36 fl oz/A per acre per year or make more than 3 applications per year. Approach may be applied by ground, air or chemigation. Do not use an adjuvant or crop oil when spraying corn between the V8 and VT growth stages. Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Do not apply 7 days before harvest for grain or ear. There is 0 day wait for forage.

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#### **Approach Prima** (*cyproconazole + picoxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 3.4-6.8 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight and stalk rot, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, southern corn leaf blight, Physoderma brown spot, leaf spots (*Alternaria* spp.), yellow leaf blight, and tar spot.

**Restrictions:** Apply before disease occurs. The minimum retreatment interval is 7 days. Use the higher rate and shorter interval when disease pressure is high. Apply a 3.4 fl oz/A application for preventive early season disease control/ suppression. Do not apply within 30 days of harvest for grain or 21 days for silage. Do not apply more than two sequential applications of Approach Prima without alternating with another fungicide chemistry. Do not exceed 6.8 fl oz/A per crop. Approach Prima may be applied by ground, air or chemigation. Do not use an adjuvant or crop oil when spraying corn between the V8 and VT growth stages.

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#### **Aviv** (*Bacillus subtilis strain IAB/BS03*) Mode of Action: BM 02 (microbial)

**Application rate:** 10-30 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, common rust, southern rust, northern leaf blight, and southern corn leaf blight.

**Restrictions:** Applications should be made when the environment is conducive to disease development. Repeat on a 7-10 day interval as needed. Apply in 15-40 gallons per acre for ground application. For aerial application, apply this product in a minimum of 5 gallons of water per acre.

**Azterknot** (*azoxystrobin* + *extract of Reynoutria sachalinensis*) Mode of Action: 11, P 05 (QoI, plant extract)

**Application rate:** 7.4-18.4 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, southern rust

**Restrictions:** Early season applications can be made from V4-V8 with a rate of 7.4 fl oz/A. Applications should be made as soon as disease is seen and continue applications every 7 to 21 days if needed without exceeding 147.2 fl oz/A in a single year. Do not make more than 2 sequential applications without using a fungicide outside of Group 11. Do not make applications less than 7 days apart. Do not apply within 7 days of harvest.

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**Azteroid FC 3.3** (*azoxystrobin*) Mode of Action: 11 (QoI)

**Application rate:** 3.9-9.7 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, common rust, and southern rust.

**Restrictions:** Begin applications prior to disease development and continue on a 7-14 day spray schedule if disease continues. Do not make more than 2 consecutive applications of any Group 11 fungicide before alternating to another group. AZteroid FC 3.3 may be applied by ground, air, and chemigation. Do not apply more than 77.6 fl oz/A per year. Do not make more than 8 applications per year at 9.7 fl oz/A, 13 applications per year at 5.8 fl oz/A, or 19 applications per year at 3.9 fl oz/A. Do not apply within 7 days of harvest.

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**Bravo Ultrex, Bravo Weather Stik, Echo 720, Echo 90DF, Echo ZN, Eluvium, Equus 720 SST, Initiate 720, Iinitiate ZN, Oranil 6L, Praiz, Rialto 720F** (*chlorothalonil*) Mode of Action: M 05 (multi-site)

**Application rates:** 0.75-2 pints/A

**Bravo Ultrex:** 0.7-1.8 lbs/A

**Echo 90 DF:** 1.25-1.625 lbs/A

**Echo ZN, Initiate ZN:** 1.125-2.75 pints/A

**REI:** 12 hours

**Targeted diseases:** Northern corn leaf blight, northern corn leaf spot, common rust, southern corn leaf blight, and southern rust.

**Restrictions:** Begin applications when conditions favor disease and repeat every 7 days. Do not apply more than 10.9 lbs (Bravo Ultrex), 9.0 lbs a.i. (Echo 720, Echo 90 DF, Echo ZN, Initiate ZN), 12 pints (Bravo Weather Stik, Equus 720 SST, Initiate 720, Oranil 6L, Praiz, Rialto 720 F) of product per acre per season. Under severe disease conditions, use 1.4-1.8 lbs/A (Bravo Ultrex, Bravo Weather Stik), and 1.5-2 pints/A (Echo 720, Equus 720 SST, Initiate 720). Do not apply within 14 days of harvest. Do not apply to sweet corn to be processed. Do not allow livestock to graze treated fields. Do not ensile treated corn or use as livestock forage. Apply by ground, air or chemigation. Use sufficient water to obtain adequate coverage, 5-10 gal/A for concentrated ground and aerial application.

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**Brixen** (*tetraconazole* + *azoxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 13-19 fl oz/A

**REI:** 12 hours; 3 days for detasseling corn grown for seed

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, southern rust, tar spot, and web blight.

**Restrictions:** Apply before disease is present when conditions are favorable for disease development. Apply at least 10 gallons of spray suspension/A by ground or 2 gallons of spray suspension/A by air. Applications of fungicide should be alternated with another mode of action. Do not apply if rain is expected within 2 hours of application or control may be reduced. Do not apply more than 19 fl oz/A per year. Do not make more than 1 application per year. Do not harvest silage within 21 days of an application of Brixen. Do not use adjuvants between V8 and VT. Do not apply to corn after R3. Do not use Brixen within 7 days of harvest.

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**Bumper, Bumper 41.8 EC, Fitness, Tide Propiconazole 41.8% EC, Omni-Brand Propiconazole 41.8% EC, Propicon EC, Propimax EC, Propi-Star EC, Rustic, Shar-Shield PPZ, Slant EC, Tilt, Topaz, Vigil, Willowood Propicon 3.6 EC** (*propiconazole*) Mode of Action: 3 (DMI)

**Application rate:** 2-4 fl oz/A, PropiMax: 2-8 fl oz/A

**REI:** 12 hours, Tilt: 24 hours

**Targeted diseases:** common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** Apply when conditions are favorable for disease development. Follow a 7-14 day spray interval as needed to maintain control. Do not apply more than 16 fl oz/A (24 fl oz/A for Fitness, Slant EC) per year. Do not apply within 30 days (45 days for Fitness, Slant EC) of forage, grain, or fodder harvest. Do not apply more than 8 fl oz/A/year (Bumper, Bumper 41.8 EC, Fitness, Tide Propiconazole 41.8% EC, Omni-Brand Propiconazole 41.8% EC, Propimax EC, Propi-Star EC, Rustic, Shar-Shield PPZ, Slant EC, Tilt, Topaz, Vigil, Willowood Propicon 3.6 EC); 7.7 fl oz/A/year (Propicon EC) on field corn harvested for forage. Do not make more than two applications per year.

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**Caramba** (*metconazole*) Mode of Action: 3 (DMI)

**Application rate:** 10-14 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, southern rust, and yellow leaf blight.

**Restrictions:** Begin applications prior to disease development when environmental conditions are conducive. Applications can be made on a 7-14 day interval if needed. Do not apply more than 60 fl oz per acre per year. Do not make more than 2 applications of a Group 3 before rotating to another mode of action. Do not apply within 7 days for forage and silage and within 20 days for grain and stover.

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**Crossover Pro** (*propiconazole + lambda-cyhalothrin*) Mode of Action: 3 (DMI)

**Application rate:** 2-4 fl oz/A

**REI:** 24 hours

**Targeted diseases:** Common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** Apply when conditions are favorable for disease development. Follow a 7-14 day spray interval as needed to maintain control. Do not apply more than 14 fl oz/A per year. Do not apply more than 8 fl oz/A per year of Crossover Pro. Do not apply within 30 days of harvest for forage, grain and stover. Do not feed fodder or silage to meat or dairy animals within 30 days of the last treatment.

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**Helmstar Plus SC, Tebaz** (*azoxystrobin + tebuconazole*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 9-12.9 fl oz/A Tebaz

**Application rate:** 7.2-10.8 fl oz/A Helmstar Plus SC

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, and southern rust.

**Restrictions:** Apply when conditions are favorable for disease development. Follow a 7-14 day spray interval as needed to maintain control. Do not use adjuvants after V8 and before VT. Adjuvants that contain silicone may contribute to phytotoxicity. Do not apply more than 51.7 fl oz/A (Custodia, Tebaz); 43.2 fl oz/A (HelmStar Plus SC) per year. Do not apply within 21 days of forage harvest or 36 days of grain or fodder harvest.

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**Delaro 325 SC** (*prothioconazole + trifloxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rates:** 4-6 fl oz/A (early season, V4 to V7), 8-12 fl oz/A (after V8)

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eyespot, common rust, southern rust, northern corn leaf spot, southern corn leaf blight, Physoderma brown spot, and tar spot.

**Restrictions:** Do not apply more than 24 fl oz per acre per year. Preharvest interval for grain and fodder 14 day. Forage may be harvested the same day of application. Application of Delaro 325 SC is not recommended at times when corn is under severe environmental stress conditions. The inclusion of an adjuvant in the spray tank, for applications made through V8 and after VT is recommended. Apply when disease first appears and at 7-14 day intervals thereafter if conditions continue to favor disease development.

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**Delaro Complete** (*prothioconazole + trifloxystrobin + fluopyram*) Mode of Action: 3, 11, 7 (DMI, QoI, SDHI)

**Application rates:** 4-6 fl oz/A (early season, V4 to V7), 8-12 fl oz/A (after V8)

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, southern corn leaf blight, Physoderma brown spot, and tar spot.

**Restrictions:** Application is not recommended at times when corn is under severe environmental stress conditions. Do not apply within 14 days of grain or fodder harvest. Do not apply more than twice or exceed a total of 24 fl oz/A per year. To diminish the potential for pathogen resistance development to this fungicide, do not make more than 2 sequential applications of any Group 11 or Group 7 fungicides before rotating with a fungicide from a different Group. For early season control of anthracnose, eyespot, and gray leaf spot, apply Delaro Complete as broadcast foliar spray at V4 to V7. For season-long control of diseases, apply a sequential treatment of Delaro Complete at 8.0-12.0 fl oz/A from VT to R2.

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**Dexter Maz** (*azoxystrobin + mancozeb*) Mode of Action: M 03, 11, 7 (multi-site, QoI)

**Application rate:** 1.6 lbs/A

**REI:** 24 hours

**Targeted diseases:** Common rust, gray leaf spot, northern corn leaf blight, northern corn leaf spot, and southern corn leaf blight

**Restrictions:** Applications should be made when disease first appears. Repeat applications on a 7-14 day interval. Use sufficient water for thorough coverage. Do not apply more than 3.2 lbs of product per acre per year. Do not feed treated forage to livestock. Do not apply within 40 days of harvest.

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**Dithane F-45 Rainshield, Dithane M-45, Koverall, Manzate Max, Manzate Pro Stick, Penncozeb 75 DF, Penncozeb 80 WP, Roper DF Rainshield** (*mancozeb*) Mode of Action: M 03 (multi-site)

**Application rates:**

**Dithane F-45 Rainshield:** 1.2 qt/acre

**Manzate Max:** 0.8-1.2 qt/acre

**Dithane M-45, Koverall, Manzate Pro Stick, Roper DF Rainshield:** 1.5 lb/acre

**Penncozeb 75 DF, Penncozeb 80 WP:** 1-1.5 lbs/A (repeat as needed)

**REI:** 24 hours

**Targeted diseases:** Gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, and southern corn leaf blight.

**Restrictions:** Do not apply more than 6 qts (Dithane F-45 Rainshield, Manzate Max, Penncozeb 80 WP), 7.5 lbs (Koverall Roper DF Rainshield), 8 lbs (Penncozeb 75 DF), 15 lbs (Manzate Pro Stick, Penncozeb 80WP, Roper DF Rainshield), or 16 lbs (Dithane M-45, Penncozeb 75DF) of product per acre per season. Do not exceed 5 applications per acre per season. Do not apply within 7 days of harvest (Dithane F-45 Rainshield, Penncozeb 80 WP) or 40 days of harvest (Dithane M-45, Koverall, Manzate Pro Stick, Penncozeb 75 DF, Roper DF Rainshield). Dithane F-45 Rainshield, Dithane M-45, Koverall, and Roper DF Rainshield are not labeled for gray leaf spot. Do not feed treated forage to livestock. Start applications at disease onset and repeat at 4 to 7-day intervals.

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**Domark 230 ME** (*tetraconazole*) Mode of Action: 3 (DMI)

**Application rate:** 4-6 fl oz/A

**REI:** 12 hours; 3 days for detasseling corn grown for seed

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eye spot, common rust, southern rust, Physoderma brown spot, northern corn leaf spot, southern corn leaf blight, yellow leaf blight, and tar spot.

**Restrictions:** Do not make more than 1 application per acre per year. Do not apply more than 6 fl oz of product per acre per application. Do not apply Domark after the R3 (brown silk/milk) growth stage. Do not use adjuvants after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. If disease pressure develops later in the season, an application of an alternative corn fungicide should be made at VT - R3 to provide extended disease control. Begin preventative applications when conditions favor disease development. Domark 230 ME may be applied via ground, air, or chemigation.

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**Double Nickel 55** (*Bacillus amyloliquefaciens strain D747*) Mode of Action: BM 02 (microbial)

**Application rate:** 0.25-3 lb/A

**REI:** 4 hours

**Targeted diseases:** Southern leaf blight and suppression of common rust

**Restrictions:** Begin applications at crop emergence or when environmental conditions are conducive to disease development. Repeat every 7 to 10 days as needed.

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**Ellora, Prosaro 421 SC** (*tebuconazole + prothioconazole*) Mode of Action: 3 (DMI)

**Application rate:** 6.5 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eye spot, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Applications can be made by ground, air or chemigation. For ground treatments, make an application of 10 gpa spray solution. For aerial treatments, make application of a minimum of 2 gpa spray solution. Do not use adjuvants between the V8 and the VT growth stages. Apply when disease first appears and at 7-14 day intervals, if conditions continue to favor disease. Do not apply more than 26 fl oz/A/ season. Do not apply within 21 days of harvest for forage or 36 days of harvest for grain or fodder.

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**Everlon, Priaxor Xemium** (*fluxapyroxad + pyraclostrobin*) Mode of Action: 7, 11 (SDHI, QoI)

**Application rate:** 4-8 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, common rust, southern rust, southern corn leaf blight, and yellow leaf blight.

**Restrictions:** Do not apply more than 2 applications per acre per year. Do not apply within 21 days of harvest or within 7 days when harvesting for forage. Do not apply more than two applications of any Group 7 or Group 11 without alternating with a fungicide that has a different mode of action for at least one application. Do not apply more than 16 fl oz of product/A per year. Adjuvant or crop oil damage can occur when applied after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. Apply before disease occurs and repeat on a 7-14 day interval, if conditions continue to favor disease proliferation.

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**Evito T** (*fluxastrobin + tebuconazole*) Mode of Action: 11, 3 (QoI, DMI)

**Application rate:** 4-9 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, and southern corn leaf blight.

**Restrictions:** Do not apply more than twice. Do not apply after the R4 (early dough) growth stage. Do not apply more than 18 fl oz/A per acre per year. Apply before disease occurs and at 7 day intervals. Evito T may be applied by ground, air or chemigation. Apply in a minimum of 3 gal/A water by air or 10 gal/A water ground. Evito T may be applied up to 36 days before harvest of grain or fodder.

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**Felcura 3.6F, Monsoon, Onset 3.6L, Orius 3.6F, Tebuconazole 3.6F, Teb 3.6SC, Tebu-Crop 3.6F, Tebustar 3.6L, Tebuzol 3.6F, Toledo 3.6F, Vibe** (*tebuconazole*) Mode of Action: 3 (DMI)

**Application rate:** 4-6 fl oz/A

**REI:** 12 Hours

**Targeted diseases:** Gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, and southern corn leaf blight.

**Restrictions:** Do not apply more than 24 fl oz/A/season. Do not apply within 36 days of harvest of grain or fodder or 21 days for forage. Apply a minimum of 5 gal/A by air or 10 gal/A ground. For optimum disease control, use a spray surfactant at the lowest specified rate. Begin preventative applications when conditions favor disease development and repeat at a 7-14 day interval if conditions remain favorable for disease development.

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**Fortix** (*flutriafol + fluoxastrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 4-6 fl oz/A

**REI:** 12 hours; 5 days for detasseling corn grown for seed

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, and southern corn leaf blight.

**Restrictions:** Do not apply within 30 days of harvest for forage, stover or grain. Do not apply more than 2 applications per season. Do not apply more than 12 fl oz/A per year. Do not apply after the R4 (early dough) growth stage. Do not use adjuvants when spraying corn after the V8 growth stage and prior to the VT growth stage. Begin applications when disease occurs and repeat on a 7-10 day interval, as needed. Use the higher rate when disease pressure is high and if conditions are favorable for disease development. Fortix may be applied by ground or air. Apply a minimum of 5 gal/A air or 10 gal/A ground.

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**Headline, Headline SC** (*pyraclostrobin*) Mode of Action: 11 (QoI)

**Application rate:** 6-12 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, eyespot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, Physoderma brown spot, southern corn leaf blight, and yellow leaf blight.

**Restrictions:** Do not apply within 7 days of harvest. Do not apply more than two sequential applications without alternating with a fungicide that has a different mode of action for at least one application. Do not apply more than 72 fl oz/A per year. Adjuvant or crop oil damage can occur when applied after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. Apply before diseases occur. If conditions favorable for disease persist, reapply every 7-14 days. Use the higher rate and shorter intervals when disease pressure is high. Adjuvants may be used with Headline and Headline SC. There are no livestock feeding restrictions.

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**Headline AMP** (*metconazole + pyraclostrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 10-14.4 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eyespot, common rust, southern rust, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, and yellow leaf blight.

**Restrictions:** Do not apply within 7 days of harvest for field corn forage/silage. Do not apply within 20 days of harvest for grain or stover. Do not apply more than two applications of Headline AMP without alternating with a fungicide that has a different mode of action for at least one application. Do not apply more than 57.6 fl oz/A per season. Do not make more than 4 applications per acre per year. Adjuvant or crop oil damage can occur when applied after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. Apply before disease occurs. If conditions favorable for disease persist, reapply every 7-14 days. Use the higher rate and shorter intervals when disease pressure is high. Do not use less than 10 gpa spray volume for ground applications. Do not use less than 2 gpa spray volume for aerial applications.

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**Innliven P** (*pyraclostrobin + propiconazole*) Mode of Action: 11, 3 (QoI, DMI)

**Application rate:** 5.56-7.6 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, common rust, northern corn leaf spot, southern corn leaf blight, southern rust, Physoderma brown spot, and yellow leaf blight.

**Restrictions:** Begin applications when environmental conditions are right for disease development and continue on a 7-14 day schedule. Do not apply more than 30.4 fl oz per acre per year. Adjuvant or crop oil damage can occur when applied after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. Do not apply more than 7.6 fl oz per acre per application. Do not make more than 2 sequential applications of a Group 3 or Group 11 before switching to another Group. Do not apply within 7 days of grain harvest and within 14 days of forage harvest. There are no livestock feeding restrictions. Innliven P may be applied by ground, air, or chemigation.

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**Innliven TRZ** (*pyraclostrobin + tetraconazole*) Mode of Action: 11, 3 (QoI, DMI)

**Application rate:** 4.6-9.5 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, common rust, northern corn leaf spot, southern corn leaf blight, southern rust, Physoderma brown spot, tar spot, and yellow leaf blight.

**Restrictions:** Begin applications when environmental conditions are right for disease development and continue on a 7-14 day schedule. Do not apply more than 9.5 fl oz per acre per year. Adjuvant or crop oil damage can occur when applied after the V8 (8 leaf collar) stage and prior to the VT (tassel) stage. Do not make more than 2 sequential applications of the lowest rate. Do not apply within 7 days of harvest. There are no livestock feeding restrictions. Innliven TRZ may be applied by ground, air, or chemigation.

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**Lucento** (*bixafen + flutriafol*) Mode of Action: 7, 3 (SDHI, DMI)

**Application rate:** 3-5.5 fl oz/A

**REI:** 112 hours; 5 days for detasseling corn

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, common rust, northern corn leaf spot, southern corn leaf blight, southern rust, Physoderma brown spot, tar spot, and suppression only for Diplodia ear rot.

**Restrictions:** Do not apply more than two applications per year. Do not apply more than 11 fl oz per acre per year. Preharvest interval is 10 days for forage and 30 days for grain or stover. Apply from onset of diseases up to R4 growth stage. Repeat applications at 7-14 day intervals. When disease pressure is high, use the higher rate and shorter interval. Do not use an adjuvant after the V8 growth stage and prior to the VT. An adjuvant may be used at any other growth stage. Do not apply after R4 (early dough) growth stage. Lucento may be applied by ground, air, or chemigation.

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**Magistrate** (*prothioconazole + azoxystrobin + trifloxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate (Early season):** 5-6.5 fl oz/A

**Application rate:** 6.5-8 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, common rust, northern corn leaf spot, southern corn leaf blight, southern rust, Physoderma brown spot, tar spot, and suppression only for Diplodia ear rot.

**Restrictions:** An early season application can be made from V4 to V7 if conditions are favorable for disease development of anthracnose, eyespot, and gray leaf spot. Apply a sequential treatment of Magistrate at 6.5 to 8.0 fl oz/A from VT through R2. The first application should be made when disease first appears and should continue on a 7-14 day interval. Do not apply within 30 days of harvest. Do not apply more than 16 fl oz/A per year. Do not use adjuvants between V8 and VT. Applications can be made by ground, air, or chemigation. Do not make more than 2 sequential applications of any Group 11 fungicide before rotating to another Group.

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**Milagrum Plus** (*Bacillus subtilis strain IAB/BS03*) Mode of Action: BM 02 (microbial)

**Application rate:** 40-60 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, common rust, southern corn leaf blight, and southern rust.

**Restrictions:** Begin applications when conditions are conducive for disease development. Repeat applications on a 7-10 day interval as needed. Apply in 15-40 gallons per acre.

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**Miravis Neo** (*pydiflumetofen + azoxystrobin + propiconazole*) Mode of action: 7, 11, 3 (SDHI, QoI, DMI)

**Application rate:** 13.7 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, common rust, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, southern rust, tar spot, and suppression only for Diplodia ear rot and Fusarium ear rot.

**Restrictions:** Do not apply more than two applications per acre per season. Do not make more than two consecutive applications of any other Group 7, 3, and 11 fungicides before alternating with a fungicide from a different group. Pre-harvest interval is 30 days. Apply at V4-V8 for early season disease control. Late season application at VT or R1. If conditions favorable for disease persist, apply again 7-14 days later. Applications can be made by ground, air, or chemigation.

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**NU-Cop 50 DF** (*copper hydroxide*) Mode of Action: unknown

**Application rate:** 1-3 lbs/A

**REI:** 48 hours

**Targeted diseases:** Suppression only of Goss's bacterial wilt and stalk rot

**Restrictions:** Begin treatment when disease first appears and repeat every 7 to 10 days as needed. Use higher rates and shorter spray intervals when conditions favor disease. Do not apply more than 2.1 pounds per acre in a single application. Do not exceed 8.4 pounds per acre per year.

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**Odyssey** (*potassium phosphite + tebuconazole + azoxystrobin*) Mode of Action: P 33, 3, 11 (phosphonate, DMI, QoI)

**Application rate:** 2-3 pints/A for rust

**Application rate:** 2.25-3 pints/A

**REI:** 12 hours

**Targeted diseases:** Common rust, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, southern rust, and tar spot.

**Restrictions:** Begin treatment when disease first appears and repeat every 7 to 14 days as needed. Do not apply more than 3 pints of product per application. Do not apply more than 6 pints per acre per year. Do not make more than 2 applications per year. Do not apply within 7 days of harvest. Apply in a minimum of 10 gpa of water for ground application and a minimum of 2 gallons of spray solution by air. Odyssey may be applied by ground or air.

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**Phobos FC, Proline 480 SC, Prozio SC** (*prothioconazole*) Mode of Action: 3 (DMI)

**Application rate:** 5.7 fl oz/A

**Phobos FC:** 7.6 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, northern corn leaf spot, eye spot, common rust, southern rust, southern corn leaf blight. Will also suppress Fusarium, Gibberella, and Aspergillus ear rots.

**Restrictions:** Do not apply more than 22.8 fl oz/A of Proline 480 SC or 30.4 fl oz/A of Phobos FC. Do not apply within 14 days of harvest for grain and fodder. Forage may be harvested on the same day as the application. Phobos FC, Proline 480 SC, and Prozio SC may be applied by ground, air or chemigation. Apply a minimum of 3 gal/A by air or 10 gal/A ground. Do not use adjuvants between the V8 and the VT growth stages. For optimum suppression of ear rots, apply from the R1 (initial silk emergence) to the R2 (brown silk) corn growth stages. Apply when disease first appears and at 7-14 day intervals, thereafter if conditions continue to favor disease. If corn is under severe environmental stress conditions it is not recommended to make an application of Phobos FC, Proline 480 SC, or Prozio SC.

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**Propulse** (*prothioconazole + fluopyram*) Mode of Action: 3, 7 (DMI, SDHI)

**Application rate:** 13.6 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** For foliar applications, Propulse should be applied when disease first appears. Continue use on a 7-14 day interval as needed. Do not apply more than 13.6 fl oz/A in a single application or 27.2 fl oz/A per year. Do not make more than 2 applications per year. Propulse can be applied by ground, air, or chemigation. Minimum application volumes: 10 gallons/A for ground and 2 gallons/A for aerial. Do not harvest grain or fodder within 14 days of the last application. An application of Propulse is not advised when corn is under severe environmental stress conditions.

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**Prosaro Pro 400 SC** (*prothioconazole + tebuconazole + fluopyram*) Mode of Action: 3, 7 (DMI, SDHI)

**Application rate:** 10.3 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, southern rust, and tar spot.

**Restrictions:** Apply Prosaro Pro 400 SC when disease first appears. Apply on a 14 day schedule as disease persists. Do not apply more than 2 sequential applications of a Group 7 fungicide. Minimum application volumes: 10 gallons/A for ground and 2 gallons/A for aerial. Do not use adjuvants between V8 and VT. Do not harvest forage with 21 days or grain or fodder within 36 days of the last application. Do not allow livestock to graze corn forage within 21 days or corn fodder within 36 days of application. Prosaro Pro 400 SC can be applied by ground or air at a minimum rate of 10 gallons/A and 2 gallons/A, respectively.

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**Protegam YLD, Stratego YLD** (*prothioconazole + trifloxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 2-5 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eyespot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, southern rust, and diplodia ear rot.

**Restrictions:** For early season control of anthracnose, eyespot, and gray leaf spot apply at 2-5 fl oz/A at the V4 to V7 growth stage when conditions are favorable for disease. Apply when disease first appears. 4-5 fl oz/A are recommended for growth stages after V7. Apply on a 7-14 day interval as disease persists. Do not apply more than 10 fl oz per acre per year. Do not apply more than 2 sequential applications of a Group 3 or Group 11 fungicide. Do not use adjuvants between V8 and VT. Do not harvest grain or fodder within 14 days of the last application. Protegam YLD and Stratego YLD may be applied by ground, air, or chemigation. An application of Protegam YLD or Stratego YLD is not recommended at times when corn is under severe environmental stress conditions.

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**Revylok** (*mefentrifluconazole + fluxapyroxad*) Mode of Action: 3, 7 (DMI, SDHI)

**Application rate:** 4.5-6.5 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, southern corn leaf blight, and tar spot.

**Restrictions:** The first application should be made before disease development if conditions are right for disease development. Do not apply more than 6.5 fl oz per acre per application. Do not apply with 14 days of an initial application. Do not apply more than 2 applications per year. Do not apply more than 13 fl oz per acre per year. Postharvest interval: 21 days. Do not apply adjuvants between V8 and VT as damage to the crop may occur. Corn forage, fodder, or stover must not be fed to livestock sooner than 21 days after last application.

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**Revytek** (*mefentrifluconazole + fluxapyroxad + pyraclostrobin*) Mode of Action: 3, 7, 11 (DMI, SDHI, QoI)

**Application rate:** 8-15 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eyespot, common rust, southern rust, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, tar spot, and yellow leaf blight.

**Restrictions:** Do not apply more than 15 fl oz per acre per application. Do not apply more than 2 applications per year. Do not apply more than 30 fl oz per acre per year. Postharvest interval: 21 days. Do not apply adjuvants between V8 and VT as damage to the crop may occur.

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**Rustease** (*azoxystrobin + cyproconazole*) Mode of Action: 11, 3 (QoI, DMI)

**Application rate:** 3.5-6.8 fl oz/A

**REI:** 12 hours

**Target diseases:** Eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, common rust, southern rust, and southern corn leaf blight.

**Restrictions:** Apply this product when disease first appears. Use low rate when disease pressure is low. Under heavy disease pressure or if conditions are favorable for disease to develop, apply a high rate. A second application may be made 7-14 days later. Do not apply more than 2 applications per year. Do not apply more than 6.8 fl oz/A/year. Do not harvest within 30 days of application. Do not harvest for silage within 21 days of application. Do not alternate or tank mix with fungicides to which the pathogen population has developed resistance.

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**Serifel** (*Bacillus amyloliquifaciens* strain MBI 600) Mode of Action: 44 (microbial)

**Application rate:** 4-16 fl oz/A

**REI:** 12 hours

**Target diseases:** Common rust and southern leaf blight

**Restrictions:** Begin applications prior to infection and continue on a 7-10 day interval if conditions are conducive for disease development.

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**Serenade ASO, Serenade MAX** (*Bacillus subtilis* strain QST 713) Mode of Action: BM 02

**Application rates:**

**Serenade ASO:** 0.5-2 quarts/A

**Serenade MAX:** 1-3 lbs/A

**REI:** 4 hours

**Targeted diseases:** Common rust, and southern corn leaf blight.

**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.. Both products may be applied by ground, air or chemigation.

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**Stratego, Tarian** (*propiconazole + trifloxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 10-12 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eye spot, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Do not apply more than 24 fl oz/A/year. Do not apply within 30 days of harvest for forage, grain and stover. Do not apply more than 2 sequential applications. Applications can be made by ground, air or chemigation. Do not apply more than 2 sequential applications of any strobilurin fungicides. Apply when disease first appears and at 7-14 day intervals, thereafter if conditions continue to favor disease. Use higher rates and shorter intervals when disease pressure is high. An application of Stratego or Tarian is not recommended at times when corn is under severe environmental stress conditions.

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**Tepera** (*fluoxastrobin*) Mode of Action: 11 (QoI)

**Application rate:** 4.2-12.6 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** Begin applications prior to disease starting and continue with a 7-10 day interval. Use a higher rate and shorter application interval when disease pressure is high. Do not use an adjuvant after V8 and before VT. Do not apply more than 12.6 fl oz/A in a single application. Do not apply more than 2 applications per acre per year. Do not apply within 30 days of harvest. Do not apply after the R4 (early dough) growth stage.

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**Tepera Plus** (*fluoxastrobin + bifenthrin*) Mode of Action: 11 (QoI), Insecticide Mode of Action: 3A (pyrethroid)

**Application rates:** 9.2-15.4 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, southern rust, banded leaf and sheath spot, Alternaria leaf spot, Ascochyta leaf spot, Phyrenochaeta stalk and root rot, and Red Kernal.

**Restrictions:** Begin treatment prior to disease development. Reapply as needed on a 7-10 day interval. Do not use an adjuvant after V8 and prior to VT. Do not apply more than 15.4 fl oz/A per application. Do not apply after R4 (early dough) stage of growth. Do not apply more than 2 times per year. Do not harvest or graze within 30 days of the last application.

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**Tepera Plus HD** (*fluoxastrobin + bifenthrin*) Mode of Action: 11 (QoI), Insecticide Mode of Action: 3A (pyrethroid)

**Application rate:** 5.7 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, common rust, eye spot, gray leaf spot, northern corn leaf blight, northern corn leaf spot, southern corn leaf blight, and southern rust.

**Restrictions:** Begin applications prior to disease starting and continue with a 7-10 day interval. Use a higher rate and shorter application interval when disease pressure is high. Do not use an adjuvant after V8 and before VT. Do not apply more than 5.7 fl oz/A in a single application. Do not make more than 2 applications per acre per year. Do not apply within 30 days of harvest. Do not apply after the R4 (early dough) growth stage.

**Topguard** (*flutriafol*) Mode of Action: 3 (DMI)

**Application rate:** 7-14 fl oz/A

**REI:** 12 hours; 5 days for detasseling corn grown for seed

**Targeted diseases:** Anthracnose leaf blight, eyespot, gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Do not apply within 7 days of harvest for stover and grain. Do not apply more than 2 applications per year. Do not apply more than 14 fl oz/A per application. Do not apply more than 28 fl oz/A per year. Applications can be made by ground or air. Apply a minimum of 2 gal/A air or 10 gal/A ground. A surfactant may be used but do not use surfactants when spraying corn prior to the V8 growth stage and after the VT growth stage. Use the higher rate when disease pressure is high and if conditions are favorable for disease development. Minimum retreatment interval is 7 days.

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**Topguard EQ** (*flutriafol* + *azoxystrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 5-7 fl oz/A

**REI:** 12 hours; 5 days for detasseling corn grown for seed

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Do not exceed 7 fl oz/A for a single application. Do not exceed 14 fl oz/A of product per year. An adjuvant may be used prior to V8 and after VT growth stage. Do not apply within 7 days of harvest. Apply preventatively or when conditions are favorable for disease development. Apply no later than R4 (early dough) growth stage.

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**Tivapro** (*benzovindiflupyr* + *azoxystrobin* + *propiconazole*) Mode of Action: 7, 11, 3 (SDHI, QoI, DMI)

**Application rate:** 13.7 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, Curvularia leaf spot, eye spot, gray leaf spot, northern corn leaf blight, common rust, Physoderma brown spot, southern rust, northern corn leaf spot, southern corn leaf blight, tar spot, and suppression only for Diplodia ear rot.

**Restrictions:** Do not apply more than 41.1 fl oz/A/season. Do not make more than two applications of any Group 7 or 11 fungicides before changing to a fungicide that is not in Group 7 or 11. Do not apply within 30 days of harvest for forage, grain, or stover. An early application (V4-V8) may be applied for early season disease control and plant performance benefits. For later season applications, apply when disease first appears. If conditions favorable for disease persist, continue to apply on a 14-day schedule. Do not use adjuvants between V8 and VT as crop injury may occur. May be applied by ground, air, or chemigation.

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**Vacciplant** (*laminarin*) Mode of Action: P 04 (natural compound)

**Application rate:** 14-22 fl oz/A

**REI:** 4 hours

**Targeted diseases:** Anthracnose leaf blight, eye spot, gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Begin applications when disease development is favorable. Repeat applications can be made every 7-14 days. At water volumes less than 70 gpa apply at 14 fl oz/A. At water volumes above 70 gpa apply at 0.15% v/v. There is 0 day pre-harvest interval.

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**Veltyma** (*mefentrifluconazole* + *pyraclostrobin*) Mode of Action: 3, 11 (DMI, QoI)

**Application rate:** 7-10 fl oz/A

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, eye spot, common rust, southern rust, northern corn leaf spot, Physoderma brown spot, southern corn leaf blight, tar spot, and yellow leaf blight.

**Restrictions:** Do not apply more than 10 fl oz per acre per application. Do not make more than 2 applications per year. Do not apply more than 20 fl oz per acre per year. Do not apply within 21 days of harvest. Do not apply with an adjuvant between V8 and VT as crop injury may occur.

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**Vertisan** (*penthiopyrad*) Mode of Action: 7 (SDHI)

**Application rate:** 10-24 fl oz/A

**Application rate:** 16-24 fl oz/A for Physoderma brown spot

**REI:** 12 hours

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, common rust, southern rust, Physoderma brown spot, northern corn leaf spot, southern corn leaf blight, and leaf spots.

**Restrictions:** Do not exceed 48 fl oz/acre per year. Do not apply more than two sequential applications without alternating with another fungicide chemistry. Apply a minimum of 2 gal/A by air or 15 gal/A ground. Do not apply within 7 days of grain and stover harvest. Corn may be grazed or used for forage right after application. Apply before disease occurs and repeat on a 7-14 day interval.

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**Viathon** (*potassium phosphite* + *tebuconazole*) Mode of Action: P 07, 3 (phosphonate, DMI)

**Application rate:** 2-3 pints/A

**REI:** 12 hours

**Targeted diseases:** gray leaf spot, northern corn leaf blight, common rust, southern rust, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** The first application should be made when weather conditions become conducive for disease development. Repeat applications on a 7-14 day interval. Do not exceed 6 applications per year. Do not apply more than 12 pints per acre per season. Do not apply within 7 days of harvest. When tank mixing, no label dosage rate may be exceeded, and the most restrictive label precautions and restrictions must be followed.

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**Zolera FX** (*tetraconazole + fluoxastrobin*) Mode of Action 3, 11 (DMI, QoI)

**Application rate:** 4.4-6.8 fl oz/A

**REI:** 12 hours; 3 days for detasseling corn grown for seeds

**Targeted diseases:** Anthracnose leaf blight, gray leaf spot, northern corn leaf blight, common rust, southern rust, eye spot, northern corn leaf spot, and southern corn leaf blight.

**Restrictions:** Do not apply more than 6.8 fl oz per acre per application. Do not apply more than 1 application of 6.8 fl oz per acre per year. Do not use adjuvants in sprays made between V8 (8 leaf collar) and VT (lowest branch of the tassel visible but silks have not emerged) growth stages. Do not apply within 30 days of harvest. Apply by ground in a minimum of 10 GPA, by air in a minimum of 2 GPA, or through chemigation in sufficient water to obtain thorough coverage of plants. If tank mixing or sequentially applying another product containing fluoxastrobin, do not apply more than 0.36 lb ai fluoxastrobin per acre per year. Do not apply more than 0.09 lb ai tetraconazole per acre per year. Do not apply after corn growth stage R3 (brown silk/milk). Zolera FX may be applied by ground, air, or chemigation.