

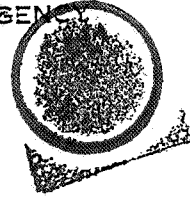
US EPA ARCHIVE DOCUMENT

TOX

Atrazine / review # 35 / 1-13-81 / ~~also~~ 14 pages



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460



Releasable

Caswell # 63

OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

DATE: January 13, 1981

SUBJECT: Atrazine 4L  
EPA File Symbol 36480-RU

FROM: Sherell A. Sterling  
FHB/TSS

*Handwritten notes:*  
1-17-81  
E-1081

TO: Robert Taylor  
Product Manager (25)

Applicant: Mid America Chemical Co., Inc.  
402 South 5th Street  
Leavenworth, KS 66048

Active Ingredients:

Atrazine.....	40.8%
Related Compounds.....	2.2%
Inert Ingredients.....	57.0%

Background:

Previously submitted data were reviewed (Sterling, 11/17/80) and found deficient in the Acute Inhalation study. Dr. Robbins of Cosmopolitan Safety Evaluation, Inc. of Somerville, NJ called to inquire about the acceptability of the Acute Inhalation study. The original application was the conditional registration of this product under the "alternate" method of support.

Recommendations:

1. After reconsideration FHB/TSS will agree to the revision of the Acute Inhalation study classification for the following reasons:
  - a. The nominal concentration was maintained at 5 mg/l for 4 hours. In order to use the signal word CAUTION, the product must have an LC50 greater than 2.0 mg/l actual concentration with a one hour exposure. Any deviations between actual and nominal concentrations are expected to be compensated for with such a high nominal concentration over a 4 hour period.

- b. No mortalities and no remarkable pathological alterations were noted in animals exposed to 5 mg/l nominal concentration for 4 hours.
  - c. The appropriate signal word (CAUTION) can be assigned based on this rationale which does not alter the product's required signal word.
2. It must be noted that exceptions to the requirement for actual concentration values are the result of careful consideration of specific cases. These exceptions are not meant to be applied in general. In all normal instances, the Acute Inhalation study review must be based on actual concentrations.

Labeling Recommendations:

1. The current labeling statements concerning inhalation hazards are adequate.
2. The word "Precautions" used in conjunction with Directions for Use may be misleading since the term "Precautionary Statements" is intended to be used in conjunction with "Hazards to Humans and Domestic Animals," "Environmental Hazards" and "Physical or Chemical Hazards." Consequently the word "Precaution" should be revised wherever it appears under the Directions for Use. *Terms such as NOTE or NOTICE are examples of appropriate substitute words.*
3. The referral statement which appears on the front panel must be revised to the following or similar statement:  
  
"See side (back) panel for additional precautionary statements."



# ATRAZINE 4L

## HERBICIDE

FOR SEASON-LONG WEED CONTROL  
IN CORN AND SORGHUM.

ATRAZINE 4L CONTAINS 4 LBS. ACTIVE  
INGREDIENTS PER GALLON.

CAUTION: Keep out of reach of Children  
SEE ADDITIONAL PRECAUTIONS ON SIDE PANELS

**ACTIVE INGREDIENTS:**

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine) ..... 40.87  
Related compounds ..... 2.27

INERT INGREDIENTS: ..... 57.07  
TOTAL ..... 100.07

2 1/2 GALLONS



## DIRECTIONS FOR USE AND CONDITIONS OF SALE AND WARRANTY

**IMPORTANT:** Read the entire Directions for Use and the Conditions of Sale and Warranty before using this product.

### Conditions of Sale and Warranty

The Directions for Use of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness, or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application all of which are beyond the control of the above company or the Seller. All such risks shall be assumed by the Buyer.

The above company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the Directions for Use subject to the inherent risks referred to above. The above company makes no other express or implied warranty of Fitness or Merchantability or any other express or implied warranty. In no case shall the above company or the Seller be liable for consequential, special, or indirect damages resulting from the use or handling of this product. The above company and the Seller offer this product, and the Buyer and user accept it, subject to the foregoing Conditions of Sale and Warranty, which may be varied only by agreement in writing signed by a duly authorized representative of the above company.

### General Information

This herbicide controls many annual broadleaf and grass weeds in corn and sorghum including barnyardgrass, witchgrass (*Penicum capillare*), yellow foxtail, green foxtail, wild oats, large (hairy) crabgrass, giant foxtail, velvetleaf, morningglory, lambsquarters, pigweed, ragweed, nightshade, purslane, and mustard. This product may be applied before or after weeds emerge.

Where use directions give a range of rates, use the lower rate on coarse-textured soil and soil low in organic matter, and the higher rate on fine-textured soil and soil high in organic matter.

Since this product acts mainly through root absorption, its effectiveness depends on moisture to move it into the root zone. If weeds develop, a shallow cultivation or rotary hoeing will generally result in better weed control.

This product is nonflammable.

Avoid using where adjacent desirable trees, shrubs, or plants might be injured.

Note: The above company does not recommend applications in combination with other herbicides or oils except as specifically described on the label or in literature published by the above company.

### Application Procedures

#### Ground application

For the most uniform distribution of broadcast applications, use 80 flat fan-type nozzles. For band applications, use flat fan even spray nozzles. Screens and strainers should be no finer than 50-mesh. Use a pump with capacity to (1) provide sufficient agitation during mixing and application to keep material in suspension, and (2) maintain 30-40 psi operating pressure. Unless otherwise specified, use a minimum of 5 gal of water/A for preplant incorporated, preemergence, and postemergence (without oil or surfactant) applications. Use a minimum of 10 gal of water/A for all postemergence applications combined with oil or surfactant.

For band applications, calculate amount to be applied per acre as follows:

$$\frac{\text{Band width in inches}}{\text{Row width in inches}} \times \text{Broadcast rate per acre} = \text{Amount needed per acre of field}$$

#### Aerial application

For preplant and preemergence broadcast treatments, apply at a 1:1 ratio to water (example: recommended rate of 1 qt of product is mixed with 1 qt of water) to be applied/A. For postemergence treatments, apply recommended rate in a minimum of 2 gal of water/A. Avoid applications under conditions where uniform coverage cannot be obtained or where excessive spray drift may occur.

Do not apply directly to humans or animals. Flagmen or loaders should avoid inhalation of spray mist and contact with skin and should wash thoroughly before eating and at the end of each day's operation.

**Application in water or liquid fertilizer**

Nitrogen solutions or complete liquid fertilizers may replace all or part of the water as a carrier for preemergence and preplant applications. Check the compatibility of this product with liquid fertilizer and/or nitrogen solution before use. Do not apply in liquid fertilizers after corn or sorghum emerges as crop injury may occur.

**Application in water plus emulsifiable oil or oil concentrate**

Adding emulsifiable oil or oil concentrate to postemergence water-based sprays may improve weed control. However, under certain conditions, use of either emulsifiable oil or oil concentrate may seriously damage corn or sorghum. To minimize this possibility, follow directions, procedures, and precautions below.

Use a crop oil designated for use with this product containing 1-2% suitable emulsifier, or a suitable crop oil concentrate designed for use with this product and containing not more than 20% emulsifier or surfactant blend. Several oils and crop oil concentrates of this types are on the market. Emulsifiable oil and oil concentrate contaminated with water or other materials can cause compatibility problems with/or crop injury.

Mixing procedures--all uses: (1) Be sure sprayer is clean and not contaminated with 2,4-D or other materials, as crop injury or sprayer clogging may result. (2) Fill tank 1/2 to 2/3 full with clean water. (3) Start agitation. (4) Pour product directly from container into tank. (5) Add emulsifiable oil, oil concentrate, or a tank mix herbicide. (6) Finish filling tank with water, nitrogen solution or liquid fertilizer. (7) Empty tank as completely as possible before refilling to prevent buildup of oil or emulsifiable concentrate residue in tank. Maintain agitation to avoid separation of other materials from water, nitrogen solution, or liquid fertilizer remaining in tank. (8) If an oil or oil concentrate film starts to build up in tank, drain it, and clean with strong detergent solution or solvent. (9) Clean sprayer thoroughly immediately after use by flushing system with water containing a detergent. (10) For liquid nitrogen or liquid fertilizer, use suction screens of 16-mesh or coarser.

**Directions for Use**

**FAILURE TO FOLLOW ALL PRECAUTIONS ON THIS LABEL MAY RESULT IN POOR WEED CONTROL, CROP INJURY, OR ILLEGAL RESIDUES.**

**Corn**

Apply before planting, at planting, or after planting as indicated below.

Preplant (Broadleaf and grass control)

Broadcast in spring after plowing at rate in Table 1. Apply before, during, or after final seedbed preparation. If soil is tilled or worked after application, avoid deep incorporation. For best results, apply within two weeks prior to planting.

Preemergence (Broadleaf and grass control)

Apply during or shortly after planting, prior to weed emergence at rate in Table 1.

Postemergence (Broadleaf and grass control)

Apply before weeds exceed 1.5 inches in height, at rate in Table 1.

**TABLE 1  
Broadleaf and Grass Weed Control on Corn\***

Soil texture	Broadcast rate/A
<b>COARSE</b> Sand, loamy sand, sandy loam	4 pt
<b>MEDIUM</b> Silt and clay loam low in organic matter	4.75 pt
<b>FINE</b> Silt and clay loam with medium to high organic matter, clay (including the dark prairie soils of the Corn Belt)	6 pt
Peat, muck, high organic clay (postemergence only)	6 pt

\*Broadleaf weed control (eastern CO, western KS, western NE, NM, OK Pan Handle, west TX, and eastern WY): On sand, loamy sand, sandy loam, mild to strongly alkaline soil, and all recently leveled soil, apply 2.4 pt/A, either preplant or preemergence. Controls many broadleaf weeds including pigweed, lambsquarters, nightshade, purslane, and lochia. On other soil types in these areas, apply at rate in Table 1 for broadleaf and grass control

### Lay-by treatment (Broadleaf and grass control)

Broadcast 2-4 pt/A in a minimum of 5 gal of water or nitrogen solution, before weeds are 1.5 inches high and corn is 20-30 inches high. When using nitrogen solutions, direct the spray to lower 3-4 inches of cornstalks to avoid corn foliage injury. Maintain agitation in spray tank during application.

Postemergence with emulsifiable oil or oil concentrate in water

Broadleaf and grass control: Broadcast 4 pt/A after weed emergence, but before weeds reach 1.5 inches in height. Add emulsifiable oil at rate of 1 gal/A for ground applications and 0.5 gal/A for aerial applications. Add oil concentrate at rate of 1 qt/A for ground applications.

Broadleaf control: Broadcast 2.4 pt/A for control of broadleaf weeds, such as annual morningglory, cocklebur, lambsquarters, mustard, pigweed, ragweed, smartweed, and wild buckwheat. Add emulsifiable oil at rate of 1 gal/A for ground applications and 0.5 gal/A for aerial applications. Add oil concentrate at rate of 1 qt/A for ground applications. Apply before pigweed and lambsquarters reach 6 inches in height and before all other weeds reach 4 inches in height. A cultivation may be necessary if all weeds are not controlled or if weeds regrow.

Precautions for applications with emulsifiable oil or oil concentrate in water: (1) Do not apply when crop is under stress from prolonged cold, wet weather, poor fertility, or other factors, or when crop is wet and succulent from recent rainfall, as crop injury may occur. (2) Inbred lines or any breeding stock may be severely injured by applications with emulsifiable oil or oil concentrate. (3) Adding other insecticides, herbicides, liquid fertilizers, and other materials is not recommended because they may cause compatibility problems and/or crop injury. (4) Store and handle emulsifiable oil and oil concentrate carefully. Oil contaminated with even a small amount of water may not emulsify properly when added to tank. (5) Do not make more than one application per season except as recommended for control of yellow nutsedge and Canada thistle on this label.

### Center pivot sprinkler application - Preemergence or postemergence (CO, KS, NE, SD, AND SY)

Apply with irrigation water either after planting before corn and weeds emerge, or after corn emergence, but before lay-by (20-30 inches) and before weeds exceed 1.5 inches in height, at rates in Table 1. Prepare mixture with minimum ratio of 1 part product to 1 part water. Injecting a larger volume of a more dilute slurry per hour will assure more accurate calibration of metering equipment. Maintain sufficient agitation to keep herbicide in suspension. Meter slurry into irrigation water during entire period. Apply in  $\frac{1}{2}$ -1 inch of water. Use the lower volume on coarser textured soils, the higher volume on finer textured soils. More than 1 inch of water may reduce weed control by moving herbicide below the effective zone in the soil. Inject dilute slurry into system through a positive displacement pump.

Refer to supplemental literature published by the above company for more information on calibrating.

Precautions: (1) Apply only through irrigation systems containing anti-siphon and check valves to prevent contamination of well during shutdown and overflow of solution tank. (2) Inject ahead of any right angle turn in the main line to insure adequate mixing. (3) Chemical injection pumps and water pumps must have interlocking controls to insure simultaneous shutoff. (4) Application when drift may occur from windy conditions, when system points and connections are leaking, or when nozzles are not providing uniform distribution may cause crop injury. (5) Where sprinkler distribution patterns do not overlap sufficiently, unacceptable weed control may result. Where sprinkler distribution patterns overlap excessively, crop injury may result.

### Problem weeds

Yellow nutsedge and Canada thistle: This product will control yellow nutsedge (*Cyperus esculentus*) and Canada thistle (*Cirsium arvense*) when applied according to use directions. For best results, apply each year until yellow nutsedge or Canada thistle is eliminated or reaches a level of infestation where neither weed is a problem. If yellow nutsedge or Canada thistle regrow following last application, cultivate once. When this product is applied postemergence to the weeds, add 1 gal of emulsifiable crop oil or 1 qt of oil concentrate/A.

Six alternative methods of use for control of yellow nutsedge and Canada thistle are listed below in order of preference. If other weed species, such as annual grasses, are also expected, use alternative 2,3,5, or 6.

1. Broadcast 4 pt plus 1 gal of emulsifiable oil or 1 qt of oil concentrate/A, after crop and yellow nutsedge or Canada thistle emerge, but before yellow nutsedge reaches a height of 3 inches or Canada thistle reaches a height of 6 inches. Repeat application before lay-by (20-30 inches), 10-20 days after the first application has been made.
2. Broadcast 4 pt/A preplant. Follow with an application of 4 pt plus 1 gal of emulsifiable oil or 1 qt of oil concentrate/A, after corn and weeds emerge, but before yellow nutsedge reaches a height of 3 inches (yellow nutsedge control only).
3. Broadcast 4 pt/A during or shortly after planting, but prior to crop or weed emergence. Follow with an application of 4 pt plus 1 gal of emulsifiable oil or 1 qt of oil concentrate/A, after corn and weeds emerge, but before yellow nutsedge reaches a height of 3 inches or Canada thistle reaches a height of 6 inches.
4. Broadcast 8 pt plus 1 gal of emulsifiable oil or 1 qt of oil concentrate/A after crop emerges, but prior to lay-by (20-30 inches) and after yellow nutsedge and Canada thistle emerge, but before yellow nutsedge is 3 inches tall or Canada thistle is 6 inches tall.
5. Broadcast 8 pt/A preplant (yellow nutsedge control only).
6. Broadcast 8 pt/A during or shortly after planting, but prior to crop or weed emergence (yellow nutsedge control only).

Note: Do not use emulsifiable oil or oil concentrate when corn is wet or under stress, especially when using 8 pt of this product/A. See "Precautions for applications with emulsifiable oil or oil concentrate in water" for additional directions.

Quackgrass control on land going into corn production

Split application: Broadcast 4 pt/A in fall or spring. Plow 1-3 weeks later. Broadcast a second application at 4 pt/A in spring before, during, or after planting, but before weeds are 1.5 inches high. This split application will control both quackgrass and most annual broadleaf and grass weeds.

Single application: Broadcast 6-8 pt/A in fall or spring. Plow 1-3 weeks later.

#### Tank Mixtures for Corn

##### Dual® 6E

Use as tank mixture for control of certain broadleaf and grass weeds in corn. Refer to Dual 6E label for all directions, weeds controlled, precautions, and limitations.

##### Lasso® or Lasso EC (alachlor)

Use as tank mixture for control of many annual broadleaf and grass weeds in corn (field, hybrid seed, silage, sweet, popcorn), including barnyardgrass, carpetweed, crabgrass, fall panicum, Florida pusley, foxtails (giant, green, yellow), goosegrass, jimsonweed, kochia, lambsquarters, mustard, nightshade, pigweed, purslane, ragweed, signalgrass (Brachiaria), smartweed, and witchgrass. This tank mix will reduce competition from the hard to control annual weeds--annual morningglory, cocklebur, and velvetleaf (buttonweed).

For preemergence or early postemergence broadcast application, use rates in Table 2. Apply tank mixture any time from immediately after planting until weeds reach 2-leaf stage and corn is no more than 5 inches tall. On sweet corn, apply before crop and weeds emerge. Application after the 2-leaf weed stage will not give satisfactory control. With postemergence application, occasional corn leaf burn should not affect growth or yield. If applied with liquid fertilizers, spray before crop emerges.



**TABLE 2**  
**Tank Mixtures with Lasso on Corn**

Soil texture	Broadcast rate/A			
	Less than 3% organic matter		3% or more organic matter.	
	This product	Lasso	This product	Lasso
<b>COARSE*</b> Sand, loamy sand, sandy loam	2 pt	1.5 qt.	2 pt	1.5 qt
<b>MEDIUM</b> Loam, silt loam, silt	2-2.4 pt	1.75 qt	2.4-2.8 pt	2 qt
<b>FINE</b> Silty clay loam, sandy clay loam, silty clay, sandy clay, clay loam, clay	2.4-3.2 pt	2.25 qt	2.4-3.2 pt	2.5 qt

\*When applied via center pivot irrigation on coarse soils, apply 2 pt of this product and 2 qt of Lasso/A.

For preplant incorporated applications, use 0.4 pt more of this product plus 0.5 qt more Lasso/A than indicated in Table 2. Use no more than 3.2 pt of this product plus 2.5qt of Lasso/A. Broadcast within 7 days before planting and incorporate 2 inches deep.

Apply tank mixture in a minimum of 20 gal of water/A. Liquid fertilizer may replace all or part of the water. Add this product to spray tank, thoroughly mix with water, then add Lasso. Follow mixing procedures in the section, "Application Procedures" of this label.

Refer to Lasso label for information concerning center pivot irrigation applications and other directions, limitations, and cautions.

**Simazin 80W or Simazin 4L**

Use as tank mixture for control of many annual weeds, including carperweed, crabgrass, fall panicum, foxtail, lambsquarters, morningglory, pigweed, ragweed, and velvetleaf. Apply before planting, at planting, or after planting, but before crop and weeds emerge, at rates in Table 2a. Use 1:1 ratio for control of above weeds, Use 1:2 ratio for expected heavy infestations of crabgrass and fall panicum. Apply in a minimum of 20 gal of water/A. Cultivate shallowly if weeds develop.

Preplant: Apply in spring during or after final seedbed preparation. If soil is tilled or worked after application, avoid deep incorporation. For best results, apply within two weeks before planting.

Preemergence: Apply during or shortly after planting, but before crop and weeds emerge. Refer to Corn sections of this label and to Simazin 80W or Simazin 4L label for further directions, limitations, and cautions.

**Table 2a**  
**Tank Mixtures with Simazin on Corn**

Soil texture	Broadcast rate/A			
	1:1 Ratio*		1:2 Ratio**	
	This product	Simazin 80W or Simazin 4L	This product	Simazin 80W or Simazin 4L
Sand, loamy sand, sandy loam	2 pt	1.25 lb or 2 pt	1.32 pt	1.67 lb or 2.67 pt
Loam, silt loam, silt, clay loam, sandy clay loam, silty clay loam, sandy clay, or silty clay with low organic matter	2.4 pt	1.5 lb or 2.4 pt	1.6 pt	2 lb or 3.2 pt

\* For control of above weeds.

\*\*For control of expected heavy infestations of crabgrass and fall panicum.

### Propachlor 65WP

Use as tank mixture for control of many annual broadleaf and grass weeds in corn (field, hybrid seed, silage and sweet corn only), including annual morningglory, annual ryegrass, armyardgrass (watergrass), buttonweed (velvetleaf), carpetweed, cocklebur, crabgrass, fall panicum, Florida pusley, giant foxtail, green foxtail, yellow foxtail, goosegrass, purslane, ragweed, smartweed, and sunflower. Broadcast 2.1-3.2 pt of this product plus 3.8-6 lb of propachlor 65WP/A on soil surface any time after planting until broadleaf and grass weeds reach the 2-leaf stage. Use lower rates on coarse-textured soil low in organic matter. Use higher rates on fine-textured soil high in organic matter.

Use a minimum of 2.8 pt/A of this product in tank mixture for better control of annual morningglory, buttonweed (velvetleaf) cocklebur, and sunflower.

Apply in a minimum of 20 gal/A. Non-pressure fluid fertilizer may replace all or part of the water used as a carrier for applications before crop and weeds emerge. Add this product to spray tank and thoroughly mix with water. Then, cut the propachlor 65WP bag and fill with water to fill line. Grasp neck of bag firmly, shake vigorously, and add contents to spray tank.

Refer to propachlor 65WP label for further directions, limitations, and cautions.

### Paraquat CL

For control of existing vegetation and residual control where corn will be planted directly into cover crop, established sod, or in previous crop residues, broadcast 4-6 pt of this product and 1-2 pt Paraquat CL in 20-60 gal of water/A. Add 8 oz of a nonionic surfactant, such as X-77, per 100 gal of spray mixture. Add this product to water in spray tank, agitate until thoroughly mixed with water, and then add Paraquat CL and surfactant.

### Simazin 80W plus Paraquat CL

Use as tank mixture with Simazin 80W plus Paraquat CL for kill of existing vegetation and residual weed control where corn will be planted directly into cover crop, established sod, or in previous crop residues. Add this product and Simazin 80W to water in spray tank, agitating until thoroughly mixed. Then add Paraquat CL and a nonionic surfactant, such as X-77. Continue agitation during application. Apply 2-4 pt of this product plus 1.25-2.5 lb Simazin 80W plus 1-2 pt Paraquat CL in 20-60 gal of water per sprayed acre within 3 weeks before, during, or after planting, but before corn crop emerges. Add 8 fl oz of a nonionic surfactant, such as X-77, per 100 gal of spray mixture. Use lower rates of this product and of Simazin 80W on coarse soil, and higher rates on fine-textured soil. Use the 2 pt rate of Paraquat CL if existing vegetation is 4-6 inches tall. This mixture will not control weeds taller than 6 inches.

Refer to further limitations and precautions on labels for this product, Simazin 80W, and Paraquat CL

Precautions for all applications to corn: (1) Do not apply more than 8pt/A of this product to corn in any one year. (2) Following harvest, plow (moldboard or disk-plow) and thoroughly till soil in fall or spring to minimize possible injury to rotational spring-seeded crops, regardless of rate used.

Note for all applications to corn: Do not graze or feed forage from treated areas to livestock for 21 days following application.

### Rotational crops

(1) Do not rotate to any crop except corn or sorghum until the following year, as injury may occur. (2) If applied after June 10, do not rotate with crops other than corn or sorghum the next year, as crop injury may occur. (3) If used at a rate higher than 6 pt/A or equivalent band application rate, a crop of untreated corn or sorghum should precede the next rotational crop. (4) In the High Plains and intermountain areas of the West where rainfall is sparse and erratic or where irrigation is required, use only when corn or sorghum is to follow corn or sorghum or when a crop of untreated corn or sorghum is to precede other rotational crops. (5) In eastern parts of the Dakotas, KS, western MN, and NE, do not rotate to soybeans if the rate applied to corn or sorghum was more than a 4 pt/A or equivalent band application rate, as soybean injury may occur. (6) Injury may occur to soybeans planted in north-central and northwest IA, south-central and southwest MN, northeast NE, southeast SD, and other areas the year following application on soils having a calcareous surface layer. (7) Do not plant sugar beets, tobacco, vegetables (including dry beans), spring-seeded small grains, or small-seeded legumes and grasses

**Sorghum and Sorghum-sudan<sup>8</sup> Hybrids (Grain and Forage Types)**

Apply before planting, at planting, or after planting. See Corn section for weeds controlled.

**Preplant (Broadleaf and grass control)**

Broadcast in spring after plowing at rate in Table 3. Apply before, during, or after final seedbed preparation. If soil is tilled or worked after application, avoid deep incorporation. For best results, apply within two weeks prior to planting.

**Preemergence (Broadleaf and grass control)**

Apply during or shortly after planting, but prior to weed or crop emergence at rate in Table 3.

**TABLE 3**  
**Preplant and Preemergence for Broadleaf and Grass Weed Control in Sorghum\***

Soil texture	Organic matter	Broadcast rate/A
<b>COARSE</b> Sand, loamy sand, sandy loam, sandy clay loam	any level	DO NOT USE (except for preemergent use on bedded sorghum in AZ and CA as indicated below)
<b>MEDIUM AND FINE</b> Silt loam, clay loam, clay	less than 1%	
	1-1.5%	3.2-4pt
	more than 1.5%	4-4.75 pt

\*Do not apply preplant in AL, AR, FL, GA, LA, MS, NC, NM, SC, TN and TX. Do not apply preemergence in NM, OK, and TX, except in northeast OK and the TX Gulf Coast.

In case of planting failure, sorghum may be replanted. Do not make a second broadcast application, as injury may occur. If originally applied in a band and sorghum is replanted in untreated row middles, this product may be applied in a band to the second planting.

Preemergence broadleaf control in furrow irrigated bedded sorghum (AZ and CA only) For preemergence control of broadleaf weeds, including groundcherry, lambsquarters, morningglory, mustard, pigweed, and purslane, broadcast 1.6-2.4 pt/A. Apply after bed preparation, during or after planting, but before sorghum and weeds emerge, and before the first furrow irrigation. Follow with several regular irrigations to thoroughly wet all soil. Use lower rate on coarse-textured soil and soil low in organic matter, use higher rate on fine-textured soil and soil high in organic matter.

Precautions for preemergence application to furrow irrigated bedded sorghum grown in AZ and CA: To avoid possible sorghum injury, do not use on sand or loamy sand soil or on sorghum planted in the furrow. Application to sorghum growing on alkali soil or where cuts, fills or erosions have exposed calcareous or alkali subsoil may cause crop injury. Do not replant sorghum for 8 months following application. Corn may be planted immediately.

**Postemergence (Broadleaf and grass control)**

Apply at rate in Table 4 before weeds exceed 1.5 inches in height. Apply up to "close-in."

**TABLE 4**  
**Postemergence Broadleaf and Grass Weed Control in Sorghum**

Soil texture	Minimum sorghum height at treatment	Broadcast rate/A
Sand or loamy sand	DO NOT USE	
Sandy loam	See directions for broadleaf weed control below	
Silt loam to sandy clay loam	Completely emerged	4-4.75 pt
Olton and Pullman clay soil	At least 6 inches high	4-4.75 pt
Silty clay loam and finer textured soil	Completely emerged	6 pt

Postemergence broadleaf control with emulsifiable oil or oil concentrate in water. Broadcast 2.4 pt/A for control of broadleaf weeds, including annual morningglory, cocklebur, lambsquarters, mustard, pigweed, ragweed, smartweed, and wild buckwheat. Apply before pigweed and lambsquarters reach 6 inches in height and before all other weeds reach 4 inches in height. In CO, western KS, NM, OK, TX, and the desert regions of AZ and CA, apply when sorghum is 6-10 inches in height, but before boot stage. In all other areas, apply after sorghum reaches the 3-leaf stage. Add emulsifiable oil at 1 gal/A for ground applications and 0.5 gal/A for aerial applications. Add oil concentrate at 1 qt/A for ground applications. A cultivation may be necessary if all weeds are not controlled or if weeds regrow.

Precautions for applications with emulsifiable oil or oil concentrate in water: See "Precautions for applications with emulsifiable oil or oil concentrate in water" in Corn section.

Postemergence broadleaf control with surfactant (CO, western KS, NM, OK, TX, and desert regions of AZ and CA only)  
Broadcast 2.4 pt plus 0.75-1.5 pt of surfactant/A after sorghum reaches 6 inches in height, but before weeds reach 1.5 inches in height. Apply only on sandy loam and finer textured soil

Precautions for all applications to sorghum: (1) Heavy rain immediately following application tends to cause excessive concentrations of herbicide in seed furrow, resulting in possible crop injury. Do not apply to furrow planted sorghum until furrows are leveled (plowed-in). Level deep planter marks or seed furrows before application. (2) Application to sorghum growing under stress caused by minor element deficiency or to sorghum growing on highly calcareous soils may result in crop injury. (3) Following harvest, plow (moldboard or disk-plow) and thoroughly till the soil in the fall or spring to minimize possible injury to rotational spring-seeded crops, regardless of rate used. (4) Injury may occur if both this herbicide, preplant or preemergence, and an at-planting systemic insecticide are used.

Note: Do not graze or feed forage from treated areas for 21 days following application.

Rotational crops  
See "Rotational Crops" at end of Corn section.

#### Tank Mixtures for Grain Sorghum

##### Igran 80W

Use as tank mixture for control of certain broadleaf and grass weeds in grain sorghum. Refer to Igran 80W label for all directions, weeds controlled, precautions, and imitations.

#### Chemical Fallow

##### Wheat-Sorghum-Fallow

The treatment controls annual broadleaf and grass weeds following wheat harvest and in the following sorghum crop when grown under minimum tillage.

Apply 6 pt to wheat stubble immediately following wheat harvest. If weeds are present, remove them with a sweep plow or other suitable implement after application. Plant sorghum into wheat stubble the following spring with minimum disturbance of the soil. Use a surface planter or a planter leaving a shallow furrow. If weeds are present at planting, remove them with a sweep plow or other suitable implement before planting.

**Precautions:** (1) Use only on silt loam or finer textured soil. (2) Wheat-sorghum-fallow cropping sequence must be followed. (3) Do not apply following sorghum harvest.

**Note:** Do not graze or feed forage from treated area to livestock. Do not plant any crop other than those on this label within 18 months following treatment.

#### Tank Mixtures for Wheat-Sorghum-Fallow

##### Igran® 80W

Use as tank mixture for control of certain broadleaf and grass weeds in wheat-sorghum-fallow rotations. Refer to Igran 80W label for directions, weeds controlled, precautions, and limitations.

##### Wheat-Corn-Fallow (KS,NE)

This product controls cheatgrass (downy brome, chess), kochia, mustards, pigweed, Russian thistle, wild lettuce, wild sunflower, and volunteer wheat during period after wheat harvest. Weed control may extend into following corn crop grown under minimum tillage.

Apply with ground equipment only.

Follow directions for use, notes, and precautions in the "Wheat-Sorghum-Fallow" section above, substituting corn for references to sorghum.

#### Tank Mixtures for Wheat-Corn-Fallow(KS, NE)

##### Igran® 80W

Use as tank mixture for control of certain broadleaf and grass weeds in wheat-corn-fallow rotations. Refer to Igran 80W label for directions, weeds controlled, precautions, and limitations.

##### Wheat-Fallow-Wheat(CO,KS,MT,NE,ND,SD,and WY)

For reemergence control of cheatgrass (downy brome, chess), common lambsquarters, field pennycress, kochia, mustard, Russian thistle, wild lettuce, and suppression of volunteer wheat during fallow period of a wheat-fallow-wheat rotation, apply 1-2 pt in 10-40 gal of water/A for ground application, or in a minimum of 5 gal of water/A for aerial application, on all soils except those listed under "Precautions." For control of pigweed, and wild sunflower, use the higher rate. Apply to stubble ground. Treat only once during same fallow period.

#### Tank Mixtures for Wheat-Fallow-Wheat (CO,KS,MT,NE,ND,SD,WY)

##### Igran® 80W

Use as tank mixture for control of certain broadleaf and grass weeds in wheat-fallow-wheat rotations. Refer to Igran 80W label for directions, weeds controlled, precautions, and limitations.

##### Paraquat CL

If weeds are present at application, a tank mix with Paraquat CL may be used. Broadcast 1-2 pt of this product plus 1-2 pt of Paraquat CL in 20-60 gal of water/A by ground equipment. Add 0.5-1 pt of a nonionic surfactant, such as X-77, per 100 gal of spray mixture. Add this product to spray tank first and thoroughly mix with water. Then add Paraquat CL, followed by surfactant. Use the 2 pt rate of Paraquat CL if weeds are 4-6 inches tall. This mixture will not control weeds taller than 6 inches. Apply to stubble ground. Treat only once during the same fallow period. Refer to Paraquat CL label for further directions, precautions, and limitations.

If weeds are present at application and this product is used alone, use either an approved contact herbicide before or after treatment, or tillage after treatment.

Use tillage to control weeds which escape during fallow period. Till before planting. For this product applied alone or in tank mixture with Paraquat CL, plant at least 2 inches deep and 12 months or more after application.

Precautions: (1) Do not use on sand soil. (2) Do not treat eroded hillsides, caliche and rocky outcroppings, or exposed calcareous subsoil. (3) Do not treat soils of the Rosebud and Canyon Series in western NE and adjoining counties in CO and WY. (4) Do not treat soils with calcareous surface layers. (5) Avoid spray overlap.

Note: Do not graze treated areas within 6 months after application.

## Rangeland

To control certain weeds, including cheatgrass (downy brome, chess), common (annual) broomweed, little barley, medusahead, sagewort, and tumble mustard. Use lower rate where cheatgrass is major problem weed; use higher rate for other weeds.

For ground applications, use a minimum of 10 gal of water/A. For aerial applications, use a minimum of 5 gal of water/A. See "Application Procedures" for additional information.

Establishment of perennial range grasses in West (CA, ID, NV, OR, UT, WA)

Apply 1.6-2 pt/A in fall after rains begin but before ground freezes. Perennial range grass may be seeded when rain begins the next fall following treatment. Plant in deep furrows such as those made by a deep furrow rangeland drill. Treated areas may be grazed 7 months after seeding. However, to provide sufficient time for establishment of desirable range grasses, treated areas should not be grazed until the fall following seeding.

Renovation of existing stands of perennial range grasses

Central Great Plains (CO,KS,MT,NE,ND,SD,WY): Apply 1-2 pt/A in fall before ground freezes.

Southern Great Plains (OK,TX): Apply 2 pt/A in spring before April 30.

West (CA,ID,NV,OR,UT,WA): Do not graze area to be treated for 6 months prior to application. Apply 1-1.5 pt/A by ground equipment in fall before ground freezes. Bluegrass and intermediate wheatgrass may be injured by this product at recommended rates.

Note: Do not cut or feed range grass hay. Do not graze treated areas within 7 months following fall application or 3 months following spring application. Apply only once per year.

Warm season perennial range grasses--Midwest

Switchgrass and Big Bluestem

For control of many annual broadleaf and grass weeds including cheatgrass, foxtails (giant, green, and yellow), lambsquarters, pigweed, ragweed, smartweed, and velvetleaf.

For ground application use a minimum of 15 gal of water/A/

Use only on loam, silt loam, silty clay loam, clay loam, and silty clay soils with at least 1 percent organic matter.

New seeding: Apply 2 qt/A after planting but before weeds emerge. Prepare a good, firm seedbed. Plant 1/2 inch deep with a grassland drill (preferred method) or a conventional drill. If a conventional drill is used on prepared seedbeds, remove all tension from the disk openers. For best results, cultipack or roll after planting. Clip weeds that escape in July or August. Avoid clipping switchgrass or big bluestem seedings.

Established stands: Apply 2 qt/A in April or early May, before weed emergence.

Note

Do not cut for hay. Do not graze treated areas within 4 months following application at seeding or 3 months following application to established switchgrass or big bluestem. Treat only once per year.

Rotational crops: See "Rotational crops" in Corn section.

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## Sugarcane

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For control of many annual broadleaf and grass weeds, including amaranths, crabgrass, fireweed, Flora's paintbrush, foxtails, junglerice, and wiregrass: Broadcast 2-4 qt in 20-50 gal of water/A for adequate coverage of the soil surface at time of planting or ratooning, but before cane emerges. One additional application may be made over cane as it emerges, and two additional applications may be made interline after emergence as directed sprays.

For control of emerged pellitory weed (Florida only): Apply 0.8-1.2 pt in at least 40 gal of water/A as a directed spray. Add 2 qt of surfactant for each 50 gal of spray. Thoroughly cover weed foliage.

Precautions: (1) Do not apply after "close-in." (2) Do not apply more than 10 qt/A to any one crop of cane.

For control of alexandergrass, large crabgrass, pellitory (artillery) weed, and spiny amaranth, use one of the following methods at planting or ratooning (Florida only):

1. Apply 4 qt in 20-50 gal of water/A, preemergence, broadcast or banded. Follow with one or two broadcast or banded over-the-top applications as needed, postemergence to sugarcane and weeds, at 2 qt in 20-50 gal of water/A. Treat before weeds exceed 1.5 inches in height.
2. Apply 1-3 times as needed, at 2 qt in 20-50 gal of water/A either broadcast or banded over-the-top, postemergence to sugarcane and weeds. Treat before weeds exceed 1.5 inches in height.

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Douglas Fir, Grand Fir, Noble Fir, White Fir, Lodgepole Pine, Ponderosa Pine, and Scotch Pine

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Annual broadleaf and grass weed control: Broadcast 2-4 qt in 20-40 gal/A between fall and early spring while trees are dormant or soon after transplanting. Apply before weeds are 1.5 inches tall.

Quackgrass control: Broadcast 4 qt/A in fall or early spring while trees are dormant and before quackgrass is more than 1.5 inches tall.

Precautions: (1) Do not graze treated areas. (2) Do not apply to seedbeds. (3) Apply only once per year.

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## Caution

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Keep Out of Reach of Children.

Harmful or fatal if swallowed. Do not get in eyes. Avoid contact with skin, inhalation of vapors or spray mist, and contamination of food and feed.

Do not contaminate domestic or irrigation water supplies or lakes, streams or ponds.

Do not reuse container. Destroy when empty.

Dual<sup>®</sup> trademark of CIBA-GEIGY for metolachlor  
U.S. Patent No. 3,937,730

Igran<sup>®</sup> trademark of CIBA-GEIGY for terbutryn  
U.S. Patent No. 3,634,062

Lasso<sup>®</sup> trademark of Monsanto Company for alachlor  
X-77 trademark of KALO Laboratories, Inc.