SDSU Extension

Sorghum
Weed Control

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Safety First

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

Applicator Safety. The most serious risk of exposure from chemicals is during handling and mixing operations with 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.

Poison Control Center 1-800-222-1222

Water Protection. Preventing spills and accidents during handling and mixing reduces risk of groundwater and surface water contamination. Mix herbicides away from wells and water sources. Prevent back-siphoning into wells. Install anti-backflow devices in irrigation equipment used for pesticides. Triple rinse containers. Store herbicides properly. Identify high-risk areas, such as coarse soils or areas where the water table is near the surface. Be aware of herbicide properties that increase the risk of contamination.

Trade names for herbicides are used in this publication to aid reader recognition. The common name is also listed and is used for herbicides 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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SOUTH DAKOTA STATE UNIVERSITY®
AGRONOMY, HORTICULTURE & PLANT SCIENCE DEPARTMENT

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HERBICIDE SUGGESTIONS:

Early competition, especially from grass, is critical for successfully controlling weeds in sorghum. There are preemergence as well as postemergence herbicides available for this crop. Early treatment provides the best control of broadleaved weeds with crop stage also being a critical factor for some postemergence treatments.

Grain sorghum works well in no-till systems. Herbicides to burn down existing weeds or residual treatments are useful. Early preplant and planting-time combinations for no-till are included in several sections of this publication.

Information in this publication is based on South Dakota Agricultural Experiment Station research and other research and observations. An herbicide is included only after the chemical is registered by the Environmental Protection Agency (EPA). This information provides a summary of uses and does not imply a guarantee or responsibility for results, and the label should always be used as the final guide.

RATES:

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

HERBICIDE COST:

The costs per acre for low and high rates are listed, however it does not include the cost of additives. Price does not reflect special marketing programs; always consult your dealer for actual price.

RESISTANCE MANAGEMENT:

The table on page 2 contains 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 towards 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.

ABBREVIATIONS AND DEFINITIONS:

EPPS=Early Preplant Surface: Applications usually 2 to 6 weeks before planting in no-till situations.
PPS=Preplant Surface: Prior to planting
SPPI=Shallow Preplant Incorporated: Preplant incorporated, but usually restricted to the top 2 inches of soil with single-pass incorporation.
PPI=Preplant Incorporated: Incorporated before the crop is planted.
PRE=Preemergence: After planting but before crop or weeds emerge.
EPOST=Early Postemergence: After initial emergence of crop or weeds.
POST=Postemergence: After the crop or weeds have emerged.

ae=acid equivalent
ai=active ingredient
gal=gallon
gpa=gallons per acre
lb=pound
oz=ounce
pt=pint
qt=quart
% v/v=percent volume per volume

AMS=ammonium sulfate
COC=crop oil concentrate
DF, DG, SG, WDG=dry sprayable
L=liquid
MSO=methylated seed oil
NIS=nonionic surfactant
UAN=urea+ammonium nitrate liquid fertilizer
WSP=water soluble packet

Group Numbers Associated with Herbicide Sites or Modes of Action

WSSA Group Number	Site of Mode of Action	Examples
2	ALS inhibitor	prosulfuron, halosulfuron
3	Microtubule inhibitor	pendimethalin
4	Growth regulator	2,4-D, dicamba
5	Photosynthesis inhibitor (triazine, triazinone)	atrazine
6	Photosynthesis inhibitor (contact)	bentazon, bromoxynil
9	EPSP inhibitor	glyphosate
14	Cell membrane disrupter (PPO inhibitor)	carfentrazone
15	Seedling shoot inhibitor	acetochlor, metolachlor
22	Cell membrane disrupter (PSI inhibitor)	paraquat
27	Bleacher (HPPD)	mesotrione

SORGHUM HERBICIDES

S-METOLACHLOR PRODUCTS *(s-metolachlor)* Site of Action: 15 ($ 7.80-28.60)

1-1.67 pt Dual Magnum, Brawl, Charger Basic, EverpreX, Medal 7.62L (1-1.6 lb ai)
1-1.67 pt Dual II Magnum, Brawl II, Charger Max, Cinch, Ladem, Medal II 7.64L (1-1.6 lb ai)

Grain and forage sorghum. Concep safened seed is required. It provides very good control of several annual grasses. Fair on pigweed, it does not control most other broadleaves. Rainfall is required. Good crop tolerance when using safened seed. Rates of 1.33 to 1.67 pt per acre have been satisfactory in SDSU tests on heavy soil. Minimum carrier is 5 gpa for ground or 2 gpa for air. Granules not labeled.

EPPS. In minimum or no-till apply 2/3 of the herbicide early preplant and the remainder at planting if treating 30 to 45 days prior. Use a split or single application if treating less than 30 days before planting. On coarse soils, apply 1.33 pt/A no earlier than 2 weeks prior to planting.

SPPI. Usually more consistent than preemergence application. Incorporate into top 2 inches within 14 days of planting. Deeper incorporation reduces control.

PRE. Requires 0.5 to 0.75 inch of rain within one week after application.

TANK-MIX It can be tank-mixed with atrazine, except for lister-planted sorghum. Rates vary by soil texture and organic matter. Do not use on coarse soils. Crop injury may occur under cool, wet conditions or on alkaline or calcareous soils when using the higher rates. Note atrazine carryover limitations.

Can also be tank-mixed with Gramoxone, glyphosate, and others for burndown in minimum-till or no-till.

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

1-1.67 pt Me-Too-Lachlor, Parallel PCS, Stalwart, Visor Broadcrop 8L
1-1.67 pt Phenomenon 7.8L (1 - 1.67 lb ai)

Grain and forage sorghum. Herbicide efficacy may be similar to or slightly less than s-metolachlor. Use only where sorghum seed has been treated with a safener (Concep or Screen).

EPPS. In minimum or no-till, for applications 30-45 days before planting, make a split application of 1.5 pt/A, on medium texture soils or 1.67 pt/a on fine textured soils. Apply 2/3 the rate initially and the last 1/3 rate at planting. Applications less than 30 days prior to planting may be split or single applications. On coarse soils, apply 1.33 pt/A no earlier than 2 weeks prior to planting.

SPPI or PRE. Apply 1-1.33 pt/A on coarse texture soil, 1.33-1.5 pt/A on medium texture soil, or 1.33-1.67 pt/A on fine texture soils.

TANK-MIXES May be tank-mixed with atrazine however, when conditions are cool and wet or on highly alkaline soils there is risk of sorghum injury. Do not use on medium texture soil with less than 1.5% OM or on coarse texture soil.

May also tank-mix metolachlor or metolachlor + atrazine with Gramoxone, or glyphosate for applications before, during, or after planting but before sorghum emergence. Rates of the tank-mix partners vary with weed sizes.

PREMIXES

S-METOLACHLOR/METOLACHLOR + ATRAZINE PREMIXES Site of Action: 15 + 5 (Restricted Use Pesticides)

Product Name	s-metolachlor + atrazine lb/gal	metolachlor + atrazine lb/gal	product/A qt	equivalent atrazine/A lb ai	Rate qt/A	
					EPP	SPPI, PRE >1% OM
Bicep II Magnum, Brawl II ATZ, Cinch ATZ, Ladem AT, Medal II ATZ 5.5L	2.4 + 3.1	---	1.6-2.6	1.2-2	2.1-2.6	1.6-2.1
Bicep Lite II Magnum, Charger Max ATZ Lite, Cinch ATZ Lite 6L	3.3 + 2.7	---	1.1-1.9	0.9-1.3	1.5-1.9	1.1-1.5
Triangle	---	3.2 + 2.7	1.6-2.1	1.1-1.4	1.84-2	1.6-2.1
Parallel Plus, Phenomenon Duo	---	2.7 + 2.8	1.9-2.49	1.33-1.7	2.18-2.37	1.9-2.49
SPPI, EPP or PRE. Grain and forage sorghum. Rate based on soil texture and organic matter. Do not use on medium soils with <1% O.M or coarse soils. Note restrictions as for atrazine. Safened seed required.						

LUMAX EZ, LEXAR EZ, or TRIZAR *(s-metolachlor + mesotrione + atrazine)* ($ 50.25-53.70) Site of Action: 15 + 27 + 5 (Restricted Use Pesticide)

2.7 qt Lumax EZ 3.67L (1.7 + 0.17 + 0.63 lb ai)
3 qt Lexar EZ, Trizar 3.7L (1.3 + 0.17 + 1.3 lb ai)

Grain sorghum only. Lexar EZ provides a lower rate of s-metolachlor and a higher rate of atrazine compared to Lumax EZ. Controls several grass and broadleaf weed species, such as foxtails, witchgrass, lambsquarters, pigweed, velvetleaf, wild buckwheat, horseweed (marestail), kochia, and others. Only for use on seed treated with a safener such as Concep III. Do not apply on sandy soils.

For foliar activity on emerged weeds, add NIS at 0.25% v/v or COC at 1% v/v. A nitrogen product, such as AMS (8.5 lb per 100 gallons) or UAN (2.5% v/v) may also be added. Corn and grain sorghum can be planted anytime. If applied before June 1 corn, small grains, soybeans, or sorghum may be planted the following spring. For Lumax EZ, winter wheat, barley, or rye can be planted after 4.5 months. Most other crops can be planted after 18 months. If the combined atrazine rate was greater than 2 lb ai/A allow 18 months for soybeans or injury may occur. Atrazine rates exceeding 0.5 lb ai post or 0.75 lb ai preemergence can cause carryover to small grains and broadleaf crops in dry conditions.

EPPS or PRE. Apply from 21 days prior to planting up to preemergence. Applying less than 7 days before planting increases the risk for sorghum injury. Do not apply after sorghum emergence. Do not incorporate.

ZEMAX or PALACE *(s-metolachlor + mesotrione)* Site of Action: 15 + 27

2 qt Zemax or Palace 3.67L (1.67 + 0.165 lb ai)

Grain sorghum only. Only for use on seed treated with a safener such as Concep III. Excellent control of small seeded broadleaves. Good control of velvetleaf and suppression only on kochia. Minimum carrier is 10 GPA for ground application. Not labeled for aerial application. Corn and grain sorghum can be planted anytime. Rotational restrictions are: 4.5 months for barley, oats, rye, and wheat; the following spring for soybeans; and 18 months for most other crops. Do not use on sandy soil.

EPP or PRE. Apply from 21 days prior to planting up to preemergence. Applying less than 7 days before planting increases the risk for sorghum injury. Can be applied as a split application. Do not apply after sorghum emergence. Do not incorporate.

HALEX GT *(s-metolachlor + glyphosate + mesotrione)* Site of Action: 15 + 9 + 27 ($32.00-48.00)

4-6 pt Halex GT 4.39L (1.045-1.57 + 1.045-1.57 + 0.105-0.157 lb ai)

Supplemental label for grain sorghum only. Halex GT contains 2.09 lb ai s-metolachlor, 2.09 lb ae glyphosate and 0.209 lb ai mesotrione per gallon. Only for use on seed treated with a safener such as Concep III. Do not apply on sandy soils.

For foliar activity on emerged weeds add NIS at 0.25-0.5% v/v. May also add AMS at 8.5-17 lb/100 gallons. Minimum carrier is 10 gpa for ground application.

EPP or PRE. Apply from 21 days prior to planting up to preemergence. Applying less than 7 days before planting increases the risk for sorghum injury. Can be applied as a split application. Do not apply after sorghum emergence. Do not incorporate.

WARRANT *(acetochlor)* Site of Action: 15 ($14.75-29.55)

1.5-3 qt Warrant (1.1 - 2.3 lb ai)

Grain and forage sorghum. Must use seed treated with a safener. Rates will vary based on soil texture and organic matter. Apply 1.5 – 2.5 qt/A on coarse texture soil or 1.5 – 3 qt/A on medium or fine texture soil. Provides residual control of several annual grass weed species and some small-seeded broadleaf weed species. Ground applications only. Minimum carrier of 10 gpa.

SPPI, PRE. Requires rain prior to weed emergence.

POST. May apply to sorghum up to 11 inches tall (5-6 leaf stage). Do not use liquid fertilizer as a carrier.

PREMIX

DEGREE XTRA or FULTIME NXT *(acetochlor + atrazine)* Site of Action: 15 + 5 ($ 23.15-45.95) (Restricted Use Pesticide)

2-3.7 qt Degree Xtra or FulTime NXT (1.35 - 2.5 + 0.67 - 1.2 lb ai)

Grain sorghum. Must use seed treated with a safener. Rates will vary based on soil texture and organic matter. Apply 2 – 2.9 qt/A on coarse texture soil or 2 – 3.7 qt/A on medium or fine texture soil. Controls several annual grass weed species and some annual broadleaf weed species. Products are encapsulated formulations of acetochlor that are released as temperatures rise above 50°F. Ground applications only. Minimum carrier of 10 gpa.

SPPI, PRE. Do not apply preplant incorporated on coarse or medium texture soil.

POST. May apply to sorghum up to 11 inches tall (5-6 leaf stage).

OUTLOOK OR SLIDER *(dimethenamid-p)* Site of Action: 15 ($14.35-25.10)

12-21 oz Outlook or Slider 6L (0.56 – 0.98 lb ai)

Grain sorghum. Chemically related to Dual. Chloroacetamide safener must be applied on the seed. Very good control of several annual grasses; sandbur and wild proso millet are partially controlled. Fair to good control of annual broadleaves such as pigweed or black nightshade if conditions are favorable. Crop tolerance appears adequate under conditions in SDSU tests. Temporary stunting or leaf wrapping may occur under high soil moisture and cool conditions.

Higher rates are for fine-textured soils and soils over 3% OM. Use 12 oz per acre Outlook in coarse textured soils. For grain sorghum produced under irrigation, use a minimum of 13 oz Outlook per acre. Do not apply to coarse soil (sand) with less than 3% OM and where groundwater is 30 feet or less below the surface. Reduced rates of 8-16 oz (depending on soil type) may be used to provide partial control when combined with sequential herbicide applications. Minimum carrier is 5 gpa for ground or 2 gpa for air equipment. There are no rotational crop restrictions for the next season. Winter wheat can be planted 4 months after application. Grain sorghum forage may be grazed or fed 60 days after application. Grain and fodder may be harvested and fed 80 days after application.

EPPS. For reduced or no-till systems. May be applied up to 45 days before planting; use the highest rate in the range for soil type. 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 shallowly into the top 1 to 2 inches. Avoid deep incorporation.

PRE. Requires rain prior to weed emergence.

POST. Apply to sorghum up to 12 inches.

TANK-MIX. May be tank-mixed with Gramoxone, glyphosate, and dicamba products for burndown. Additional tank-mixes include atrazine, Verdict, Sharpen and others. Check individual labels for rates and restrictions.

PREMIX

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

Grain sorghum. Use 2 to 3.5 pt premix containing 2.25 lb dimethenamid-p (Outlook) plus 2.75 lb atrazine/gal.

PPS, SPPI, PRE, or POST. Apply as for Outlook to sorghum up to 12 inches. Best results with soil application.

PENDIMETHALIN PRODUCTS *(pendimethalin)* Site of Action: 3 ($10.50-23.00)

2.4-3.6 pt Acumen, Framework, PendiPro, Prowl 3.3EC or Stealth 3.3L (1 - 1.5 lb ai)
2.2-3.3 pt Satellite Flex 3.5L
2-3 pt Prowl H2O or Satellite Hydrocap 3.8L (0.95 - 1.4 lb ai)

Good control of several annual grass weed species and some small-seeded broadleaf weed species, such as kochia, pigweed, and common lambsquarters. Application options in sorghum are restricted.

POST. Apply only postemergence with incorporation (cultispray) in grain sorghum. Movement of soil to

the base of sorghum plants will minimize pendimethalin contact with brace roots. Serious injury can result if applied preplant incorporated or preemergence. May be applied from 4 inch tall sorghum to the last cultivation.

ATRAZINE *(atrazine)* Site of Action: 5 (Restricted Use Pesticide) ($ 3.80-8.90)

2.4- 4 pt atrazine 4L
1.3-2.2 lb atrazine 90DF (1.2 - 2 lb ai)

Grain and forage sorghum, sorghum-sudan hybrids. Excellent control of small-seeded annual broadleaves. Good control of large- seeded annual broadleaves. Poor to fair control of annual grasses. Fair crop tolerance on heavy soils. Risk of injury greatest on light, low-organic-matter soil and under cold, wet conditions. Stands may be reduced. Do not use on sandy soil.

Minimum carrier for ground application is 10 gpa. Minimum carrier is 1 qt for each quart of 4L or 1 gallon for each pound of dry formulation for aerial preplant or preemergence application. Minimum carrier is 2 gpa for postemergence aerial applications.

Corn or sorghum may be planted the following year. Lower rate used in combinations reduces carryover, but may still damage susceptible crops. Not for furrow-planted crops. Do not graze or feed forage for 21 days after application.

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 at "highly erodible soils" (HEL) if there is less than 30% residue. The maximum postemergence atrazine rate is 2 lb ai per acre on fields with no soil-applied atrazine in the same year. Do not exceed 2.5 lb ai per acre per season.

A 66-foot buffer setback is required on HEL land. Atrazine cannot be applied within 66 feet of points where surface water enters streams or rivers or within 200 feet of lakes or reservoirs or loaded or applied within 50 feet of a well or sinkhole.

EPPS. 3.25-4 pt 4L or 1.8-2.2 lb DF Apply 2/3 of the usual rate 30 to 45 days before planting and the remainder at planting. Applications less than 30 days before planting may be applied as a split or single application. Excellent broadleaf control.

SPPI. 3.25-4 pt 4L or 1.8-2.2 lb DF Apply within 2 weeks of planting and incorporate into the top 2 inches. Most consistent application.

PRE. 3.25-4 pt 4L or 1.8-2.2 lb DF Requires 0.75 to 1 inch of rain within one week of application. Less consistent than preplant.

EPOST. 4 pt 4L or 2.2 lb DF Without oil. Crop completely emerged to 12 inches high. Slightly better crop tolerance but less consistent weed control than with oil.

EPOST with OIL. 2.4 pt 4L or 1.3 lb DF Apply when crop is in 3-leaf to 12-inch stage. Intended for annual broadleaves less than 4 inches high. Fair crop tolerance. Greatest risk is on lighter, low-organic-matter soil and under wet, cold conditions. Stands can be reduced. Do not use on sandy soil. Add emulsifiable oil at 1 gal/A for ground applications or 0.5 gal/A for aerial applications. COC at 1 qt/A may be used for ground application. Do not use liquid fertilizer carrier.

WHEAT-SORGHUM FALLOW. 4 pt 4L or 2.2 lb DF Apply atrazine in wheat stubble as soon as possible after wheat harvest. Lower rate (1-1.5 lb/A ai) has provided short-term control when risk of carryover must be minimized. Maximum of 1 lb ai per acre suggested if pH exceeds 7.5.

MILO-PRO *(propazine)* Site of Action: 5 (Restricted Use Pesticide)

0.5-1.2 qt Milo-Pro 4L (0.5-1.2 lb ai)

Grain sorghum only. Good kochia, mustard, pigweed and lambsquarters control. Does not control grasses. Rates depend on soil type.

May be tank-mixed with other herbicides but not with atrazine or products that contain atrazine. Rotation restrictions are 4 months for small grains, 12 months for corn, and 18 months for all other crops. Minimum carrier is 3 gpa for aerial applications or 10 gpa for ground applications. Do not chop for 70 days. Do not harvest stover or grain for 90 days.

EPPS. May be applied up to 4 weeks before planting.

PRE. Apply at planting but before sorghum emergence. Will not control emerged weeds.

SHARPEN *(saflufenacil)* Site of Action: 14 ($ 6.75-13.50)

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

Grain sorghum only. May be used to enhance foliar activity during burndown or preemergence applications and provide about 2-4 weeks of residual weed control. Has activity on broadleaf weed species such as wild buckwheat, common lambsquarters, waterhemp, pigweed, mustard species, horseweed (marestail), cocklebur, and several others.

Some sorghum varieties may be sensitive. After application, at least 0.5 inch of rain is needed to activate the herbicide in the soil. Do not apply more than 1 oz within 30 days of planting in fields with organophosphate or carbamate insecticides applied at planting. More flexible rotation options than atrazine. Crop rotation restriction is 5 months or less for most crops. May tank mix with glyphosate, atrazine, Outlook, Clarity or other herbicides for control of grass and additional broadleaf weed species.

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 5 gpa for ground applications or 3 gpa for aerial applications.

EPPS or PRE. Do not apply after sorghum emergence.

PREMIX

VERDICT *(saflufenacil + dimethenamid)* Site of Action: 14 + 15 ($19.30-34.80)

10-18 oz Verdict 5.57L (0.04 - 0.08 + 0.39 – 0.7 lb ai)

Grain sorghum. Seed must be treated with a chloroacetamide safener. Do not use on soils with less than 1.5% organic matter. Apply 10-12 oz/A on coarse soils, 13-15 oz/A on medium texture soils, or 16-18 oz/A on fine texture soil. May have some foliar activity on weeds and short-term residual activity. Do not use organophosphate or carbamate insecticides at planting. May rotate to fall seeded cereals in 4 months. No planting restrictions the following spring. In replant situations soybeans may be planted in 1-4 months. Add tank mix partner, such as atrazine, if longer residual activity is desired. Use additives as for Sharpen.

PPS, PPI, or PRE. May apply up to 14 days prior to planting. If incorporating, mix only in to the upper 1-2 inches of the soil surface. Applications must be made prior to sorghum emergence to avoid crop injury.

MESOTRIONE PRODUCTS *(mesotrione)* Site of Action: 27 ($3.55-16.50)

3-6.4 oz Callisto, Argos, Explorer, Incinerate, Meso Star, Mesotrione, or Motif 4L (0.09 – 0.20 lb ai)

Grain sorghum. Provides residual activity on several broadleaf weed species and suppression of crabgrass. Also has foliar activity if weeds are emerged at the time of application. Callisto is sometimes referred to as a "bleacher" herbicide because it can whiten weed leaves. Tank mixing with atrazine will improve wild buckwheat control and provide more consistent weed control. Do not apply more than 6.4 oz/A total per year. Do not use on coarse textured soils.

EPP or PRE. Apply 6-6.4 oz. Do not apply after sorghum emergence. May apply up to 21 days prior to sorghum planting. Do not incorporate. Applications less than 7 days prior to planting increase the risk of sorghum injury if excessive moisture washes Callisto into the soil. Injury symptoms may include whitening or bleaching of the sorghum leaves.

POST-DIRECTED. Apply 3 oz as a post-directed spray to the base of the crop after the sorghum is at least 8 inches tall. Add NIS at 0.25% v/v or COC at 1% v/v. May also add UAN at 2.5% v/v or AMS at 8.5 lb/100 gals. Apply before seedhead has begun to emerge. Do not harvest for forage for 30 days or harvest grain or stover for 60 days.

2,4-D Site of Action: 4 ($ 0.90-2.70)

0.25-0.75 lb ae 2,4-D amine
0.25-0.5 lb ae 2,4-D ester

Grain and forage sorghum. For annual or perennial broadleaf weeds. Very good control of several annual broadleaves such as sunflower or Russian thistle. Erratic on pigweed under dry conditions. Poor on kochia. Marginal crop tolerance. Small weeds may be controlled by lower rates than listed on labels. Some labels provide for higher rates to improve perennial weed control; however, users must assume increased injury risk.

Labels for 2,4-D vary. Sorghum is being interpreted by some labelers to include all forage types. Some labels include applications of 2 lb ae per acre after the dough stage as a harvest aid for grain sorghum. Consult product label.

POST. Apply when crop is 5 to 12 inches high from soil to tip of whorl leaf. Tolerance is best at the early stage. Treating at early emergence may inhibit root development and cause lodging; later spraying may cause poor seed development. Use drop nozzles after the crop is 8 inches high to minimize injury.

DICAMBA PRODUCTS *(dicamba)* Site of Action: 4 (Restricted Use Pesticides) ($ 2.55-6.75)

There are several dicamba products available, including **Banvel, Banvel 480, Clarity, Clash, Detonate, Diablo, Engenia, Fexapan, Rifle, Sterling Blue, Strut, Vision, Xtendimax**, and **others**. Refer to specific product label.

0.5 pt dicamba 4L (0.25 lb ae)
6.4 oz Engenia 5L
11 oz Fexapan or Xtendimax 2.9L

Grain sorghum. Very good control of annual broadleaves. Especially effective on kochia and pigweed. Fair to marginal crop tolerance. Maximum rate is 0.25 lb ae per acre. Lower rates (0.33 pt) improve crop tolerance

and may be adequate for small weeds. Minimum carrier for 4L products is 5 gpa for ground and 3 gpa for air. Minimum carrier for Engenia, Fexapan and Xtendimax is 15 gpa for ground. Aerial application is not allowed for Engenia, Fexapan, and Xtendimax. Do not add surfactant.

EPPS. Apply at least 15 days before planting.

POST. Best time to apply is the 3- to 5-leaf stage, usually within 25 days after planting. Use drop nozzles after crop is 8 inches. Do not apply after 15 inches. Injury may be severe if applied late. Do not harvest for forage before mature grain stage.

TANK-MIX. May be applied sequentially or tank-mixed with several sorghum herbicides including atrazine and bromoxynil.

PREMIX

DICAMBA + 2,4-D PRODUCTS *(dicamba + 2,4-D amine)* Site of Action: 4 + 4 ($ 3.80-4.30)

1 pt Spitfire 3.57L or Brash, Range Star, Weedmaster, or Rifle-D 3.87L
0.66 pt Brush-Rhap 4.2L

Best control when weeds are small (less than 3 inches tall). Application during periods of rapid growth may result in temporary plant leaning. Sorghum may be most sensitive to injury if applied during stressful conditions, such as high moisture, low fertility, or abnormal temperatures.

Recommended carrier rate is 5-40 gpa for broadcast applications, 3-10 gpa for aerial applications. Use greater volumes when applying to dense vegetation. Do not use surfactants or oils. Do not apply to sorghum grown for seed production.

POST. Apply in the 3-5 leaf stage (4-8 inches tall).

TANK-MIX. Tank-mix partners may include atrazine, Basagran, bromoxynil, quinclorac, Peak, and Permit.

STARANE ULTRA OR COMET *(fluroxypyr)* Site of Action: 4 ($14.15)

0.66 pt Comet 1.5L (0.13 lb ae)
0.4 pt Starane Ultra 2.8L (0.14 lb ae)

For control of broadleaf weeds such as kochia (including ALS resistant), common ragweed, puncturevine, and sunflower. Apply while weeds are actively growing but before they are 8 inches tall. May be tank-mixed with several other herbicides labeled for sorghum.

Do not make more than 2 applications per season or apply more than 0.7 pt/A (Starane Ultra) or 1.33 pt/A (Comet) per season. Do not graze or harvest for forage within 40 days after application. Do not harvest grain or use stover for 70 days.

BURNDOWN/PRE. May be tank-mixed for burndown application after weed emergence but prior to sorghum emergence. Fluroxypyr does not provide residual weed control.

POST. Make broadcast applications between the 3 and 7 leaf stage of sorghum. Drop nozzles may be used between the 8 leaf stage and boot. Do not apply after the boot stage.

PREMIXES

STARANE NXT *(fluroxypyr + bromoxynil)* Site of Action: 4 + 6 ($14.90)

21 oz Starane NXT 2.9L (0.096 + 0.38 lb ai)

Grain and forage sorghum. Good control of kochia, wild buckwheat, and other small seeded broadleaves. May be tank mixed with dicamba and 2,4-D but may cause stalk brittleness. Minimum spray volume is 8 gpa for ground and 3 gpa for aerial applications. Do not make more than one application per year. Spray additives may cause excessive leaf burn. Do not harvest straw, harvest grain or graze for 45 days. Any crop may be planted after 4 months.

POST. Apply from the 4-lf to 7-lf stage. Use drop nozzles from the 8-lf to pre-boot stage.

KOCHIAVORE *(fluroxypyr + bromoxynil + 2,4-D)* Site of Action: 4 + 6 + 4 ($8.05-12.10)

1-1.5 pt Kochiavore 4L (0.08-0.125 + 0.21-0.31 + 0.21-0.31 lb ae)

Grain and forage sorghum. For control of several common broadleaf weed species, such as wild buckwheat, kochia, mustards, lambsquarters, prickly lettuce, common ragweed, and several others.

Minimum carrier is 5 gpa for ground and 3 gpa for aerial applications. Do not apply when wind speeds exceed 15 mph. Do not tank- mix with atrazine or add adjuvants. Do not graze or harvest forage or fodder within 45 days after application. Do not harvest within 70 days of application. Make only one application per growing season. Some varieties are sensitive to 2,4-D and crop response may be increased by high moisture and temperature conditions.

POST. Apply from V4 but prior to pre-boot stage. From the V8 to pre-boot stage, use drop nozzles to reduce crop injury potential.

TRUMP CARD *(fluroxypyr + 2,4-D)* Site of Action: 4 + 4 ($10.30-30.95)

1-3 pt Trump Card 3.31L (0.08-0.248 + 0.33-1 lb ai)

Grain sorghum. Premix containing 0.66 lb ae fluroxypyr (Starane) and 2.65 lb ae 2,4-D per gallon. Minimum carrier is 3 gpa for air and 10 gpa for ground. Do not apply more than once per crop season. Do not graze or harvest for forage for 40 days or harvest for 70 days after application.

PRE. Apply 1.5-3 pt to emerged weeds after planting but prior to crop emergence for no-till or burndown.

POST. Apply 1-2.5 pt when sorghum is 6 to 15 inches tall. When sorghum is taller than 8 inches, use drop nozzles and keep spray off crop foliage.

SCORCH *(fluroxypyr + 2,4-D + dicamba)* Site of Action: 4 + 4 + 4 ($7.55-9.85)

1-1.3 pt Scorch 4.77L (0.094-0.122 + 0.38-0.49 + 0.125-0.163 lb ai)

Grain and forage sorghum. Premix containing 0.75 lb fluroxypyr (Starane) and 3.02 lb 2,4-D and 1 lb dicamba. Minimum carrier is 3 gpa for air or 5 gpa for ground. Do not add surfactants or oils. Do not graze or harvest for forage for 40 days or harvest for 70 days after application. Do not apply more than once per crop season.

POST. Apply 1-1.3 pt from the 3-5 leaf stage (4-8 in tall). For best results apply when weeds are small (<3 inches).

BROMOXYNIL PRODUCTS *(bromoxynil)* Site of Action: 6 ($ 4.40-11.35)

1-1.5 pt Broclean, Brox, Maestro, Moxy 2L (0.25 - 0.38 lb ae)

Grain and forage sorghum. Most effective on small weeds. Very good to excellent control of sunflower, cocklebur, and wild buckwheat. Good control has been noted on small, actively growing kochia. Weak on pigweed. Does not control grasses or eliminate perennials. Apply bromoxynil before weeds exceed the most susceptible stage; cocklebur (8 inches), sunflower (6 inches), or wild buckwheat (6 inches). Less susceptible weeds like pigweed, velvetleaf, and wild mustard require the higher rate and must be treated before they reach 2 to 4 inches.

Excellent crop safety. Does not cause lodging. Some leaf burn may be noted under warm, humid conditions. Contact herbicide, coverage important. Minimum carrier is 10 gpa for ground or 5 gpa for air; 5 gpa for ground or 3 gpa for air may be used if coverage is adequate with small weeds or low densities. Do not cut for feed or graze treated areas for 30 days after application.

PRE. Apply anytime before planting to crop emergence. Does not provide residual weed control.

POST. Weeds must be emerged. Apply when sorghum is at the 3-leaf to boot stage. The crop should have reached the 4-leaf stage for the high rates.

TANK-MIXES. May be tank-mixed with atrazine, dicamba and 2,4-D. Tank-mixes with dicamba or 2,4-D provide additional perennial broadleaf weed control.

PREMIXES

BROZINE *(bromoxynil + atrazine)* Site of Action: 6 + 5 (Restricted Use Pesticide)

1.5-3 pt Brozine (0.1875-0.375 + 0.375-0.75 lb ai)

Grain and forage sorghum. Premix contains 1 lb bromoxynil plus 2 lb atrazine per gallon. Rate is 1.5 to 3 pt product/A, which is equivalent to 0.75-1.5 pt/A bromoxynil 2L and 0.75- 1.5 pt/A atrazine 4L. Apply preemergence before planting to before crop emergence or postemergence from 3 lf up to 12 inches. Note restrictions and precautions as for bromoxynil and atrazine.

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

0.75-1.1 pt Deadbolt (0.234-0.343 + 0.293-0.43 lb ai)

Grain and forage sorghum. Premix contains 2.5 lb bromoxynil plus 3.125 lb 2,4-D per gallon. Rate is 0.75-1.1 pt product/A, which is equivalent to 0.9-1.3 pt bromoxynil 2L and 0.75-0.9 pt 2,4-D ester 4L

POST. Apply from 3 leaf to pre-boot or 15 inches. Use drop nozzles for sorghum over 8 inches. Note restrictions and precautions as for bromoxynil and 2,4-D ester.

HUSKIE *(pyrasulfotole + bromoxynil)* Site of Action: 6 + 27 ($11.80-14.70)

12.8-16 oz Huskie 2.06L (0.031-0.039 + 0.175-0.22 lb ai)

Grain and forage sorghum. Most effective on small weeds up to 4 inches. Provides good control of kochia, Russian thistle, mustards, lambsquarters, wild buckwheat, and several other small seeded broadleaves.

Some temporary leaf burn may occur. Hot and humid conditions may increase crop response. For improved weed control in challenging conditions add 1 lb/A AMS. NIS (0.25% v/v) or HSOC (0.5% v/v) may also be included under arid conditions. Ground application only. Minimum carrier is 10 gpa. Rainfast in one hour. Crop

injury may occur if mesotrione (Callisto, Lumax, etc) products were previously applied.

Crop rotation restrictions are: 1 month for wheat, barley, sorghum, oats, rye, and triticale; 4 months for alfalfa, corn, millet, and soybeans; and 9 months for canola, chickpeas, drybeans, flax, peas, mustards, safflower, and sunflowers. Check label for rainfall restrictions and additional crops.

POST. Apply from 3-lf stage up to 30 inches or before flag leaf emergence (whichever occurs first).

TANK-MIXES. Can be tank-mixed with atrazine for added control. Huskie plus atrazine may be tank-mixed with 2,4-D or dicamba. Huskie may also be tank mixed with other products including; Bicep II Magnum, Dual II Magnum, Outlook, Starane, and Warrant.

BASAGRAN, BASHAZON OR BROADLOOM *(bentazon)* Site of Action: 6 ($6.85-15.75)

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

Grain and forage sorghum. Excellent control of cocklebur. Very good control of small sunflower. Weak on pigweed and kochia. Contact herbicide. Excellent crop tolerance. Use 1 qt COC and 2 qt 28% N per acre in minimum of 20 gpa for ground; reduce 28% N to 1 pt per acre in a minimum of 5 gpa for air. Coverage important. Do not graze treated fields for 12 days.

POST. Usually applied at the 1- to 5-leaf stage. Do not apply to heading or blooming sorghum.

TANK-MIXES. May be tank-mixed with atrazine, dicamba, Outlook, and quinclorac (Facet).

PERMIT, HALOMAX 75, HERBIVORE, OR PROFINE *(halosulfuron)* Site of Action: 2 ($12.25-23.50)

0.67-1 oz Permit, Halomax 75, Herbivore, or Profine 75WDG (0.032 – 0.047 lb ai)

Grain sorghum. Permit provides very good to excellent control of cocklebur, sunflower, common ragweed, and velvetleaf. It also controls non-ALS kochia and smartweed. Labeling includes cocklebur and velvetleaf up to 9 inches; sunflower to 12 inches.

Lambsquarters control is variable. Suppression activity on milkweed has been noted. There is no activity on annual grasses. Crop tolerance is considered adequate; slight stunting and delay has been noted as the result of early, cold stress conditions.

NIS is recommended; however other adjuvants vary by product, consult individual label. Minimum carrier is 10-15 gpa for ground application and 3 gpa for aerial application. COC may be used in place of surfactant.

Treated fields may be replanted or rotated to corn (1 month); barley, wheat, oats, forage grasses, sorghum or proso millet (2 months); alfalfa, peas, or soybean (9 months); or sunflower (18 months). Do not graze or harvest for forage for 30 days after application.

POST. Apply from the 2-leaf but before head emergence.

TANK-MIXES. Can be tank-mixed with atrazine, bromoxynil, 2,4-D and others.

PREMIX

YUKON *(halosulfuron + dicamba)* Site of Action: 2 + 4 ($15.95-23.95)

Grain sorghum. Premix containing 12.5% halosulfuron (Permit) plus 55% sodium salt of dicamba. Effective

for kochia, lambsquarters, pigweed, ragweed and others. Temporary injury may occur under stressful conditions but the crop will recover under normal conditions.

POST. Apply 4-6 oz to 2-lf to 15 inch sorghum. Apply at 3- to 5-leaf stage for best crop safety. Use drop nozzles after 8 inches. Yukon may be tank-mixed with atrazine.

GAMBIT *(halosulfuron + prosulfuron)* Site of Action: 2 + 2

1-1.5 oz Gambit 79DF (0.031-0.047 + 0.018-0.027 lb ai)

Grain sorghum. Premix containing 50% halosulfuron (Permit) and 29% prosulfuron (Peak).

Minimum carrier is 10 gpa for ground and 3 gpa for aerial application. NIS at 0.25-0.5% v/v is required. May substitute COC or MSO at 1% v/v for NIS. May also add AMS (2-4 lb/A) or 28% N (2-4 qt/A). Allow 30 days before grazing or harvesting forage or silage. Do not apply within 10 days before or 7 days after an organophosphate application. Follow rotational crop guidelines.

POST. Apply from the 2-leaf but before head emergence. Apply to small (1-3 inches) actively growing broadleaf weeds.

TANK-MIXES. Can be tank-mixed with atrazine, bromoxynil, and 2,4-D.

PEAK *(prosulfuron)* Site of Action: 2 ($ 9.05-18.10)

0.5-1 oz Peak 57DF (0.018-0.036 lb ai)

Grain sorghum. Sulfonyl-urea (ALS) herbicide. Peak gives good to very good control of several annual broadleaf weeds including pigweed, lambsquarters, kochia (non-ALS), sunflower, and Russian thistle. Crop tolerance is adequate. Weeds should be small for best results.

Minimum carrier is 5 gpa for ground or 2 gpa for air. Add NIS at 0.25-0.5 %v/v or COC at 1 to 4 pt/A. UAN (0.5-1 gal/A) or AMS (2 lb/A) may also be added to enhance activity. Rate is 0.5 to 1 oz Peak per acre; 0.75 oz is suggested for most situations. Use the low rate (0.5 oz) in tank-mixes for small weeds.

Crop rotation guidelines include soil pH and application dates. Carryover is extended on high pH. Corn, grain sorghum, small grain, and proso millet may be planted the following year when using the low rate and following guidelines.

POST. Apply from 5 to 30 inches but prior to head emergence. Crop tolerance is less at earlier stages.

TANK-MIXES. Combinations using the lower rate of Peak with other herbicides improve consistency for several weeds. Lower rates of Peak reduce carryover risk. Several tank-mixes include dicamba, 2,4-D, atrazine, bromoxynil, and bromoxynil + atrazine. Follow crop stage guidelines for each product. Only NIS additive is used with tank-mixes; except COC may be used with atrazine. Crop tolerance will be reduced with some combinations that include growth regulator products with surfactant additives.

AIM *(carfentrazone)* Site of Action: 14 ($ 3.05-6.05)

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

Grain and forage sorghum. For annual broadleaf weeds. Aim gives very good to excellent control of kochia (including ALS resistant) and velvetleaf. It also controls black nightshade, pigweed, and lambsquarters.

Apply before weeds exceed 2 to 4 inches. Crop tolerance is adequate; however application to wet foliage or during stress such as cool, cloudy, or wet weather increases foliar response. Drop nozzles may be used. Minimum carrier is 10 gpa for ground or 3 gpa for air. Add NIS at 2 pt/100 gal. No rotation restriction for labeled crops; 30 day interval for others.

BURNDOWN/FALLOW. Apply 0.5 to 1 oz per acre with NIS or COC as a post harvest fallow or burndown prior to planting. Add NIS at 2 pt/100 gal or COC at 1.5 to 2 pt/A. For annual weeds up to 4 inches tall or rosettes less than 3 inches.

POST. Grain sorghum only. Apply 0.5 oz from 4 inch but prior to boot stage.

TANK-MIXES. Aim may be tank-mixed with several labeled herbicides including dicamba, quinclorac, Peak, or Permit.

QUINSTAR OR FACET *(quinclorac)* Site of Action: 4 ($ 12.50-31.15)

0.5-0.75 pt QuinStar 3.8L (0.24 - 0.36 lb ai)
22-32 oz Facet L 1.5L (0.26 - 0.37 lb ai)

Grain and forage sorghum. Foxtail control has been good in SDSU tests. Field bindweed is also controlled. There is activity on annual broadleaf weeds such as kochia, lambsquarters, sunflower, and Russian thistle. Weed control, especially for annual broadleaves, has been most consistent when used in a tank-mix with atrazine. The higher rates improve bindweed stand reduction. Treat foxtail before it exceeds 1 to 2 inches. Drought stress reduces activity. Crop tolerance has been adequate.

Minimum carrier is 5 to 30 gpa for ground equipment. Good coverage is important. Add MSO at 1 to 2 pt or COC at 2 pt plus 2 to 4 qt 28% N or 2.5 lb AMS per acre. Following a crop failure spring or winter wheat or sorghum may be planted immediately. Do not plant alfalfa, flax, peas, and lentils, and several solanaceous crops for 24 months and complete a bioassay. Other crops may be planted after 10 months.

FALLOW. May be applied in fallow prior to planting wheat or sorghum.

POST. Apply from emergence to 12 inch sorghum. Avoid drift.

TANK-MIXES. Tank-mixes improve annual broadleaf control and provide burndown in no-till systems. Quinclorac can be tank-mixed with atrazine, 2,4-D, Clarity, bromoxynil or Peak when used postemergence in sorghum. Crop tolerance is reduced with some combinations.

PARAQUAT PRODUCTS *(paraquat)* Site of Action: 22 (Restricted Use Pesticide) ($ 2.55-6.90)

1-2 pt Gramoxone or Cyclone 2L (0.25-0.5 lb ai)
0.7-1.3 pt Bonedry, Devour, Firestorm, Helmquat, Paraquat, Para-Shot 3.0, Parazone 3L

HOODED or DIRECTED SPRAY. Grain sorghum. Nonselective, no residual. Controls emerged weeds between the rows. Hooded or shielded sprayers should have wheels or skids to maintain uniform height. Directed spray without hood or shield has greater risk of crop injury; sorghum must be 12 inches. Maximum pressure is 30 psi. No more than the lower 3 inches of the sorghum stalk may be contacted. Minimum carrier is 10 gpa. Add NIS at 0.25% v/v or COC at 1% v/v. Weeds should be less than 6 inches. Some visual crop speckling should be expected. Allow 20 days for forage or 48 days before harvesting grain.

HERBICIDE RESISTANT SORGHUM

Herbicide for use only on herbicide resistant sorghum is listed in this section. Herbicides listed for standard sorghum may also be used in weed control programs for herbicide resistant sorghum.

ZEST *(nicosulfuron)* Site of Action: 2

0.67-1.33 oz Zest 75WDG (0.032-0.063 lb ai)

Grain sorghum. May only be applied to sorghum containing the INZEN herbicide tolerance trait. Zest provides control of some annual and perennial grass and annual broadleaf weeds. Crop tolerance is good. Some temporary yellow flash may occur.

Minimum carrier is 10-15 gpa for ground and 3 gpa for aerial application. Must add up to 1% v/v COC (2% for arid conditions or 0.5% for aerial) or up to 0.25% v/v NIS (0.5% for arid conditions). Add 2 qt/A 28% N or 2 lb/A AMS.

Do not make more than 2 applications or exceed 0.084 lb ai nicosulfuron per year. Grain sorghum forage may be grazed or fed once the crop has reached the soft dough stage. Grain and stover may be harvested at mature grain stage.

Corn can be planted anytime. Crop rotation restrictions following the maximum application rate of 1.33 oz/A are: 0.5 month for soybeans; 4 months for winter cereals; 8 months for spring cereals (barley, oats, rye, wheat); 10 months for dry beans and peas; 12 months for alfalfa; and 18 months for sorghum. Rotational interval for sunflowers is 11-18 months depending on soil pH. Consult label for the 0.67 oz rate as some rotation intervals may be shorter.

POST. Apply to grain sorghum up to 20 inches. Crop tolerance is best from 4-20 inches (5-leaf to flag leaf stage). Allow 7 days between sequential applications.

TANK-MIXES. May be tank-mixed with 2,4-D ester, dicamba, atrazine, and Starane Ultra. Do not use COC when tank-mixing with dicamba or 2,4-D. Some crop injury will occur when tank-mixing with dicamba or 2,4-D. Do not tank-mix with Huskie as it may cause significant grass antagonism and crop injury.

NO-TILL

Grain sorghum works well in reduced- or no-till systems. Several soil-applied herbicides described previously are available for use at planting in minimum-till systems. These systems utilize shallow tillage to destroy emerged weeds at planting. For no-till, residual or contact herbicides replace seedbed tillage operations. Herbicides specifically for no-till grain sorghum are listed in the section below.

PARAQUAT PRODUCTS *(paraquat)* Site of Action: 22 (Restricted Use Pesticide) ($4.75-13.80)

2- 4 pt Gramoxone or Cyclone 2L (0.5-1 lb ai)
1.3-2.7 pt Bonedry, Devour, Firestorm, Helmquat, Paraquat, Para-Shot 3.0, Parazone 3L

BURNDOWN/PRE. Paraquat is a non-selective, non-residual, contact herbicide used at planting in combination with other herbicides in no-till or reduced-tillage systems. Paraquat controls emerged grasses and broadleaves and kills top growth of perennials. Weather and temperature have less effect on

performance than weed size. Weeds under 2 inches usually are controlled by the lower rate; high rate is for larger weeds or dense stands. Apply in a minimum of 10 gpa carrier for ground or 5 gpa for aerial equipment. Add NIS at 0.25% v/v or COC at 1% v/v for ground application. For air, add NIS at 0.25% v/v or 1 pt/A COC. Paraquat is toxic if ingested. Follow handling and safety precautions.

TANK-MIXES. Paraquat products may be tank-mixed with atrazine, 2,4-D and other herbicides used for residual control. Paraquat provides burndown of emerged weeds.

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

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

Glyphosate Concentration	Trade Names	Rate for (0.38-1.5 lb ae/A)	Cost (0.38-1.5 lb ae/A)
3 ae, 4 ai	Abundit Extra, Alecto 41-S Buccaneer (Plus), Credit (41) (41 Extra), Cornerstone (Plus), Envy (Intense), Four Power Plus, GlyFine Plus, Glyfos X-tra, Glyphosate 41, GlyStar Gold, Helosate Plus, Honcho (Plus), Mad Dog (Plus), Makaze (Yield Pro), Rascal Plus, Showdown	16-64 oz	$1.65-8.25
4 ae	Cinco, Cornerstone 5 Plus, Duramax, Durango DMA	18-48 oz	$2.45-8.45
4.5 ae, 5.5 ai	Abundit Edge, Roundup Powermax, Roundup Weathermax, RT3	11-43 oz	$2.25-10.55
4.5 ae, 5.8 ai	Credit Xtreme	11-43 oz	
5 ae	Touchdown HiTech	14-19 oz	

Grain sorghum. Glyphosate is a non-selective, translocated herbicide with no soil residual weed control. It may be applied before planting or at planting before crop emergence. Some products require the addition of NIS; AMS products at the equivalent rate of 8.5 to 17 lb/100 gal are required for most formulations. Check crop use and application directions on the product being used.

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. Daytime temperatures under 65°F. may also reduce activity. Avoid tillage for one day after application.

Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Maximum rate for air is 0.75 lb ae for most products, however some labels allow up to 1.5 lb ae. Use precaution to avoid droplet drift to non-target crops. Follow cleanup procedures to avoid damage from equipment contamination.

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

Formulation	Amount of product for equivalent lb ae			
	0.38 ae	0.75 ae	1.5 ae	3 ae
3 lb ae (4 lb ai)	16 oz	32 oz	64 oz	128 oz
4 lb ae	12 oz	24 oz	48 oz	96 oz
4.5 lb ae (5.5 lb ai)	11 oz	21 oz	43 oz	86 oz
5 lb ae (---)	10 oz	19 oz	38 oz	77 oz

The amount of glyphosate 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 of 3 lb ae product is 16 oz for most small annuals; 12 oz per acre may be adequate for some situations. Use 20 to 24 oz of 3 lb ae per acre for large or most tolerant annuals or for post harvest stubble burndown. Rate of 32 oz of 3 lb ae per acre is for perennials.

SPOT TREATMENT. Apply before heading. Crop will be killed. Not more than 10% of total field area can be treated.

PREHARVEST. Apply after grain is less than 30% moisture. Maximum rate is 2 qt of 3 lb ae per acre. Allow minimum of 7 days before harvest.

TANK-MIX. Glyphosate is frequently used in tank-mix or premix combinations for burndown and residual control. Rates vary depending on glyphosate product and weed size. Apply before planting. Refer to label restrictions.

PREMIXES

FALLOW STAR *(glyphosate + dicamba)* Site of Action: 9 + 4

22- 44 oz Fallow Star 1.6L (0.19-0.38 + 0.09-0.17 lb ae)

BURNDOWN. Grain and forage sorghum. Do not plant for 15 days after application. Rate depends on weeds present and weed size. Carrier volume is 3-10 gpa for ground application and 3-5 gpa for aerial application. Add AMS at 8.5-17 lb per 100 gallons.

SEQUENCE *(glyphosate + s-metolachlor)* Site of Action: 9 + 15 ($15.75-25.15)

BURNDOWN/PRE. Grain and forage sorghum. Sorghum seed must be treated with a safener (Concep). Premix containing 2.25 lb glyphosate and 3 lb s-metolachlor per gallon. Do not apply after sorghum emergence. Rate is 2.5-4 pt/A depending on weeds present and soil texture. May add AMS at 8.5-17 lbs/100 gallons spray solution. Minimum carrier volume is 10 gpa for ground applications or 3 gpa for aerial applications.

EXPERT *(glyphosate + atrazine + s-metolachlor)* Site of Action: 9 + 5 +15 (Restricted Use Pesticide)

BURNDOWN/PRE. Grain and forage sorghum. Sorghum seed must be treated with a safener (Concep). Premix containing 1 lb ai glyphosate plus 2.14 lb atrazine plus 1.74 lb s-metolachlor per gallon. Application rates range from 2.5 to 3.75 qt/A depending on soil texture and organic matter. Apply 3 qt/A on medium texture soil with more than 1.5% O.M., which is equivalent to 24 oz glyphosate 3 lb ae, approximately 1.5 lb atrazine, and 1.4 pt Dual II Magnum. Do not apply on soils with a pH greater than 8. Note atrazine restrictions.

VALOR, OUTFLANK, PANTHER OR TUSCANY *(flumioxazin)* Site of Action: 14 ($ 3.75-10.60)

1-2 oz Valor, Outflank, Panther or Tuscany 51DF (0.032-0.064 lb ai)
1-2 oz Valor EZ, Panther SC or Tuscany SC 4L (0.032-0.064 lb ai)

BURNDOWN/EPP. Apply at least 30 days before planting. One inch of rainfall required between application and planting. Minimum carrier is 15 gpa for burndown. Use recommended adjuvants for burndown. Tillage after application may reduce residual control.

WEED RESPONSE to HERBICIDES

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

9 - 10	Excellent	Usually over 90%. Seldom 100%.	Best choice for weed.
7 - 8	Good	Sometimes under 80%. Seldom over 90%.	Usually satisfactory.
6	Fair	Sometimes under 70% Seldom over 80%	Sometimes unsatisfactory. Not recommended.
5	Marginal	Sometimes under 50%. Seldom over 70%.	Seldom satisfactory.
1 - 4	Poor	Seldom over 50%. Erratic.	Not effective.
0	None	No control.	Not recommended.

CROP RESPONSE. Crop response is based on visual symptoms. Early-season symptoms do not necessarily cause yield losses.

N = none; VS = very slight; S = slight; M = moderate; H = High; + = usually high part of range

Herbicide	Foxtail	Sandbur	General Broadleaves	W. buckwheat	Kochia (ALS)	Pigweed	Cocklebur	Sunflower	Field bindweed	Crop	Carryover
PPI/PRE											
Atrazine	5	4	8	10	10	10	7	7	2	S+	H
Dual II Magnum	9	5	4	0	4	7	0	0	0	S	N
Lumax	9	5	8	9	9	9	7	7	2	S	M
Outlook	9	5	4	0	4	7	0	0	0	S	N
Sharpen	0	0	7	6	4	7	7	7	0	S	N
Verdict	9	5	7	6	4	7	7	7	0	S	N
Warrant	9	5	5	0	4	8	0	0	0	S	N
Zemax	9	5	8	7	8	9	7	7	2	S	S
POST											
Aim	0	0	7	4	7	8	6	6	3	S+	N
Atrazine+oil	4	3	8	10	9	10	8	9	3	M	M
Basagran	0	0	6	8	6	9	5	5	5	VS	N
Bromoxynil	0	0	8	9	9	6	9	9	4	S	N
Bromoxynil/atrazine	4	3	9	10	10	9	9	9	4	S	M
dicamba	0	0	9	9	9	9	7	8	7	M+	N
dicamba+atrazine	4	3	9	10	9	9	9	9	7	S	S+
dicamba+2,4-D	0	0	9	9	9	9	9	9	7	M+	N
Huskie	0	0	8	8	9	8	8	9	4	M	S
Facet	7	6	4	2	2	4	0	3	8	VS	S
Facet+atrazine	7	6	8	9	9	9	8	9	8	S	M
Peak	0	0	7	8	3	8	9	9	4	S+	M
Permit	0	0	7	4	3	8	9	8	2	S+	S
Starane Ultra	0	0	6	6	10	2	6	6	0	VS	N
Yukon	0	0	8	7	7	9	9	9	6	S+	M
Zest	8	8	5	2	0	7	5	4	3	S	S
2,4-D	0	0	7	6	5	8	9	7	7	M	N