MP44

Arkansas 2016

Recommended Chemicals for weed and brush control

UofA DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

See MP44 on the web at
www.uaex.edu

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Should the registration of a herbicide or certain uses of a herbicide be cancelled by federal or state agencies, recommendations thus affected herein are no longer applicable after such action is taken. For herbicides such as MSMA, 2,4-D, diuron, etc., where several manufacturers and formulations exist, not all formulations may be labeled for the same uses. Use only a herbicide which has the intended use on the label. Use of products and trade names in this handbook does not constitute a guarantee or warranty of the products named and does not signify that these products are approved to the exclusion of comparable products. Some tank mix treatments are listed "grower's risk." This indicates the two herbicides are not labeled for the tank mix, but research has shown them to be effective. To tank mix is not a violation of law, but it is done at the grower's own risk.

UNIVERSITY OF ARKANSAS SYSTEM DIVISION OF AGRICULTURE, COOPERATIVE EXTENSION SERVICE

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RECOMMENDED CHEMICALS FOR WEED AND BRUSH CONTROL

Prepared By
R.C. Scott, L.T. Barber and J.W. Boyd, Extension weed scientists, University of Arkansas System Division of Agriculture;
George Selden, Extension aquaculture specialist, University of Arkansas at Pine Bluff; J.K. Norsworthy and Nilda Burgos, weed scientists,
Agricultural Experiment Station of the University of Arkansas; the personnel of the Cooperative Extension Service; and USDA

The control of weeds and brush is essential for the economical production of crops. The high cost and decreasing availability of labor make it necessary to fit the use of herbicides into the production practices already in use on many crops.

This publication is a summary of the latest recommendations for the use of herbicides in Arkansas and conforms with federal and state regulations. Supplemental leaflets giving more detailed information on herbicide usage for specific crops are listed in this book. For some crops, new herbicides or practices are suggested for trial usage on limited acreages and are not listed in this publication. Further information on these materials can be obtained from the county Extension agent. A herbicide should be tried on a limited acreage until one is experienced with it. Because of volatility and drift hazards to sensitive crops, 2,4-D related compounds must be applied according to Arkansas State Plant Board and regulations listed in Revised Circular No. 9A, *Arkansas Regulations on 2,4-D, 2,4-DB, MCPA and Other State Restricted Use Herbicides,* which is available from P.O. Box 1069, Little Rock, Arkansas 72203, or from the county Extension agent. It is important that the user of a herbicide **carefully read and follow the label directions and precautions** on the container. See label on grazing restrictions.

NOTE:

Herbicide rates recommended are all on a broadcast basis unless specified. When a herbicide is applied as a band over the row, reduce the rate of material accordingly.

$$\text{i.e. } \frac{\text{Band width}}{\text{Row width}} \text{ X Broadcast rate = Band rate}$$

For example, where the material is applied in 19" bands on 38" rows, the rate of material should be decreased to $^{19}/_{38}$ or ½ of the amount suggested for broadcast spray. Refer to herbicide application section for specific examples.

Conversion Table

1 tablespoon = 3 teaspoons (0.5 oz)
1 oz = 2 tablespoons
1 cup (½ pint) = 16 tablespoons (8 oz)
1 pint (2 cups) = 32 tablespoons (16 oz or 1 lb) (473 ml)
1 gallon (16 cups) = 8 pints or 4 quarts (8.4 lb water)
1 cu ft = 7.48 gal (62.4 lb)
1 acre = 43,560 sq ft
1 ppm = 3.6 oz/A inch = 0.0038 grams/gal
1 cfs = 450 gal/min
1 mph = 88 ft/min

$$\text{Acres} = \frac{\text{Length (ft) x width (ft)}}{43{,}560}$$

$$\text{Number of Rows/A} = \frac{43{,}560}{\text{Row width (ft) x row length (ft)}}$$

Trial or Limited Use

Certain new herbicides are suggested to be used on a limited acreage. An individual producer will determine the extent of his usage of these materials. This type of suggestion is included for those materials which have shown promise but have not yet received broad scale field evaluation. Those recommended for trial use are shaded as this is.

Rating Tables

The rating tables preceding the recommendations for each crop give the performance the University of Arkansas Research and Extension personnel expect under optimum conditions, which include such factors as proper incorporation, adequate moisture for activation, proper timing, spray coverage for postemergence herbicides, etc.

Since many factors may cause a herbicide to vary in performance, the University of Arkansas in no way guarantees these estimates. In addition, a high rating on a weed that is not listed on a herbicide label does not constitute a recommendation for that particular herbicide on that particular weed. Rating scale is 0-10, where 10 equals excellent control and 0 equals no control. A "–" indicates no data.

Herbicide Spray Additives

The addition of a surfactant to a postemergence herbicide spray mixture in many cases increases its effectiveness. Where a surfactant is called for, use the herbicide manufacturer's label recommendations.

HERBICIDE APPLICATION

Tips for Proper Mixing*

1. See that **equipment is clean and in good running condition,** free of oil, grease or residue.
2. Always **follow label instructions** about mixtures.
3. If there's any question about compatibility, **do a jar test first.**
4. Add chemicals in W-A-L-E sequence.

   Wettable powders or water dispersible granules
   Agitation
   Liquids (flowable liquids)
   Emulsifiable concentrates
5. Start with **tank** ¼ **full** of carrier, and add **all** W or WDG chemicals first.
6. Get good, strong agitation with a rolling effect on the surface of the carrier. Allow time for good dispersal.
7. Have a shut-off valve installed in the bottom of each tank.
8. Use a 16-mesh suction screen to allow chemicals to circulate through the pump.
9. Empty the tank as much as possible before mixing a new batch.

Compatibility Test: Since liquid fertilizers can vary, even within the same analysis, always **check compatibility with herbicide(s) each time before use.** Be especially careful when using complete suspension or fluid fertilizers as serious compatibility problems are more likely to occur. Commercial application equipment may improve compatibility in some instances. The following test assumes a spray volume of 25 gallons per acre. For other spray volumes, make appropriate changes in the ingredients. Check compatibility using this procedure:

1. Add 1 pint of fertilizer to each of 2 one-quart jars with tight lids.
2. To **one** of the jars add ¼ teaspoon or 1.2 milliliters of a compatibility agent approved for this use, such as Compex or Unite (¼ teaspoon is equivalent to 2 pints per 100 gallons of spray). Shake or stir gently to mix.
3. To **both** jars add the appropriate amount of herbicide(s). If more than one herbicide is used, add them separately with dry herbicides first, flowables next and emulsifiable concentrates last. After each addition, shake or stir gently to thoroughly mix. The appropriate amount of herbicides for this test follows:

   Dry herbicides: For each pound to be applied per acre, add 1.5 level teaspoons to each jar.

   Liquid herbicides: For each pint to be applied per acre, add 0.5 teaspoon or 2.5 milliliters to each jar.
4. After adding all ingredients, put lids on and tighten, and invert each jar ten times to mix. Let the mixtures stand 15 minutes and then look for separation, large flakes, precipitates, gels, heavy oily film on the jar or other signs of incompatibility. Determine if the compatibility agent is needed in the spray mixture by comparing the two jars. If either mixture separates but can be remixed readily, the mixture can be sprayed as long as good agitation is used. If the mixtures are incompatible, test the following methods of improving compatibility: (A) slurry the dry herbicide(s) in water before addition, or (B) add ½ of the compatibility agent to the fertilizer and the other ½ to the emulsifiable concentrate or flowable herbicide before addition to the mixture.

Checklist for Proper Spray Application

If you cannot check all the following (where applicable), perhaps you have a weakness in your weed control program that can be corrected.

( ) 1. Use flat fan or other nozzle designed for uniform distribution when making broadcast applications.
( ) 2. Use "E" (even-spray) nozzles for banding behind press wheel.
( ) 3. Use flat fan or OC nozzles for postdirected.
( ) 4. Use a minimum screen size of 50 mesh for wettable powders or flowables.
( ) 5. Use stainless steel, ceramic or nylon tips for wettable powders or flowables.
( ) 6. Accurately measure band width.
( ) 7. Convert broadcast rates for band.
( ) 8. Accurately calibrate sprayer.
( ) 9. Refer to label and precautions in this publication to choose proper spray volume and pressure for herbicide used.
( ) 10. Have proper equipment for the herbicide.
( ) 11. Have proper agitation (not just bypass) for powders and flowables.

Herbicide Application

The success of any herbicide treatment depends upon proper application. The following information should provide some guidelines for proper application. This material lacks detail in several areas such as nozzle selection, agitation, etc. However, detailed information on most aspects of spray application is available from your county Extension agent.

Spray Volumes

In general, spray volumes should be in the 5 to 20 gpa range (ground application) for broadcast, soil-applied herbicides. For band applications, a volume equivalent to ½ gallon per inch of band is sufficient (i.e., 10 gpa on a 20-inch band). These volumes are usually adequate for postemergence herbicides, but there are exceptions. Refer to the comments on each herbicide to note any specific application instructions.

Sprayer Tank Agitation

The type of pesticide formulation dictates the need for agitation. Soluble liquids, soluble powders and emulsifiable concentrates require little agitation. Usually the flow from the bypass hose maintains a uniform mixture.

Wettable powder and flowable formulations are only in suspension, and they require vigorous agitation to prevent settling out. Every year, many instances can be cited where insufficient agitation has resulted in excessive crop injury, loss of crop and/or lack of weed control.

Jet Agitation in a Nutshell

1. Insufficient agitation can cost more than the entire sprayer cost.
2. Running a bypass hose into the tank is not agitation.
3. Agitation can be expected to use more pump capacity than the nozzles require.
4. Pre-mixing wettable powders will get pesticides into suspension; insufficient agitation allows them to drop out. Continue agitation until all the spray is distributed.

Nozzle Tips

Herbicides are best applied with the proper nozzle tip design. For broadcast application of soil- or foliar-applied herbicides, use a flat fan tip such as an 8003, LF3-80°, etc. The tip size will depend on the pressure and speed. For postemergence directed herbicides, use a **flat fan** tip such as 8002 and LF2-80° or an **off center** tip such as an OC-02. For band application behind the planter, use an **even spray** tip such as 8003-E or LE3-80°. Note the band application behind the planter is the only use for the even spray tips.

For wettable powder application, use stainless steel, ceramic or nylon tips and a 50-mesh screen. For more information on nozzle selection and special applications, refer to manufacturers' catalogs.

Nozzle Selection

Manufacturers of spray nozzles provide a wealth of information about the selection, setup and use of their products in their catalogs. These include such things as hose flow information and nozzle selection guides. It would be impractical to reprint all that information here. Manuals or catalogs for the type of product you are using are obtained from dealers. If you cannot locate a personal copy, each county Extension office usually keeps at least one copy of popular brand item catalogs.

Nozzle manufacturers continue to offer more types of tips to improve spray applications. Most nozzle tips are now color coded to improve size distinction. Nozzle caps are now designed for easy on/off to facilitate cleaning when necessary. Most nozzle tips have a code stamped on them somewhere. These codes describe the nozzle characteristics, size and material type. Examples – 8002VK is an eighty degree flat fan, size number 2, ceramic tip, and a LFR80-3 Thermoplastic is an eighty degree extended range flat fan tip in size 3 made of thermoplastic material. Tips are available in a number of materials. Stainless steel, nylon and ceramics offer the best wear characteristics. Most manufacturers offer an extended range type flat fan nozzle which helps eliminate some drift potential if operated at lower pressures. Low operation pressures also extend tip life.

Many nozzle manufacturers now utilize air induction chambers to help control the droplet spectrum. This helps avoid the development of so many fine spray particles. Nozzle chambers also help stabilize the droplet spectrum over a wider pressure range.

A good tool of any spray operation is a current manufacturer's catalog. Obtain one for the type spray components you are using and read it carefully to improve your spray accuracy. Several nozzle manufacturer addresses and web pages are listed here. Most have excellent web pages with a wealth of information. Web pages and catalogs should be studied carefully for nozzle selection, setup and operation.

Spray Equipment Addresses:

Teejet Midwest
3062 104th Street
Urbandale, IA 50322
Phone: 515-270-8415
http://www.teejet.com

Greenleaf Technologies
P. O. Box 1767
Covington, LA 70434
Phone: 800-881-4832
sales@turbodrop.com
www.greenleaftech.com

Lurmark Nozzles
Hypro Corporation
375 Fifth Avenue NW
New Brighton, MN 55112-3288
www.hypropumps.com

Wilger, Inc.
Mark H. Bartel
16540 Hwy 104 North
Lexington, TN 38351-6358
Phone: 877-968-7695
wilgeresc@netease.net
www.wilger.net

Wind Compensation

When wind velocity is too high to be practical, the best solution is to park the sprayer. However, there are approaches to compensate for some wind. One solution is to change tips. Use a larger tip (i.e., an 8005 instead of an 8003), and lower the spray pressure (i.e., go up on the nozzle size and down on the pressure). Also, consider a wider angle tip such as a 9503 instead of an 8003. This allows the nozzle to be adjusted closer to the ground without changing the width of the spray pattern where it impacts on the ground. Properly used low pressure tips and Raindrop nozzles will reduce the drift possibility. Low pressure nozzles will substitute for flat fans. Raindrop nozzles (RA series) should be angled either 45° forward or back. Follow the manufacturer's recommendations. The new air induction style nozzles emit fewer fines and may be a very good tool to avoid drift potential. Air induction tips are typically not as sensitive to droplet size changes as operating pressures increase. This helps avoid small droplet formations when the sprayer is operating at higher speeds and the flow control is increasing pressure to ensure the correct dosage.

Band Application

All rates are given as broadcast rates. For band application, you **must** adjust the rate by the following formula:

$$\frac{\text{Band width}}{\text{Row width}} \times \text{Broadcast Rate} = \text{Band Rate}$$

Refer to calibration examples on following pages.

Sprayer Calibration

Useful Formulas

$$\text{GPM (Per Nozzle)} = \frac{\text{GPA} \times \text{mph} \times \text{W}}{5{,}940}$$

$$\text{GPA} = \frac{5{,}940 \times \text{GPM (Per Nozzle)}}{\text{mph} \times \text{W}}$$

GPM – gallons per minute
GPA – gallons per acre
mph – miles per hour
W – nozzle spacing (in inches) for broadcast spraying
– spray width (in inches) for single nozzle, band spraying or boomless spraying
– row spacing (in inches) divided by the number of nozzles per row for directed spraying

Measuring Travel Speed

Measure a test course in the area to be sprayed or in an area with similar surface conditions. Minimum lengths of 100 and 200 feet are recommended for measuring speeds up to 5 and 10 mph, respectively. Determine the time required to travel the test course. To help ensure accuracy, conduct the speed check with a loaded sprayer and select the engine throttle setting and gear that will be used when spraying. Repeat the above process and average the times that were measured. Use the following equation or the table on page 6 to determine ground speed.

$$\text{Speed (mph)} = \frac{\text{Distance (ft)} \times 60}{\text{Time (seconds)} \times 88}$$

Miscellaneous Conversion Factors

One acre = 43,560 square feet = 0.405 hectares

One hectare = 2.471 acres

One gallon per acre = 9.35 liters per hectare

One mile = 5,280 feet = 1,610 meters = 1.61 kilometers

One gallon = 128 fluid ounces = 8 pints = 4 quarts = 3.79 liters = 0.83 imperial gallons

One pound per square inch = 0.069 bar = 6,896 kilopascal

One mile per hour = 1.609 kilometers per hour

No single aspect of spray application is as important and so abused as sprayer calibration. There is no way to accurately apply a herbicide without accurately calibrating the sprayer and figuring the tank mix. Using the following method and examples, you can calibrate quickly, so do it!

Determining Gallons Per Acre (ounce method)

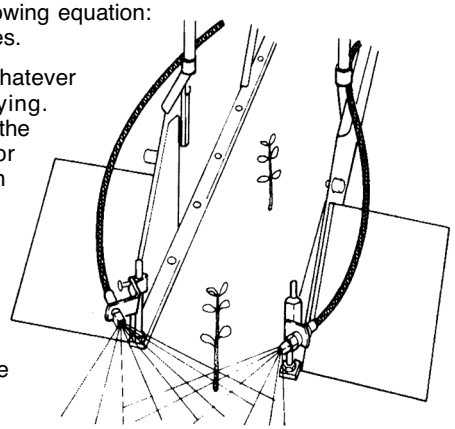
1. Check the table below for the proper distance related to the row or nozzle spacing on your sprayer. For broadcast, use nozzle spacing; for band application such as post directed or band behind press wheel, use row spacing. Mark off this distance in the field you will be spraying.

Row or Nozzle Spacing (Inches)	Calibration Distance (Feet)
40	102
38	107
36	113
34	120
32	127
30	136
28	146
26	157
24	170
22	185
20	204
18	227

   For row or nozzle spacings and calibration distances not shown here, any calibration distance (feet) may be determined by the following equation: 4080 / (average row or nozzle spacing) in inches.

2. Attach row conditioner, Triple-K, planter or whatever tool to be pulled by the tractor when spraying. Engage the tool to the proper depth and use the throttle setting and gear that will be used for spraying. Note on a stopwatch the time in seconds that it takes to drive the calibration distance measured.

3. Catch the nozzle discharge for the noted time in Step 2 in a container graduated in ounces (plastic measuring cup, baby bottle, etc.). If you are using a broadcast boom with nozzles spaced evenly, catch the output from one nozzle for the time measured in Step 2.



   If more than one nozzle per row is used (directed, insecticide or fungicide rig), catch the spray from each nozzle for the time noted in Step 2. Then combine the amount from all nozzles spraying on a single row.

4. The total discharge measured in ounces is equal to the gallons per acre applied. With a broadcast boom, this is the amount caught from one nozzle. Where you have used row spacing in Step 1, all nozzles directed to that row must be measured to determine the gallons per acre.

5. Check each nozzle to assure equal spray distribution across the width of the sprayer. Repeat Steps 3 and 4 to assure that nozzles do not vary more than 10 percent across the width of the sprayer.

Determining Tank Mix

Divide tank refill capacity by the calibrated gallons per acre (determined in Step 4). This is the number of acres the sprayer will cover per refill. Multiply the broadcast rate of herbicide (or band rate) times the acreage per refill to get the amount of herbicide (commercial product) to be put in the tank.

Example 1 – Broadcast Application

A grower will apply Anychem 1 with a broadcast boom having nozzles spaced 20 inches apart while pulling a disk for incorporation.

Step 1 The distance to travel for 20-inch **nozzle** spacing is 204 feet. Measure 204 feet in the field to be sprayed.

Step 2 Select the desired gear and throttle setting with the disk down. Let's say it takes 20 seconds to cover the 204 feet.

Step 3 Set the pressure to be used and catch one nozzle's output for 20 seconds (the time required to travel the 204 feet).

Step 4 The output in ounces is the amount applied in gallons per acre. If the nozzle output was 15 ounces in 20 seconds, the sprayer applies 15 gpa.

Step 5 Repeat Step 4, checking each nozzle.

Let's assume you have a 200-gallon tank and wish to apply one pint of Anychem 1 per acre.

$$\frac{\text{200 gal/refill}}{\text{15 gpa}} = \text{13.3 acres covered per tank (or refill)}$$

Since you wish to use 1 pt/A, you would use 13.3 pints of Anychem 1 per refill, i.e., 1 pt/A x 13.3 acres = 13.3 pints.

[See Note in Example 2]

Example 2 – Band Behind Planter

A grower will apply Anychem 2 behind his planter with a 14-inch spray band on a 38-inch row.

Step 1 The distance to travel for a 38-inch row is 107 feet.

Step 2 Select the planting speed and travel the measured 107 feet with planter down. Let's say it takes 18 seconds in this example.

Step 3 Set the pressure and catch one nozzle's output for 18 seconds (the time required to travel 107 feet).

Step 4 The output in ounces is the amount applied in gallons per acre. If the nozzle output was 10 ounces in 18 seconds, the sprayer applies 10 gpa. (This is all on a band.)

Step 5 Repeat Step 4, checking each nozzle.

Let's assume a 400-gallon tank (two 200-gallon saddle tanks) refill capacity and the rate of Anychem 2 50W for your soil is 1 lb/A **broadcast**. Reduce this rate to a 14-inch band.

$$\frac{14\text{" band}}{38\text{" row}} \text{ X 1 lb/A = 0.37 lb/A to be applied on the band}$$

$$\frac{400 \text{ gal/refill}}{10 \text{ gpa}} = 40 \text{ acres per tank refill}$$

40 acres x 0.37 lb/A = 14.8 lbs of Anychem 2 50W per tank refill; i.e., 7.4 lbs in each 200-gallon saddle tank.

NOTE: Plan on the amount of water required to refill the tank, **not** the capacity of the tank itself. For example, if you have the above 200-gallon saddle tanks but you have 50 gallons of spray left in each when you refill, it only takes 300 gallons to refill them.

Therefore:

$$\frac{300 \text{ gal/refill}}{10 \text{ gpa}} = 30 \text{ acres per refill}$$

30 A/refill x 0.37 lb/A = 11 lbs of Anychem 2 50W per refill (5.5 lbs in each of the two tanks).

Example 3 – Directed Spray

A grower will apply Anychem 3 + Anychem 4 on a 16-inch band on a 32-inch row using 2 OC-02 nozzles per row (one on each side).

Step 1 The distance to travel for a 32-inch row is 127 feet.

Step 2 Select speed and drive the 127 feet. Assume it takes 15 seconds.

Step 3 Set the pressure and catch each of the 2 nozzles per row for 15 seconds or time determined in Step 2.

Step 4 Add the quantity from the two tips. The amount in ounces is the gallons per acre. Assume 5 ounces per tip for a total of 10; therefore, a 10 gpa output.

Step 5 Repeat Step 4, checking the nozzles on each row.

Let's assume two 200-gallon saddle tanks and the **broadcast** rate is 1 lb Anychem 3 50W + 1 pt Anychem 4 per acre. Reduce the rates for the 16-in band:

16⁄32 x 1 lb = ½ lb Anychem 3 16⁄32 x 1 pt = ½ pt Anychem 4/A

$$\frac{400 \text{ gal tank capacity}}{10 \text{ gpa}} = 40 \text{ acres per refill}$$

40 acres x ½ lb Anychem 3 = 20 lb Anychem 3
40 acres x ½ pt Anychem 4 = 20 pts Anychem 4
Put ½ this amount (10 lb Anychem 3 + 10 pt Anychem 4) in **each** tank.

Postemergence Spray Application

Following are some guidelines and diagrams for properly applying postemergence directed herbicides and for ground application of contact/systemic materials.

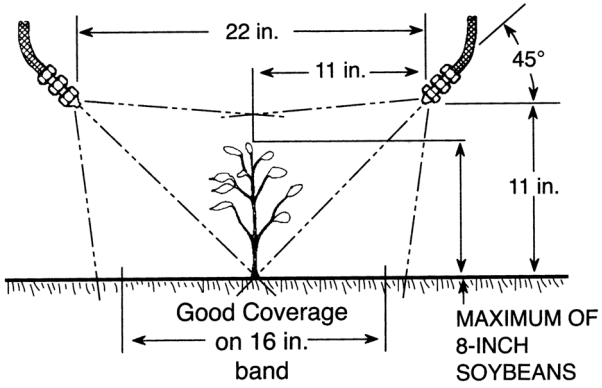
Nozzle Arrangements for Row Banding Overtop Herbicides

Guidelines

Adjust sprayer to apply a minimum of 20 gal/A broadcast at 20-60 psi.
Two-nozzle arrangements effective on 6 inch tall or smaller weeds.
Keep nozzles a minimum of 10 inches from soybean canopy to develop pattern width.
Nozzles should never be angled less than 45° to horizontal because part of the spray will be aimed upward.
Spray should overlap cultivated ground at least 4 inches to assure weed-free row shoulders.
Coverage is essential (contact herbicide).

Soybeans Up to 8 Inches Tall

TWO NOZZLE ARRANGEMENT



Nozzles can be angled greater than 45° or moved to spacings narrower than 22 inches where soybeans and weeds are small.

Special 95° tips can be used where nozzle support doesn't permit adequate nozzle spacing. Angle these tips downward at least 50° from horizontal and keep them a minimum of 8 inches from soybean canopy.

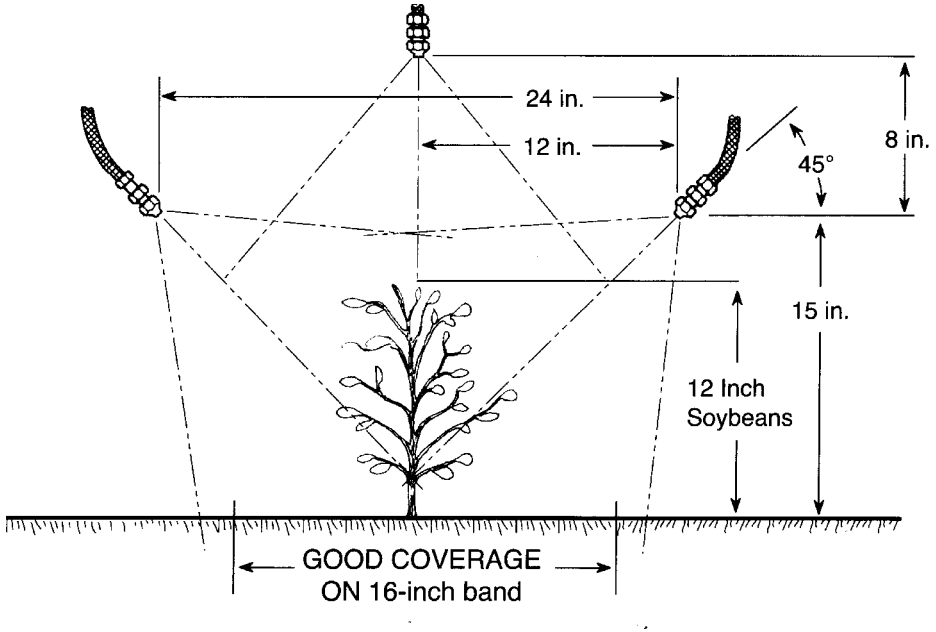
Always measure the band width to determine proper herbicide tank mix.

Nozzle Tip Options
(two nozzles on 38-inch row)*

Speed (mph)	Flat Fan (50 psi)
4	LF2-80°, 8002 (17 gpa)
6	LF2-80°, 8002 (12 gpa)
8	LF3-80°, 8003 (13 gpa)

*EXAMPLE ONLY – lower pressures may be selected and corresponding rate determined.

THREE NOZZLE ARRANGEMENT



The three nozzle arrangement is better if weed pressure is heavy and if cocklebur and soybeans are the same height and good coverage is needed in terminal region.

If weeds beside the drill are the primary cause for spraying, maintain the center nozzle height 10 inches above the soybeans. Increase the rate on the shoulders by increasing the 45° angle slightly and lowering the side nozzles (but no lower than 10 inches from the ground).

If weeds in the canopy are the primary cause for spraying, but they are no more than 4 inches above the canopy, maintain the dimensions shown. Raise all nozzles equally if larger weeds are a problem. For example, when weeds are 7 inches above the canopy, raise all nozzles 3 inches (7 – 4 = 3 inches).

Always measure the band width to determine proper herbicide tank mix.

Nozzle Tip Options*
(three nozzles on 38-inch row)

Speed (mph)	Flat Fan (50 psi)
4	LF2-80°, 8002 (27 gpa)
6	LF2-80°, 8002 (17 gpa)
8	LF3-80°, 8003 (13 gpa)

*EXAMPLE ONLY – lower pressures may be selected and corresponding rate determined.

Directed Spray Nozzle Arrangements for Cultivator-Mounted and Shoe-Mounted Nozzles

Guidelines

One-half to one gallon per inch of band is adequate.

Nozzles should not spray higher on the crop than the herbicide label allows, but positioning is largely dependent on the primary weed problem. One-third up the soybean stem is a good rule of thumb.

Two nozzles per row are generally sufficient. Two are much easier to adjust and maintain than four nozzles. Spray weeds early so herbicides are more effective and crop competition is eliminated.

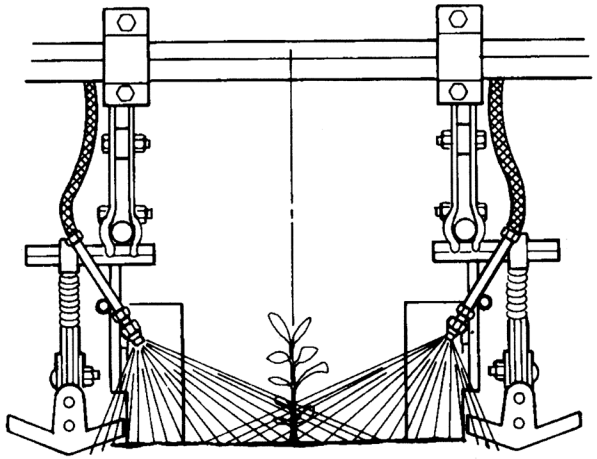
These rigs can be used carefully on 6-inch or taller soybeans, but the height differential is essential.

Thorough coverage is necessary.

Nozzle Tip Options
(two nozzles on 38-inch row)

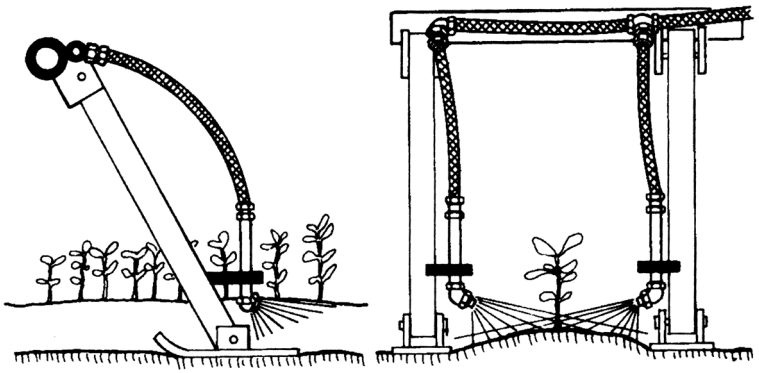
Speed (mph)	Flat Fan Tips (30 psi)	Off Center Tips (30 psi)	Volume of Spray (gpa)
4	8002, LF2-80°	OC-02, LX-2	14
6	8003, LF3-80°	OC-03, LX-3	13

Early Postdirected Spray on Cultivator



View From Front
(Flat Fan Tips)

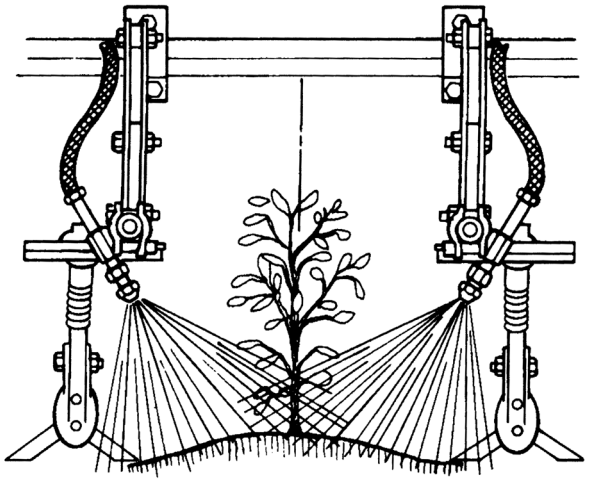
Early Postdirected Rig Adjustment



Side Rear

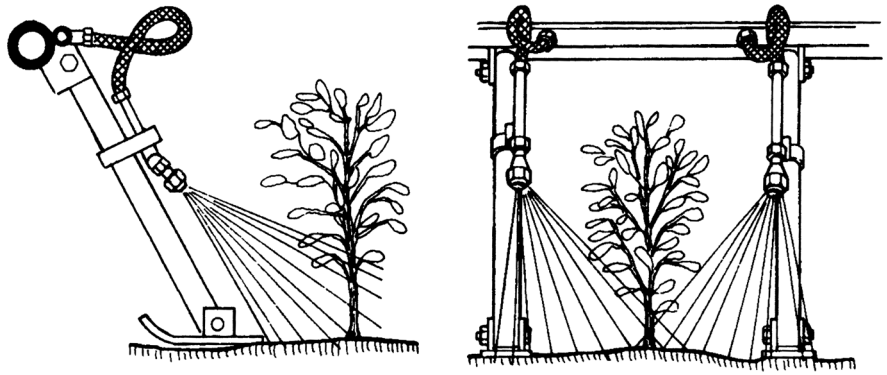
(Off-Center Tips)

Later Season Cultivator Mount



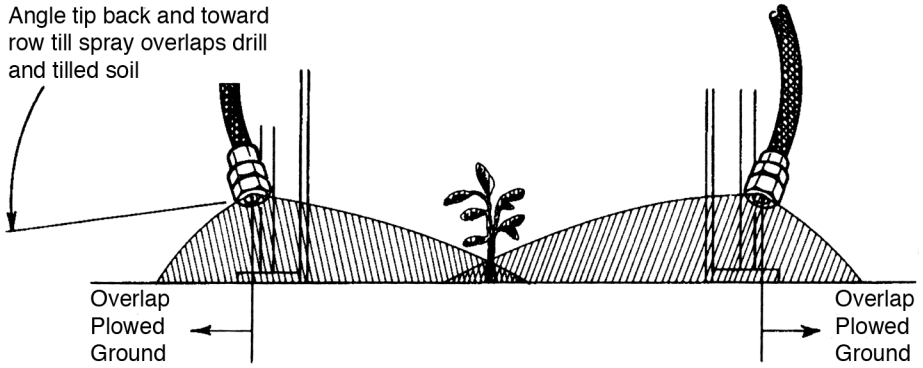
View From Rear
(Flat Fan Tips)

Later Season Postdirected Rig Adjustment



Side Rear

(Flat Fan Tips)



Rear View

Summary

If postdirected application is a new concept, it is certainly worth considering. For very little investment, directed spray can solve morningglory, cocklebur and red rice problems in soybeans. In fact, one of the rigs pictured is the only postdirected sprayer needed for many chemicals, if operated properly.

Nozzle Tip Options
(two nozzles on 38-inch row)

Speed (mph)	Flat Fan Tips (30 psi)	Off Center Tips (30 psi)	Volume of Spray (gpa)
3	9502 or 8002	OC-02	18
4	9502 or 8002	OC-02	14
5	9502 or 8002	OC-02	11

(LF2-80° is nearly the same as 8002; LF2-95° is nearly the same as 9502; and LX-2 is nearly the same as OC-02.)

NOTE: Early postemergence is an excellent application of the special 95° flat fan tips (9502) because the spray pattern taps the drill and shoulder when mounted low.

Nozzle Arrangements for Precision Postemergence [Fenders]

Guidelines

One-half gallon per acre per inch of band is desirable.

Position nozzle about as high as the crop is tall.

Spray should overlap cultivated ground at least 4 inches to assure weed-free row shoulders.

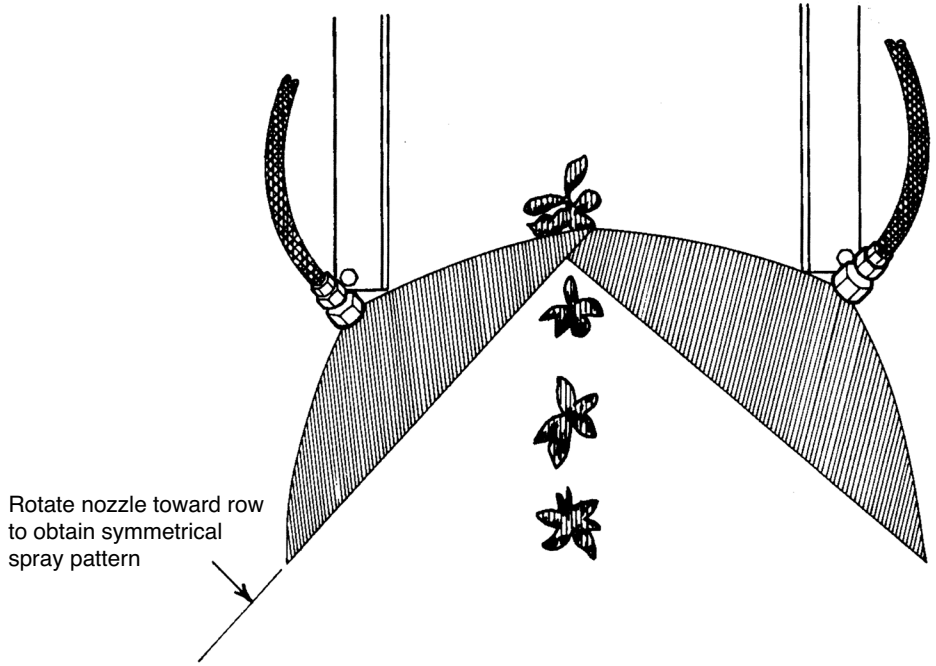
Position nozzles so spray intersects crop no higher than the label of the herbicide permits. Consider bed height and field roughness.

Attempt to obtain uniform distribution of spray where pattern strikes the soil.

Two nozzles per row is adequate when nozzles provide uniform coverage from drill to 4-inch "plow" overlap.

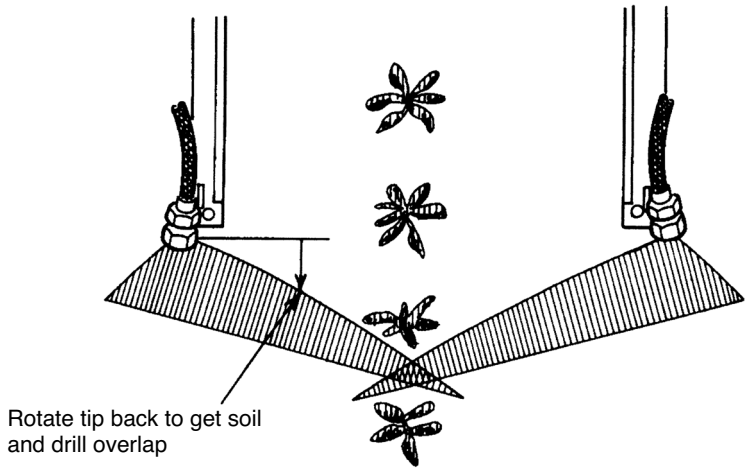
Coverage is essential (contact herbicide), but crop must be taller than weeds to use equipment to an advantage.

Flat Fan Tips

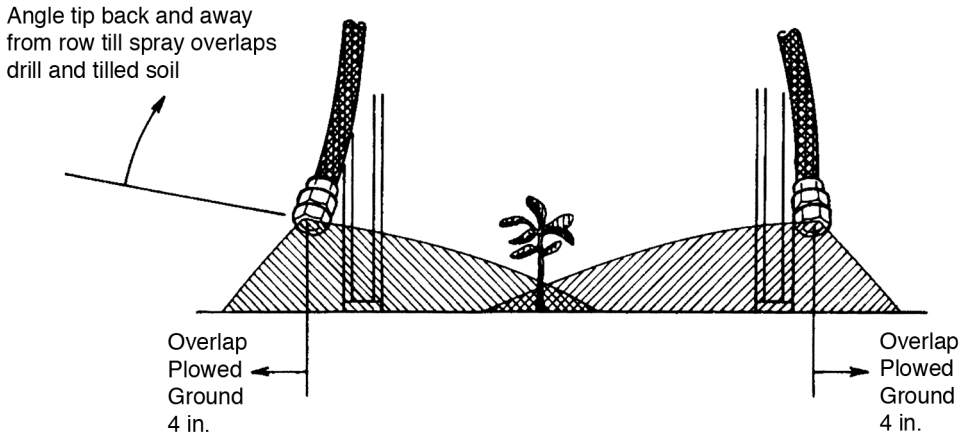


Top View

Off-Center Tips



Top View



Rear View

WEED RESISTANCE TO HERBICIDES

In Arkansas and surrounding states, the following examples of weed resistance to herbicides have been documented: horseweed, Palmer amaranth, common ragweed, giant ragweed, annual ryegrass and johnsongrass resistance to glyphosate; barnyardgrass resistance to propanil, quinclorac and clomazone; cocklebur and pigweed resistance to Scepter and Classic; ryegrass resistance to Hoelon and Osprey; and johnsongrass resistance to Select and Fusilade.

Things That Promote Resistance

1) Overdependence on single herbicides.
2) Relying on a single mode of action year after year.
3) Sequential applications of the same herbicides within a year.
4) Applying sub-lethal rates of herbicides.

In order to manage herbicide-resistant weeds and to prevent the widespread development of resistance, the University of Arkansas recommends the following strategies:

General Resistance Management Strategies

1) Rotate crops.
2) Use tillage, cultivation and other cultural practices in rotation, when possible.
3) Rotate herbicides using different modes of action.
4) Use tank-mixtures at effective rates, with different modes of action.
5) Avoid using sequential applications of the same single herbicide over and over again.
6) Control weeds on fallow ground or set aside land to prevent spreading (glyphosate-resistant horseweed is a good example).
7) **If you suspect resistance after a herbicide application: Attempt to eradicate escapes with alternative herbicides or cultural methods. Do not let them go to seed! Collect seed samples from suspect plants and take them to your county Extension agent who will have them tested at the University of Arkansas or can let you know if resistant populations are known to exist.**

Some Examples of Herbicides Having Same Mode of Action and Weeds That Are Resistant to Them in Arkansas

MOA	Herbicides	Weeds Resistant to This Group in Arkansas
9	**EPSPS inhibitor** Roundup	horseweed, Palmer pigweed, common ragweed, giant ragweed, annual ryegrass and johnsongrass
1	**Postemergence grass herbicide (ACCase inhibitor)** Hoelon, Axial, Select, Fusilade, Clincher, Ricestar HT, Assure II, Poast	annual ryegrass
2	**ALS inhibitor herbicide** Newpath, Classic, Staple, FirstRate, Scepter, Synchrony XP, FirstShot, Harmony, Oust, Regiment, Permit, Finesse	annual ryegrass, pigweed, common cocklebur, red rice, barnyardgrass, annual nutsedge, smallflower, umbrella sedge and yellow nutsedge
7	**Photosynthesis inhibitors (amides)** Propanil (Superwham, Stam, others)	barnyardgrass
13	**Pigment inhibitors** Command	barnyardgrass
4	**Synthetic auxins** Facet	barnyardgrass
3	**DNA herbicides** Prowl H_2O, Treflan, Sonolan, Barricade, Pendimax, Trilin	goosegrass

Other herbicides with the same mode of action (resistance not documented in Arkansas):

MOA	Herbicides
15	**Acetamide herbicides** Dual, Lasso, Degree, Outlook, Parrlay
5,6,7	**Photosynthesis inhibitors** Atrazine, metribuzin, Meturon, Lorox, Karmex, Cotoran
14	**PPO inhibitors** Valor, Flexstar, Ultra Blazer
10	**Glutamine synthetase inhibitor** glufosinate

Specific Weed Control Strategies:

1) **Glyphosate-resistant horseweed in soybean and cotton.**
   a. Most horseweed in Arkansas is now resistant to glyphosate. In soybeans, begin with a burndown application of 8 oz/A of Clarity tank-mixed with glyphosate or start clean with tillage. If burning down with Clarity, allow at least 14 days after 1.0 inches of rainfall prior to planting. Include a residual component such as Valor or a Valor-containing pre-mix for extended horseweed control.
   b. In cotton, apply glyphosate plus Clarity at least 21 days prior to planting + 1 inch of rainfall. Valor can be added for extended residual control.
   c. Glufosinate may be a partially effective burndown treatment for glyphosate-resistant horseweed if the Clarity timing is missed. In soybean, 1.0 oz/A of Python can be added for burndown and residual control.
   d. Tank-mix glyphosate with FirstRate herbicide POST in soybean.
   e. Rotate to Liberty Link varieties and use glufosinate POST.

2) **Glyphosate-resistant Palmer amaranth in soybean and cotton.**
   a. In soybean, start clean with tillage or a burndown program. Use a residual treatment of either Prefix, Dual, Valor or Valor-containing pre-mix (Valor XLT, Gangster, Envive, etc.). Use Flexstar or Ultra Blazer at a full rate early-POST to 3- to 4-inch pigweeds. Rotate to Liberty Link Soybean and use glufosinate in combination with a residual treatment listed above.

b. In cotton, start clean with a good burndown program or tillage. It is necessary to prevent pigweeds from emerging in cotton as postemergence options in conventional and Roundup Ready cotton are not effective. Apply Prowl or Treflan PPI. Apply Direx, Caparol or Cotoran PRE to delay the emergence of pigweed. Metolachlor-containing products can be applied POST up to the fifth leaf with glyphosate. Follow this with a lay-by application of Valor. Consider rotating to corn, use atrazine or Liberty Link cotton, and use glufosinate POST.

3) **PPO (Group 14)-resistant Palmer amaranth in soybean and cotton.**
   a. In soybean, consider a rotation to Liberty Link technology. Start clean with tillage or a burndown program that includes Gramoxone (paraquat). Use a residual PRE or preplant treatment that includes herbicides with multiple modes of action. Boundary, Canopy + Dual Magnum or other herbicide combinations of metribuzin and Dual Magnum or Zidua are highly recommended. In Liberty Link Soybean, include Prefix, Dual Magnum or Zidua with the early post applications of Liberty.
   b. In cotton, plant a cultivar that is tolerant to Liberty herbicide. Apply Gramoxone (paraquat) plus Cotoran or Diuron at planting. Early post applications of Liberty should include a residual herbicide such as Dual Magnum for pigweed control. Layby applications should include MSMA plus Anthem Flex, Zidua or Fierce.

4) **Glyphosate-resistant giant ragweed in soybean.**
   a. Use tillage to control ragweed prior to planting. Giant ragweed usually only germinates one time per year and can be controlled with a timely tillage. Use 2,4-D in a burndown program, at least 14 days prior to planting + 1 inch rainfall.
   b. Use a full rate of Flexstar or FirstRate postemergence prior to 6-inch giant ragweed.

5) **Glyphosate-resistant johnsongrass in soybean and cotton.**
   a. Apply a full rate of Select or other graminicide instead of glyphosate to 8-inch-tall johnsongrass. Multiple applications may be needed.
   b. In Liberty Link soybeans, use two applications of glufosinate plus a half rate of a graminicide.

6) **Hoelon-resistant ryegrass in wheat.**
   a. Most wheat-producing counties in Arkansas have had at least one confirmed field of Hoelon-resistant ryegrass. A preemergence treatment of Finesse or very early POST treatment of Finesse Grass and Broadleaf will provide effective control of Hoelon-resistant ryegrass. A rainfall is needed to activate the residual component of these treatments. Utilize Osprey or PowerFlex POST for control of Hoelon-resistant ryegrass. Prowl H_2O or Axiom are good residual options if you are planning on a follow-up POST treatment.

7) **ALS-resistant weeds (Group 2).**
   a. ALS-resistant pigweed and cocklebur once infested soybean fields from years of Scepter and Classic use. However, since the introduction of Roundup Ready soybeans, the occurrence of these has been significantly reduced. See glyphosate-resistant Palmer amaranth above.
   b. Since the introduction of Clearfield rice, outcrossing of weedy rice with the CL varieties has occurred. This has resulted in the occurrence of CL-tolerant red rice or outcrossed ALS-resistant biotypes of red rice. Rotation to Roundup Ready soybeans or conventional soybeans with a red rice program of Dual followed by a graminicide (Select) is recommended for these fields. In addition, the heavy reliance on Newpath herbicide for barnyardgrass control has sparked concerns over more grass species becoming resistant to Newpath and other ALS chemistry. The University of Arkansas Cooperative Extension Service recommends the use of Command, propanil or other non-ALS barnyardgrass herbicides in combination with Newpath for resistance management.

8) **Propanil-resistant barnyardgrass in rice.**
   a. Most rice-producing counties have tested positive for at least one field of propanil-resistant barnyardgrass. Alternate propanil with other barnyardgrass control options in rice such as Ricestar HT, Facet or Regiment. Begin with a preemergence application of Command. Tank-mix residual herbicides, such as Bolero, Prowl H_2O, Command and Facet, with propanil.

9) **Command-resistant barnyardgrass in rice.**
   a. Two populations of Command-resistant barnyardgrass have been identified in Arkansas as of the fall of 2008.
   b. Follow up any “misses” from a Command PRE application with Ricestar HT or Facet and do not allow these plants to get too big or go to seed. Often Command can antagonize glyphosate (Roundup), causing control failures in burndown applications. Do not allow these plants to get too big prior to a follow-up in-season application in rice.

10) **Facet-resistant barnyardgrass in rice.**
   a. A growing number of rice fields have tested positive for Facet-resistant or a combination of Facet + propanil-resistant barnyardgrass.
   b. Alternative programs should be used. Clearfield rice with Newpath herbicide, Command PRE and Ricestar HT or Clincher POST.

11) **ALS-resistant barnyardgrass in rice (Group 2).**
   a. Use Command PRE in Clearfield rice.
   b. Grasp and Regiment are also ALS herbicides.

12) **DNA-resistant goosegrass.**
   a. Documented occurrence of this pest has been reduced since the introduction of Roundup Ready crops.

13) **ALS-resistant sedges, annual sedge, smallflower, umbrella sedge and yellow nutsedge (Group 2).**
   a. Bolero delayed PRE followed by propanil + Basagran.
   b. Strada, Permit, Grasp, League, Regiment, Newpath and Beyond are ALS herbicides.

14) **Glyphosate-resistant ryegrass.**
   Populations of ryegrass have been identified in Arkansas that are resistant to glyphosate. Treatment options include fall applications of herbicides, such as Dual, for preemergence control of ryegrass along with POST applications in the fall or early spring of paraquat or Select. See the burndown section for more information.

HERBICIDE TRADE NAME, COMMON NAME, FORMULATION, MODE (SITE) OF ACTION, AND MANUFACTURER, ORDERED BY WSSA SITE OF ACTION

Trade Name	Common Name	Formulation[1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Acclaim Extra	fenoxaprop	0.57 E	1	A	Bayer
Assure II	quizalofop	0.88 EC	1	A	DuPont
Axial	penoxaden	0.83 EC	1	A	Syngenta
Clincher SF	cyhalofop	2.38 L	1	A	Dow AgroSciences
Envoy	clethodim	0.94 EC	1	A	Valent
Fusilade DX	fluazifop	2 EC	1	A	Syngenta
Hoelon	diclofop	3 EC	1	A	Bayer
Illoxan	diclofop	3 EC	1	A	Bayer
Ornamec	fluazifop-P	0.5 EC	1	A	PBI Gordon
Poast	sethoxydim	1.5 EC	1	A	Microflo
Poast Plus	sethoxydim	1 EC	1	A	Microflo
Ricestar HT	fenoxaprop	0.58 EW	1	A	Bayer
Select	clethodim	2 EC	1	A	Valent
Targa	quizalofop	0.88 EC	1	A	Gowan
Vantage	sethoxydim	1 EC	1	A	BASF; Microflo
Accent Q	nicosulfuron	54.5 DF	2	B	DuPont
Ally XP	metsulfuron	60 DF	2	B	DuPont
Arsenal A.C.	imazapyr	4 AC	2	B	BASF
Beacon	primisulfuron	75 DF	2	B	Syngenta
Beyond	imazamox	1 S	2	B	BASF
Cadre	imazapic	70 DG	2	B	BASF
Certainty	sulfosulfuron	75 DF	2	B	Monsanto
Chopper	imazapyr	2 S	2	B	BASF
Cimarron Plus	metsulfuron + chlor-sulfuron (48% + 15%)	63 DF	2	B	DuPont
Classic	chlorimuron	25 DF	2	B	DuPont
Corsair	chlorsulfuron	75 WDG	2	B	Nufarm
Crusher	rimsulfuron + thifensulfuron	50 DF	2	B	Cheminova
Envoke	trifloxysulfuron	75 DG	2	B	Syngenta
Escort	metsulfuron	60 DF	2	B	DuPont
Express	tribenuron	50 SG	2	B	DuPont
FirstRate	cloransulam	84 DF	2	B	Dow AgroSciences
Grasp	penoxsulam	2 EC	2	B	Dow AgroSciences
Habitat	imazapyr	2.0 lb/gal	2	B	BASF
Halo Max 75	halosulfuron	75 WG	2	B	Aceto
Harmony GT	thifensulfuron	75 DF	2	B	DuPont
Image	imazaquin	1.5 EC	2	B	BASF
League	imazosulfuron	75 WG	2	B	Valent
Londax	bensulfuron	60 DF	2	B	RiceCo
Manor	metsulfuron	60 WDG	2	B	Nufarm; Riverdale
Matrix	rimsulfuron	25 DF	2	B	DuPont
Monument	trifloxysulfuron	75 WG	2	B	Syngenta
Newpath	imazethapyr	2 AS	2	B	BASF
Osprey	mesosulfuron	4.5 DF	2	B	Bayer
Oust	sulfometuron	75 WDG	2	B	DuPont
Outrider	sulfosulfuron	75 WP	2	B	Monsanto
Peak	prosulfuron	57 DG	2	B	Syngenta
Permit	halosulfuron	75 DG	2	B	Gowan
Plateau	imazapic	70 DG	2	B	BASF
Pursuit	imazethapyr	2 AS; 70 DG	2	B	BASF
Python	flumetsulam	80 WDG	2	B	Dow AgroSciences
Raptor	imazamox	1 AS	2	B	BASF
Regiment	bispyribac	80 DF	2	B	Valent
Resolve	rimsulfuron	25 DF	2	B	DuPont
Revolver	foramsulfuron	0.19 L	2	B	Bayer
Sandea	halosulfuron	75 DF	2	B	Gowan
Scepter	imazaquin	70 DG	2	B	AMVAC
Sedgehammer	halosulfuron	75 DF	2	B	Gowan
Stalker	imazapyr	2 SL	2	B	BASF
Staple LX	pyrithiobac	3.2 SL	2	B	DuPont
Strada	orthosulfamuron	50 WG	2	B	Isagro-USA
Strongarm	diclosulam	0.84 L	2	B	Dow AgroSciences
Synchrony XP	chlorimuron + thifensulfuron	28.4 XP (21.5 + 6.9%)	2	B	DuPont
Telar	chlorsulfuron	75 DF	2	B	DuPont
Balan	benefin	60 DF	3	K1	Dow AgroSciences
Barricade	prodiamine	65 WG	3	K1	Syngenta
Curbit	ethalfluralin	3 EC	3	K1	Platte Chemical
Dacthal	DCPA	75 WP; 6 L	3	K1	Amvac Chemical
Dimension	dithiopyr	2 EC	3	K1	Dow AgroSciences
Endurance	prodiamine	65 WDG	3	K1	Syngenta
Factor	prodiamine	65 WSG	3	K1	Syngenta
Kerb	pronamide	50 W	3	K1	Dow AgroSciences
Lesco PRE-M	pendimethalin	50 WP (others)	3	K1	Lesco

(Continued on page 14)

Herbicide Trade Name, Common Name, Formulation, Mode (Site) of Action, and Manufacturer, Ordered By WSSA Site of Action [cont.]

Trade Name	Common Name	Formulation[1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Pendimax	pendimethalin	3.3 EC	3	K1	Dow AgroSciences
Pendulum	pendimethalin	3.3 EC; 2 G; 60 WDG	3	K1	BASF
Pendulum Aqua-Cap	pendimethalin	3.8 lb/gal	3	K1	BASF
Preen	trifluralin	1.47 G	3	K1	Lebanon Seaboard
Prowl	pendimethalin	3.3 EC	3	K1	BASF
Prowl H_2O	pendimethalin	3.8 CS	3	K1	BASF
Regalkade	prodiamine	0.5% G	3	K1	Regal
Sonalan	ethalfluralin	3 EC	3	K1	Dow AgroSciences
Surflan	oryzalin	4 EC	3	K1	Dow AgroSciences
Treflan	trifluralin	10 G	3	K1	Dow AgroSciences
Treflan HFP	trifluralin	4 EC	3	K1	Dow AgroSciences
2,4-D amine or ester	2,4-D	several	4	O	several
2,4-DB	2,4-DB	several	4	O	several
Banvel	dicamba	4 SL	4	O	Microflo
Banvel II	dicamba	2 SL	4	O	Microflo
Barrage HF	2,4-D ester	4.7 EC	4	O	Helena
Butoxone 200	2,4-DB	2 SL	4	O	Cedar Chemical
Butyrac 200	2,4-DB	2 SL	4	O	Albaugh
Clarity	dicamba	4 S	4	O	BASF
Drive	quinclorac	75 DF	4	O	BASF
Facet, Facet L	quinclorac	75 DF, 1.5 L	4	O	BASF
Forestry Garlon 4	triclopyr	4 SL	4	O	Dow AgroSciences
Formula 40	2,4-D	3.8 SL	4	O	Aventis
Garlon	triclopyr	4 L; 3 L	4	O	Dow AgroSciences
Grandstand R	triclopyr	3 SL	4	O	Dow AgroSciences
GrazonNext HL	aminopyralid + 2,4-D	3 lb/gal (0.33 + 2.67 lb/gal)	4	O	Dow AgroSciences
Lontrel	clopyralid	3 L	4	O	Dow AgroSciences
MCP amine	MCPA	4 SL	4	O	Loveland; Platte
MCPP	MCPP	4 L	4	O	Verdicon
Mecomec	mecoprop	2.5 L	4	O	PBI Gordon
Milestone	aminopyralid	2 lb/gal	4	O	Dow AgroSciences
Opti-Amine	2,4-D	3.8 EC	4	O	Helena
PastureGard HL	triclopyr + fluroxypyr	1.5 + 0.5	4	O	Dow AgroSciences
Pathfinder II	triclopyr	0.75 SL	4	O	Dow AgroSciences
Remedy Ultra	triclopyr	4 SL	4	O	Dow AgroSciences
Renovate	triclopyr	3.0 lb/gal	4	O	SePro
Status	dicamba	40% SL	4	O	BASF
Stinger	clopyralid	3 SL	4	O	Dow AgroSciences
Surmount	picloram + fluroxypyr	1.19 + 0.96	4	O	Dow AgroSciences
Tahoe 3A	triclopyr amine	3 SL	4	O	Nufarm
Tahoe 4E	triclopyr ester	4 EC	4	O	Nufarm
Tordon 22K	picloram	2 SL	4	O	Dow AgroSciences
Tordon K	picloram	2 SL	4	O	Dow AgroSciences
Transline	clopyralid	3 L	4	O	Dow AgroSciences
Turflon Ester	triclopyr	4 L	4	O	Dow AgroSciences
Unison	2,4-D	1.74 EC	4	O	Helena
Vanquish	dicamba	4 SL	4	O	Syngenta
Weedar 64	2,4-D	3.8 SL	4	O	Nufarm
Velpar	hexazinone	75 DF; 2 L	5	C1	DuPont
AAtrex	atrazine	4L, 90 DF	5	C1	Syngenta
Caparol	prometryn	80 DF; 4 L	5	Cl	Syngenta
Hyvar X	bromacil	80 WP	5	C1	DuPont
Pramitol	prometon	25 E (25% active liquid)	5	C1	Agriliance
Princep	simazine	4 L; 90 DG	5	C1	Syngenta
Pronone	hexazinone	10 G; 2.5 G	5	C1	Proserve
Pyramin	pyrazon	65 DF	5	C1	Microflo
Spin-Aid	phenmedipham	1.3 L	5	C1	Bayer
Basagran	bentazon	4 SL	6	C3	Microflo
Basagran T/O	bentazon	4 SL	6	C3	Microflo
Buctril	bromoxynil	4 EC; 2 EC	6	C3	Bayer
Cotoran	fluometuron	4 L; 80 DF	7	C2	MANA
Direx	diuron	4 L	7	C2	MANA
Karmex	diuron	4 L; 80 DF	7	C2	MANA
Linex	linuron	4 L	7	C2	NovaSource
Spike	tebuthiuron	80 DF; 20 P	7	C2	Dow AgroSciences
Stam M4	propanil	4 L; 80 DF	7	C2	Dow AgroSciences
Super Wham	propanil	4 EC	7	C2	RiceCo
Tupersan	siduron	50 WP	7	C2	PBI Gordon; Gowan

(Continued on page 15)

Herbicide Trade Name, Common Name, Formulation, Mode (Site) of Action, and Manufacturer, Ordered By WSSA Site of Action [cont.]

Trade Name	Common Name	Formulation[1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Betamec	bensulide	4 EC	8	N	PBI Gordon
Betasan	bensulide	4 EC	8	N	Platte
Bolero	thiobencarb	8 EC	8	N	Valent
Eptam	EPTC	7 EC	8	N	Syngenta
Lescosan	bensulide	4 L (others)	8	N	Lesco
Prefar	bensulide	4 E	8	N	Gowan
Pre-san	bensulide	7 G	8	N	PBI Gordon
Ro-Neet	cycloate	6 E	8	N	Helm
Accord Concentrate	glyphosate	4 SL (acid eq.)	9	G	Dow AgroSciences
glyphosate formulations	glyphosate	various	9	G	various
Roundup formulations	glyphosate	various	9	G	Monsanto
Touchdown HiTech	glyphosate	4.5 SL (acid eq.)	9	G	Syngenta
Touchdown IQ	glyphosate	3 SL (acid eq.)	9	G	Syngenta
Touchdown Total	glyphosate	4.17 SL (acid eq.)	9	G	Syngenta
Cheetah	glufosinate	2.34 SL	10	H	Nufarm
Finale	glufosinate	1 SL	10	H	Bayer
Interline	glufosinate	2.34 SL	10	H	UPI
Liberty	glufosinate	2.34 SL	10	H	Bayer
Rely	glufosinate	1 SL	10	H	Bayer
Predict	norflurazon	78.6 DF	12	F1	Syngenta
Solicam	norflurazon	78.6 DF	12	F1	Syngenta
Command	clomazone	3 ME	13	F4	FMC
Aim	carfentrazone	2 EC	14	E	FMC
Armezon, Pylex	topramezone	2.8 L	14	E	BASF
BroadStar	flumioxazin	51% WDG	14	E	Valent
Cadet	fluthiacet methyl	0.91 EC	14	E	FMC
Cobra	lactofen	2 EC	14	E	Valent
Delta Goal	oxyfluorfen	4 EC	14	E	Dow AgroSciences
Dismiss	sulfentrazone	4L	14	E	FMC
Flexstar, Rhythm	fomesafen	1.88 ME	14	E	Syngenta; Cheminova
Goal 2XL	oxyfluorfen	2 EC	14	E	Dow AgroSciences
Marvel	fomesafen + fluthiacet-methyl	35 C (2.88 + 0.12 lb/gal)	14	E	FMC
Quicksilver	carfentrazone	1.9 L	14	E	FMC
Reflex, Dawn	fomesafen	2 LC	14	E	Syngenta; Cheminova
Resource	flumiclorac	0.86 EC	14	E	Valent
Ronstar	oxadiazon	50 SP; 2 G	14	E	Bayer
Sharpen	saflufenacil	2.85 SC	14	E	BASF
Spartan	sulfentrazone	4 F	14	E	FMC
Spartan Charge	carfentrazone + sulfentrazone	4.5L (0.35 + 3.15 lb/gal)	14	E	FMC
Sureguard	flumioxazin	0.25% G	14	E	Valent
Ultra Blazer	acifluorfen	2 SL	14	E	UPI
Valor	flumioxazin	51 WDG	14	E	Valent
Cinch	S-metolachlor	7.64 EC	15	K3	DuPont
Degree	acetochlor	3.8 SL	15	K3	Monsanto
Devrinol	napropamide	2 G; 2 EC	15	K3	United Phosphorus
Dual II Magnum	S-metolachlor	7.64 EC	15	K3	Syngenta
Dual Magnum	S-metolachlor	7.62 EC	15	K3	Syngenta
Harness, Warrant	acetochlor	7 EC	15	K3	Monsanto
Outlook	dimethenamid-p	6 EC	15	K3	BASF
Parrlay	metolachlor	8 EC	15	K3	Monsanto
Pennant Magnum	S-metolachlor	7.62 EC	15	K3	Syngenta
Tower	dimethenamid	6 lb/gal	15	K3	BASF
Zidua	pyroxasulfone	85% WDG	15	K3	BASF
Prograss	ethofumesate	1.5 EC	16	N	Bayer
DSMA Plus	DSMA	3.8 SL	17	Z	UAP-Loveland
MSMA (others)	MSMA	6 SL; 6.6 SL	17	Z	several
Alanap	naptalam	2 L	19	P	Crompton Uniroyal
Casoron	dichlobenil	2 G; 4 G	20	L	Crompton
Dyclomec	dichlobenil	4 G	20	L	PBI Gordon
Norosac	dichlobenil	4 G	20	L	PBI Gordon
Gallery	isoxaben	75 DF	21	L	Dow AgroSciences
Gramoxone, Parazone, Quik-Quat	paraquat	2 SL	22	D	Syngenta; Drexel; MANA
Reward	diquat	2 SL	22	D	Syngenta
Basamid Granular	dazomet	99 G	26	Z	BASF
Krenite S	fosamine	4 S	26	Z	DuPont
Balance Flexx	isoxaflutole	2.05 L	27	F2	Bayer

(Continued on page 16)

Herbicide Trade Name, Common Name, Formulation, Mode (Site) of Action, and Manufacturer, Ordered By WSSA Site of Action [cont.]

Trade Name	Common Name	Formulation [1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Callisto	mesotrione	4 L	27	F2	Syngenta
Laudis	tembotrione	3.5 L	27	F2	Bayer
Laudis	tembotrione + isoxadifen	3.5 SC	27	F2	Bayer
Fusion	fluazifop + fenoxaprop	2.56 EC (2 + 0.56 lb/gal)	1 + 1	A + A	Syngenta
Canopy EX	chlorimuron + tribenuron	29.5% WDG (22.7% + 6.8%)	2 + 2	B + B	DuPont
Exceed	primisulfuron + prosulfuron	57 DF (28.5 + 28.5%)	2 + 2	B + B	Syngenta
Finesse	chlorsulfuron + metsulfuron	75 DF (62.5 + 12.5%)	2 + 2	B + B	DuPont
FirstShot SG	thifensulfuron + tribenuron	50% SG (25% + 25%)	2 + 2	B + B	DuPont
Frontrow	cloransulam + flumetsulam	co-pack 84% + 80%	2 + 2	B + B	Dow AgroSciences
Harmony Extra SG	thifensulfuron + tribenuron	50 SG (33.3 + 16.7%)	2 + 2	B + B	DuPont
Landmark II MP	sulfometuron + chlorsulfuron	75 DG (56.25 + 18.75%)	2 + 2	B + B	DuPont
LeadOff	rimsulfuron + thifensulfuron	33.4 SG (16.7 + 16.7%)	2 + 2	B + B	DuPont
Lightning	imazethapyr + imazapyr	70 DG (52.5 + 17.5%)	2 + 2	B + B	BASF
Resolve Q	rimsulfuron + thifensulfuron-methyl	22.4 DG (18.4 + 4%)	2 + 2	B	DuPont
Steadfast Q	nicosulfuron + rimsulfuron	38 DG (25 + 13%)	2 + 2	B + B	DuPont
Afforia	thifensulfuron + tribenuron + flumioxazin	50.8 DG (5 + 5 + 40.8%)	2 + 2 + 14	B + B + E	DuPont
Yukon	halosulfuron + dicamba	67.5 WSG (12.5 + 55%)	2 + 4	B + O	Gowan
Chaparral	aminopyralid + metsulfuron	72 DF (62 + 9%)	2 + 4	B + O	Dow AgroSciences
Cimarron Max	two-part mix: metsulfuron and 2,4-D + dicamba	60 DF and 1.87 + 1 lb/gal	2 + 4 + 4	B + O + O	DuPont
SureStart	acetochlor + flumetsulam + clopyralid	4.25 EC	2 + 4 + 15	B + O + K3	Dow
Oustar	sulfometuron + hexazinone	75 DG (11.8 + 63.2%)	2 + 5	B + C1	DuPont
Envive	chlorimuron + flumioxazin + thifensulfuron	41.3 WDG (9.2% + 29.2% + 0.9%)	2 + 14 + 2	B + E + B	DuPont
Enlite	chlorimuron + flumioxazin + thifensulfuron	47.9 WDG (2.85 + 36.21 + 8.8%)	2 + 14 + 2	B + E + B	DuPont
Trivence	chlorimuron + flumioxazin + metribuzin	61.3 DG (3.9 + 12.8 + 44.6%)	2 + 14 + 5	B + E + C1	DuPont
Realm Q	rimsulfuron + mesotrione	38.75 DG (7.5 + 31.25%)	2 + 27	B + F2	DuPont
Strategy	ethalfluralin + clomazone	2.1 EC (1.6 + 0.5 lb/gal)	3 + 13	K1 + F4	Platte; Loveland
Ornamental Herbicide II	pendimethalin + oxyfluorfen	3 G (1 + 2%)	3 + 14	K1 + E	Scott's
Rout	oryzalin + oxyfluorfen	3 G (1 + 2%)	3 + 14	K1 + E	Scott's Sierra
Snapshot 2.5 TG	trifluralin + isoxaben	2.5 G (2 + 0.5%)	3 + 21	K1 + L	Dow AgroSciences
Showcase	trifluralin + isoxaben + oxyfluorfen	2.5 G	3 + 21 + 14	K1 + L + E	Dow AgroSciences
Weedmaster	dicamba + 2,4-D	3.87 SL (1 + 2.87 lb/gal)	4 + 4	O + O	BASF
Confront	triclopyr + clopyralid	3 L (2.25 + 0.75 lb/gal)	4 + 4	O + O	Dow AgroSciences
Crossbow	2,4-D + triclopyr	3 S (2 + 1 lb/gal)	4 + 4	O + O	Dow AgroSciences
Grazon P + D	picloram + 2,4-D	2.54 L (0.54 + 2 lb/gal)	4 + 4	O + O	Dow AgroSciences
Outlaw	2,4-D + dicamba	2.55 EC (1.45 + 1.1 lb/gal)	4 + 4	O + O	Albaugh
Overdrive	dicamba + diflufenzopyr	0.7 L (0.5 + 0.2 lb/gal)	4 + 4	O + O	BASF
Chaser	2,4-D + triclopyr	3 S (2 + 1 lb/gal)	4 + 4	O + O	Verdicon
Pathway	picloram + 2,4-D	ready-to-use liquid (3 + 11.2% active)	4 + 4	O + O	Dow AgroSciences
Redeem R & P	triclopyr + clopyralid	3 L (2.25 + 0.75 lb/gal)	4 + 4	O + O	Dow AgroSciences

(Continued on page 17)

Herbicide Trade Name, Common Name, Formulation, Mode (Site) of Action, and Manufacturer, Ordered By WSSA Site of Action [cont.]

Trade Name	Common Name	Formulation[1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Status	dicamba + diflufenzopyr	56% EC (40 + 16%)	4 + 4	O + O	BASF
Trimec, Endrun	2,4-D + mecoprop + dicamba	various	4 + 4 + 4	O + O + O	various
Trimec Ester	2,4-D + MCPA + dicamba	3.96 SL (2.44 + 1.3 + 0.22 lb/gal)	4 + 4 + 4	O + O + O	PBI Gordon
Obey	clomozone + quinclorac	2.5 ZC (1.25 + 1.25 lb/gal)	4 + 13	O + F4	FMC
Surge	2,4-D + MCPP + dicamba + sulfentrazone	0.06 + 1.4 + 0.5 + 0.22	4 + 14	E + O	PBI Gordon
Canopy	metribuzin + chlorimuron	75 DF (64.3 + 10.7%)	5 + 2	C1 + B	DuPont
Suprend	prometryn +trifloxysulfuron	80 WG (79.3 + 0.7%)	5 + 2	C1 + B	Syngenta
Krovar	bromacil + diuron	80 DF (40 + 40%)	5 + 7	C1 + C2	DuPont
Guardsman Max	atrazine + dimethenamid	5 L (3.3 + 1.7 lb/gal)	5 + 15	C1 + K3	BASF
Keystone	acetochlor + atrazine	5.5 L	5 + 15	C1 + K3	Dow
Prompt	bentazon + atrazine	5 L (2.5 + 2.5 lb/gal)	6 + 5	C3 + C1	Microflo
Storm	bentazon + acifluorfen	4 SL (2.67 + 1.33 lb/gal)	6 + 14	C3 + E	UPI
Duet	propanil + bensulfuron	60 DF (60 + 0.46%)	7 + 2	C2 + B	RiceCo
RicePro	propanil + quinclorac	4.1875 SL (43% + 2%)	7 + 4	C2 + O	RiceCo
RicePyr	propanil + triclopyr	3.3 SL (36.5% + 3.8%)	7 + 4	C2 + O	RiceCo
RiceBeaux	propanil + thiobencarb	6 SL (35% + 31%)	7 + 8	C2 + N	RiceCo
Goosegrass/Crabgrass Control	bensulide + oxadiazon	5.25 G	8 + 14	N + E	Scott's
OneStep	glyphosate + imazapyr	2.16 L (1.53 + 0.637 lb/gal)	9 + 2	G + B	BASF
Costarr	glyphosate + dicamba	2.1 EC (1.5 + 0.6 lb/gal)	9 + 4	G + O	Albaugh
Landmaster	glyphosate + 2,4-D	3.1 EC (1.2 + 1.9 lb/gal)	9 + 4	G + O	Albaugh
Journey	glyphosate + imazapic	1.5 + 0.75 SL	9 + 8	G + B	BASF
Sequence	glyphosate + S-metolachlor	5.25 F (2.25 + 3 lb/gal)	9 + 15	G + K3	Syngenta
Lariat	alachlor + atrazine	4 L (2.5 + 1.5 lb/gal)	13 + 5	K3 + C1	Monsanto
Authority Maxx	sulfentrazone + chlorimuron ethyl	66 DF (0.62 + 0.04 lb/lb)	14 + 2	E + B	FMC
Authority XL	sulfentrazone + chlorimuron	0.7 DG (0.62 + 0.08 lb/lb)	14 + 2	E + B	FMC
OpTill	saflufenacil + imazethapyr	68 WG (17.8 + 50.2)	14 + 2	E + B	BASF
Surveil	flumioxazin + cloransulam	48 WDG (36% + 12%)	14 + 2	E + B	Valent
Valor XLT	flumioxazin + chlorimuron	40.3 WDG (30% + 10.3%)	14 + 2	E + B	Valent
Echelon	sulfentrazone + prodiamine	4 SC	14 + 3	E + K1	FMC
Power Zone	carfentrazone + MCPA + mecoprop + dicamba	2.9 EC (0.04 + 2.21 + 0.44 + 0.22 lb/gal)	14 + 4 + 4 + 4	E + O + O + O	PBI Gordon
Speed Zone	carfentrazone + mecoprop + 2,4-D + dicamba	2.2 EC (0.05 +1.53 + 0.48 + 0.14 lb/gal)	14 + 4 + 4 + 4	E + O + O + O	PBI Gordon
Authority MTZ	sulfentrazone + metribuzin	45 DG (18 + 27%)	14 + 5	E + Cl	FMC
Anthem ATZ	pyroxasulfone + atrazine + fluthiacet-methyl	4.5 SE (0.485 + 4 + 0.014 lb/gal)	14 + 5 + 15	E + C1 + K3	FMC
Flexstar GT	fomesafen + glyphosate	3.3 L (2.63 + 0.66 lb/gal)	14 + 9	K3 + G	Syngenta
Status	dicamba + diflufenzopyr	56% EC (40 + 16%)	4 + 4	O + O	BASF
Display	carfentrazone + fluthiacet-methyl	4.3 SE (4.174 + 0.126 lb/gal)	14 + 14	E + E	FMC
Anthem Maxx	pyroxasulfone + fluthiacet-methyl	2.15 SE (2.087 + 0.063 lb/gal)	14 + 15	E + K3	FMC
BroadAxe, Authority Elite	sulfentrazone + *S*-metolachlor	7 EC (0.7 + 6.3 lb/gal)	14 + 15	E + E	FMC/Syngenta
BroadAxe XC	sulfentrazone + *S*-metolachlor	7.0 lb/gal (0.7 + 6.3)	14 + 15	E + K3	Syngenta
Integrity	saflufenacil + dimethenamid	5.5 L	14 + 15	E + K3	BASF
Prefix	S-metolachlor + fomesafen	Co-Pak (7.62 EC/2 LC)	14 + 15	E + K3	Syngenta
Verdict	saflufenacil + dimethenamid	5.57 EC (0.57 + 5.0)	14 + 15	E + K3	BASF

(Continued on page 18)

Herbicide Trade Name, Common Name, Formulation, Mode (Site) of Action, and Manufacturer, Ordered By WSSA Site of Action [cont.]

Trade Name	Common Name	Formulation[1]	Resistance Management Site of Action [2]		Manufacturer
			WSSA	HRAC	
Freehand	dimethenamid + pendimethalin	1.75 G	15 + 3	K3 + K1	BASF
Axiom	flufenacet + metribuzin	68 DF (54.4 + 13.6%)	15 + 5	K3 + C1	Bayer
Bicep II Magnum	S-metolachlor + atrazine	5.5 L (3.1 + 2.4 lb/gal)	15 + 5	K3 + C1	Syngenta
Bicep Lite II Magnum	S-metolachlor + atrazine	6 L (3.33 + 2.67 lb/gal)	15 + 5	K3 + C1	Syngenta
Boundary	S-metolachlor + metribuzin	7.8 EC (6.3 + 1.5 lb/gal); 6.5 EC (5.25 + 1.25 lb/gal)	15 + 5	K3 + C1	Syngenta
Cinch ATZ	S-metolachlor + atrazine	5.5 F (3.1 + 2.4 lb/gal)	15 + 5	K3 + C1	DuPont
Degree Xtra	acetochlor + atrazine	4 SL	15 + 5	K3 + Cl	Monsanto
Harness Extra	acetochlor + atrazine	5.6 L (3.1 + 2.5 lb/gal); 6 L (4.3 + 1.7 lb/gal)	15 + 5	K3 + C1	Monsanto
Keystone	acetochlor + atrazine	5.5 L (3 + 2.5 lb/gal)	15 + 5	K3 + C1	Dow AgroSciences
Acuron	S-metolachlor + atrazine + bicyclopyrone + mesotrione	3.44 L (2.14 lb + 1.0 lb + 0.06 lb + 0.24 lb)	15 + 5 + 27	K3 + C1 + F2	Syngenta
Lumax	S-metolachlor + atrazine + mesotrione	3.948 L (2.68 + 1 + 0.268 lb/gal)	15 + 5 + 27	K3 + C1 + F2	Syngenta
Anthem Flex	pyroxasulfone + carfentrazone	4 SE (3.733 + 0.267 lb/gal)	15 + 14	K3 + E	FMC
Fierce	pyroxasulfone + flumioxazin	76 WDG	15 + 14	K3 + E	FMC
Armezon PRO	dimethenamid + topramezone	5.35 EC (5.25 + 0.1 lb/gal)	15 + 27	K3 + F2	BASF
Corvus	isoxoflutole + thiencarbazone	2.63 SC (0.75 + 1.88)	27 + 2	F2 + B	Bayer
Halex GT	mesotrione + S-metolachlor + glyphosate	4.4 L (0.209 + 2.09 + 2.09)	27 + 15 + 9	F2, K3 + G	Syngenta

[1] **Liquid** formulations include AC, applicator's concentration; CS, aqueous capsule suspension; E, EC or EW, emulsifiable concentrate; F, flowable; L, liquid; ME, micro-encapsulated; SL, soluble liquid; S, suspension. **Dry** formulations include DF, dry flowable; DG, dispersible granules; G, granules; SP, soluble powder; W, WG or WDG, wettable dispersible granules; WP, wettable powder; WSG, wettable soluble granule.

[2] Herbicide classification according to primary site of action as described by Weed Science Society of America (WSSA) (number designation) and Herbicide Resistance Action Committee (HRAC) (letter designation). *From Mallory-Smith and Retzinger.*

Rotating herbicides so plants are not exposed to a single herbicidal mode of action for several seasons or plant generations is highly recommended as part of a resistance-management program. The classification presented here can be used as a tool to choose herbicides in different site-of-action groups so that mixtures or rotations of active ingredients can be planned. An attempt should be made to rotate herbicides designated with the same number or letter to those with different numbers or letters (i.e., different sites or modes of action). See table on page 19 for sites of action associated with each classification.

HERBICIDE CLASSIFICATION ACCORDING TO PRIMARY SITE OF ACTION

Resistance Group WSSA	HRAC	Site of Action	Herbicide Families in Group
1	A	ACCase (acetyl CoA carboxylase) inhibitor	Aryloxyphenoxy propionate Cyclohexanedione
2	B	ALS (acetolactate synthase) or AHAS (acetohydroxyacid synthase) inhibitor	Imidazolinone Pyrimidinylthio-benzoate Sulfonylamino-carbonyltriazolinone Sulfonylurea Triazolopyrimidine
3	K1	Inhibitor of microtubule assembly	Dinitroaniline Pyridine
4	O	Synthetic auxins	Phenoxy Benzoic acid Carboxylic acid Quinaline carboxylic acid
5	C1	Inhibitor of photosynthesis at photosystem II site A	Phenyl-carbamate Pyridazinone Triazine Triazinone Triazolinone Uracil
6	C3	Inhibitor of photosynthesis at photosystem II site B	Benzothiadiazole Nitrile Phenyl-pyridazine
7	C2	Inhibitor of photosynthesis at photosystem II site A; different binding from group 5	Amide Urea
8	N	Inhibitor of lipid synthesis; not ACCase inhibition	Thiocarbamate Phosphorodithioate*
9	G	EPSP synthase inhibitor	Glycine*
10	H	Glutamine synthetase inhibitor	Phosphinic acids*
11	F3	Carotenoid biosynthesis inhibitor (bleaching)	Triazole
12	F1	PDS (phytoene desaturase) inhibitor (bleaching)	Pyridazinone Pyridinecarboxamide Other
13	F4	DOXP (1-deoxy-D-xyulose 5-phosphate synthetase) inhibitor (bleaching)	Isoxazolidinone
14	E	Protox (protoporphyrinogen oxidase) inhibitor	Diphenylether *N*-phenylphthalimide Oxadiazole Phenylpyrazole Pyrimidindione Thiadiazole Triazinone Triazolone
15	K3	Inhibitor of synthesis of very long-chain fatty acids	Acetamide Chloroacetamide Oxyacetamide Tetrazolinone
16	N	Unknown	Benzofuran
17	Z	Unknown	Organoarsenical
18	I	DHP (7,8-dihydro-pteroate) synthetase inhibitor	Carbamate
19	P	Inhibitor of indoleacetic acid transport	Phthalamate Semicarbazone
20	L	Inhibitor of cell wall synthesis site A	Nitrile
21	L	Inhibitor of cell wall synthesis site B	Benzamide
22	D	Photosystem I electron diverter	Bipyridylium
23	K2	Mitosis inhibitor	Carbanilate
24	M	Membrane disruptor (uncouplers)	Dinitrophenol
25	Z	Unknown	Arylaminopropionic acid
26	Z	Unknown	Various
27	F2	Inhibitor of 4-HPPD (4-hydroxy-phenyl-pyruvate dioxygenase) (bleaching)	Isoxazole Pyrazole Triketone

* Name used by HRAC.

HERBICIDES ALPHABETIZED BY COMMON NAME

Common Name	Trade Name*
2,4-D	Barrage, Formula 40, Opt-Amine, Weedar 64
2,4-D + MCPA + dicamba	Endrun, Trimec, Trimec Ester
2,4-D + triclopyr	Chaser, Crossbow
2,4-DB	Butoxone, Butyrac, others
acetochlor	Harness, Surpass, Warrent
acetochlor + atrazine	Harness Extra, Keystone
acifluorfen	Ultra Blazer
alachlor	Intrro, Lasso, Micro-Tech
alachlor + atrazine	Bullet, Lariat
aminocyclopyrachlor + chlorsulfuron	Perspective
aminocyclopyrachlor + metsulfuron	Streamline
aminocyclopyrachlor + metsulfuron + imazapyr	Viewpoint
atrazine	AAtrex
atrazine + dimethenamid	Guardsman Max
atrazine + nicosulfuron + rimsulfuron	Basis Gold
atrazine + *S*-metolachlor + bicyclopyrone + mesotrione	Acuron
benefin	Balan
benefin + oryzalin	XL 2G
bensulfuron	Londax
bensulide	Betamec, Betasan, Lescosan, Prefar, Pre-san
bensulide + oxadiazon	Goosegrass/Crabgrass Control
bentazon	Basagran, Basagran T/O
bentazon + acifluorfen	Storm
bentazon + atrazine	Prompt
bispyribac	Regiment
bromacil	Hyvar X
bromacil + diuron	Krovar
bromoxynil	Buctril
bromoxynil + pyrasulfotole	Huskie
carfentrazone	Aim, Quicksilver
carfentrazone + fluthiocet-methyl	Display
carfentrazone + mecoprop + 2,4-D + dicamba	Speed Zone
carfentrazone + MCPA + mecoprop + dicamba	Power Zone
chlorimuron	Classic
chlorimuron + tribenuron	Canopy EX
chlorimuron + thifensulfuron	Synchrony XP
chlorsulfuron	Glean, Report, Telar
chlorsulfuron + metsulfuron	Chisum, Finesse, Report Extra
clethodim	Arrow, Envoy, Section, Select, Select Max, Tapout
clomazone	Command
clomazone + quinclorac	Obey
clopyralid	Lontrel, Stinger, Transline
cloransulam	FirstRate
cloransulam + flumetsulam	Frontrow
cycloate	Ro-Neet
cyhalofop	Clincher SF
dazomet	Basamid Granular
DCPA	Dacthal
dicamba	Banvel, Clarity, Distinct, Status, Vanquish, Vision
dicamba + 2,4-D	Brash, KambaMaster, Latigo, Outlaw, Weedmaster
dicamba + diflufenzopyr	Overdrive
dicamba + halosulfuron	Yukon
dicamba + iodosulfuron + thiencarbazone	Celsius
dichlobenil	Casoran, Dyclomec, Norosac
diclofop	Hoelon, Illoxan
diclosulam	Strongarm
dimethenamid-p	Outlook, Tower
diquat	Reward, Aceto Diquat
dithiopyr	Dimension
diuron	Direx, Karmex
DSMA	DSMA Plus
EPTC	Eptam
ethalfluralin	Curbit, Sonalan
ethalfluralin + clomazone	Strategy
ethofumesate	Prograss
fenoxaprop	Acclaim Extra, Ricestar HT
fluazifop-P	Fusilade DX, Ornamec
fluazifop + fenoxaprop	Fusion
flufenacet + metribuzin	Axiom
flumetsulam	Python
flumiclorac	Resource
flumioxazin	Chateau, Galleon, Rowel, Valor
flumioxazin + chloransulam-methyl	Surveil
flumioxazin + chlorimuron + thifensulfuron	Enlite, Envive
flumioxazin + metribuzin to chlorimuron	Trivence
flumioxazin + thifensulfuron + tribenuron	Afforia
fluometuron	Cotoran
fomesafen	Dawn, Flexstar, Reflex, Rhythm
fomesafen + fluthiacet-methyl	Marvel
fomesafen + *S*-metolachlor	Prefix
foramsulfuron	Option, Revolver
fosamine	Krenite S
glufosinate	Cheetah, Finale, Liberty, Rely
glyphosate	various
glyphosate + fomesafen	Flexstar GT
glyphosate + imazapyr	OneStep
glyphosate + mesotrione + *S*-metolachlor	Halex GT
glyphosate + *S*-metolachlor	Sequence
halosulfuron	Halomax 75, Permit, Sandea, SedgeHammer
halosulfuron + thifensulfuron	Permit Plus
hexazinone	Pronone, Velpar, Velossa
imazamox	Beyond, Raptor
imazapic	Cadre, Panoramic, Plateau
imazapyr	Arsenal A.C., Chopper, Chopper Gen 2, Habitat, Stalker
imazaquin	Image, Scepter
imazethapyr	Newpath, Pursuit, Thunder
imazethapyr + imazapyr	Lightning
imazethapyr + quinclorac	ClearPath
imazosulfuron	League
indaziflam	Esplanade, Specticle, Alion
isoxaben	Gallery

* Other trade names for some of these compounds may be available. The University of Arkansas Division of Agriculture does not recommend or endorse specific herbicide brands.

(Continued on page 21)

Herbicides Alphabetized by Common Name (cont.)

Common Name	Trade Name*
isoxaflutole	Balance Flexx
lactofen	Cobra
linuron	Linex
MCPA	MCP amine
MCPP	MCPP
mecoprop	Mecomec
mesosulfuron	Osprey
mesotrione	Callisto, Tenacity
metolachlor	(see *S*-metolachlor)
metribuzin	Sencor
metribuzin + chlorimuron	Canopy
metsulfuron	Accurate, Blade, Escort, Manor, Patriot, Valuron
metsulfuron + 2,4-D + dicamba	Cimarron Max
metsulfuron + rimsulfuron	Negate
metsulfuron + thifensulfuron + tribenuron	Accurate Extra, Ally Extra
MSMA	MSMA (others)
napropamide	Devrinol
naptalam	Alanap
nicosulfuron	Accent Q, Nic-It
nicosulfuron + metsulfuron	Pastora
nicosulfuron + rimsulfuron	Steadfast Q
oryzalin	Surflan
oryzalin + oxyfluorfen	Rout
oxadiazon	Ronstar
oxyfluorfen	Delta Goal, Goal 2X
paraquat	Gramoxone, Firestorm, Parazone
pendimethalin	Pendimax, Pendulum, Prowl, Prowl H_2O
pendimethalin + oxyfluorfen	Ornamental Herbicide II
penoxaden	Axial
penoxsulam	Grasp, Lockup
penoxsulam + cyhalofop	Rebel EX
phenmedipham	Spin-Aid
picloram	Tordon
picloram + 2,4-D	Grazon P + D, Pathway, Trooper II
primisulfuron	Beacon
primisulfuron + prosulfuron	Exceed
prodiamine	Barricade, Endurance, Factor, Regalkade
prometon	Pramitol
prometryn	Caparol, Cotton-Pro
prometryn + trifloxysulfuron	Suprend
pronamide	Kerb
propanil	Stam M4, Super Wham
propanil + bensulfuron	Duet
prosulfuron	Peak
pyrazon	Pyramin
pyrithiobac	Staple LX
pyroxasulfone	Zidua
pyroxasulfone + fluthiacet-methyl	Anthem Maxx
pyroxasulfone + fluthiacet-methyl + atrazine	Anthem ATZ
pyroxsulam	PowerFlex
quinclorac	Drive, Drive XLR8, Facet, Paramount, Quinstar, Facet L
quinclorac + propanil	RicePro
quizalofop	Assure II
rimsulfuron	Matrix, Resolve, TranXit GTA, Bestow
rimsulfuron + mesotrione	Realm Q, Instigate
rimsulfuron + thifensulfuron	Resolve Q, Leadoff
S-metolachlor	Cinch, Dual Magnum, Dual II Magnum, Me-Too-Lachlor II
S-metolachlor + atrazine	Bicep II Magnum, Bicep Lite II Magnum, Cinch ATZ, Trizmet
S-metolachlor + atrazine + mesotrione	Lumax/Lexar
S-metolachlor + bicyclopyrone + mesotrione	Acuron
S-metolachlor + metribuzin	Boundary
saflufenacil	Kixor, Sharpen
saflufenacil + dimethenamid	Integrity, Verdict
saflufenacil + imazethapyr	Op-Till
sethoxydim	Poast, Poast Plus, Segment, Vantage
siduron	Tupersan
simazine	Princep
sulfentrazone	Dismiss, Spartan
sulfentrazone + cloransulam	Authority First
sulfentrazone + clorimuron	Authority XL
sulfentrazone + metribuzin	Authority MTZ
sulfentrazone + *S*-metolachlor	BroadAxe, BroadAxe XC, Authority Elite
sulfometuron	Oust
sulfometuron + chlorsulfuron	Landmark II MP
sulfometuron + hexazinone	Oustar
sulfosulfuron	Certainty, Maverick, Outrider
tebuthiuron	Spike
tembotrione	Laudis
terbacil	Sinbar
thiencarbazone + tembotrione	Capreno
thiencarbazone + isoxaflutole	Corvus
thifensulfuron	Harmony GT, Harass
thifensulfuron + tribenuron	Edition BS, Edition TM, Harmony Extra, Nimble, First Shot
thiobencarb	Bolero
thiobencarb + propanil	RiceBeaux
topramezone	Pylex
tribenuron	Express, Nuance
triclopyr amine	Garlon 3A, Grandstand, Renovate, Tahoe 3A, Trycera
triclopyr ester	Garlon 4, Pathfinder II, Remedy, Tahoe 4E, Turflon Ester
triclopyr + clopyralid	Confront, Redeem R & P
triclopyr + penoxsulam	Grasp Xtra
triclopyr + propanil	Ricepyr
trifloxysulfuron	Envoke, Monument
trifluralin	Preen, Treflan, Treflan HFP, Trilin, Aceto Trifluralin
trifluralin + isoxaben	Snapshot 2.5 TG

* Other trade names for some of these compounds may be available. The University of Arkansas Division of Agriculture does not recommend or endorse specific herbicide brands.

APPROXIMATE COSTS OF RECOMMENDED HERBICIDES*

Herbicide	Approximate Cost/Unit	Herbicide	Approximate Cost/Unit	Herbicide	Approximate Cost/Unit	Herbicide	Approximate Cost/Unit
2,4-D amine	$15.40/gal	Cotton Pro	$32.00/gal	Lorox DF	$12.90/lb	Roundup Pro	$85.00/gal
2,4-D LV ester	$14.25/gal	Crossbow	$65.00/gal	Manor	$20.00/oz	Roundup Weather Max	$35.00/gal
AAtrex 4L	$16.90/gal	Dacthal 75W	$14.75/lb	Monument	$259.00/oz	Roundup Power Max	$20.00/gal
AAtrex Nine-0	$3.94/lb	Dimension	$244.00/gal	MSMA (6 lb/gal)	$24.00/gal	SedgeHammer	$60.00/oz
Accent	$35.75/oz	Dimension 2EW	$200.00/gal	MSMA (6.6 lb/gal)	$25.00/gal	Select	$188.00/gal
Acclaim Extra	$639.00/gal	Direx 4L	$25.00/gal	Newpath	370.00/gal	Select Max	$125.00/gal
Accord	$65.00/gal	Dismiss	$12.00/oz	Obey	$140.00/gal	Sencor DF	$16.00/lb
Aim	$5.96/oz	Dismiss South	$200.00/pt	Osprey	$3.80/oz	Sequence	$53.30/gal
Aqua-Kleen	$2.25/lb	Drive XLR8	$140.00/gal	Oust	$150.00/lb	Simazine 4L	$21.00/gal
Aquathol G	$3.00/lb	Dual Magnum	$109.00/gal	Outlook	$163.50/gal	Sinbar 80W	$34.00/lb
Aquathol K	$63.85/gal	Express	$21.50/oz	Pastora	$16.45/oz	SnapShot	$113.00/50 lb
Arsenal 2S	$100.00/gal	Facet 75DF	$55.00/lb	PastureGard	$56.17/gal	Sodium Chlorate	$5.50/gal
Arsenal A.C.	$200.00/gal	Finesse	$16.50/oz	Pathway	$30.00/gal	Sonar 4AS	$1315.00/gal
Assure II	$134.00/gal	FirstRate	$33.45/oz	Peak	$13.50/oz	Sonar SRP 5G	$27.50/lb
Atrazine 4L	$16.20/gal	FirstShot	$7.32/oz	Pendulum AquaCap	$72.00/gal	Specticle Flo	$1,400.00/gal
Axial XL	$225.00/gal	Flexstar	$120.00/gal	Permit	$17.00/oz	Spike 80W	$23.00/lb
Banvel	$65.00/gal	Flexstar GT	$38.00/gal	Poast	$81.75/oz	Stam	$25.00/gal
Barricade	$20.00/lb	Freehand 1.75G	$87.00/50 lb	Poast Plus	$57.50/oz	Staple XL	$7.00/oz
Basagran T/O	$135.00/gal	Fusilade DX	$166.00/gal	PowerFlex	$3.75/oz	Steadfast	$23.50/oz
Beacon	$28.55/oz	Fusilade II T&O	$78.00/qt	Pramitol 25E	$29.50/gal	Steadfast ATZ	$22.00/gal
Beyond	$480.00/gal	Fusion	$165.00/gal	Pramitol 5PS	$2.20/lb	Storm	$75.30/gal
Bicep II Magnum	$40.16/gal	Gallery	$180.00/lb	Prefar 4E	$53.00/gal	Superwham	$25.40/gal
Bolero	$39.50/gal	Garlon 4	$250.00/gal	Prefix	$48.50/gal	Suprend	$10.30/lb
Boundary	$76.00/gal	Goal	$92.50/gal	Primo	$385.00/gal	Surflan AS	$83.46/gal
Broadstar	$107.00/50 lb	Gramoxone	$33.00/gal	Princep 4L	$20.00/gal	Surflan 4L	$64.00/gal
Buctril 4EC	$85.00/gal	Grandstand	$99.00/gal	Prograss	$99.00/gal	Surmount	$58.00/gal
Butoxone 175	$29.00/gal	Grasp	$9.36/oz	Propanil	$21.75/gal	Synchrony XP	$8.05/oz
Butyrac 200	$28.16/gal	Grazon P + D	$35.00/gal	Prowl 3.3EC	$33.60/gal	Tordon 22K	$97.00/gal
Callisto	$604.50/gal	Halex GT	$42.00/gal	Prowl H_2O	$38.25/gal	Touchdown Total	$40.00/gal
Caparol	$38.00/gal	Harmony Extra	$11.50/oz	Pursuit 70DG	$12.60/oz	Tower	$90.00/gal
Celsius WG	$9.00/oz	Hoelon	$82.00/gal	Python	$12.65/oz	Tranxit	$90.00/oz
Certainty	$91.00/oz	Hydrothol 191	$64.00/gal	QuickSilver	$20.00/oz	Treflan 5HFP	$25.92/gal
Certainty 75DF	$80.00/oz	Hydrothol 191 11G	$2.80/lb	Reflex	$103.00/gal	Tribute Total	$51.00/oz
Cimarron	$29.50/oz	Hyvar X	$21.00/lb	Regiment	$35.50/oz	Trimec 992	$27.00/gal
Cimarron Max	$58.00/gal	Hyvar XL	$69.00/lb	Remedy Ultra	$100.00/gal	Trimec Classic	$38.00/gal
Clarity	$76.80/gal	Image 70DG	$10.00/oz	Revolver	$200.00/qt	Trimec Super	$68.50/gal
Classic	$14.50/oz	Karmex DF	$7.12/lb	Reward	$110.00/gal	Tupersan 50WP	$16.75/lb
Clearpath	$7.40/lb	Katana	$68.00/oz	RiceBeaux	$36.25/gal	Turbo	$59.50/gal
Clincher	$248.00/gal	Kerb WSP	$38.50/lb	RiceShot	$19.00/gal	Typhoon	$55.00/gal
Cobra	$155.00/gal	Krenite S	$58.00/gal	RicePro	$34.00/gal	Ultra Blazer	$64.00/gal
Command 3ME	$118.00/gal	Krovar	$15.00/lb	RicePyr	$25.00/gal	Valor	$4.38/oz
Confront	$170.00/gal	Lexar	48.00/gal	Ricestar HT	$159.00/gal	Vantage 1EC	$96.50/gal
Cotoran 4L	$42.00/gal	Liberty	$53.90/gal	Ronstar 50WP	$22.00/lb	Velpar L	$75.00/gal
Cotoran DF	$7.00/lb	Linex	$62.25/gal	Roundup Original Max	$38.00/gal	Weedmaster	$28.00/gal

*These are 2013 prices and are intended for purposes of planning. Specific prices should be obtained from local dealer.

WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES – ALL CROPS

(See Explanation of Rating Tables on Page 3.)

Herbicide[1] / Weeds	Annual Bluegrass	Barnyardgrass	Broadleaf Signalgrass	Buttercup	Carolina Geranium	Chickweeds	Common Lambsquarter	Common Ragweed	Coreopsis	Crabgrass	Curly Dock	Cutleaf Eveningprimrose	Giant Foxtail	Henbit[5]	Horseweed, Glyphosate-Resistant[6]	Little Barley	Mayweed	Morningglory spp.	Mustards	Palmer Amaranth, Glyphosate-Resistant	Prickly Lettuce	Red Rice	Ryegrass[5]	Smartweed spp.	Sow Thistle spp.	Swinecress	Vetch Cover	Virginia Pepperweed	Wheat Cover	Yellow Nutsedge
2,4-D (labeled formulations)	0	0	0	8	5	0	2	9	7	0	9	8	0	5	8	0	8	9	6	9	8	0	0	6	7	6	10	2	0	4
Clarity	0	0	0	6	7	8	4	9	7	0	8	8	0	6	9	0	6	9	7	8	7	0	0	6	8	7	9	3	0	0
Glyphosate	10	9	8	5	7	10	8	9	4	10	7	6	8	7	2	10	7	6	10	0	9	8	6	8	8	6	6	10	9	4
Glyphosate + Clarity or 2,4-D[2]	10	10	9	10	9	10	10	10	7	10	9	9	8	10	9	10	10	10	10	8	10	8	6	9	9	8	8	10	9	4
Glyphosate + FirstShot	10	7	8	8	9	10	10	9	4	8	10	7	8	9	5	10	8	7	10	4	10	8	6	10	8	6	8	10	9	4
Glyphosate + Goal	10	8	8	9	9	10	8	9	4	9	7	7	8	10	8	10	7	7	10	7	9	8	6	10	8	6	7	8	9	4
Glyphosate + LeadOff	10	8	8	9	9	10	10	9	6	8	10	7	8	9	6	10	9	7	10	5	10	8	8	9	8	8	8	9	9	6
Glyphosate + Sharpen	10	10	9	10	8	8	10	10	7	9	7	7	9	8	8	8	8	8	9	8	8	9	6	9	9	7	8	9	10	7
Glyphosate + Sharpen + 2,4-D	10	10	9	10	10	10	10	10	9	9	10	8	9	10	10	10	10	10	10	10	10	9	6	10	10	9	10	10	9	7
Glyphosate + Valor[3]	10	9	8	6	8	10	9	9	6	10	7	9	8	9	2	10	7	9	10	4	9	8	6	9	-	-	8	10	9	6
Glufosinate + 2,4-D or Clarity	6	7	7	10	8	10	9	10	7	7	8	8	8	10	9	7	10	10	10	10	9	7	5	8	8	8	10	10	5	5
Paraquat[4]	9	7	8	7	9	10	9	8	8	8	5	7	8	8	5	9	7	8	10	9	6	7	6	6	6	4	7	0	7	4

[1]Herbicide rates are: Glyphosate (4 lb/gal) 1 qt/A; paraquat 40 oz/A. Add 0.25% v/v surfactant with paraquat.

[2]Glyphosate (4 lb/gal) 1 qt + 2,4-D 1 pt/A.

[3]Adding Valor or other flumioxazin products like Afforia will provide residual control of horseweed and pigweed, but no postemerge control.

[4]Burndown ratings for paraquat on summer weeds can be increased by adding metribuzin **(soybeans only).**

[5]**For glyphosate-resistant ryegrass and henbit, fall applications may be more effective than typical burndown applications applied in the spring. Apply 2 oz/A Zidua or 1.33 pints per acre of Dual Magnum or equivalent in the fall prior to weed emergence. Valor is effective for broadleaves such as henbit, but not for ryegrass. All crops on the Dual label can be planted the following spring. POST applications of paraquat tank-mixed with a photosystem II inhibitor (metribuzin, diuron or atrazine) have also been effective for ryegrass. Select or Select MAX has also been effective at controlling smaller ryegrass; however, it has failed as a late spring salvage in University trials.**

[6]ALS-resistant populations of horseweed, mayweed, red rice and ryegrass have been documented.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
COTTON **For additional information on burndown herbicides see p. 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.** **Preplant–Burndown**				
paraquat @ 0.47 to 0.94 lb/A	Most emerged broadleaf weeds and grasses.	**Paraquat (2 or 3 lb/gal formulations)** 32 to 64 oz/A or 1.25 to 2.5 pt/A. Use high rate on weeds larger than 2 inches. Add a surfactant (p. 3).	After beds are formed but prior to planting.	Apply for knockdown of existing vegetation prior to planting. Not dependent upon temperature for activity. Add 2,4-D or Clarity for improved control of horseweed.
glufosinate @ 0.73 lb/A	Most emerged broadleaf and grass weeds.	**Glufosinate (280 SL formulations)** 40 oz/A. Follow label for surfactant use.	Prior to planting.	Add 2,4-D or Clarity for improved control of horseweed if preplant interval can be achieved. Use nozzles and pressure that create medium spray droplets. Use 10 gpa.
glyphosate @ 1 lb/A	Annual grasses and broadleaf weeds. Does not control entireleaf and ivyleaf morningglories.	**Glyphosate (4 lb/gal formulations)** 2 pt/A.	Use prior to planting for vegetation knockdown.	Add 2,4-D or Clarity for control of horseweed.
glyphosate + carfentrazone @ 1 lb/A + 0.016 lb/A	Improved control of morningglory and henbit.	**Glyphosate (4 lb/gal formulations) + Aim 2EC** 2 pt/A + 1.0 oz.	Use prior to planting for vegetation knockdown.	Add surfactant if glyphosate formulation does not contain one. Add 2,4-D or Clarity for improved control of horseweed.
glyphosate + 2,4-D @ 1 lb/A + 1 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + 4 SL 2,4-D Amine** 2 pt/A + 2 pt/A.	At least 28 days prior to planting.	Adding residual herbicide such as Caparol, Valor, Cotoran or Direx provides residual control of horseweed.
glyphosate + 2,4-D + rimsulfuron/thifensulfuron @ 1 + 1 + 0.25/0.25 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + 2,4-D + LeadOff** 2 pt/A + 1.5 pt/A + 1.5 oz/A.	At least 30 days prior to planting.	For horseweed use 8 oz/A dicamba.
glyphosate + dicamba @ 1 lb/A + 0.25 lb/A	Annual grasses and broadleaf weeds including horseweed.	**Glyphosate (4 lb/gal formulations) + Clarity 4 SL** 2 pt/A + 8 oz/A.	At least 21 days prior to planting following 1 inch of rainfall.	Good option for glyphosate-resistant horseweed. Adding residual herbicide such as Valor, Caparol, Cotoran or Direx provides residual control of horseweed.
glyphosate + flumioxazin @ 1 lb/A + 0.032 to 0.063 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + Valor 51 WDG** 2 pt/A + 1 to 2 oz/A.	At least 14 days for 1 oz/A or 21 days for 2 oz/A + 1 inch of rain prior to planting.	Valor is rainfast in 1 hour. Provides residual control of horseweed. Add Clarity for resistant horseweed.
glyphosate + fomesafen @ 1 lb/A + 0.25 lb/A	Broadleaf weeds including Palmer pigweed.	**Glyphosate (4 lb/gal formulations) + Reflex 2 EC** 2 pt/A + 1 pt/A.	Apply 14-21 days preplant + 0.5 inch rainfall prior to planting.	Provides residual control of horseweed and pigweed for 6 weeks after application. Knocking or dragging top of beds prior to planting will remove herbicide and allow weed infestation.
glyphosate + flumioxazin + dicamba @ 1 lb/A + 0.063 lb/A + 0.25 lb/A	Annual grass and broadleaf weeds including horseweed.	**Glyphosate (4 lb/gal formulations) + Clarity + Valor 51 WDG or Afforia** 2 pt/A + 8 oz/A + 2 oz/A or 2.5 oz/A.	At least 30 days following 1 inch of rainfall prior to planting.	Provides residual control of horseweed and pigweed for 6 weeks after application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate + oxyfluorfen @ 1 lb/A + 0.25 lb/A	Annual grass and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + Goal 2XL** 2 pt/A + 1 pt/A.	Apply late February to mid March.	If planting directly into the stale seedbed, application of Goal requires at least 30 days prior to planting **and** at least three ¼-inch rainfalls. If these conditions are not met, a 2-inch surface incorporation is required before planting.
SOYBEANS				
For additional information on burndown herbicides see page 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.				
Preplant–Burndown				
paraquat @ 0.47 to 0.94 lb/A	Annual broadleaf and grass weeds (existing vegetation).	**Paraquat (2 or 3 lb/gal formulations)** 32 to 64 oz/A or 1.88 to 3 pt/A in at least 20 gal water per acre for ground application. 5 to 10 gal for aerial application. Add 0.25% surfactant.	Use prior to planting on seedbeds that are not to be disturbed before planting. Use higher rate on weeds larger than 2 inches.	Good spray coverage is essential.
glyphosate @ 1 lb/A	Annual grasses and broadleaf weeds (existing vegetation). Weak on morningglories.	**Glyphosate (4 lb/gal formulations)** 2 pt/A. Use high rate on all but very small weeds.	Use prior to planting for vegetation knockdown.	Best results when applied in lower spray volumes, i.e., 5 to 10 gpa.
glufosinate @ 0.64 lb/A	Good option for glyphosate-resistant horseweed. Annual grasses and broadleaf weeds (existing vegetation).	**Glufosinate (280 SL formulations)** 36 oz/A.	Use prior to planting for vegetation knockdown.	Good coverage and warm weather will increase efficacy. Do not use prior to planting Liberty Link soybeans.
glyphosate or paraquat + metribuzin @ 1 lb/A or 0.47 to 0.78 + 0.25 to 0.75 lb/A	Postemergence control of existing annual weeds. See rating table for preemergence control with metribuzin.	**Glyphosate (4 lb/gal formulations) or Paraquat (2 or 3 lb/gal formulations) + Metribuzin 75DF** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 0.33 to 1 lb/A DF. Add 0.25% surfactant.	At planting or prior to crop emergence.	Tank mix. Apply as above. Do not use on sensitive varieties listed on label. A list of metribuzin-tolerant varieties is available. Avoid use on high pH soils.
glyphosate or paraquat + chlorimuron/metribuzin @ 1 lb/A or 0.47 to 0.94 + 0.188 lb/A	Annual broadleaf and grass weeds. Improved control of cocklebur, hemp sesbania, morninglories, smartweed and prickly sida. See rating table for preemergence control with Canopy.	**Glyphosate (4 lb/gal formulations) or Paraquat (2 or 3 lb/gal formulations) + Canopy 75DF** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 6 oz/A. Add 0.25% surfactant.	Prior to planting.	This is a reduced rate of Canopy. Higher rates have been shown to cause injury in minimum tillage culture. Tank mix with Dual or another grass herbicide, or follow this treatment with a postemergence grass herbicide for season-long grass control. A follow-up postemergence broadleaf treatment will also likely be needed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
For additional information on burndown herbicides see page 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.				
Preplant–Burndown [cont.]				
glyphosate or paraquat + sulfentrazone/cloransulam @ 1 lb/A or 0.47 to 0.94 + 0.13 to 0.26 lb/A	Annual broadleaf and grass weeds. Improved control of cocklebur, morningglories, smartweed and horseweed. Additional residual control of many broadleaf weeds, including Palmer amaranth.	**Glyphosate (4 lb/gal formulations) or Paraquat (2 or 3 lb/gal formulations) + Sonic** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 3 to 6 oz/A.	Prior to planting.	Tank mix. Good program for burndown with residual broadleaf control. Good program for Liberty Link soybeans.
glyphosate + oxyfluorfen @ 1 lb/A + 0.25 lb/A	Annual grass and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + Goal 2XL** 2 pt/A + 1 pt/A.	Apply late February to mid March.	If planting directly into the stale seedbed, application of Goal requires at least 30 days prior to planting **and** at least three ¼-inch rainfalls. If these conditions are not met, a 2-inch surface incorporation is required before planting.
glyphosate or paraquat + 2,4-D or dicamba + chlorimuron/tribenuron or flumioxazin @ 1 lb/A or 0.47 to 0.94 + 1 lb/A or 0.25 lb/A + 0.28 to 0.37 lb/A or 0.063 lb/A	Horseweed and other broadleaf weeds.	**Glyphosate (4 lb/gal formulations) or Paraquat (2 or 3 lb/gal formulations) + 2,4-D or dicamba + Canopy EX or Valor (or other Valor-containing premixes)** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt + 2 pt/A or 8 oz/A + 1.5 to 2 oz/A or 2 oz.	For dicamba and 2,4-D, 21 days after 1.0 inch rainfall, prior to planting.	Burndown plus enhanced control of broadleaf weeds. If horseweed is present, use at least 8 oz/A of dicamba.
glyphosate + thifensulfuron/ tribenuron @ 1 lb/A + 0.016 to 0.025 lb/A	Improved control of garlic, curly dock, smartweed and henbit.	**Glyphosate (4 lb/gal formulations) + FirstShot SG** 2 pt/A + 0.5 to 0.8 oz/A.	Immediately prior to planting. Label requires application be made at least 7 days prior to planting.	Burndown plus enhanced control of broadleaf weeds.
glyphosate + carfentrazone @ 1 lb/A + 0.016 lb/A	Improved control of morningglories.	**Glyphosate (4 lb/gal formulations) + Aim 2 EC** 2 pt/A + 1 oz/A.	At planting or prior to crop emergence.	Good spray coverage is essential.
sulfentrazone + metribuzin @ 0.225 + 0.2 lb/A	Broadleaf weeds.	**Authority MTZ** 12-16 oz/A. Add 1% COC.	Up to 14 days prior to planting.	Add glyphosate or paraquat for existing vegetation. See soil texture chart on page 47. For higher rates, use tolerant varieties. Use 16 oz/A on clay soils.
flumioxazin @ 0.063 lb/A	Residual horseweed control. No post horseweed activity.	**Valor 51 WDG** 2 oz/A.	Prior to soybean emergence.	Apply to clean ground or tank-mix for post weed control. Rainfall at emergence may result in injury, mainly cosmetic.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
flumetsulam @ 0.05 to 0.066 lb/A	Horseweed and other broadleaves.	**Python 80 WDG** 1 to 1.33 oz/A.	Prior to planting wheat-beans.	Contact and residual for horseweed. Good tank mix with glufosinate. Good option where horseweed is present less than 14 days prior to planting.
flumioxazin + chlorimuron/ thifensulfuron	Residual horseweed control.	**Envive or Enlite WDG** 3.5 or 2.8 oz/A.	Prior to soybean emergence.	Use 2.8 oz/A Enlite on high pH soils.
saflufenacil @ 0.022 to 0.044 lb/A	Horseweed rapid burndown – regrowth will occur.	**Sharpen 2.85 SC** 1 to 2 oz/A.	Prior to soybean emergence. 30 days prior to plant depending on rate applied and soil type.	Tank mix with glyphosate, 1% MSO and 2% v/v of AMS or UAN for best activity. 30-day plant back on coarse soils.
saflufenacil + dimethenamid @ 0.022 to 0.044 + 0.2 to 0.4 lb/A	Horseweed burndown and residual control.	**Verdict 5.57 EC** 5 to 10 oz/A.	Prior to planting to preplant. 30 days prior to plant depending on rate applied and soil type.	Tank mix with glyphosate, 1% MSO and 2% v/v of AMS or UAN for best activity.
glyphosate + 2,4-D + rimsulfuron/thifensulfuron @ 1 + 1 + 0.25/0.25 lb/A	Henbit, grasses and broadleaves.	**Glyphosate (4 lb/gal formulations) + 2,4-D + Leadoff** 2 pt/A + 1.5 pt/A + 1.5 oz/A.	At least 30 days prior to planting. Must plant STS or BOLT soybeans to avoid injury.	For horseweed, substitute dicamba 8 oz/A for 2,4-D. See label for specific plant-back intervals to soybean.
flumioxazin + thifensulfuron + tribenuron@ 0.063 + 0.008 + 0.008 lb/A	Residual horseweed control. No post horseweed activity. Post activity of winter annuals and smartweed.	**Afforia 50.8 WDG** 2.5 oz/A..	Prior to soybean emergence.	Apply to clean ground or tank-mix for post weed control. Rainfall at emergence may result in injury, mainly cosmetic.
RICE **For additional information on burndown herbicides see p. 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.** **Preplant-Vegetation Knockdown**				
glyphosate @ 1.0 lb/A	Emerged weeds.	**Glyphosate (4 lb/gal formulations)** 32 oz/A.	Apply at least 7 days before seedbed preparation.	Field must be free of standing water.
saflufenacil @ 0.022-0.044 lb/A	Pigweed, mare's tail, morningglory and small-seeded broadleaves.	**Sharpen** 1 to 2 oz/A. Must use a minimum of 1 pt/A MSO + AMS.	Prior to planting. Timing to small weeds or prior to weed emergence.	Tank mix with glyphosate or paraquat. Use high water volumes for best coverage. See label for crop specific restrictions and limitations.
glyphosate + thifensulfuron + tribenuron @ 1.0 + 0.016 to 0.025 lb/A	Improved control of curly dock, smartweed, henbit and garlic.	**Glyphosate (4 lb/gal formulations) + FirstShot 50 SG** 32 oz/A + 0.5 to 0.8 oz/A.	Prior to planting	Field must be free of standing water.
glyphosate + bensulfuron @ 1.0 + 0.023 lb/A	Improved control of yellow nutsedge, morningglory and hemp sesbania.	**Glyphosate (4 lb/gal formulations) + Londax 60 DF** 32 oz/A + 0.5 oz/A.	Apply at least 7 days before seedbed preparation or planting.	Field must be free of standing water.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE **For additional information on burndown herbicides see p. 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.** **Preplant-Vegetation Knockdown [cont.]**				
glyphosate + clomazone @ 1.0 lb + 0.3-0.6 lb/A	Emerged weeds plus residual grass.	**Glyphosate (4 lb/gal formulations)** 32 oz **+ Command 3 ME** 0.8-1.6 pt/A Medium (Silt Loam) 0.8-1.1 pt/A Fine (Clay) 1.3-1.6 pt/A Research has shown very little difference in grass control among rates within each soil type. **Note: On thin soils, especially those that have been leveled, consider rates as low as 0.5 pt/A.**	Up to 14 days prior to planting.	Field must be free of standing water. Antagonism has been documented with this tank mix. Always use full rate of glyphosate.
glyphosate + halosulfuron @ 1.0 lb + 0.065 lb/A	Emerged weeds plus enhanced sedge control. Will suppress other broadleaves.	**Glyphosate (4 lb/gal formulations) + Permit 75 WG** 32 oz/A + 1 oz/A.	Up to 14 days prior to planting.	Field must be free of standing water. Avoid glyphosate drift to corn. pH must be less than 8.0.
paraquat @ 0.625 lb/A	Emerged weeds.	**Paraquat (2 or 3 lb/gal formulations)** 40 or 26 oz/A. Add 0.25% v/v nonionic surfactant.	Use high rate on weeds larger than 2 inches.	Provides rapid desiccation of existing vegetation. Paraquat is sensitive to off-target movement; therefore, drift control is necessary. Refer to label for precautions and tank-mix instructions.
2,4-D amine @ 0.5 to 1 lb/A	Emerged broadleaf weeds.	**2,4-D** **Various formulations** 1 to 2 pt/A. Add 0.25% v/v nonionic surfactant.	See label for plant-back intervals.	Some plants are sensitive to off-target movement. Therefore, avoid drift. May be tank-mixed with Roundup.

PLANT-BACK RECOMMENDATIONS FOR BURNDOWN HERBICIDES[1]

HERBICIDE	Grain Sorghum	Corn	Wheat	Soybeans	Cotton	Rice	Peanut
2,4-D[2]	7d[3]	7d	7d	14d	28d	21d	
Canopy EX	10m	9m	4m	0d	10m	10m	
Clarity[3] (8 oz)	15d	I	22d	14d	21d	22d	14
Diuron	6m	I	6m	6m	I	6m	6m
Express	14d	14d	I[4]	14d	14d	I	
FirstShot	14d	14d	I	7d	14d	I	
Goal	10m	30d	10m	7d	7d	10m	60d
Glyphosate	I	I	I	I	I	I	I
Glufosinate	180d	I	70d	I	I	I	I
Harmony GT	I	I	I	I	7d	I	
LeadOff	10m	I	3m	30d[5]	30d	10m	45d
Python	12m	I	4m	I	18m	6m	
Sharpen[6]	I	I	I	1m	3m	I	5m
Valor/Afforia	30d	30d	30d	I	30d	30d	45d
Verdict[7]	I	I	4m	I-4m	1.5m	FY	4m
Zidua[7] (2 oz)	6m	I	30d	I	2m	12m	4m

[1] Always read and follow the label.

[2]Most 2,4-D labels state rotation to all crops after 90 days or until sufficiently dissipated.

[3]**Days listed are based on University data and after receiving 1.0 inches or more rainfall – 8 oz 14d and 16 oz 28d to beans.**

[4] I = immediately, d = days, m = months.

[5]Labeled plant-back to soybean is 30d for 1.5 oz/A and 60d for 2.0 oz/A – must plant STS or BOLT beans to avoid injury.

[6]Rotational intervals are determined by rate – see label. Intervals shown are for 2.0 oz/A.

[7]Rotational intervals increase with rate.

SENSITIVITY† OF MAJOR ARKANSAS FIELD CROPS TO COMMONLY USED HERBICIDES

HERBICIDE	Soybean††	Corn	Cotton	Grain Sorghum	Rice	Peanuts	Wheat
2,4-D	S	T	VS	T	T	S	T
Aim	M	M/S	M/S	M/S	T	S	T
Blazer/Storm	T	M/S	M	M/S	T	T	M
Bolero	MS	MT	MS		T		
Clincher	T	VS	T	VS	T	T	S
Command	T	M	M	M	T	T	M
Dicamba	VS	T	S	T	T	VS	T
Facet	M	M	S	T	T	M	S
FirstRate	T		S				
Flexstar	T	S	M	VS	M/S	M/S	M/S
Glufosinate	VS/T*	S/T*	S/T*	VS	M/S	S	S
Glyphosate	VS/T*	VS/T*	S/T*	VS	VS	VS	VS
Grandstand	S	M	S	M	T	S	T
Grasp	VS	T	S	T	T	VS	T
League	VS	T	S	S	T	S	S
Londax	VS	S	S	S	T	VS	-
Newpath/Beyond	T	S	S	S	T*/VS	T	S*
Permit	VS	T	S	T	T	VS	M
Propanil	S	S	S	S	T	S	S
Prowl	T	T	T	M	T	T	T
Python	T	T	S				
Regiment	VS	S	S	S	T	VS	S
RiceStar	T	VS	T	VS	T	T	S
Strada	VS	S	S	S	T	VS	-
Valor	MS	MT	S	S	MS	MT	MT

† T=Tolerant, M=Moderately Tolerant, S=Sensitive, VS=Very Sensitive; T* Some crops are available with herbicide tolerance to these herbicides. These ratings are based on the best available information to date and on foliar application or drift.

†† Some soybeans are available with tolerance to ALS herbicides, STS or BOLT Soybeans; this tolerance varies for rice ALS herbicides.

Smart Stack and Herculex are tolerant to glyphosate and glufosinate.
Tolerance does not imply that this herbicide is labeled for a specific crop.

WEED RESPONSE RATINGS FOR COTTON HERBICIDES

(See Explanation of Rating Tables on Page 3)

HERBICIDES	MODE OF ACTION	GRASSES									BROADLEAVES																SEDGES		
		Barnyardgrass	Bermudagrass	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Foxtail	Goosegrass	Rhizome Johnsongrass	Seedling Johnsongrass	Bigroot Morningglory	Cocklebur	Common Ragweed	Entireleaf Morningglory	Hophornbeam Copperleaf	Lambsquarters	Palmer Amaranth	Pitted Morningglory	Prickly Sida (Teaweed)	Purslane	Redvine	Sicklepod	Smartweed	Spotted Spurge	Spurred Anoda	Velvetleaf (Wild Cotton)	Flatsedges	Yellow Nutsedge	Crop Tolerance G – Good F – Fair
Preplant																													
Treflan or Prowl	3	9	0	9	9	9	9	6	3	9	0	0	3	2	0	8	6	2	0	9	0	0	2	2	0	2	3	0	G
Treflan + Cotoran/Meturon	3, 7	9	0	9	9	9	9	9	3	9	0	7	9	7	9	9	9	7	7	9	0	6	7	3	6	5	9	0	G
Reflex	14	6	0	6	6	6	6	6	4	6	0	-	-	6	-	-	10	6	-	-	0	0	-	-	-	-	-	7	G
Preemergence																													
Cotoran	7	8	0	8	9	9	8	8	0	7	0	8	9	8	9	9	8	8	8	9	0	6	7	6	7	6	9	0	G
Direx	7	9	0	9	9	9	9	9	0	7	0	7	8	8	9	9	8	8	7	9	0	5	7	6	6	5	9	0	G
Staple LX	2	6	0	6	6	-	6	6	2	7	0	-	4	8	0	-	6	8	9	-	0	4	7	9	8	8	-	5	G
Staple LX + Cotoran	2, 7	7	0	8	9	8	8	8	0	7	0	8	9	8	9	9	8	8	9	9	0	6	7	9	8	8	9	5	G
Postemergence (over-the-top)																													
Assure II	1	8	8	9	9	9	9	9	9	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G
Fusilade DX	1	7	9	8	7	9	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G
Poast Plus	1	8	7	9	9	9.5	8.5	9	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G
Select	1	8	8	9	9	9	9	9	9	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G
Envoke	2	7	0	5	5	-	-	6	1	5	-	-	-	9	-	-	5	9	2	-	-	9	-	-	5	9	9	9	F/G
Staple LX	2	2	0	2	2	2	2	2	2	6	-	8	4	9	0	0	5	8.5	7	-	-	6	8.5	6	9	9	7	6	G
Glyphosate[1]	9	9	6	10	10	10	10	10	10	10	7	10	9	8	8	9	10[1]	8	8	10	6	8	7	8	7	8	8	5	G
Glyphosate + Envoke	9, 2	9	6	10	9	10	10	10	10	10	8	9	9	9.5	8	9	6	9.5	8	10	5	9	8.5	8	9	9	9	8	G
Glyphosate + Staple	9, 2	9	6	10	10	10	10	10	10	10	8	9	9	9.5	8	9	6	9.5	9	10	6	8	8.5	8	9	9	9	7	G
Glufosinate[2]	10	8	4	8	8	-	-	6	8	9	-	9	-	10	-	7	9	10	7	-	5	7	8	-	-	10	2	3	G
Dual Magnum/Outlook	15	9	0	8	9	9	9	9	0	5	0	0	-	5	5	7	8	2	3	-	0	0	4	3	3	3	8	6	F/G
Warrant	15	6	0	6	6	6	6	6	0	2	0	0	2	0	-	-	8	0	2	-	0	0	-	3	2	2	7	4	F
Postemergence (directed)																													
Suprend	5, 2	9	0	8	8	-	-	7	-	8	-	10	8	9.5	-	-	8	10	9	-	-	9	8	9	-	9	10	9	G
Caparol + MSMA	5, 17	9	0	9	9	9	9	9	6	9	2	9	8	8	9	9	9	8	8	8	0	7	7	5	7	6	8	6	G
Cheetah Max	10, 14	8	4	8	8	-	-	6	1	5	-	9	9	9	9	-	9	10	7	-	-	7	9	-	7	10	2	6	G
Zidua	15	9	0	8	9	8	9	9	0	4	0	-	-	4	-	5	9	6	7	-	0	-	-	-	5	5	9	7	G
Linex	7	7	0	7	8	7	7	7	0	7	2	7	8	8	9	9	7	8	8	9	0	7	7	7	7	7	7	2	G
Cotoran + MSMA	7, 17	8	0	8	9	9	8	8	6	8	2	9	8	8	9	9	9	8	7	6	0	7	8	5	7	6	8	6	G
Karmex + MSMA	7, 17	9	0	9	9	9	9	9	6	9	2	9	8	8	9	9	9	8	8	8	0	7	7	5	6	6	8	6	G
Aim	14	0	0	0	0	0	0	0	0	0	2	7	7	10	-	-	7	10	7	9	0	4	8	-	-	9	0	2	G
Valor (layby) + MSMA	14	9	0	8	8	8	8	5	6	8	3	10	9	10	9	9	9	10	9	10	2	-	9	9	9	9	-	4	G
DSMA or MSMA	17	8	0	8	8	8	8	5	6	8	1	9	5	3	3	5	5	3	2	3	0	3	2	0	1	1	6	6	G
Fierce + MSMA (layby)	15, 14, 17	9	0	8	9	8	9	9	6	4	3	10	9	10	9	9	9	10	9	10	2	8	9	9	9	9	9	7	G

Rating scale – 0 = No Control 10 = 100% Control. Dash means insufficient data.

[1]Glyphosate-resistant populations of Palmer amaranth, horseweed and johnsongrass have been found in Arkansas.

[2]Glufosinate in-crop rating on glyphosate-resistant horseweed is an 8.

CROP REPLANT AND ROTATION GUIDE FOR COTTON HERBICIDES*

Herbicide	Replant/ Crop Rotation	Time Interval	Precautions
Aim 2 EC	C,CT,S,R,GS All	I 30 days	
Anthem Flex	S,C R SG W CT,P,SF	I 10 months 11 months 4 months 4 months	
Assure II	CT,S All	I 4 months	
Caparol/others	CT SG,GS, as cover crops. All	I I† FY	† Must be plowed and not used for food or feed.
Cotoran	CT All	I 6 months	
Direx	CT† All	I FY	† Do not retreat with second application in same year.
Dual Magnum	S,C,CT,GS† SG Rice All	I 4.5 months Next spring 18 months	† Use Concep-treated grain sorghum seed.
Envoke	C,GS,S,R CT W All	7 months 30 days 3 months 18 months	Cotton rotation increases with higher rates.
Fierce	CT C GS R S W	45 days 30 days 12 months 10 months I 1 month	
Fusilade/Fusion	CT,S All	I 2 months	
Glufosinate	CT,C,S,R W GS	I 70 days 180 days	
Glyphosate	All	I	
Linex	C,GS,S All	I 4 months	Thoroughly rework soil before replanting. Do not retreat with second application. Plant corn at least 1.75 inches deep and grain sorghum at least 1 inch deep.
MSMA, DSMA	All	I	Research has shown arsenical herbicides (MSMA/DSMA) can cause straighthead in rice. Precautions for straighthead should be taken when rice is grown following cotton.
Paraquat			No restrictions.
Poast Plus			No restrictions.
Prowl, Pendimax	CT,S W,B All	I 4 months FY	Do not rework soil deeper than treated zone.
Prowl, Pendimax (2X rate)	CT,S All	I FY	Do not rework soil deeper than treated zone.
Reflex//Flexstar/ Cheetah Max	S,CT W,SG C,R,GS SF	I 4 months 10 months 18 months	
Select Max	C	30 days	
Staple LX	CT S R GS C	I 10 months 9 months Do not rotate the following season. IMI-resistant corn – 9 months. Any other variety – 10 months if not more than 3.8 oz Staple XL was applied.	
Suprend	W CT,C,GS,R,S	3 months 7 months	
Treflan/others	CT,S W,B All	I Fall FY	
Treflan/others (2X rate)	CT,S Rice All	I FY 2 years	
Valor	C,CT,R,GS, W,SF S All others	 30 days I 12 months	Must receive 1 inch of rain.
Zidua	CT,C,S W GS R, others	I 70 days 6 months FY	

*This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

Key

Crop

C = Corn
CT = Cotton
B = Barley
GS = Grain Sorghum
R = Rice
S = Soybeans
SF = Sunflowers
SG = Small Grains
W = Wheat

Timing

All = All crops not specified
I = Immediately
FY = Following year (usually spring)

FEED, FORAGE AND GRAZING RESTRICTIONS FOR COTTON HERBICIDES

Herbicide	Restrictions
Assure II	Do not graze treated fields or harvest for forage or hay.
Caparol	Do not feed treated forage to livestock or graze treated areas or illegal residues may result.
Cotoran	Do not feed foliage from treated cotton plants or gin trash to livestock.
Direx	Do not allow livestock to graze treated corn.
DSMA	Do not feed treated foliage to livestock or graze treated areas.
Dual Magnum	No information on label.
Envoke	Do not graze or harvest for forage or hay.
Fusilade DX	Do not graze or harvest for forage or hay.
Glufosinate	No information on label.
Glyphosate	Do not graze or feed.
Linex	Do not graze treated fields or feed forage from treated areas to livestock. Do not feed gin trash to livestock
MSMA	Do not feed treated foliage to livestock or graze treated areas.
Paraquat	Do not graze or feed.
Poast Plus	Do not graze treated cotton fields, and do not feed treated cotton forage to livestock.
Prowl	Do not feed forage or graze livestock in treated cotton fields.
Reflex	Do not graze or harvest for forage or hay.
Select Max	Do not graze treated fields or feed treated forage or hay to livestock.
Staple LX	Do not feed treated gin by-products (trash) to livestock.
Treflan	No information on label.
Valor	Do not graze or harvest for forage or hay.

Restrictions are listed as worded on the labels. Feeding and application restrictions for herbicides are generally based on residue tolerances allowed for animal feeding. The restrictions are generally not due to acute toxicity (poisoning) problems. Livestock that are accidentally fed treated crops earlier than allowed may not be harmed but may have illegal pesticide residues in their meat or milk. If you have fed livestock treated crops within the restricted period, refer to the label, your dealer or herbicide company representative for more information.

*Many labels refer to soybean plants as 'vines'.

COTTON POSTEMERGENCE HERBICIDE

PREHARVEST APPLICATION INTERVALS (PHI)

Herbicide	PHI
Aim	7 days
Assure II	80 days
Caparol/Cotton Pro	No restrictions.
Cotoran	60 days
Direx	No restrictions.
DSMA	1st bloom
Envoke	60 days
Fusilade DX	90 days
Glufosinate	70 days
Glyphosate	7 days
Linex	No restrictions.
MSMA	1st bloom
Poast Plus	40 days
Reflex	70 days
Select	60 days
Staple	60 days
Valor LX	60 days

These intervals are the number of days that must be allowed between herbicide application and harvest. Applications made after these interval restrictions could cause illegal herbicide residues to be present in the harvested seed or fiber.

LABELED SOIL-APPLIED HERBICIDE RATES FOR COTTON

SOIL TEXTURE

Herbicide	Coarse (light)	Medium	Fine (heavy)
Preplant Herbicides			
Cotoran 4L or 80DF	1.6 pt or 1 lb	2.4-3.2 pt or 1.5-2 lb	3.2-4 pt or 2-2.5 lb
Prowl or Pendimax 3.3 EC	1.2-1.8 pt	1.8-2.4 pt	2.4-3.6 pt
Prowl H_2O	1.0-1.6 pt	1.6-2.1 pt	2.1-3.2 pt
Treflan 4E	1 pt	1.5 pt	2 pt
Treflan + Cotoran 4L	1 pt + 1 lb or 1.6 pt	1.5 pt + 1.25-2 lb or 2-3.2 pt	2 pt + 2-2.4 lb or 3.2-4 pt
Preemergence Herbicides			
Cotoran 4L or 80DF	1.6 pt or 1 lb	2.4-3.2 pt or 1.5-2 lb	3.2-4 pt or 2-2.5 lb
Direx 80DF or 4L	0.63 lb or 1 pt	1.25 lb or 2 pt	2 lb or 3 pt
Staple LX	1.3-2.1 oz/A	1.3-2.1 oz/A	1.3-2.1 oz/A

All rates are **broadcast rates.** Reduce rate for appropriate band width. See Example 2 on page 6.

COTTON HERBICIDE

COMPATIBILITY WITH FERTILIZERS AS APPLICATION CARRIERS

	Fertilizer	
	Fluid	**Dry**
Aim	N	N
Assure II	N	N
Caparol 4L	N	N
Cotoran 4L, 80W (preemergence only)	Y	N
Direx	N	N
DSMA	N	N
Dual Magnum	Y	Y
Fusilade DX	N	N
Glufosinate	Y	N
Glyphosate	Y	N
Linex 50DF	N	N
MSMA	N	N
Poast Plus	N	N
Prowl 3.3EC	Y	Y
Select	N	N
Treflan 4EC	Y	Y

Y = Yes, N = No

There are many specific fertilizer incompatibilities and restrictions with most herbicides. Be sure to read the herbicide label for specific mixing or impregnation instructions. Compatibility agents are required for many mixes. A typical compatibility test procedure for mixing herbicides in fluid fertilizers is given on page 4. NOTE: Compatibility with dry fertilizer is listed here from a labeling standpoint. The University of Arkansas only recommends herbicide application on dry fertilizer as a third alternative to spraying in water or in liquid fertilizer.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
COTTON				
Preplant Incorporated				
pendimethalin @ 0.5 to 1.5 lb/A	Annual grasses, seedling johnsongrass, pigweed and suppression of morninglories.	**Prowl** 1.2 to 3.6 pt/A. or **Prowl H_2O 3.8 CS** 1.0 to 3.2 pt/A.	Immediately prior to planting.	**All preplant herbicides on cotton are recommended to be applied during final seedbed preparation, after bed knockdown, and incorporated immediately. The rolling cultivator or a similar implement does an excellent job of incorporating the herbicide in the top 2 inches and leaves the soil intact on the bed. A Do-All tends to drag treated soil from the bed but can be used with care.**
trifluralin @ 0.5 to 1 lb/A	Same as above.	**Treflan 4 EC, Trilin 4 EC** 1 to 2 pt/A.	Same as above.	NOTE: Where rhizome johnsongrass is a severe problem, the herbicide should be disked in prior to bedding to get the herbicide deeper.
Preplant				
fomesafen @ 0.25 lb/A	Pigweed and morningglory.	**Reflex 2L** 1 pt/A.	Do not plant until 0.5 inch rainfall occurs.	Do not disturb beds after application. Follow up with a preemergence herbicide.
Preemergence – All preemerge herbicides should include 2 pt/A paraquat unless tillage is done immediately prior to planting.				
diuron @ 0.5 to 1 lb/A	Most annual grasses and small-seeded broadleaf weeds. Good option for pigweed.	**Direx 4L** 1 to 2 pt/A. Be sure to check label for formulation.	At planting.	Use the lowest rate on low organic sandy loam and silt loam soils. Can cause more injury than fluometuron. **Crop injury may occur with diuron or fluometuron when organophosphate insecticides are used.**
fluometuron @ 0.8 to 1 lb/A	Same as above but more effective on hard-to-kill weeds such as prickly sida (teaweed), cocklebur and morningglory.	**Cotoran 4L** 1.6 to 2 pt/A 4L.	Same as above.	See above notes on injury.
pyrithiobac @ 0.032 to 0.070 lb/A	Prickly sida, spurge, spurred anoda and velvetleaf.	**Staple 3.2 LX** 1.3 to 2.1 oz/A.	At planting.	Temporary leaf yellowing or stunting may occur following preemergence treatments – especially in wet, cool conditions. Some pigweed species are known to be resistant to ALS herbicides.
pyrithiobac + fluometuron or diuron 0.032 lb/A + 0.5 to 0.75 lb ai/A	Most annual grasses and small-seeded broadleaf weeds with improved control of spurge, prickly sida and pigweed over Cotoran alone.	**Staple 3.2 LX + Cotoran 4L or Direx** Add 1.3 oz/A broadcast rate of Staple LX to labeled rate of Cotoran or Direx, 1.0 to1.5 pt/A.	At planting.	Addition of Staple LX may not improve control of morningglory and cocklebur over Cotoran alone.
REPLANTING–It is recommended that an additional preemergence surface herbicide not be applied at time of planting. However, if only an incorporated material has been used, a surface-applied herbicide can be used if weeds remain uncontrolled.				

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Postemergence – Over the Top				
Roundup Flex Varieties Only				
glyphosate @ 1 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morninglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed. See table for other species.	**Glyphosate (4 lb/gal formulations)** 2 pt/A per application. Sequential applications are needed for difficult-to-control weeds.	Application timing is important. Apply to actively growing weeds. Application should be made before morninglories produce runners. Maximum of 175 ounces of 4 lb/gal or equivalent glyphosate per season. Maximum of 60 ounces 4 lb/gal or equivalent glyphosate between layby and 60% open bolls.	**For use on Roundup Flex varieties only.** **Check labels of glyphosate products to insure that they are approved for use on Roundup Flex cotton.** **Properly used residual herbicides will help control and prevent development and spread of glyphosate-resistant weeds.**
glyphosate + *S*-metolachlor @ 1 lb/A + 0.95 to 1.25 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morninglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed plus residual on pigweed and grass. See table for other species.	Same as above + **Dual Magnum 7.62 EC or metolachlor 8 EC** 1.0 or 1.25 pt/A. or **Sequence 5.25 L** 2.5 pt/A.		University data suggests that 1.25X generic metolachlor product rate is needed to provide equal weed control to the S-isomer Dual Magnum product. Sequential applications are needed for optimum pigweed control and should be spaced 14-21 days apart.
glyphosate + acetochlor @ 1 lb/A + 0.94 to 1.5 lb/A	Same as above but expect less control of grass and broadleaf weeds. See table for weed ratings.	**Glyphosate (4 lb/gal formulations) + Warrant** 2 pt/A + 1.25 to 2 qt/A.	May be slower to activate, especially in cooler temperatures. Weed control may be inconsistent.	Some leaf injury may occur. Sequential applications are needed for optimum pigweed control and should be spaced 14-21 days apart.
pyrithiobac + glyphosate @ 0.021 to 0.032 + 1 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morninglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed. Better control of yellow nutsedge, morningglory. Adds residual control of some weeds. See table for other species.	**Staple LX 3.2 + Glyphosate (4 lb/gal formulations)** 0.8 to 1.7 oz/A + 2 pt/A.		Staple LX may cause temporary yellowing and stunting. Do not tank mix with Dual for postemergence applications. Staple LX can be applied in two sequential applications of 0.4 oz/A.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
COTTON				
Postemergence – Over the Top [cont.]				
Glytol + Liberty Link Varieties	Cotton varieties containing the "Widestrike" insecticide gene have shown some tolerance to glufosinate. The level of tolerance is lower and less consistent than in the Liberty Link varieties, especially with higher rates of Liberty (glufosinate).			
glyphosate @ 1 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morningglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed. See table for other species.	**Glyphosate (4 lb/gal formulations)** 2 pt/A per application. Sequential applications are needed for difficult-to-control weeds.	Application timing is important. Apply to actively growing weeds. Application should be made before morningglories produce runners. Maximum of 175 ounces of 4 lb/gal or equivalent glyphosate per season. Maximum of 60 ounces of 4 lb/gal or equivalent glyphosate between layby and 60% open bolls.	**For use on Roundup Flex varieties only.** **Check labels of glyphosate products to insure that they are approved for use on Roundup Flex cotton.** **Properly used residual herbicides will help control and prevent development and spread of glyphosate-resistant weeds.**
glufosinate @ 0.53 lb/A	Emerged annual grasses, seedling johnsongrass, annual broadleaf weeds.	**Glufosinate (280 SL formulations)** (2.34 lb ai/gal) 29 oz/A.	Apply over the top to small, actively growing weeds. From cotton emergence to early bloom stage. Apply between hours of 9 a.m. to 6 p.m.	Complete coverage of weeds is crucial. Air induction spray tips and low water volumes may reduce effectiveness. See label for restrictions. Do not apply more than 72 ounces per season.
glufosinate @ 0.78 lb/A	Emerged annual grasses, seedling johnsongrass, annual broadleaf weeds.	**Glufosinate (280 SL formulations)** (2.34 lb ai/gal) 43 oz/A.	May be used for salvage situations.	Slight cotton stunting may occur when higher rates are used. Research indicates that two applications of 29 ounces ten days apart are superior to single 43-ounce rate. Cotton injury is likely under prolonged cloudy conditions.
glyphosate + metolachlor @ 1 lb/A + 0.95 to 1.25 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morningglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed plus residual on pigweed and grass. See table for other species.	Same as above + **Dual Magnum 7.62 EC or metolachlor 8 EC** 1.0 or 1.25 pt/A. or **Sequence 5.25 L** 2.5 pt/A.		University data suggests that 1.25X generic metolachlor product rate is needed to provide equal weed control to the S-isomer Dual Magnum product.
glufosinate + *S*-metolachlor @ 0.53 + 0.95 or 1.25 lb/A	Improved residual on pigweeds and grasses.	**Glufosinate (280 SL formulations) + Dual Magnum 7.62 EC or metolachlor 8 EC** 29 oz/A + 1 pt or 1.25 pt.	Apply over the top prior to 12-leaf cotton.	Some leaf speckling may occur, but it normally is only temporary.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate + glufosinate @ 1 lb + 0.53 lb/A	Broad spectrum control of grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + Glufosinate (280 SL formulations)** 2 pt/A + 29 oz/A.	Apply to small, actively growing weeds. From cotton emergence to early bloom stage.	Complete coverage of weeds is crucial. Cotton injury is likely under prolonged cloudy conditions.
glyphosate + glufosinate + *S*-metolachlor @ 1 + 0.53 + 0.95 lb/A	Broad spectrum control of grasses and broadleaf weeds, with added residual for grasses and glyphosate-resistant pigweed.	**Glyphosate (4 lb/gal formulations) + Glufosinate (280 SL formulations) + Dual Magnum 7.62 EC** 2 pt/A + 29 oz/A + 1 pt/A.	Apply over the top prior to 12-leaf cotton.	Complete coverage of weeds is crucial. Cotton injury is likely under prolonged cloudy conditions. Increased injury/leaf burn is possible with addition of metolachlor products.
glufosinate + fomesafen @ 0.53 + 0.25 lb/A	Emerged annual grasses, seedling johnsongrass, annual broadleaf weeds.	**Cheetah Max** 32 oz/A.	6-inch cotton through layby.	Use a directed spray or under row-hoods. Direct in a way to obtain maximum coverage with minimum contact to cotton foliage.
Roundup Flex, Liberty Link and Conventional Varieties				
pyrithiobac @ 0.065 lb/A	Morninglories, cocklebur, velvetleaf, smartweed and suppression of prickly sida and spurge.	**Staple 3.2 LX** 2.6 oz/A. Add 0.25% nonionic surfactant.	Apply to small, actively growing weeds. Cotyledon or larger cotton.	Rainfall after application aids in prickly sida and spurge control. Avoid drift to corn or grain sorghum. Some pigweed species are known to be resistant to ALS herbicides.
trifloxysulfuron @ 0.0047 to 0.007 lb/A	Sicklepod, nutsedge, good on morningglory.	**Envoke 75 DG** 0.10 to 0.15 oz/A. Use 0.25% v/v nonionic surfactant.	After 5-leaf stage. Post direct on large cotton to improve coverage and soil contact.	Crop response in the form of temporary chlorosis and stunting may be observed. Do not apply within 24 hours of a malathion application. Some pigweed species are known to be resistant to ALS herbicides (Group 2). Do not apply within 60 days of harvest.
sethoxydim @ 0.188 to 0.25 b/A	Annual grasses, johnsongrass.	**Poast Plus 1 EC** 1.5 to 2 pt/A. Add 1 qt/A crop oil concentrate. Use 1 pt rate only on small annual grasses. Bermudagrass may require repeat treatment of 1 pt/A following initial 1.5 pt treatment. For spot treatment, use 1% solution of Poast + 1% crop oil concentrate. Spray to wet but not to runoff.	Before annual grasses exceed 14 days after emergence. Timing very critical. Johnsongrass–15" to 20"	Apply only under conditions of active growth. Thorough coverage required. Do not tank mix with other pesticides. Do not cultivate 7 days before or after treatment. However, cultivation soon after 7 days will be helpful.
fluazifop @ 0.188 lb/A	Bermudagrass, johnsongrass, annual grasses.	**Fusilade DX 2 EC** 0.75 pt/A. Add 1% crop oil concentrate or 0.25% nonionic surfactant. For spot treatment use 2 qt Fusilade/100 gal. Add 1% oil or 1% nonionic surfactant.	Before annual grasses exceed 14 days after emergence. Timing very critical. Johnsongrass–12" to 18" Bermudagrass–3" ht or 6" to 12" runner length maximum	Apply only under conditions of active growth. Somewhat less effective than Poast on annual grasses, more effective on bermudagrass. Repeat if necessary. Thorough coverage required. Do not tank mix. Do not cultivate 7 days before or after treatment. However, cultivation soon after 7 days will be helpful. See label for details.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
COTTON				
Postemergence – Over the Top				
Roundup Flex, Liberty Link and Conventional Varieties [cont.]				
fluazifop @ 0.094 to 0.188 lb/A + fenoxaprop @ 0.026 to 0.053 lb/A	Bermudagrass, johnsongrass, annual grasses.	**Fusion 2.56 EC** 6 to 12 oz/A most annual grasses. 10 oz/A red rice. 12 oz/A bermudagrass and johnsongrass and repeat with 8 oz/A for regrowth. Add 1% crop oil concentrate or 0.25% nonionic surfactant. For spot treatment use 2 qt Fusion per 100 gal. Add 1% crop oil concentrate or 1% nonionic surfactant.	Apply to most annual grasses at 2" to 4". Johnsongrass–8" to 18" Bermudagrass–4" to 8" runner	See above comments for Fusilade on cultivation and tank-mixes.
quizalofop p-ethyl @ 0.031 to 0.063 lb/A	Annual grasses, bermudagrass, johnsongrass, red rice.	**Assure II 0.88 EC** 5 oz/A volunteer corn and milo, 8 oz/A most annual grasses, 9 oz/A red rice. Repeat if needed. 10 oz/A rhizome johnsongrass and bermudagrass. Add crop oil concentrate at 1% ground application or 0.5% for aerial application or nonionic surfactant at 0.25%.	Before annual grasses exceed 14 days after emergence. Timing very critical. Johnsongrass – 10" to 24" Red rice – 1st 14 days after emergence or 1 to 4 leaf Timing for annual grass and red rice is very critical.	See above comments for Poast and Fusilade on cultivation and tank mixing. Performance comparable to Poast on annual grasses and Fusilade on rhizome johnsongrass. Better than either on small red rice.
clethodim @ 0.094 to 0.25 lb/A	Annual grasses, bermudagrass, johnsongrass.	**Select Max** 12 to 16 oz/A most annual grasses. 16 to 20 oz/A rhizome johnsongrass. Repeat application with 12 to 16 oz/A for regrowth. 16 to 32 oz/A bermudagrass. Repeat application with 12 to 16 oz/A for regrowth. Add 1% crop oil concentrate.	Before annual grasses exceed 14 days after emergence. Johnsongrass–2" to 24" Bermudagrass–3" height or 6" runner length maximum	See above comments for Poast and Fusilade on cultivation and tank mixing. Performance comparable to Assure II for annual grasses and johnsongrass.
Postemergence – Directed				
carfentrazone @ 0.025 lb/A	Morningglory, hemp sesbania and prickly sida.	**Aim 2 EC** 1.6 oz/A. Add crop oil concentrate at 1 pt/A.	After cotton plants are 8 inches or more. Extreme care must be taken to avoid contact with foliage.	Must be mixed with another product for residual control. Do not mix with MSMA. Direct to base of cotton. Avoid fine spray droplets.
glyphosate @ 0.75 to 1 lb/A + prometryn @ 0.5 to 0.8 lb/A	Emerged annual grasses, johnsongrass, cocklebur, sicklepod, morningglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed. See table for other species. Improved morningglory control and improved pigweed control.	**Glyphosate (4 lb/gal formulations)** 2 pt/A plus **Caparol 4L** or **Cotton Pro 4L** at 1 to 1.6 pt/A.	After cotton is 6 inches or more high.	Avoid contacting foliage with spray.
glyphosate @ 0.75 to 1 lb/A + fluometuron @ 0.8 lb/A	Same as glyphosate with improved residual control of morningglory and pigweed.	Same as glyphosate above + **Cotoran 4L** at 1.6 pt/A.	After cotton is 6 inches or more high.	Avoid contacting foliage with spray.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
pyroxasulfone @ 0.06 to 0.11 lb/A	Residual control of grasses and pigweed.	**Zidua 0.85 WG** 0.75 to 2.1 oz/A.	Post directed to cotton between 5th leaf stage and bloom.	Provides residual control only; for control of emerged weeds, all MSMA, glyphosate or glufosinate.
pyroxasulfone + carfentrazone @ 0.058 to 0.131 lb/A + 0.0042 to 0.0094 lb/A	Residual control of grasses and pigweed.	**Anthem Flex 4SE** 2 to 4.5 oz/A.	Post directed to cotton that is at least 6 inches tall.	Provides mostly residual control; for increased control, spike with 0.5 to 0.75 oz/A Aim or add MSMA or glyphosate.
flumioxazin + pyroxasulfone @ 1/28 + 1 oz/A	Annual grasses and small-seeded broadleaves.	**Fierce 76 WDG** 3 oz/A.	Under row-hoods or layby after cotton has reached 16 inches in height.	For increased control of emerged weeds, add MSMA, glyphosate or glufosinate.
MSMA @ 2 lb/A	Small grasses and seedling cocklebur. Suppression of nutsedge and small johnsongrass.	**MSMA** Many formulations exist. Refer to label on specific material to be used.	After cotton is 3 inches tall and before first bloom.	Use as a directed spray. Combination with other herbicides more effective if a broad spectrum of weeds is present.
NOTE: The herbicide combinations with MSMA should not need an additional surfactant if the MSMA used contains one. If the MSMA does not contain a surfactant, add it according to herbicide label directions. All MSMA rates listed are average rates. Refer to specific label on product to be used for exact rate. NOTE: Research has shown arsenical herbicides can cause straighthead in rice. Precautions for straighthead should be taken when rice is grown following cotton.				
fluometuron + MSMA @ 0.8 lb/A + 1.5 to 2 lb/A	Most small-seeded annual and perennial weeds in the seedling stage of growth.	**Cotoran 4L + MSMA** Tank mix at 1 lb/A Cotoran + 1 qt of 6.6 lb/gal MSMA or equivalent.	After cotton plants are 6 or more inches.	Direct in manner to obtain maximum coverage of weeds with minimum contact to cotton foliage.
prometryn + MSMA @ 0.5 + 2 lb/A	Same weed spectrum as Cotoran but more active.	**Caparol 4L or Cotton Pro 4L + MSMA** 1 pt/A Caparol or Cotton Pro + MSMA at rates shown above.	After cotton plants are 6 or more inches.	Same as above.
trifloxysulfuron + prometryn @ 0.007 to 0.015 lb/A + 0.79 to 1.19 lb/A	Morningglories, sicklepod, yellow nutsedge.	**Suprend 80 WG** 1 to 1.5 lb/A. Add 0.25% v/v nonionic surfactant.	After cotton plants are 6 or more inches.	Avoid contact with foliage.
diuron + MSMA @ 0.4 lb/A + 1.5 to 2 lb/A	Same as above.	**Direx 4L + MSMA** 1 pt/A + MSMA at rates shown above.	After cotton plants are 6 or more inches.	Direct spray to lower ⅓ of cotton stem.
prometryn @ 1.2 to 1.6 lb/A	Cocklebur, prickly sida and spurge, but more effective on morningglory, grasses and cocklebur.	**Caparol or Cotton Pro 4L** Coarse Soil 2.4 pt/A Medium Soil 2.8 pt/A Fine Soil 3.2 pt/A Add a surfactant.	After cotton is 15 inches tall.	Do not plant rotational crops other than cereal cover crops until the following year.
trifloxysulfuron + prometryn @ 0.007 to 0.015 lb/A + 0.79 to 1.19 lb/A	Morningglories, sicklepod, yellow nutsedge.	**Suprend 80 WG** 1 to 1.5 lb/A. Add 0.25% v/v nonionic surfactant.	After cotton plants are 6 or more inches.	Avoid contact with foliage.
diuron + MSMA @ 0.4 lb/A + 1.5 to 2 lb/A	Same as above.	**Direx 4L + MSMA** 1 pt/A + MSMA at rates shown above.	After cotton plants are 6 or more inches.	Direct spray to lower ⅓ of cotton stem.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
COTTON **Postemergence – Directed [cont.]**				
prometryn @ 1.2 to 1.6 lb/A	Cocklebur, prickly sida and spurge, but more effective on morning-glory, grasses and cocklebur.	**Caparol or Cotton Pro 4L** Coarse Soil 2.4 pt/A Medium Soil 2.8 pt/A Fine Soil 3.2 pt/A Add a surfactant.	After cotton is 15 inches tall.	Do not plant rotational crops other than cereal cover crops until the following year.
diuron @ 0.4 to 1.2 lb/A	Most small-seeded annual grasses and broadleaf weeds.	**Direx 4L** Coarse Soil (light) - 0.8 pt/A Medium Soil - 1.6 pt/A Fine Soil (heavy) - 2.4 pt/A Add a surfactant if emerged weeds present.	After cotton is 15 inches tall.	Provide longest residual and greatest potential for carryover to sensitive crops. Less burn on emerged weeds.
linuron @ 0.5 to 1.5 lb/A	Most small-seeded annual grasses and broadleaf weeds.	**Linex 4L** Coarse Soil - 1 pt/A Medium Soil - 2 pt/A Fine Soil - 3 pt/A Add a surfactant if emerged weeds present.	After cotton is 15 inches tall.	Intermediate residual period. Fall-seeded cereal crops may be planted.
flumioxazin @ 0.063 lb/A	Most annual broadleaves and small grasses.	**Valor 51 WDG** 2 oz/A. Add 0.25% NIS.	After cotton has 4 inches of bark. Good residual control of pigweed and morningglory.	Minimize contact with foliage. Adding glyphosate, glufosinate or MSMA will improve control of larger grasses. If emerged pigweed is present, use diuron (Direx) for PPO resistance management and increased pigweed control.
fomesafen @ 0.25 to 0.375 lb/A	Most annual broadleaves and small grasses.	**Reflex 2L** 1 to 1.5 pt/A. Add 0.25% NIS.	After cotton has 4 inches of bark. Good residual control of pigweed and morningglory.	Minimize contact with foliage. Adding glyphosate, glufosinate or MSMA will improve control of larger grasses. Do not apply more than 0.375 lb fomesafen per acre per year. If emerged pigweed is present, use diuron (Direx) for PPO resistance management and increased pigweed control.
S-metolachlor + fomesafen @ 1.09 to 1.26 + 0.24 to 0.28 lb/A	Pigweed and residual control of grass and small-seeded broadleaf weeds.	**Prefix** 2 to 2.33 pt/A.	6-inch cotton through layby. Avoid contact with foliage.	Minimize contact with foliage. Adding glyphosate, glufosinate or MSMA will improve control of larger grasses. Do not apply more than 0.375 lb fomesafen per acre per year. 80-day PHI. If emerged pigweed is present, use diuron (Direx) for PPO resistance management and increased pigweed control.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate + fomesafen @ 1.17 + 0.28 lb/A	Pigweed, grasses and other broadleaf weeds.	**Flexstar GT 3.5** 3.5 pt/A.	6-inch cotton through layby. Avoid contact with foliage.	Minimize contact with foliage. Adding glyphosate, glufosinate or MSMA will improve control of larger grasses. Do not apply more than 0.375 lb fomesafen per acre per year. 70-day PHI. If emerged pigweed is present, use diuron (Direx) for PPO resistance management and increased pigweed control.
Spot Treatment	**Also see Poast and Fusilade above.**			
glyphosate	Johnsongrass, bermudagrass, purple nutsedge, trumpetcreeper and most other annual and perennial grasses.	**Glyphosate (4 lb/gal formulations)** 2% solution. Add 1% surfactant.	Anytime before boll opening.	Treatment most effective on large, actively growing weeds. Cotton in area will be severely injured or killed. Avoid windy conditions and high pressure. Follow label directions.
Postemergence – Speciality Treatments Conventional Cotton				
glyphosate wipe-on	Johnsongrass emerged above canopy.	**Glyphosate (4 lb/gal formulations)** 33% solution in Ropewick or other wipe-on applicator.	Anytime before boll opening. Ropewick applicator.	Cotton will not tolerate accidental crop contact. Even though vegetative effects are not obvious, yield reduction may occur.
paraquat + diuron @ 0.5 + 0.5 lb ai/A	**Pigweed** and small grasses.	**Paraquat (2 or 3 lb/gal formulations) + Direx 4L** 32 or 21 oz/A + 1 pt.	Apply in middles with **hooded sprayer**. Do not allow any spray particles to escape from under the hood.	May be used in salvage situations to remove pigweed from middles and reduce hand chopping labor. Apply under hoods only!
Between Cropping Application				
dicamba @ 2 lb/A	Redvine.	**Banvel SGF 2 SL** 1 gal/A + 0.25% nonionic surfactant. **Clarity 4 SL** 2 qt/A + 0.25% nonionic surfactant.	After harvest and at least 1 week prior to killing frost.	Apply when redvine has recovered from defoliants/desiccants and is actively growing.
glyphosate @ 1 to 2 lb/A	Trumpetcreeper, johnsongrass.	**Glyphosate (4 lb/gal formulations)** 2 to 4 pt/A.	Can be applied with defoliant at 60% open bolls or after harvest but at least 1 week prior to killing frost.	Good coverage is essential; for trumpetcreeper control, good coverage will usually be achieved after harvest.

WEED RESPONSE RATINGS FOR SOYBEAN HERBICIDES

(See Explanation of Rating Tables on Page 3.)

HERBICIDES	HERBICIDE FAMILY	GRASSES								BROADLEAVES																		SEDGES	
		Barnyardgrass	Broadleaf Signalgrass	Crabgrass	Giant Foxtail and Fall Panicum	Goosegrass	Red Rice	Rhizome Johnsongrass[1]	Seedling Johnsongrass[1]	Balloonvine	Cocklebur	Cutleaf Groundcherry	Entire and Ivyleaf Morningglories	Giant Ragweed	Hemp Sesbania (Coffeebean)	Hophornbeam Copperleaf	Horseweed[1]	Northern Jointvetch (Curly Indigo)	Palmer Amaranth[1]	Palmleaf Morningglory	Pitted Morningglory	Prickly Sida (Teaweed)	Sicklepod	Smartweed spp.	Spurge	Spurred Anoda	Texas Gourd/Smellmelon	Velvetleaf	Annual Flatsedge	Yellow Nutsedge
Preplant Incorporated																													
Treflan, Prowl, Pendimax	3	9	9	9	9	9	4	3***	9	0	0	0	2	3	0	0	8	0	7	2	2	0	2	2	2	0	0	2	3	0
Dual Magnum, Outlook	15	8	8	9	9	9	7	0	6	1	0	9	2	7	4	5	8	0	8	2	2	6	0	5	5	3	5	4	10	9
Dual Magnum + Metribuzin, Boundary	15,5	9	9	9	9	9	7	0	6	7	5	10	3	9	9	9	9	7	8	7	6	9	7	9	9	9	6	8	10	7
Preemergence																														
Python	2	6	6	6	6	6	4	0	6	3	9	9	7	9	2	7	9	0	6	7	7	9	7	9	9	9	-	8	-	-
Scepter	2	6	6	6	6	6	5	3	6	5	9	9	6	9	4	6	8	0	7	9	9	7	8*	9	9	7	9	6	9	5
Canopy	2,5	6	6	6	6	6	-	0	5	7	9	9	8	-	9	9	8	7	9	9	9	9	8*	9	9	9	7	7	8	5
Trivence	2,5,14	7	7	7	7	7	6	4	6	7	9	9	8	8	9	9	10	8	10	10	10	9	9	10	9	9	8	9	9	5
Envive, Enlite	2,14	7	7	7	7	7	6	4	6	7	9	9	8	8	9	9	10	8	10	10	10	9	9	10	9	9	8	9	9	5
Sonic	2,14	4	4	4	-	-	-	-	-	-	8	8	9	9	6	-	9	6	7	8	9	-	5	9	-	8	8	8	-	7
Surveil	2,14	7	7	7	6	7	5	4	6	-	9	-	8	8	9	9	10	8	9.5	10	10	9	9	9	-	-	-	9	9	4
Metribuzin	5	6	6	6	6	6	4	0	5	7	6	9	2	9	9	9	8	7	8	7	7	9	8*	9	9	9	7	7	8	2
Valor	14	7	7	7	6	7	5	4	6	-	9	-	8	8	9	9	10	8	9.5	10	10	9	9	9	-	-	-	9	9	4
Authority MTZ	14,5	6	6	6	6	-	-	0	-	-	6	-	9.5	7	6	-	8	7	9	-	9.5	8	-	9	-	-	-	6	-	7
Dual Magnum, Outlook	15	8	7	9	9	9	5	0	5	1	0	5	0	5	0	5	8	0	8	0	0	3	0	4	3	0	3	3	9	7
Zidua/Anthem	15/2,15	7	6	8	8	-	4	0	5	1	0	4	4	0	8	0	8	0	9	-	6	-	0	3	4	0	3	2	9	5
Dual Magnum + Metribuzin, Boundary	15,5	9	9	9	9	9	7	0	7	7	7	10	2	9	9	9	8	7	8	7	7	9	8*	9	9	9	7	8	9	5
Prefix	15,14	9	9	10	10	10	7	5	9	-	-	9	8	5	3	5	8	3	10	-	8	8	-	7	3	-	-	7	8	7
Verdict	15,14	8	8	8	8	8	6	0	7	7	7	7	3	8	8	8	7	6	8	7	7	9	8	8	8	8	6	7	8	4
Warrant	15	6	4	5	5	5	5	0	2	0	0	-	0	0	7	-	7	-	8	0	0	3	0	2	3	-	3	3	7	5
Postemergence-OT																														
Assure II	1	8	9	9	9	9	8**	9	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fusilade DX/Fusion	1	7	8	7	8	9	6**	9	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poast Plus	1	8	9	9	9	9	7**	8	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Select (Clethodim)	1	8	9	9	9	9	7	9	9.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Classic	2	0	0	0	0	0	0	0	0	5	9	-	8	9	10	-	0	6	5	8	9	0	7	9	0	0	6	7	-	6
FirstRate	2	0	0	0	0	0	0	0	0	-	9	-	8	-	5	5	8.5	0	2	9	9	4	6	-	4	9	-	8	8	6
Pursuit	2	7	7	7	8	5	8	7	8	4	7	-	7	5	0	5	3	0	6	8	9	6	0	7	9	6	4	7	7	8
Scepter	2	0	0	0	0	0	6	3	6	0	9.5	0	0	8	0	0	3	0	6	10	7	3	4	7	0	0	7	0	0	0
Scepter + Ultra Blazer	2,14	2	2	2	2	2	0	3	6	8	9.5	9	8	9	9	9	4	4	7	9	9	4	4	9	5	0	9	4	0	0
Basagran	6	0	0	0	0	0	0	0	0	8	9.5	0	3	8	4	0	0	0	4	8	7	9	0	9	0	8	0	8	8	6
Glyphosate, Single	9	9	9	9	9	8	8	9	10	6	9	7	6	9	4	6	3	7	10	7	6	6	8	5	8	5	-	6	7	4
Glyphosate, Split	9	10	10	10	10	10	9	10	10	8	10	9	8	9	7	8	4	9	10	9	8	8	9	7	8	7	-	8	8	5
Glufosinate, Single	10	7	9	9	-	6	9	7	10	-	9	7	10	8	10	-	6	10	7	10	10	7	7	6	-	-	9	8	3	3
Glufosinate, Split	10	9	10	10	-	8	10	9	10	-	10	8	10	9	10	-	8	10	9	10	10	9	8	8	-	-	10	10	4	4
Cobra[2]	14	0	0	0	0	0	0	0	0	9.5	8	9	6	9	9.5	9	5	6	6	8	8	8	5	7	8	7	9	8	2	2
Flexstar[2]	14	0	0	0	0	0	0	6	7	8	9	9	8	9	9.5	9	5	7	8	9	9	6	2	9	-	6	-	7	-	6
Ultra Blazer[2]	14	2	2	2	6	0	2	0	4	8	7	9	8	9	9.5	9	3	4	7	9	9	2	0	9	5	2	9	4	7	3
Ultra Blazer + Basagran or Storm	14,6	2	2	2	6	4	0	0	4	8	9	9	8	9	9.5	9	3	4	7	9	9	8	0	9	5	8	9	7	8	4

*Follow-up postemergence spray will be necessary to achieve these ratings.
**Red rice ratings with Poast, Fusilade and Assure can be increased if repeat applications used.
***Rhizome johnsongrass ratings with Treflan and Prowl increased to 7 if 2x rate used.

[1]Glyphosate-resistant populations of Palmer amaranth, horseweed, johnsongrass, giant ragweed and ryegrass have been found in Arkansas.

Rating Scale - 0 = No Control 10 = 100% Control Dash = insufficient data

[2]Group 14 (PPO) – resistant populations of pigweed have been identified in Arkansas.

Crop Replant and Rotation Guide for Soybean Herbicides*

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
Anthem Maxx	S,C CT,P,SF,W AL,R SG	I 4 months 10 months 11 months	See label for rotational intervals based on rates applied.
Assure II	S,C All	I 120 days	
Authority MTZ	S B,W,SG R A,CT,GS,P,SF	I 4 months 10 months 12 months	
Authority XL	S B,W,GS C,GS,R A,CT,P SF	I 4 months 10 months 12 months 15 months	See label for pH, rate restrictions. High pH rates have longer rotational intervals.
Basagran	All	I	
Broadaxe XC	S,SU,DSP P W FC,R,GS O,CT* SC,PC	I 4 months 4.5 months 10 months 12 months 18 months	
Butyrac/Butoxone (2,4-DB)			No restrictions.
Cadet	All	I	
Canopy	S W,B,RG C AL,CT,GS,R CL P All	I 4 months 9 months 10 months 12 months 8 months 18 months†	Use only on soils with pH of 7.0 or less. † Successful field bioassay must be completed prior to planting. Wait 15 months before trying a bioassay.
Canopy (pH 7.1 to 7.5)	S W,B,RG AL,CL,C, CT,GS,R,P All others	I 4 months 18 months 18 months†	Use only in soils with pH 7.5 or less. † Successful field bioassay must be completed prior to planting. Wait 15 months before trying a bioassay.
Canopy EX	W C,GS,R,AL,CL CT SF,CA	3 months 9 months 10 months 18 months	See label for pH, rate and geographical restrictions. High pH soils have longer rotational intervals.
Classic	S† SG,RG P C,CT CL,GS,R All	I 3 months 6 months 8 months 18 months††	If applied after Aug. 1, extend recrop interval for C, CT, R and GS 2 months. † Recrop intervals may also be extended if Classic is applied after application of Canopy. See labels for information. †† Successful field bioassay must be completed prior to planting. Wait 9 months before trying a bioassay.
Cobra			No restrictions.
Dual Magnum or Sequence	S,C,CT,GS† SG,W Rice All	I 4.5 months Next spring 18 months	†Use Concep-treated grain sorghum seed.
Enlight	W CT,C,R,SF AL,CL	4 months 9 months 12 months	
Envive	W CT,C,GS,R,AL,CL SF,CA	4 months 10 months 18 months	See label for pH and geographical restrictions. High pH soils have longer rotational intervals.
FirstRate	W C,CT,P,R,GS	3 months 9 months	All others – 30 months plus bioassay.
Flexstar GT 3.5	CT,S W C,P,R,GS Other	0 months 4 months 10 months 18 months	See Reflex.
Fusilade DX or Fusion	S, CT All	I 2 months	
Glufosinate	C,S,CT,R,CA W,B,O GS	I 70 days 180 days	No restrictions.
Glyphosate	All	I	
Metribuzin	S† AL,C,FG,W,B CT,R All (except root crops)†† Root crops	I 4 months 8 months 12 months 18 months	† Waiting period for replanting soybeans depends on the rate of metribuzin used. See specific label for more information. Add 2 months to time intervals if pH of soil is above 7.5. †† Cover crops may be planted anytime, but stand reductions may occur.
Outlook	C,S SG All	I 4 months FY	Do not retreat field with second application.

*This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

NOTE: See page 44 for key to abbreviations.

(continued on page 44)

Crop Replant and Rotation Guide for Soybean Herbicides* [cont.]

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
Paraquat			No restrictions.
Poast/Poast Plus			See label.
Prefix	S CT AL,W,O,R,RY,B GS,R,C	I 1 month 4.5 months 10 months	Use Concep-treated grain sorghum seed. Do not use Reflex or Flexstar in-season.
Prowl	S,CT W,B All	I 4 months† FY	Do not rework soil deeper than treated zone. † Cannot replant using no-tillage practices.
Pursuit	S B,W C Rice All	I† 4 months 9.5 months 40 months 18 months	† Do not rework soil deeper than 2 inches. Do not apply Classic, Canopy, Lorox Plus, Scepter, Squadron or Tri-Scept the same year as Pursuit or injury to following crops may occur.
Python	AL,P,B,W,RY,O R C GS CT, Sunflower	4 months 6 months 1 month 12 months 18 months	Requires successful bioassay.
Reflex or Flexstar	S SG, W C,CT,R,P,GS All	I 4 months 10 months 18 months	
Resource	SG S,C All	120 days I 30 days	
Select Max	C		See label.
Sharpen	C,GS,SG,S,R CT SF, others	I 1.5 months 4 months	† Rotation intervals based on rate – see label.
Sonic	W C,R CT,A,B,O, RY,GS	4 months 10 months 12 months	
Storm	All	Fall	
Surveil	S W C,P,R,GS SF	I 3 months 9 months 30 days	
Treflan/others	S,CT W,B All	I Fall FY	
Treflan (2X rate)	S,CT R All	I FY 2 years	
Trivence	S W C R CT All	I 4 months 10 months 12 months 18 months 18 months	Rotational intervals based on pH and rates – see label.
Typhoon	W C,CT,R GS and all others	4 months 10 months 18 months	
Ultra Blazer	S All	I Fall	
Valor	S,P W,C,R,GS CT B A,O,CL,CA	I 30 days 21 days 4 months 8 months	Pre-emerge treatments may injure soybeans.
Verdict	C,S, GS CT,R W	I FY 4 months	† Rotation intervals based on rate – see label.
Warrant	CT,C,GS,S W R, others	I 4 months FY	Do not use more than 3.0 lb/A/year.
Zidua	CT,C,S W GS R, others	I 1 month 6 months FY	

Key

Crop

All = All crops not specified		CT = Cotton		O = Oats		S = Soybeans	
AL = Alfalfa		DSP = Dry Shelled Peas		P = Peanuts		SC = Sweet Corn	
B = Barley		FC = Field Corn		PC = Popcorn		SF = Sunflowers	
C = Corn		FG = Forage Grasses		R = Rice		SG = Small Grains	
CA = Canola		FL = Forage Legumes		RG = Ryegrass		W = Wheat	
CL = Clovers		GS = Grain Sorghum		RY = Rye			

Timing

I = Immediately F = Following year (usually spring or following fall - 11 to 16 months)

*This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

Forage, Feed and Grazing Restrictions for Soybean Herbicides

Herbicide	Restrictions
Assure II	Do not graze treated fields or harvest for forage or hay. Do not apply within 80 days of harvest.
Authority MTZ	Do not graze or harvest for forage or hay.
Basagran	No restrictions on label.
Broadstrike + Dual or Treflan, Python	Do not graze or feed treated soybean forage, hay or straw to livestock.
Butyrac/Butoxone (2,4-DB)	Do not graze or feed soybean hay within 60 days after application of a 2,4-DB tank-mix application. Do not harvest soybeans within 60 days after spray application.
Canopy	Do not graze treated fields or harvest for forage or hay.
Classic	Do not graze treated fields or harvest for forage or hay. Do not apply later than 60 days before soybean maturity.
Cobra	Do not graze animals on green forage or stubble. Do not utilize hay or straw for animal feed or bedding. Apply not later than 90 days before harvest.
Dual Magnum	No restrictions on label.
FirstRate	Do not harvest for forage or hay for 25 days.
Fusilade DX, Fusion	Do not graze or harvest for forage or hay.
Glufosinate	Do not feed green soybean plants to livestock.
Glyphosate	Do not harvest or feed treated crops for 8 weeks after application. Allow 14 days following spot treatment or selective equipment before grazing domestic livestock.
Metribuzin	Treated vines* may be grazed or fed to livestock 40 days after application.
Outlook	Do not graze or feed forage, hay or straw to livestock.

Herbicide	Restrictions
Paraquat	Do not graze treated areas or feed treated forage to livestock.
Poast/ Poast Plus	Do not graze treated fields and do not feed treated soybean forage (green succulent) or ensilage to livestock. Treated soybean hay may be fed. Do not apply to soybeans within 90 days of harvest.
Prowl	Livestock *can* graze or be fed soybean forage from treated fields.
Pursuit	Do not graze or feed treated soybean forage, hay or straw to livestock. There should be an interval of at least 85 days between an application of Pursuit and soybean harvest.
Python	Do not graze or harvest for forage or hay.
Reflex/Flexstar	Do not graze treated areas or harvest for forage or hay. Do not graze rotated small grain crops or harvest for livestock forage or straw. Do not apply after first bloom.
Resource	Do not graze or harvest for forage or hay.
Select	Do not graze treated fields or feed treated forage or hay to livestock.
Storm	Do not use treated plants for feed or forage. Do not apply within 50 days of harvest.
Surveil	Do not graze or harvest for forage or hay.
Synchrony	Do not graze treated fields or harvest for forage or hay. Do not apply later than 60 days before soybean maturity.
Treflan	No restrictions on label.
Trivence	Do not graze or harvest for forage or hay.
Typhoon	Do not graze or harvest for forage or hay.
Ultra Blazer	Do not use treated plants for feed or forage.
Valor	Do not graze or harvest for forage or hay.
Warrant	Do not graze or feed for 60 days.
Zidua/Anthem	Do not graze or feed for 37 days.

Restrictions are listed as worded on the labels. Feeding and application restrictions for herbicides are generally based on residue tolerances allowed for animal feeding. The restrictions are generally not due to acute toxicity (poisoning) problems. Livestock that are accidentally fed treated crops earlier than allowed will not be harmed, but may have illegal pesticide residues in their meat or milk. If you have fed livestock treated crops within the restricted period, refer to the label, your dealer or herbicide company representative for more information.

* Many labels refer to soybean plants as 'vines'.

Soybean Herbicide

Compatibility with Fertilizers as Application Carriers

Herbicide	Fertilizer	
	Fluid	Dry
Assure II	N	N
Broadstrike + Dual or Treflan	Y	Y
Canopy	Y	Y
Dual Magnum	Y	Y
FirstRate	Y	Y
Glyphosate	N	N
Liberty/Cheetah	N	N
Metribuzin	Y	Y
Outlook	Y	Y
Paraquat	Y	N
Prowl	Y	Y
Pursuit	Y	N
Python	Y	Y
Select Max	N	N
Sharpen	Y	Y
Synchrony XP	N	N
Treflan/Trilin/trifluralin	Y	Y
Turbo	Y	Y
Valor	Y	Y
Warrant	N	Y
Zidua	Y	Y

Y = Yes, N = No

There are many specific fertilizer incompatibilities and restrictions with most herbicides. Be sure to read the herbicide label for specific mixing or impregnation instructions. Compatibility agents are required for many mixes. A typical compatibility test procedure for mixing herbicides in fluid fertilizers is given on page 4. NOTE: Compatibility with dry fertilizer is listed here from a labeling standpoint. The University of Arkansas only recommends herbicide application on dry fertilizer as a third alternative to spraying in water or in liquid fertilizer.

Rainfall-free Periods for Postemergence Herbicides

Herbicide	Time Before Rainfall
2,4-DB	4 hrs
Assure II	1 hr
Basagran	8 hrs
Classic	4 hrs
Cobra	30 min
FirstRate	2 hrs
Fusilade, Fusion	1 hr
Glyphosate	4-6 hrs
Liberty/Cheetah	4 hrs
Paraquat	30 min
Poast/Poast Plus	1 hr
Pursuit	1 hr
Python	4 hrs
Reflex, Flexstar, Typhoon	4 hrs
Resource	1 hr
Select Max	1 hr
Sharpen	6 hrs
Storm	8 hrs
Synchrony XP	4 hrs
Ultra Blazer	6 hrs
Valor	1 hr

These are intervals that must occur between application and the first rainfall event in order for no loss in herbicide activity to occur.

Soybean Postemergence Herbicide

Preharvest Application Intervals (PHI)

Herbicide	PHI
2,4-DB	60 days
Assure II	80 days
Basagran	No restrictions
Classic	60 days
Cobra	90 days
FirstRate	65 days
Fusilade DX	1st bloom
Glyphosate	After flowering
Liberty/Cheetah	70 days
Poast/Poast Plus	90 days
Pursuit	85 days
Python	85 days
Reflex, Flexstar, Typhoon	1st bloom
Resource	60 days
Select Max	60 days
Sharpen	3 days
Storm	50 days
Synchrony XP	60 days
Ultra Blazer	50 days
Valor	60 days

These intervals are the number of days that must be allowed between herbicide application and harvest. Applications made after these interval restrictions could cause illegal herbicide residues to be present in the harvested grain.

Soil-Applied Herbicide Rates for Soybeans
Soil Texture

Herbicide	Coarse (light)	Medium	Fine (heavy)
	Broadcast Rates Per Acre		
Preplant (Normal Rates)			
Afforia	2.5 oz	2.5 oz	2.5 oz
Dual Magnum	1 pt	1.33 pt	1.67 pt
Dual Magnum + metribuzin 75DF	0.8 pt + 0.33 lb	1 pt + 0.5 lb	1.33 pt + 0.67 lb
Prowl 3.3EC	1.2-1.8 pt	1.8-2.4 pt	2.4-3.6 pt
Prowl H_2O 3.8 CS	1.0-1.6 pt	1.6-2.1 pt	2.1-3.2 pt
Sonic	3-6 oz	3-6 oz	3-6 oz
Synchrony XP	1.5 oz	1.5 oz	1.5 oz
Treflan, Trilin, Trifluralin 4EC	1 pt	1.5 pt	2 pt
Valor	2 oz	2 oz	2 oz
Preemergence			
Anthem	5-6.5 oz	6.5-9.5 oz	8.5-11 oz
Authority MTZ	10-12 oz	12-14 oz	14-18 oz
BroadAxe XC	19-25 oz	25-32 oz	25-32 oz
Canopy (labeled) 75DF	0.375 lb	0.5 lb	0.67 lb
Dual Magnum	1 pt	1.33 pt	1.67 pt
Dual Magnum + metribuzin 75DF, Boundary	0.8 pt + 0.33 lb	1 pt + 0.5 lb	1.33 pt + 0.67 lb
Enlite	2.8 oz	2.8 oz	2.8 oz
Envive	3.5 oz	3.5 oz	3.5 oz[1]
Metribuzin 75DF	0.33-0.5 lb	0.5-0.67 lb	0.67-1 lb
Outlook	10-14 oz	14-16 oz	16-18 oz
Prefix	2 pt	2-2.5 pt	2-3 pt
Python	1 oz	1.1 oz	1.3 oz
Sharpen	--	1 oz	1 oz
Sonic	3-6 oz	3-6 oz	3-6 oz
Surveil (co-pack)	3 oz	3 oz	3 oz
Trivence[1]	6 oz	6-8 oz	8-10 oz
Valor	2 oz	2 oz	2 oz
Verdict	--	5 oz	5 oz
Warrant	1.25 qt	1.5 qt	1.9 qt
Zidua	1-2.1 oz	1.5-3.0 oz	2.0-3.5 oz

[1]See label for pH restrictions.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
For additional information on burndown herbicides see page 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.				
Preplant–Burndown				
paraquat @ 0.47 to 0.94 lb/A	Annual broadleaf and grass weeds (existing vegetation).	**Paraquat (2 or 3 lb/gal formulations)** 32 to 64 oz/A or 1.88 to 3 pt/A in at least 20 gal water per acre for ground application. 5 to 10 gal for aerial application. Add 0.25% surfactant.	Use prior to planting on seedbeds that are not to be disturbed before planting. Use higher rate on weeds larger than 2 inches.	Good spray coverage is essential.
glyphosate @ 1 lb/A	Annual grasses and broadleaf weeds (existing vegetation). Weak on morninglories.	**Glyphosate (4 lb/gal formulations)** 2 pt/A. Use high rate on all but very small weeds.	Use prior to planting for vegetation knockdown.	Best results when applied in lower spray volumes, i.e., 5 to 10 gpa.
glufosinate @ 0.64 lb/A	Good option for glyphosate-resistant horseweed. Annual grasses and broadleaf weeds (existing vegetation).	**Glufosinate (280 SL formulations)** 36 oz/A.	Use prior to planting for vegetation knockdown.	Good coverage and warm weather will increase efficacy. Do not use prior to planting Liberty Link soybeans.
glyphosate or paraquat + metribuzin @ 1 lb/A or 0.47 to 0.78 + 0.25 to 0.75 lb/A	Postemergence control of existing annual weeds. See rating table for preemergence control with metribuzin.	**Glyphosate (4 lb/gal formulations) or paraquat (2 or 3 lb/gal formulations) + metribuzin** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 0.33 to 1 lb/A DF. Add 0.25% surfactant.	At planting or prior to crop emergence.	Tank mix. Apply as above. Do not use on sensitive varieties listed on label. A list of metribuzin-tolerant varieties is available. Avoid use on high pH soils.
glyphosate or paraquat + chlorimuron/metribuzin @ 1 lb/A or 0.47 to 0.94 + 0.188 lb/A	Annual broadleaf and grass weeds. Improved control of cocklebur, hemp sesbania, morninglories, smartweed and prickly sida. See rating table for preemergence control with Canopy.	**Glyphosate (4 lb/gal formulations) or paraquat (2 or 3 lb/gal formulations) + Canopy 75DF** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 6 oz/A. Add 0.25% surfactant.	Prior to planting.	This is a reduced rate of Canopy. Higher rates have been shown to cause injury in minimum tillage culture. Tank mix with Dual or another grass herbicide, or follow this treatment with a postemergence grass herbicide for season-long grass control. A follow-up postemergence broadleaf treatment will also likely be needed.
glyphosate or paraquat + sulfentrazone/cloransulam @ 1 lb/A or 0.47 to 0.94 + 0.13 to 0.26 lb/A	Annual broadleaf and grass weeds. Improved control of cocklebur, morninglories, smartweed and horseweed. Additional residual control of many broadleaf weeds, including Palmer amaranth.	**Glyphosate (4 lb/gal formulations) or paraquat (2 or 3 lb/gal formulations) + Sonic** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt/A + 3 to 6 oz/A.	Prior to planting.	Tank mix. Good program for burndown with residual broadleaf control. Good program for Liberty Link soybeans.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate or paraquat + 2,4-D or dicamba + chlorimuron/tribenuron or flumioxazin @ 1 lb/A or 0.47 to 0.94 + 1 lb/A or 0.25 lb/A + 0.28 to 0.37 lb/A or 0.063 lb/A	Horseweed and other broadleaf weeds.	**Glyphosate (4 lb/gal formulations) or paraquat (2 or 3 lb/gal formulations) + 2,4-D or dicamba + Canopy EX or Valor (or other Valor-containing premixes)** 2 pt/A or 32 to 64 oz/A or 1.8 to 3 pt + 2 pt/A or 8 oz/A + 1.5 to 2 oz/A or 2 oz.	For dicamba and 2,4-D, 21 days after 1.0 inch rainfall, prior to planting.	Burndown plus enhanced control of broadleaf weeds. If horseweed is present, use at least 8 oz/A of dicamba.
glyphosate + thifensulfuron/ tribenuron @ 1 lb/A + 0.016 to 0.025 lb/A	Improved control of garlic, curly dock, smartweed and henbit.	**Glyphosate (4 lb/gal formulations) + FirstShot SG** 2 pt/A + 0.5 to 0.8 oz/A.	Immediately prior to planting. Label requires application be made at least 7 days prior to planting.	Burndown plus enhanced control of broadleaf weeds.
glyphosate + carfentrazone @ 1 lb/A + 0.016 lb/A	Improved control of morning-glories.	**Glyphosate (4 lb/gal formulations) + Aim 2 EC** 2 pt/A + 1 oz/A.	At planting or prior to crop emergence.	Good spray coverage is essential.
sulfentrazone + metribuzin @ 0.225 + 0.2 lb/A	Broadleaf weeds.	**Authority MTZ** 12-16 oz/A. Add 1% COC.	Up to 14 days prior to planting.	Add glyphosate or paraquat for existing vegetation. See soil texture chart on page 47. For higher rates, use tolerant varieties. Use 16 oz/A on clay soils.
flumioxazin @ 0.063 lb/A	Residual horseweed control. No post horseweed activity.	**Valor 51 WDG** 2 oz/A.	Prior to soybean emergence.	Apply to clean ground or tank-mix for post weed control. Rainfall at emergence may result in injury, mainly cosmetic.
flumetsulam @ 0.05 to 0.066 lb/A	Horseweed and other broad-leaves.	**Python 80 WDG** 1 to 1.33 oz/A.	Prior to planting wheat-beans.	Contact and residual for horseweed. Good tank mix with Liberty. Good option where horseweed is present less than 14 days prior to planting.
flumioxazin + chlorimuron/ thifensulfuron	Residual horseweed, pigweed and morningglory control.	**Envive or Enlite WDG** 3.5 or 2.8 oz/A.	Prior to soybean emergence.	Use 2.8 oz/A Enlite on high pH soils.
flumioxazin + chlorimuron + metribuzin @ 0.063 + 0.02 + 0.223 lb/A	Residual horseweed, pigweed and morningglory control.	**Trivence 61.3 DG** 8 oz/A.	Prior to soybean emergence.	Use 6 oz/A on high pH soils.
saflufenacil @ 0.022 to 0.044 lb/A	Horseweed rapid burndown – regrowth will occur.	**Sharpen 2.85 SC** 1 to 2 oz/A.	Prior to soybean emergence. 30 days up to prior to emergence.	Tank mix with glyphosate, 1% MSO and 2% v/v of AMS or UAN for best activity. 30-day plant back on coarse soils.
saflufenacil + dimethenamid @ 0.022 to 0.044 + 0.2 to 0.4 lb/A	Horseweed burndown and residual control.	**Verdict 5.57 EC** 5 to 10 oz/A.	Prior to planting to preplant. 30 days up to prior to emergence.	

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
Preplant–Burndown [cont.]	**For additional information on burndown herbicides see page 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.**			
glyphosate + 2,4-D + rimsulfuron/thifensulfuron @ 1 + 1 + 0.25/0.25 lb/A	Henbit, grasses and broadleaves.	**Glyphosate (4 lb/gal formulations) + 2,4-D + Leadoff** 2 pt/A + 1.5 pt/A + 1.5 oz/A.	At least 30 days prior to planting.	For horseweed, substitute dicamba 8 oz/A for 2,4-D. See label for specific plant-back intervals to soybean.
halosulfuron + thifensulfuron @ 0.31 to 0.62 + 0.004 to 0.008 lb/A	Sedges and smartweed.	**Permit Plus 75 WG** 0.75 to 1.5 oz/A.	Up to 21 days prior to planting.	<*STS/BOLT varieties only!
SOYBEANS				
Wheat - Stubble Planted or Reduced Tillage or Stale Seedbed Soybean Culture				
Important factors to consider in stale seedbed and reduced tillage soybean culture. 1. If your goal is to conserve moisture at planting time and heavy vegetation is present, moisture reserves may already be depleted and establishing soybean stands may not be feasible without rainfall. 2. In a dry year, failure to obtain good control of existing vegetation will result in failure to obtain a stand of soybeans because the weeds will deplete the soil moisture before the seedling soybeans can become established. 3. Spray volume for herbicides should be in the 10 to 20 gallon per acre range for best results. 4. Thorough and uniform coverage is necessary for good "burndown" results. Coverage more dependent on droplet size and number of droplets (orifice size-pressure relationship) than on total volume. 5. Timely postemergence herbicide applications and, in some cases, cultivation will be necessary for full-season weed control. 6. **Compared to the burndown and residual mixtures below, a burndown herbicide such as glyphosate, paraquat, paraquat + Sencor, or Canopy followed by a total postemergence program has been cheaper and more consistent in no-till, stubble-planted soybeans.**				
Preplant–Incorporated				
trifluralin @ 0.5 to 1 lb/A	Annual grass weeds and johnsongrass from seed.	**Treflan 4 EC** 1 to 2 pt/A.	From 6 weeks prior to planting to time of planting.	**APPLICATION RECOMMENDATIONS FOR ALL FOLLOWING PREPLANT TREATMENTS** Although Treflan and Prowl are labeled for use up to 6 weeks (or 60 days for Prowl) prior to planting, poor results are often obtained with early applications of both 1 and 2X rates if extended periods of wet weather occur before planting. For this reason, apply as near to planting as practical. The following summary is taken from **Equipment and Methods for Soil Incorporation of Herbicides,** a paper by Bode, Newberg, Butler and Wax at the American Society of Agricultural Engineers meeting in 1977. Note section on large disks. Tillage from tandem disk harrows is such that the soil is inverted, and herbicides are mixed deeper in the soil than with any other incorporation tool tested. A single pass with tandem disks results in areas of low concentration, where weed streaking can occur. A second pass will help to level out the areas of high and low concentrations, but there seems to be very little difference whether the second pass is parallel, perpendicular or at any angle with the first pass. *[continued]*
pendimethalin @ 0.5 to 1.5 lb/A	Annual grass weeds and johnsongrass from seed.	**Prowl 3.3 EC** 1.2 to 3.6 pt/A. or **Prowl H_2O 3.8 CS** 1 to 3.2 pt/A.	From 60 days prior to planting until immediately prior to planting.	
S-metolachlor @ 0.95 to 1.6 lb/A	Red rice, annual grasses and yellow nutsedge.	**Dual Magnum 7.62 EC** 1 to 1.67 pt/A. or **metolachlor 8 EC** 1.25 to 1.9 pt/A	During final seedbed preparation (within 7 days of planting). Can be applied up to third trifoliate.	

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
pendimethalin or trifluralin + metribuzin @ 0.5 to 1 + 0.25 to 0.5 lb/A	Annual grasses, johnsongrass from seed, annual broadleaf weeds including hemp sesbania (coffeebean), prickly sida (teaweed), pigweed and smartweed. Poor control of cocklebur, entireleaf morningglory and sicklepod.	**Prowl or Treflan + Metribuzin 75 DF** 1.2 to 2.4 pt/A Prowl 3.3 EC or 1 to 2 pt/A Treflan 4 EC + 0.33 to 0.67 lb/A DF. Tank mix.	During final seedbed preparation before planting. Can be applied up to third trifoliate.	Large disks with blades spaced (9 inches or wider) will not give adequate soil mixing when operated at shallow depths of 4 inches or less. When large disks are operated at a 6-inch depth or more to obtain soil inversion, some of the chemical is incorporated deeper than desired, There is also some loss of horizontal uniformity with the large disk. Spacing of disk blades and depth of operation seem to be more important than blade diameter in determining the amount of soil mixing. Disks with 7-inch blade spacings gave more uniform incorporation at the desired (2- to 3-inch) depth than disks with 9-inch spacings. The field cultivator also requires two passes to obtain adequate incorporation. Better soil mixing is obtained when sweeps are used at travel speeds of 5 to 7 mph. To avoid areas of low chemical concentration which would result in strips of weeds, the second pass should be at some angle to the first pass rather than parallel to it. The rear row of shanks should not be allowed to operate deeper than the forward rows because untreated soil may be brought to the surface, and weed control would be reduced. A drag harrow mounted behind the cultivator to level the ridges will improve herbicide distribution in the top inch of soil.
metolachlor + metribuzin @ 0.95 to 1.6 lb/A + 0.375 to 0.5 lb/A	Annual grasses, johnsongrass from seed, annual broadleaf weeds including hemp sesbania (coffeebean), prickly sida (teaweed), pigweed and smartweed. Poor control of cocklebur, entireleaf morningglory and sicklepod. Better on red rice, weak on seedling johnsongrass.	**Dual Magnum + Metribuzin** 0.8 to 1.33 pt/A or 0.5 to 0.67 lb/A DF. or **Boundary 6.5 EC** 1 to 2.25 pt/A.	During final seedbed preparation (within 7 days of planting).	
pendimethalin or trifluralin + imazaquin @ 0.5 to 1 + 0.094 to 0.125 lb/A	Most annual grass, and broadleaf weeds except hemp sesbania. Sicklepod if followed by Classic.	**Prowl or Treflan + Scepter 70 DF** 1.2 to 2.4 pt/A Prowl 3.3 EC or 1 to 2 pt/A Treflan 4 EC + 1.4 to 2.8 oz/A 70 DF. If incorporating 2 to 4 weeks prior to planting, use labeled rates of Scepter. If incorporating from 0 to 2 weeks prior to planting, the University of Arkansas recommended rate is 1.4 oz/A 70 DF. See comments at right.	Up to 4 weeks prior to planting. Incorporate immediately after application. Poor weed control may occur if incorporated into dry soils unless rainfall occurs for activation.	Incorporate thoroughly in the top 2 to 3 inches of seedbed. **When applied from 0 to 2 weeks prior to planting, University of Arkansas research has shown near equal results from rates ranging from 1.4 to 2.8 oz/A – regardless of soil texture. The most consistent programs with Scepter are those that use the rate of 1.4 oz/A 70DF followed by a postemergence herbicide, if needed.**
pendimethalin or trifluralin + chlorimuron + metribuzin @ 0.5 to 1 + 0.25 to 0.5 lb/A	Same as Prowl or Treflan + Sencor with improved control of cocklebur and morningglories. Sicklepod if followed by Classic.	**Prowl or Treflan + Canopy 75 DF** 1.2 to 2.4 pt/A Prowl 3.3 EC or 1 to 2 pt/A Treflan + 0.375 to 0.67 lb/A Canopy 75 DF.	Up to 2 weeks prior to planting.	Incorporate thoroughly in the top 2 to 3 inches of seedbed. Severe crop injury can occur under prolonged wet conditions at emergence. Do not use on heavy soils with pH above 7.0.
flumetsulam @ 0.05 to 0.066 lb/A	Cocklebur, horseweed, smooth pigweed, velvetleaf, prickly sida, spurge, eclipta. Suppression of morningglories. Sicklepod if followed by Classic.	**Python 80 WDG** 1 to 1.33 oz/A + labeled rate of grass herbicide.	Apply from 0 to 30 days before planting.	Incorporate thoroughly into the top 2 inches of the seedbed. Control of cocklebur, morningglory and sicklepod may be enhanced by using the higher end of the rate range for each soil textural class. Do not use on soils with pH above 7.8. Do not rotate with cotton for 18 months or sorghum for 12 months following application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
Preplant–Incorporated [cont.]				
dimethenamid @ 0.56 to 0.98 lb/A	Red rice, annual grasses, yellow nutsedge and pigweeds. Will also reduce competition from teaweed, hophornbeam copperleaf, groundcherry and other small-seeded broadleaf weeds.	**Outlook 6E** 12 to 21 oz/A.	From 45 days prior to planting to third trifoliate.	Disk incorporation is not recommended. A field cultivator or similar type implement should be used to incorporate in the top 2 to 3 inches. Rate dependent on percent organic matter. See label.
SOYBEANS	**SEE HERBICIDE RESISTANCE STATEMENTS ON PAGES 11 AND 12.**			
Preemergence - Labeled Rates for Broadcast Application				
metolachlor @ 0.9 to 1.5 lb/A	Annual grasses, red rice, nutsedge and small-seeded broadleaves.	**Dual Magnum 7.62EC** 1 to 1.67 pt/A.	At planting, up to third trifoliate.	Rainfall needed for activation.
metribuzin @ 0.25 to 0.75 lb/A	Hemp sesbania, prickly sida, common cocklebur, pigweed, spurred anoda, common ragweed, smartweed and sicklepod.	**Metribuzin 75 DF** 0.33 to 1 lb/A.	At planting.	Do not apply to sandy soils or to sandy loam or loamy sand soils with less than 2% organic matter. Some stunting and stand reduction may occur from Sencor if heavy rains closely follow treatment. Do not apply more than once per season. Do not use treated vines for feed or forage. **See Soybean Update for list of metribuzin-sensitive varieties.** Do not use on soils pH 7.5 or above. Weak on grass weeds. Do not use 1.5 pt/A 4L or 1 lb/A DF rates on any soils except Mississippi Delta heavy clay.
acetochlor @ 0.75 to 1.3 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Warrant 3L** 2 to 3 pt/A.	At planting.	Rainfall needed for activation. Most pre applications of Warrant should be applied in combination with a Valor or Authority product.
S-metolachlor + metribuzin @ 0.8 to 1.3 + 0.25 to 0.75 lb/A	Same as above with improved annual grass control. Improved control of pigweed and sicklepod compared to above. Good choice for pigweed.	**Dual Magnum 7.62EC + Metribuzin 75 DF** 0.8 to 1.33 pt/A Dual Magnum + 0.33 to 1 lb/A 75 DF. **or** **Boundary 6.5 EC** 1 to 2.25 pt/A.	At planting.	Tank mix. Apply only once per season. Do not use on sand or loamy sand soils with less than 2% organic matter. Do not plant crops other than soybeans within 4 months after treatment. Do not use treated vines for feed or forage. Do not apply to sensitive varieties, exceed 4 qt/A/year or use with liquid fertilizer.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
flumioxazin @ 0.063 lb/A	Residual broadleaf control. No post horseweed activity. Good option for pigweed.	**Valor 51 WDG (or appropriate rate of Valor-containing premixes such as Enlite, Envive, Valor XLT, etc.)** 2 oz/A.	Prior to soybean emergence. Apply immediately after planting.	Apply to clean ground or tank-mix for post weed control. Rainfall at emergence may result in injury, mainly cosmetic.
dimethenamid + saflufenacil @ 0.156 to 0.31 + 0.022 to 0.044 lb/A	Annual grasses, pigweed, velvetleaf, morningglory and horseweed.	**Verdict** 5 oz/A.	Burndown to preemergence. **Do not** apply Verdict over the top of cracking or emerged soybeans. 5 oz/A of Verdict can be applied up to pre-emergence on medium and fine soils. 7.5 oz/A of Verdict can be applied up to 14 days before planting on medium to fine soils. 10 oz/A of Verdict can be applied up to 30 days before planting on medium to fine soils. Apply immediately after planting.	For best burndown results, tank mix with glyphosate or paraquat. An MSO and AMS must be used for burndown. On coarse soils with less than 2% organic matter, the plant back to soybeans is 30 days at 5 to 7.5 ounces and 44 at 10 ounces. See label for further recommendations and restrictions.
pyroxasulfone @ 0.72 to 2.98 oz/A or pyroxasulfone + fluthiacet-methyl @ 0.65 + 0.02 to 1.43 + 0.045 lb/A	Annual grasses and small-seeded broadleaves.	**Zidua 0.85 WG** 1 to 3.5 oz/A. **or** **Anthem 2.15 SE** 5 to 11 oz/A.	At planting.	Rainfall required for activation.
pyroxasulfone + flumioxazin @ 1.28 + 1 oz/A	Annual grasses and small-seeded broadleaves.	**Fierce 76 WDG** 3 oz/A.	At planting. Apply immediately after planting.	Rainfall required for activation. Do not apply if soybeans are cracking. Injury may be worse than expected with Valor alone. Cool, wet conditions may result in delayed recovery and growth.
saflufenacil @ 0.022 to 0.044 lb/A	Pigweed, velvetleaf, morningglory and horseweed.	**Sharpen 2.85 SC** 1 to 2 oz/A. Add surfactant.	Burndown to preemergence. **Do not** apply Sharpen over the top of cracking or emerged soybeans. 1 oz/A of Sharpen can be applied up to preemergence on medium and fine soils. 1.5 oz/A of Sharpen can be applied up to 14 days before planting on medium to fine soils. 2 oz/A of Sharpen can be applied up to 30 days before planting on medium to fine soils.	For best burndown results, tank mix with glyphosate or paraquat. An MSO and AMS must be used for burndown. On coarse soils with less than 2% organic matter, the plant back to soybeans is 30 days at 1 to 1.5 ounces and 44 at 2 ounces. See label for further recommendations and restrictions.
sulfentrazone + *S*-metolachlor @ 0.106 + 1.75 to 0.94 + 1.57 lb/A	Grass and broadleaf weeds.	**Authority Elite 7 EC or BroadAxe XC** 19 to 32 oz/A.	At planting.	Rainfall required for activation. Rate depends on soil type.
sulfentrazone + metribuzin @ 0.225 + 0.2 lb/A	Broadleaf weeds.	**Authority MTZ** 12 to 16 oz/A.	No later than three days after planting.	Make sure seed furrow is closed. See soil texture chart on page 47. For higher rates, use tolerant varieties.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS	**SEE HERBICIDE RESISTANCE STATEMENTS ON PAGES 11 AND 12.**			
Preemergence - Labeled Rates for Broadcast Application [cont.]				
S-metolachlor + fomesafen @ 1.08 to 1.6 + 0.24 to 0.36 lb/A	Grass and broadleaf weeds.	**Prefix** 2 to 3 pt/A oz/A.	At planting.	Do not use PRE if you plan to use Flexstar POST for pigweed. Rainfall required for PRE activity.
chlorimuron/metribuzin @ 0.039 + 0.25 lb/A	Cocklebur, pitted, entireleaf and ivyleaf morningglory, spurge, and hemp sesbania. Sicklepod if followed by Classic post-emergence.	**Canopy 75 DG** 6 oz/A.	At planting.	Rainfall required for activation. Not recommended for later planted soybeans due to poor probability of rainfall. Severe soybean injury can occur on soils with poor internal drainage under prolonged wet conditions at emergence. Do not use on heavy soils with pH above 7.0.
flumetsulam @ 0.05 to 0.066 lb/A	Cocklebur, horseweed, smooth pigweed, eclipta, velvetleaf, spurge, and prickly sida. Suppression of morningglories. Sicklepod if followed by Classic.	**Python 80 WDG** 1 to 1.33 oz/A + labeled rate of Dual or other preemergence grass herbicide.	At planting.	Rainfall required for activation. Control of cocklebur, morningglory and sicklepod may be enhanced by using higher end of rate range for each soil textural class. Do not plant cotton for 18 months or sorghum for 12 months following application. Do not use on soils with pH above 7.8.
dimethenamid @ 0.56 to 0.98 lb/A	Most small-seeded annuals.	**Outlook 6E** 12 to 21 oz/A.	From at planting until soybeans have reached unifoliate stage.	Rainfall needed for activation.
sulfentrazone/cloransulam @ 0.13 to 0.26 lb/A	Cocklebur, Palmer amaranth, morningglories, smartweed, and grass suppression.	**Sonic or Authority First** 3 to 6 oz/A.	PPI, preplant surface applied or pre-emergence (within 3 days of planting).	Rainfall required for activation.
Postemergence-All Cultural Systems				

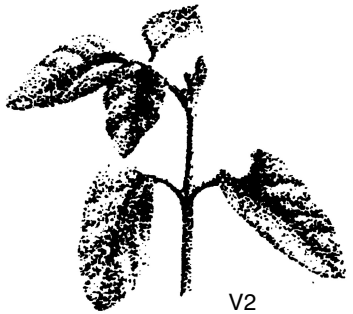
Soybean Growth Stages for Applying Postemergence Herbicides

VC

Unifoliolate leaves unrolled sufficiently so the leaf edges are not touching.

V1

Fully developed leaves at unifoliolate nodes.



V2

Fully developed trifoliolate leaf at node above the unifoliolate nodes.

flumioxazin + cloransulam methyl @0.063 + 0.021 lb/A	Small-seeded broadleaves.	**Surveil 48 WDG** 2.8 oz/A.	Preemergence.	Add Zidua or metribuzin for PPO-resistant pigweed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
Postemergence – Overtop	**Labeled Rates – See previous statement on tank mixes of grass and broadleaf herbicides.**			
bentazon @ 0.75 to 1 lb/A	Emerged common cocklebur, jimsonweed, smartweed, velvetleaf, prickly sida and common ragweed.	**Basagran 4L** 1.5 to 2 pt/A. A surfactant is optional. Research has shown no advantage to adding a surfactant for cocklebur. Use two applications for morningglory control. The addition of 2 fl oz/A of **2,4-DB** may improve morningglory control somewhat and may also improve control of cocklebur slightly larger than those listed on Basagran label. Rate may be reduced with band application.	Postemergence when soybeans are in 1 (V2) to 4 (V5) trifoliate stage. If a second flush of cocklebur emerges, repeat treatment or follow with another material as a directed spray. Most effective on cocklebur 6 inches or less.	Overtop or semi-directed. Excellent spray coverage is necessary for results. If the crop canopy shelters small weeds, use a semi-directed spray. Use high rate on cocklebur larger than 6-leaf stage. Do not apply to soybeans growing under stress. Do not apply more than 2 lb bentazon per acre in one season. **Do not add 2,4-DB unless good soil moisture is present and soybeans are actively growing. Refer to label for precautions and disclaimers.**
acifluorfen @ 0.375 to 0.5 lb/A	Emerged hemp sesbania, crotolaria, morningglory, Texas gourd, common ragweed, copperleaf, woolly croton and several other broadleaf weeds. (See rating table.)	**Ultra Blazer 2L** 1 to 2 pt/A. 1 pt rate on hemp sesbania and showy crotolaria. Use 2 pt rate on all but very small jimsonweed, purple moonflower, pitted morningglory or common ragweed. Add a surfactant. Refer to label. The addition of 2 fl oz/A of **2,4-DB** may improve cocklebur control somewhat and may also improve control of morningglory slightly larger than those listed on Ultra Blazer label. Rate may be reduced with band application.	Postemergence when soybeans are small. Ivyleaf and entireleaf morningglories must be controlled before they are beyond the 2 true leaf stage. Pigweed must be controlled first 7 to 10 days after emergence. Refer to label for specific weed sizes. For hemp sesbania (coffeebean) only, best control obtained between 12" and bloom stage.	Overtop or semi-directed. Weeds should be actively growing. Excellent spray coverage is necessary. Crop injury symptoms are foliar burn, leaf speckling and leaf crinkling. The symptoms are usually cosmetic in nature only. Notice, for successful results, labeled rates and timing of application must be strictly adhered to. **Do not add 2,4-DB unless good soil moisture is present and soybeans are actively growing. Refer to label for precautions and disclaimers. Cutoff date is 50 days prior to harvest (PHI). May be applied to soybeans in bloom stage if within the PHI.**
acifluorfen + bentazon @ 0.25 to 0.5 + 0.5 lb/A	Pigweed, cocklebur, prickly sida, hemp sesbania; pitted, purple, palmleaf and entireleaf morningglories, Texas gourd and woolly croton.	**Ultra Blazer + Basagran** 1 to 2 pt/A + 1 pt/A. Add a surfactant according to Ultra Blazer label. Rate may be reduced with band application. **or** **Storm 4L** 1.5 pt/A. Add a surfactant. **Note: Storm rate of 1½ pt/A equivalent to 1 pt/A Basagran + 1 pt/A Ultra Blazer.**	Postemergence when soybeans are small. Ivyleaf and entireleaf morningglories must be controlled before they are beyond the 2 true leaf stage. Pigweed must be controlled first 7 to 10 days after emergence. Refer to label for specific weed sizes. For hemp sesbania (coffeebean) only, best control obtained between 12" and bloom stage.	Same as above. If prickly sida is larger than 2", increase Basagran rate to 1½ pt/A. Use high Ultra Blazer rate for entireleaf and ivyleaf morningglory.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
Postemergence – Overtop [cont.]	**Labeled Rates – See previous statement on tank mixes of grass and broadleaf herbicides.**			
lactofen @ 0.2 lb/A	Balloonvine, cocklebur, pitted morningglory, prickly sida, spurge, hemp sesbania, woolly croton and others. See rating table. Weak on entireleaf morningglory.	**Cobra 2E** 0.8 pt/A. Add a nonionic surfactant or crop oil concentrate. (See label.) University of Arkansas research has often shown an increase in soybean injury with little or no increase in weed control with COC compared to surfactant.	Between 10 and 14 days after weed emergence.	Weed control rapidly diminishes as weeds exceed 14 days after emergence or if environmental conditions are poor. Timing is very critical on cocklebur or regrowth will occur. Expect 30% to 40% initial crop burn. Research has shown this does not lower yield in weed-free soybeans planted at recommended planting dates. Not recommended on soybeans planted beyond the recommended planting date. Less dependent than other herbicides on environmental conditions.
fomesafen @ 0.235 to 0.35 lb/A	Cocklebur, morningglories, pigweed, hemp sesbania, woolly croton and others. See rating table.	**Flexstar 1.88L** 1 to 1.5 pt/A. See comments at right.	Between 10 and 14 days after weed emergence. 2" to 3" pigweed.	Weed control rapidly diminishes as weeds exceed 14 days after emergence or if environmental conditions are poor. Good residual control of Palmer amaranth has been observed if rainfall occurs shortly after application. Do not plant crops other than wheat, corn, cotton, peanuts, soybeans or rice for 18 months after application.
chlorimuron @ 0.008 lb/A	Cocklebur, hemp sesbania, pitted, entireleaf and ivyleaf morningglories, northern jointvetch and sicklepod.	**Classic 25DF** 0.5 oz/A. Add a nonionic surfactant.	7 to 12 days after weed emergence.	Timing is critical. Control of sicklepod and entireleaf-ivyleaf morningglories may be erratic. Weeds must be actively growing. Avoid drift. Crop injury in forms of yellowing and leaf malformation may occur but should be quickly outgrown. Avoid drift to cotton or rice. Tank mixing with other herbicides may reduce activity.
imazethapyr @ 0.063 lb/A	Yellow nutsedge, pitted, entireleaf and ivyleaf morningglories, spotted spurge and smartweed. Suppression of annual grass, red rice and johnsongrass.	**Pursuit 70 DG** 1.45 oz/A. Add a nonionic surfactant.	Within first 10 days after weed emergence. Can tank mix with glyphosate for improved nutsedge control.	Timing is extremely critical. Weeds must be very small. Can give excellent residual control if rain occurs within 5 days. **40 month rotation to non-Clearfield rice.**
cloransulam-methyl @ 0.016 lb/A	Cocklebur, morningglory, ragweeds, sicklepod and horseweed.	**FirstRate 84 DG** 0.3 oz/A. Add 1.2% crop oil concentrate. Do not exceed 0.6 oz/A per year.	10 to 14 days after weed emergence. Cotyledon to 1 true leaf sicklepod. Up to R2 soybean.	Timing is critical. Erratic on sicklepod. Has been a good tank mix partner with glyphosate in research. **Best post option for horseweed.** PHI = 70 days.
flumetsulam @ 0.0062 lb/A	Prickly sida and other broadleaf weeds.	**Python 80 WDG** 0.125 oz/A. Add 0.5% crop oil concentrate.	10 to 14 days after weed emergence. (2- to 3-leaf sida).	Good tank mix with FirstRate in conventional soybeans. Can be tank mixed with glyphosate.
fluthiacet @ 0.0035 to 0.006 lb/A	Morningglory, velvetleaf, smartweed and hophornbeam copperleaf.	**Cadet 0.91 EC** 0.5 to 0.9 oz/A.	2- to 4-inch weeds.	Add to glyphosate for improved control of velvetleaf and morningglories.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses, johnsongrass, bermudagrass and red rice.	**Poast Plus 1E** 1 to 1.5 pt/A. Add 1 qt/A crop oil concentrate. Use 1 pt rate only on small annual grasses. Red rice may require repeat treatment of 1 pt/A following initial 1½ pt treatment. For spot treatment, use 1% solution of Poast Plus + 1% crop oil concentrate. Spray to wet but not to runoff.	Best control before annual grasses exceed 14 days after emergence. Johnsongrass - 15" to 20" Bermudagrass - 1" ht or 6" runner length max Red rice - first 7 days after emergence and before exceeds 4". **Timing for annual grass and red rice very critical.**	[Most effective grass herbicide on large annual grasses.] Apply only under conditions of active growth. Thorough coverage required. Do not cultivate 7 days before or after treatment. However, cultivation soon after 7 days will be helpful. Repeat treatments may be required if regrowth occurs. If a herbicide is needed for broadleaf weed control, apply Poast Plus first and follow with broadleaf herbicide at least 1 day later. If broadleaf weeds form canopy over small grass, apply broadleaf herbicide, and wait 7 days before applying Poast Plus.
flumiclorac @ 0.027 lb/A	Volunteer cotton, velvetleaf and other broadleaf weeds.	**Resource 0.86 EC** 6 oz/A. Add 1% crop oil concentrate.	10 to 14 days after weed emergence. Do not apply within 60 days of harvest.	Effective tank-mix partner with glyphosate for controlling volunteer Roundup Ready cotton. Do not apply more than 16 oz/year.
fluazifop @ 0.188 lb/A	Bermudagrass, johnsongrass and annual grasses.	**Fusilade DX 2E** 0.75 pt/A. Add 1% crop oil concentrate or 0.25% nonionic surfactant. Red rice may require repeat treatment. For spot treatment, use 2 qt Fusilade/100 gal. Add 1 gal crop oil or 1 qt nonionic surfactant/100 gal.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 12" to 18" Bermudagrass - 3" height or 6" to 12" runner maximum Red rice - first 7 days after emergence and before exceeds 2" **Timing for annual grass very critical.**	Apply only under conditions of active growth. Less effective than Poast Plus on annual grasses, more effective on bermudagrass and johnsongrass. Repeat if necessary. Thorough coverage required. Do not tank mix. Do not cultivate 7 days before or after treatment. However, cultivation soon after 7 days will be helpful. See label for details. Repeat treatment may be needed if regrowth occurs. No-till johnsongrass control will require two applications. If a herbicide is needed for broadleaf weed control, apply Fusilade first and follow at least 1 day later. If broadleaf weeds form canopy over small grass, apply broadleaf herbicide, and wait 7 days before applying Fusilade. Do not apply after bloom stage of soybeans.
fluazifop/fenoxaprop @ 0.166 + 0.25 lb/A	Annual grasses, johnsongrass and bermudagrass.	**Fusion 2.66 EC** 0.5 pt/A annual grasses 0.75 pt/A perennial grasses Add crop oil concentrate at 1% or 0.25% nonionic surfactant. See other comments on Fusilade above.	See above comments for Fusilade.	See above comments for Fusilade. Do not apply more than 24 fl oz/season.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS				
Postemergence – Overtop [cont.]	**Labeled Rates – See previous statement on tank mixes of grass and broadleaf herbicides.**			
quizalofop p-ethyl @ 0.031 to 0.063 lb/A	Annual grasses, bermudagrass, johnsongrass and red rice.	**Assure II 0.8E** 5 oz/A volunteer corn and milo, 8 oz/A most annual grasses, 9 oz/A red rice. Repeat if needed. 10 oz/A rhizome johnsongrass and bermudagrass. Add crop oil concentrate at 1% for ground application or 0.5% for aerial application or nonionic surfactant at 0.25%.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 10" to 24" Red rice - first 14 days after emergence or 1 to 4 leaf **Timing for annual grass and red rice is very critical.**	See above comments for Poast Plus and Fusilade on cultivation and tank mixing. Performance comparable to Poast Plus on annual grasses and Fusilade on rhizome johnsongrass. Better than either on small red rice.
clethodim @ 0.25 lb/A	Annual grasses, bermudagrass and johnsongrass. **Red rice seedhead suppression.**	**Select 2E or Select Max 0.97 EC** 8 or 16 oz/A. Add 1% crop oil concentrate.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 12" to 24" Bermudagrass - 3" height or 6" runner length maximum For red rice seedhead suppression, apply at internode elongation stage of red rice.	See above comments for Poast Plus and Fusilade on cultivation and tank mixing. Performance comparable to Assure II for annual grasses and johnsongrass.
GENERAL STATEMENT ON TANK MIXING POSTEMERGENCE GRASS AND BROADLEAF HERBICIDES Results from tank mixing these herbicides has been variable among locations, years and persons conducting the studies. As a general statement, under optimum growing conditions and weed sizes, antagonism from Ultra Blazer, Reflex and Cobra has been very slight or not at all. When tank mixing with Basagran, increase the grass herbicide rate by 50%. Do not tank mix the grass herbicide with Scepter, Classic or Pursuit. Not all combinations are labeled. Refer to label. To eliminate any possibility of antagonism (loss of grass activity), apply grass herbicide first followed by the broadleaf herbicide 1 or more days later.				
glyphosate @ 1 lb/A (two applications)	Emerged annual grasses, johnsongrass, red rice, cocklebur, sicklepod, pigweed morningglories, prickly sida, velvetleaf, eclipta, spurge, hemp sesbania, northern jointvetch and smartweed. **See rating table for other species.**	**Glyphosate (4 lb/gal formulations)** Repeat application 2 pt/A each application. See instructions at right for timing of application.	Make first application when soybeans and weeds are 10 to 14 days after emergence and repeat in 7 to 14 days. On the timing of the second application, University of Arkansas research has shown that a 14 DAE application followed by a second application 7 days later is the standard to which other programs must be compared. However, there can be exceptions depending upon environmental conditions. If repeating the application for control of regrowth on tough weeds such as morningglory, nutsedge or hemp sesbania, repeat in 7 to 10 days after the first. If applying for a second flush of weeds, repeat when second flush weeds are 10 to 14 days old.	**For use on Roundup Ready varieties only.** Research to date has shown much more consistent results with split applications compared to single treatments. The second application improves control of the more tolerant weeds, such as morningglory, hemp sesbania and prickly sida, and provides control of second flush weeds. When the recommended timing of both applications is strictly adhered to in research, there has been little difference in control from 16 oz/A compared to 32 oz/A each. However, if the timing is missed, increase the rates. Soil moisture is very critical for activity. If no soil-applied herbicides are used and the soybeans do not form a dense canopy, a third application may be required. Cultivation is recommended if soybeans are planted in wide rows.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate @ 1 lb/A	Emerged annual grasses, red rice, johnsongrass, cocklebur, pigweeds, sicklepod, common ragweed and spurge. Weak on entireleaf and pitted morningglory, prickly sida and hemp sesbania. **See rating table for other species.**	**Glyphosate (4 lb/gal formulations)** 2.0 pt/A.	14 days after soybean emergence. For rhizome johnsongrass: 12" to 15" johnsongrass.	**For use on Roundup Ready varieties only.** This treatment is primarily intended for use where a soil-applied herbicide has been used to control difficult species such as the morningglories, hemp sesbania (coffeebean) and prickly sida (teaweed). It is neither as effective on these species nor as broad spectrum as the split application recommended above. Repeat the treatment if reinfestation occurs before canopy closure. Cultivation is recommended if soybeans are planted in wide rows.
glyphosate + *S*-metolachlor @ 0.7 to 0.84 + 0.94 to 1.12 lb/A	Same as above plus residual grass and pigweed control.	**Sequence 5.25 F** 2.5 to 3.5 pt/A.	Cracking to third trifoliate.	Same as above.
glyphosate + chlorimuron @ 1 + 0.005 lb/A	Same as above with increased control of hemp sesbania, morningglories and yellow nutsedge.	**Glyphosate (4 lb/gal formulations) + Classic 25 DF** 2 pt/A + 0.33 oz/A.	After first trifoliate leaf expanded. Small weeds.	**For use on Roundup Ready soybeans only.**
S-metolachlor @ 0.95 to 1.6 lb/A	Control of grass and small-seeded broadleaf weeds.	**Dual Magnum 7.62 EC** 1 to 1.67 pt/A.	Up to third trifoliate.	Residual pigweed and grass control. No post activity.
acetochlor @ 1.13 lb/A	Control of grass and small-seeded broadleaf weeds.	**Warrant 3L** 3 pt/A.	V2-V3.	Do not exceed 4 qt/A/year. Do not use liquid fertilizer.
pyroxasulfone @0.053 to 0.12 lb/A	Residual control of small-seeded grass and broadleaf weeds.	**Zidua 0.85 WG** 1 to 2 oz/A.	Up to third trifoliate.	Residual pigweed and grass control. No post activity.
S-metolachlor + fomesafen @ 1.09 to 1.26 + 0.24 to 0.28 lb/A	Early post broadleaf with residual grass and broadleaf control. Apply to 2- to 3-inch pigweed.	**Prefix** 2 to 2.33 pt/A.	Up to V2 stage.	Temporary injury will occur.
glyphosate + cloransulam-methyl @ 1.0 + 0.008 to 0.016 lb/A	Same as glyphosate above but increased control of morningglories, horseweed and giant ragweed.	**Glyphosate (4 lb/gal formulations) + FirstRate 84DG** 2 pt/A + 0.15 to 0.3 oz/A FirstRate. Add 0.25% nonionic surfactant.	After first trifoliate leaf expanded. Small weeds.	**For use on Roundup Ready soybeans only.**
glyphosate + fomesafen or *S*-metolachlor + fomesafen @ 1.0 + 0.235 lb/A or 1.09 + 0.24 lb/A	Same as glyphosate above but increased control of morningglories, giant ragweed and Palmer pigweed.	**Glyphosate (4 lb/gal formulations) + Flexstar or Prefix** 2 pt/A + 16 oz/A or 2 pt/A.	After first trifoliate leaf expanded. Small weeds.	**For use on Roundup Ready soybeans only.**
glyphosate + fomesafen @ 1.17 + 0.28 lb/A.	Same as glyphosate above but increased control of morninglories, giant ragweed and Palmer pigweed (use full rate of Flexstar).	**Flexstar GT 3.5** 3.5 pt/A.	After first trifoliate leaf expanded. Small weeds.	**For use on Roundup Ready soybeans only.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS [cont.]				
Postemergence–Liberty Link Soybean				
University data has shown that a solid residual program applied after planting, followed by a timely application of glufosinate, is the best program approach to weed control in Liberty Link soybeans. This is especially true for glyphosate-resistant pigweed programs. In wider row spacing, a residual at planting followed by a post residual is different.				
glufosinate @ 0.53 fb. 0.53 lb/A	Grass and broadleaf weeds. Will control glyphosate-resistant weeds.	**Glufosinate 280 SL** 29 oz/A fb. 29 oz/A. (A single application of 36 oz/A is labeled.) Do not exceed 65 oz/year.	7 to 10 days after soybean emergence. 2- to 3-inch weeds. Followed by sequential application 10 to 14 days later. Do not apply past bloom.	Do not apply to non Liberty Link soybeans. **The Liberty Link soybean system works best in combination with a well planned residual herbicide applied at burndown or at planting.**
glufosinate + *S*-metolachlor @ 0.53 lb/A + 0.95 to 1.2 lb/A	Grass and broadleaf weeds. Will control glyphosate-resistant weeds. Adds residual control of grass and small-seeded broadleaves.	**Glufosinate 280 SL + Dual Magnum 7.62 EC** 29 oz/A + 1 to 1.33 pt/A fb 29 oz/A.	2- to 3-inch weeds. Up to third trifoliate. Follow with a second Liberty application as needed.	Good option where no residual was used at burndown or at planting. Expect some leaf burn.
glufosinate + pyroxasulfone @ 0.53 + 0.053 to 0.12 lb/A	Adds residual control of small-seeded grass and broadleaf weeds.	**Glufosinate 280 SL + Zidua 0.85 WG** 29 oz/A + 1 to 2 oz/A.	Up to third trifoliate.	Good option where no residual was used at burndown or at planting. Expect some leaf burn.
glufosinate + acetochlor @ 0.53 + 1.13 lb/A	Adds residual control of small-seeded grass and broadleaf weeds.	**Glufosinate 280 SL + Warrant 3L** 29 oz/A + 3 pt/A.	Up to third trifoliate.	Good option where no residual was used at burndown or at planting. Expect some leaf burn.
glufosinate + *S*-metolachlor @ + fomesafen @ 0.53 +1.09 lb/A + 0.24 lb/A	Grass and broadleaf weeds. Will control glyphosate-resistant weeds. Adds residual control of grass and small-seeded broadleaves.	**Glufosinate 280 SL + Prefix 5.3 EC or Cheetah Max** 29 oz/A + 2 pt/A fb 29 oz/A.	2- to 3-inch weeds. Up to third trifoliate. Follow with a second Liberty application as needed.	Good option where no residual was used at burndown or at planting. Expect some leaf burn.
glufosinate + clethodim @ 0.53 + 0.25 lb/A	Enhanced grass control in LL soybean.	**Glufosinate 280 SL + Select Max 0.97 EC** 29 + 16 oz/A.	14 to 21 days after grass emergence.	Do not add other tank-mix partners.
Postemergence–STS or BOLT/RR or LL Soybean				
glyphosate + chlorimuron/ thifensulfuron @ 1.0 + 0.013 to 0.02 lb/A	Hemp sesbania, morningglory and yellow nutsedge plus some residual.	**Glyphosate (4 lb/gal formulations) + Synchrony XP** 2.0 pt/A + 0.75 to 1.125 oz/A.	After first trifoliate leaf.	**Apply only to STS or BOLT/RR soybean varieties. Use Sequence or add Dual for residual grass component. The addition of Dual or Zidua may increase crop response from Permit Plus on STS soybean.**
glyphosate + halosulfuron + thifensulfuron @ 1.0 + 0.31 + 0.004 lb/A	Same as above with enhanced nutsedge and smartweed control.	**Glyphosate (4 lb/gal formulations) + Permit Plus** 2.0 pt/A + 0.75 oz/A.	From 21 days prior to planting up to 88 days prior to harvest. Brief chlorosis may occur.	**Apply only to STS or BOLT/RR soybean varieties. Use Sequence or add Dual for residual grass component. The addition of Dual or Zidua may increase crop response from Permit Plus on STS soybean.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Postemergence-Directed				
2,4-DB @ 0.2 lb/A	Common cocklebur, morningglory.	**Butyrac, Butoxone** 0.8 pt/A of 2 lb/gal 2,4-DB (Butyrac 200) or 1 pt/A of 1.75 lb/gal 2,4-DB.	Direct spray to soybeans at V4 (8-inch) stage and repeat 5 to 7 days later.	Apply directed spray treatment no higher than one-third up the soybean stem. Cover weeds thoroughly. ROOT ROT OR POOR GROWING CONDITIONS FOLLOWING THE APPLICATION MAY RESULT IN SOYBEAN INJURY. USE SAME PRECAUTIONS IN APPLYING 2,4-DB AS ARE USED IN APPLYING 2,4-D. AVOID DRIFT. DO NOT APPLY WITHIN 60 DAYS OF HARVEST.
NOTE–Many producers are reluctant to apply 2,4-DB with directed spray equipment used in cotton. This can be done successfully, and many producers do so. The following procedure has been shown to be effective in cleaning 2,4-DB from a sprayer system. (1) Replace any cracked or badly worn hoses. (2) Flush system completely with detergent water; drain.		(3) Flush system with ammonia solution (1 quart ammonia per 25 gallons water); drain. (4) Fill system with above concentration ammonia solution; let stand overnight. (5) Drain system next day; flush with excess water. (6) Flush system the day before next use. (7) Clean outside of equipment and nozzle assemblies in above manner.		
Preharvest				
paraquat @ 0.25 lb/A	Desiccation of green weed foliage and soybean defoliation.	**Paraquat (3 lb/gal formulations)** 1.0 pt/A. Add surfactant (p. 3).	When ½ of soybean leaves have dropped and the other ½ are yellow. Apply 15 days prior to harvest. R7 to one brown pod.	For indeterminate soybeans, apply when 65% of pods are brown and remaining pods are turning yellow. Do not pasture livestock within 15 days of treatment and remove 30 days before slaughter.
sodium chlorate @ 6 lb/A	Desiccation of green weed foliage and soybean defoliation.	**Sodium Chlorate** Several brands and trade names available. 2 gal/A of 3 lb/gal or 1 gal/A of 6 lb/gal.	When ½ of soybean leaves have dropped and the other ½ are yellow.	See label for details. More dependent on environmental conditions for activity than paraquat.
paraquat + sodium chlorate @ 0.167 + 3 lb/A	Desiccation of green weed foliage and soybean defoliation.	**Paraquat (2 or 3 lb/gal formulations)** 16 or 10.67 oz/A + **sodium chlorate** 3 lb ai/A (1 gal of 3 lb/gal or 0.5 gal of 6 lb/gal). Add a surfactant.	When ½ of soybean leaves have dropped and the other ½ are yellow. Apply 15 days prior to harvest.	For indeterminate soybeans, apply when 65% of pods are brown and remaining pods are turning yellow. See label for details. More dependent on environmental conditions for activity than paraquat.
glyphosate @ 1 lb/A	Desiccation of green weed foliage.	**Glyphosate (4 lb/gal formulations)** 2 pt/A.	After soybean pods have lost all green color.	See label for details. Much slower than paraquat.
carfentrazone @ 0.025 lb/A	Desiccation of morningglory foliage.	**Aim 2EC** 1.5 oz/A. Add 0.25% nonionic surfactant or 0.5% crop oil concentrate.	After soybean pods have lost all green color. 3-day pre-harvest interval.	Excellent coverage is required.
saflufenacil @ 0.044 lb/A	Desiccation of green foliage.	**Sharpen** 2.0 oz/A.	At least 3 days prior to harvest.	Excellent coverage is required.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SOYBEANS [cont.]				
Spot Treatment				
2,4-DB	Common cocklebur.	**Butyrac, Butoxone, etc.** 1/2 gal in 100 gal water.	Spot treat individual weeds.	Spray terminal area and upper leaves of cocklebur. Spray in manner similar to boom spraying with 20 gpa nozzle output.
glyphosate	Bermudagrass.	**Glyphosate (4 lb/gal formulations)** 1 to 2 gal per 100 gal water. Add surfactant.	Spot treat emerged weeds before pod set of soybeans.	More effective on large, actively growing weeds.
clethodim	Johnsongrass.	**Select 2 EC** or **Select Max 0.97 EC** 8 or 16 oz/A + 1% COC/A.	Spot treat emerged weeds before pod set of soybeans.	If field treated with glyphosate previously, this is the preferred spot treatment.
Postemergence johnsongrass emerged above canopy				
glyphosate wipe-on	Johnsongrass.	**Glyphosate (4 lb/gal formulations)** 33% solution in ropewick or other wipe-on applicator.	After there is sufficient height difference between crop and weed.	Use in conjunction with other good johnsongrass control practices.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
EDAMAME (edible vegetable bean)				
Preplant Burndown				
paraquat @ 0.47 to 0.94 lb/A	Annual broadleaf and grass weeds (existing vegetation).	**Paraquat (2 or 3 lb/gal formulations)** 32 to 64 oz/A or 1.88 to 3 pt/A in at least 20 gal water per acre for ground application. 5 to 10 gal for aerial application. Add 0.25% surfactant.	Use prior to planting on seedbeds that are not to be disturbed before planting. Use higher rate on weeds larger than 2 inches.	Good spray coverage is essential.
glyphosate @ 1 lb/A	Annual grasses and broadleaf weeds (existing vegetation). Weak on morningglories.	**Glyphosate (4 lb/gal formulations)** 2 pt/A. Use high rate on all but very small weeds.	Use prior to planting for vegetation knockdown. Can be tank mixed with Pursuit or Spartan Charge for improved control of some species and residual activity.	Best results when applied in lower spray volumes, i.e., 5 to 10 gpa.
Preplant Incorporated				
trifluralin @ 0.5 to 1 lb/A	Annual grass weeds and johnsongrass from seed.	**Treflan 4 EC** 1 to 2 pt/A.	From 6 weeks prior to planting to time of planting.	See Treflan recommendations in Soybean section (p. 50 and 51).
S-metolachlor @ 0.95 to 1.6 lb/A	Red rice, annual grasses and yellow nutsedge.	**Dual Magnum 7.62 EC** 1 to 1.67 pt/A.	During final seedbed preparation (within 7 days of planting). Can be applied up to third trifoliate.	See Dual Magnum recommendations in Soybean section (p. 50 and 51).
imazethapyr @ 0.063 lb/A	Yellow nutsedge, pitted, entire-leaf and ivyleaf morningglories, spotted spurge and smartweed. Suppression of annual grass, red rice and johnsongrass.	**Pursuit 2EC** 4 oz/A.	During final seedbed preparation up to 7 days before planting. Can be tank-mixed with Dual. Can also be tank-mixed with glyphosate for preplant burndown to improve nutsedge control.	Can give excellent residual control if rain occurs within 5 days. **40 month rotation to non Clearfield rice.**
Preemergence				
S-metolachlor @ 0.9 to 1.5 lb/A	Annual grasses, red rice, nutsedge and small-seeded broadleaves.	**Dual Magnum 7.62 EC** 1 to 1.67 pt/A.	At planting, up to third trifoliate.	Rainfall needed for activation.
linuron @ 0.5 to 1.0 lb/A	Small-seeded broadleaf weeds.	**Lorox 50 DF** 1 to 2 lb/A.	Apply immediately after planting – before soybean emergence.	See supplementary label.
carfentrazone + sulfentrazone @ 0.008 to 0.02 + 0.075 to 0.175 lb/A	Small-seeded broadleaf weeds.	**Spartan Charge 3.45 SL** 3 to 7 oz/A.	Apply immediately after planting – before soybean emergence.	See AR 24C label.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
EDAMAME (edible vegetable bean) [cont.]				
Postmergence				
imazamox @ 0.032 lb/A	Some grasses and broadleaf weeds.	**Raptor 1 EC** 4 oz/A. Add 0.25% v/v NIS.	Apply to 2" to 4" weeds.	See supplementary label.
imazethapyr @ 0.063 lb/A	Yellow nutsedge, pitted, entire-leaf and ivyleaf morninglories, spotted spurge and smartweed. Suppression of annual grass, red rice and johnsongrass.	**Pursuit 2 EC** 4 oz/A. Add a nonionic surfactant.	Within first 10 days after weed emergence.	Timing is extremely critical. Weeds must be very small. Can give excellent residual control if rain occurs within 5 days. **40-month rotation to non Clearfield rice.**
clethodim @ 0.25 lb/A	Annual grasses, bermudagrass and johnsongrass. **Red rice seedhead suppression.**	**Select 2E or Select Max 0.97 EC** 8 or 16 oz/A. Add 1% crop oil concentrate.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 12" to 24". Bermudagrass - 3" height or 6" runner length maximum. For red rice seedhead suppression, apply at internode elongation stage of red rice.	See comments (p. 57) for Poast Plus and Fusilade on cultivation and tank mixing. Performance comparable to Assure II for annual grasses and johnsongrass.
fomesafen @ 0.25 lb/A	Broadleaf weeds.	**Reflex 2 EC** 1 pt/A.	Up to three trifoliate.	Do not apply late – will burn pods and blooms.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
PEANUTS–Preplant				
pendimethalin @ 0.75 to 1 lb/A	Annual grass and small-seeded broadleaf weeds.	**Prowl 3.3 EC** 1.8 to 2.4 pt/A. or **Prowl H_2O 3.8 CS** 1.8 to 2.4 pt/A.	Incorporate in top 1" to 2" of final seedbed.	May be tank mixed with Vernam for nutsedge control. See label for details.
Preplant or preemergence				
metolachlor @ 0.9 to 1.8 lb/A	Most small-seeded annuals, yellow nutsedge.	**Dual Magnum 7.62 EC** 1 to 2 pt/A.	Preplant within 7 days before planting and incorporate 1½ to 2 inches deep or immediately after planting with or without soil incorporation.	If incorporating after planting, do not disturb seed. Incorporation may be helpful under dry soil conditions. Can be applied post up to 90 days prior to harvest.
dimethenamid @ 0.56 to 0.98 lb/A	Small-seeded annuals.	**Outlook 6 EC** 12 to 21 oz/A.	Preplant within 7 days before planting and incorporate 1½ to 2 inches deep or immediately after planting with or without soil incorporation.	If incorporating after planting, do not disturb seed. Incorporation may be helpful under dry soil conditions. Can be applied post up to 90 days prior to harvest.
diclosulam @ 0.024 lb/A	Copperleaf, eclipta, cocklebur, morninglories, other small-seeded broadleaf weeds and yellow nutsedge. Post control of horseweed.	**Strongarm 84 DG** 0.45 oz/A.	Preplant incorporated or pre-emergence.	See label for rotation restrictions and precautions.
flumioxazin @ 0.063 to 0.096 lb/A	**Pigweed**, eclipta, copperleaf, morningglory.	**Valor 51 WDG** 2 to 3 oz/A.	Preemerge immediately after planting.	Do not apply after cracking. Do not irrigate while peanuts are cracking.
imazethapyr @ 0.063 lb/A	Nutsedge suppression plus broadleaves.	**Pursuit 70 DG** 1.44 oz/A.	Shallow incorporation through at-crack.	May be tank mixed with Dual.
Postemergence				
2,4-DB @ 0.2 lb/A	Common cocklebur, morning-glory.	**Butyrac, Butoxone** 0.8 pt/A of 2 lb/gal, 2,4-DB or 1 pt/A of 1.75 lb/gal 2,4-DB.	Overtop. 2 to 12 weeks after planting.	See label for description. Cutoff is 12 weeks after planting. Do not apply if peanuts are drought stressed.
bentazon @ 0.75 to 1 lb/A	Common cocklebur, prickly sida, spurred anoda, velvetleaf, smartweed, common ragweed. Refer to soybean rating table.	**Basagran 4L** 1.5 to 2 pt/A.	Overtop to small weeds.	Do not apply to peanuts in stress condition. See label for details.
acifluorfen @ 0.375 to 0.5 lb/A	Pigweed, morningglory, prostrate spurge, hophornbeam, copperleaf and many other broadleaf weeds. Refer to soybean rating table.	**Ultra Blazer 2L** 1.5 to 2 pt/A. For most weeds, use 2 pt rate. Refer to label.	Overtop when weeds are in 2- to 4-leaf stage.	Do not apply within 75 days of harvest. Refer to label for other restrictions and precautions.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
PEANUTS				
Postemergence [cont.]				
bentazon + acifluorfen @ 0.5 + 0.25 lb/A	See Basagran and Ultra Blazer comments above. Refer to soybean rating table.	**Storm 4L** 1.5 pt/A. Add 1 pt/A crop oil concentrate.	Over top to small weeds.	See Basagran and Ultra Blazer comments above.
paraquat @ 0.125 lb/A	Most annual grasses and broadleaf weeds.	**Paraquat (2 or 3 lb/gal formulations)** 5.5 or 16 oz/A + surfactant. Can apply half rates twice, 28 days apart.	At planting or prior to crop emergence through postemergence.	Some crop injury will occur in the form of browning and leaf crinkling but will recover and develop normally. The addition of Basagran to paraquat may reduce peanut foliar burn. Do not apply more than 0.125 lb/A per year.
imazethapyr @ 0.063 lb/A	Morningglory, common cocklebur, spotted spurge, yellow and purple nutsedge, velvetleaf, ragweeds, pigweeds, smartweed and nightshades.	**Pursuit 70 DG** 4 oz/A 2SL or 1.44 oz/A 70 DG. Add a surfactant.	At cracking or early postemergence to small weeds.	Refer to label for crop rotation restrictions. Weed control with Pursuit will be slow.
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses and johnsongrass.	**Poast Plus 1E** 1 to 1.5 pt/A. Add 1 qt/A crop oil concentrate. Use 1 pt rate for small annual grasses.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 15" to 20"	See comments for Poast Plus in soybean section. Do not apply more than 2.5 pt/A per year.
clethodim @ 0.125 to 0.156 lb/A	Annual grasses and johnsongrass.	**Select 2 EC** 8 to 10 oz/A. Add 1% crop oil concentrate.	Before annual grasses exceed 14 days after emergence. Johnsongrass - 15" to 20"	See comments for Select in soybeans.
imazapic @ 0.063 lb/A	Most broadleaf and grass weeds, nutsedge and johnsongrass. Sicklepod.	**Cadre 2 AS** 4 oz/A. Add a nonionic surfactant or crop oil concentrate.	Early postemergence to small weeds.	See label for details, precautions and plantback intervals. For sicklepod, apply in combination with 2,4-DB.
lactofen @ 0.195 lb/A	Most broadleaf weeds.	**Cobra 2 EC** 12.5 oz/A + 1% v/v crop oil concentrate.	After 6-leaf stage. 45 days prior to harvest.	Rain-free period is 30 minutes.
acetochlor @ 1.13 lb/A	Small-seeded broadleaf and grass weeds.	**Warrant 3L** 3 pt/A.	3- to 4-leaf up to flowering.	Will not kill emerged weeds.
metolachlor @ 0.9 to 1.8 lb/A	Small-seeded grass and broadleaf weeds.	**Dual Magnum 7.62 EC** 1 to 2 pt/A.	3- to 4-leaf up to flowering.	Will not kill emerged weeds.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Harvest Aid				
carfentrazone @ 0.031 lb/A	Morningglory desiccation.	**Aim 2 EC** 2 oz/A + 1% v/v crop oil concentrate.	7 days prior to harvest.	Do not feed peanut hay only. One application per season. 6 to 8 hours required prior to rain or irrigation for digging.
pyraflufen ethyl @0.02 lb/A	General harvest aid – broadleaf weeds.	**E.T. 0.2 EC** 1.5 oz/A.	1 week prior to digging.	Do not feed peanut hay only. One application per season. 6 to 8 hours required prior to rain or irrigation for digging.
ALS-Resistant Pigweed Programs*				
Program 1: Prowl preplant incorporated, followed by Valor, followed by Cobra or Ultra Blazer + Dual or Warrant + 2,4-DB on 3" or smaller pigweed.				
Program 2: Prowl preplant incorporated, followed by paraquat + Storm + Dual at cracking, followed by Cobra or Ultra Blazer + 2,4-DB + Dual Magnum on 3" or smaller pigweed.				
***ALS peanut herbicides include Cadre, Pursuit and Strongarm.**				

WEED RESPONSE RATINGS FOR CORN HERBICIDES

(See Explanation of Rating Tables on Page 3.)

HERBICIDES	MODE OF ACTION	GRASSES											BROADLEAVES													SEDGES
		Barnyardgrass	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Foxtail	Goosegrass	Red Rice	Rhizome Johnsongrass	Ryegrass	Seedling Johnsongrass	Shattercane	Bigroot Morningglory	Cocklebur	Common Ragweed	Honeyvine Milkweed	Horsenettle	Lambsquarters	Morningglory	Pigweed sp.	Prickly Sida	Purslane	Sicklepod	Smartweed	Velvetleaf	Yellow Nutsedge
Preemergence																										
Surestart II	2, 4, 15	9	7	9	9	9	9	8	0	8	6	7	-	-	8	-	-	9	9	8	9	9	8	7	7	6
Prowl + Atrazine	3, 5	9	6	9	9	9	9	8	0	-	7	7	3	8	9	5	2	9	8	9	9	9	7	9	6	4
Atrazine	5	6	4	7	3	6	6	8	0	-	2	0	4	9	9	6	5	9	8	9	9	9	8	9	8	0
Anthem ATZ	5, 15	9	8	9	8	9	9	8	0	9	4	-	8	8	8	-	-	5	8	9	8	-	8	-	7	7
Verdict	14, 15	8	7	8	7	8	8	7	0	-	-	-	5	-	-	-	-	7	8	9	7	-	5	-	-	-
Anthem	15	9	8	9	8	9	9	8	0	9	4	-	-	-	-	-	-	5	6	9	7	-	-	-	5	7
Zidua	15	9	8	9	8	9	9	8	0	9	4	-	-	-	-	-	-	5	6	9	7	-	-	-	5	7
Dual II Magnum + Atrazine	15, 5	8	8	9	9	9	9	9	0	9	4	7	4	8	9	6	3	9	8	9	9	9	8	4	7	7
Degree + Atrazine	15, 5	9	7	9	9	9	9	8	0	8	6	7	4	8	9	6	3	9	8	9	9	9	8	4	7	7
Micro-Tech + Atrazine	15, 5	8	7	9	8	9	9	9	0	8	3	7	3	8	9	5	3	9	8	9	9	9	8	8	6	6
Outlook + Atrazine	15, 5	9	8	9	9	9	9	8	0	8	6	7	4	8	9	6	3	9	8	9	9	9	8	6	6	7
Lexar	15, 5, 27	9.5	9.5	9.5	8	8	7	8	0	9	3	5	4	9	9	7	3	9	9	10	9.5	9	9	9	10	7
Callisto	27	7	7	9	-	7	-	7	0	-	0	0	-	8	7	8	7	9	9	9	9	-	5	9	9	2
Postemergence																										
Accent Q	2	8	8	5	7	8	-	-	8	6	9	9	7	5	6	2	2	3	6	0	-	-	7	7	6	3
Permit	2	0	3	3	3	0	3	0	3	-	3	0	-	-	5	-	-	5	5	0	7	7	4	6	6	9
Steadfast Q	2	8	9	8	8	9	8	6	8	7	9	9	8	6	7	3	3	8	8	7	6	-	7	8	9	6
Permit Plus/Permit	2	0	0	0	0	0	3	0	3	-	0	0	-	-	5	-	-	6	6	0	8	8	5	7	7	10
Resolve Q	2	8	9	8	8	8	8	-	7	5	9	9	-	6	7	-	5	8	8	7	7	8	7	7	8	7
Capreno + Atrazine	2, 5, 27	9	8	9	8	-	9	9	5	6	10	-	5	9	8	6	8	9	9	9	9	9	8	9	9	5
Corvus + Atrazine	2, 5, 27	9	8	9	8	-	9	9	5	8	5	-	5	9	8	6	8	9	9	9	9	9	8	9	9	5
Capreno	2, 27	9	8	9	-	-	9	-	5	6	-	-	-	8	7	-	7	9	8	9	9	-	5	-	9	5
Corvus	2, 27	9	8	9	-	-	9	-	7	7	-	-	-	8	7	-	7	8	7	7	8	-	-	-	8	2
Realm Q	2, 27	8	7	8	8	8	8	-	7	6	9	9	-	9	9	-	7	8	8	8	9	8	7	9	9	7
2,4-D	4	0	0	0	0	0	0	0	0	0	0	0	3	9	9	9	4	8	9	8	8	9	8	5	8	0
Banvel or Clarity	4	0	0	0	0	0	0	0	0	0	0	0	8	8	9	9	6	9	9	9	-	-	8	9	8	0
Atrazine + oil	5	6	6	6	5	7	6	9	0	5	3	0	4	9	8	6	4	8	8	9	8	9	8	9	7	5
Basagran	6	0	0	0	0	0	0	0	0	0	0	0	3	9	8	5	0	5	4	0	7	7	0	9	8	7
Buctril	6	0	0	0	0	0	0	0	0	0	0	0	7	9	7	7	4	8	7	5	-	-	3	9	7	0
Glyphosate (4 lb/gal) (1 qt/A once)	9	9	9	9	9	9	9	8	9	6	10	8	-	9.5	9	7	6	9	7	9	8	9	9	7	7	4
Halex GT	9, 15, 27	9	9	9	9	9	9	9	9	5	10	8	9	9	9	-	7	9	8	9	9	9	9	9	9	5
Glufosinate 1 application	10	8	9	8	9	-	5	9	8	6	9	-	-	9	9	-	7	-	8	8	8	-	9	9	5	6
Paraquat directed or Hood	22	9	9	9	8	8	9	9	0	7	8	0	-	4	8	-	7	9	4	9	3	8	9	5	7	3
Callisto	27	7	7	9	7	7	7	7	0	5	0	0	-	8	7	8	-	9	8	8	9	-	5	9	9	2
Laudis	27	7	8	8	-	-	7	-	5	4	-	-	-	8	-	-	-	9	8	9	7	-	7	-	-	-

*Rating will be 0 on ALS inhibitor-resistant weeds (Group 2).
**Repeat application may be needed to achieve these ratings.

Rating scale – 0 = No Control 10 = 100% Control.

Soil-Applied Herbicide Rates for Corn

Soil Texture

Herbicide	Coarse (light)	Medium	Fine (heavy)
AAtrex Nine-0	2.2 lb	2.2 lb	2.2 lb
Anthem Max	3 oz	3-4 oz	4-5 oz
Anthem ATZ	1.75-2 pt	2-2.5 pt	2.25-3 pt
Atrazine 4L	2 qt	2 qt	2 qt
Bicep II Magnum	1.3 qt	1.5 qt	2 qt
Callisto	6 oz	6 oz	7 oz
Cinch	1 pt	1.33 pt	1.67 pt
Cinch ATZ	1.3 qt	1.5 qt	2 qt
Degree	2.75-3.75 pt	4.25-5 pt	5-5.5 pt
Degree Xtra	2.9 qt	2.9-3.7 qt	3.2-3.7 qt
Dual II Magnum	1 pt	1.33 pt	1.67 pt
Keystone NXT	1.5-2 pt	1.5-2.5 pt	2-3 pt
Lexar EZ	3 qt	3 qt	3 qt
Outlook	12-14 oz	14-21 oz*	14-21 oz*
Prowl 3.3EC + Atrazine 90	1.8 pt + 1.1 lb	2.4 pt + 1.7 lb	2.4 pt + 2.2 lb
Sharpen	2-2.5 oz	2.5-3 oz	3-3.5 oz
Surestart	1.5-2 pt	1.5-3 pt	2-3 pt
Verdict	10-12 oz	13-15 oz	16-48 oz
Zidua	1.5-2.75 oz	2-3 oz	2-4 oz

NOTE: It is impossible to list all of the combinations possible considering the different formulations of glyphosate, Atrazine, Micro-Tech, Dual and mesotrione. Refer to the label of the products in question for the correct rates.

Soil-Applied Herbicide Rates for Grain Sorghum

Soil Texture

Herbicide	Coarse (light)	Medium	Fine (heavy)
Preplant			
Dual II Magnum	1 pt	1.33 pt	1.67 pt
Micro-Tech	---	3 qt	3 qt
Outlook	0.75 pt	0.87 pt	1 pt
Preemergence			
AAtrex Nine-0	---	1.1 qt	1 qt
Acuron*	2.5 qt	2.5 qt	3 qt
Atrazine 4L	---	1 qt	1 qt
Atrazine 80W	---	1.25 lb	1.25 lb
Bicep II Magnum	---	1.5 qt	2 qt
Dual II Magnum	1 pt	1.33 pt	1.67 pt
Lexar	---	3 qt	3 qt
Sharpen	2 oz	2 oz	2 oz
Verdict	10 oz	10 oz	10 oz

All rates are broadcast rates. Reduce rates for appropriate band width. See example 2 on page 6.

*The use rate of Acuron is based more on organic matter than soil texture.

All soil types < 3% OM = 2.5 qt/A
All soil types > 3% OM = 3 qt/A

Crop Replant and Rotation Guide for Corn and Grain Sorghum Herbicides*

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
2,4-D	All	90 days	90 days or until sufficiently dissipated.
Accent Q	C W S CT	I 4 months 15 days 10 months	Sweet corn and popcorn - 10 months. All crops not specified - 10 months if pH < 6.5 or 18 months if pH > 6.5. Grain sorghum - 10 months if pH < 7.5 or 18 months if pH > 7.5.
Acuron	C SG, B, W CT, P, R, S, GS All	I 4 months 10 months 18 months	
Anthem Maxx	S, C R SG W CT, P, SF	I 10 months 11 months 4 months 4 months	See label for rotational intervals by rate applied.
Atrazine	C, GS All	I FY	If applied after June 10, only corn and grain sorghum can be planted the following year.
Basagran	All	I	
Bicep II Magnum Cinch ATZ	C, GS† S, CT SG All	I FY 15 months 18 months	† Use Concep-treated seed. If applied after June 10, only corn and grain sorghum can be planted the following year.
Buctril	C, GS SG All	I Fall FY	
Buctril + atrazine	C, GS S CT, FG, FL, R SG All others	I FY Do not plant the year following application.	If applied after June 15, plant only corn or grain sorghum the next year.
Callisto	C, GS SG All	I 4 month 10 months	Do not apply post if soil was treated with Counter or Lorsban.
Clarity	C, GS W All	I 45 days/pt† Following normal harvest of C, G, W, GS	† Wheat planting must be delayed 45 days after application per pint of Banvel used.
Dual II Magnum Cinch	C, S, GS† SG R All	I 4.5 months Next spring 18 months	† Use Concep-treated seed.
Glyphosate			No restrictions.
Guardsman Max	GS, S, CT All	FY Do not plant the year following application.	
Halex GT	C, GS† SG CT, S	I 4 months 10 months	† Use Concep-treated grain sorghum seed.
Huskie	CT SF, C GS R S W	FY 9 months 4 months FY 4 months 1 month	
Keystone NXT	C GS, S. R A, SG, SF, W	I Following spring 15 months	
Lexar EZ	C, GS CT, SG, S, P All	I Next spring 18 months	Use Concep-treated grain sorghum seed.
Glufosinate 280	CT, C, R, S SG, W All other	I 70 days 180 days	
Outlook	C, S SG All	I 4 months Next spring	
Paraquat			No restrictions.
Peak	IR Corn, SG C, GS R, FG, S, CT, P A, SF	I 1 month 10 months 22 months	Do not replant any broadleaf crop if less than 10 inches of rainfall or irrigation has occurred since the application of Peak.
Permit	W S	3 months 10 months	
Prowl	CT, S W, B All	I 120 days† FY	† 90 days after post-incorporated application, cannot plant using no-tillage practices.
Realm Q	C SG W CT, GS, S	I 9 months 4 months 10 months	
Resolve Q	C W A, R, GS, S, SF All other CT	I 3 months 10 months 18 months 1 month	If at least 15 inches of rainfall has not occurred since application, CT, GS, SF, A rotations are extended to 18 months. Do not replant rice on soils with greater than pH 6.5.
Surestart II	C W A, B, S GS SF CA, CT	I 4 months Following spring 12 months 18 months 26 months	
Zidua	C, S CT, P, SF, W R All	I 4 months 10-18 months 18 months	Depending on rate used.

*This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

Key

Crop

All = All crops not specified
A = Alfalfa
B = Barley
C = Corn
CA = Canola
CT = Cotton
FG = Forage Grasses
FL = Forage Legumes
GS = Grain Sorghum
P = Peanuts
R = Rice
S = Soybeans
SF = Sunflowers
SG = Small Grains
W = Wheat

Timing

I = Immediately
FY = Following year (usually spring)

Forage, Feed and Grazing Restrictions for Corn and Grain Sorghum Herbicides

Herbicide	Restrictions
2,4-D amine or ester	Do not forage or feed corn fodder for 7 days following application.
Acuron	Do not graze or feed forage from treated areas for 45 days following application.
Atrazine	Do not graze or feed forage from treated areas for 21 days following application, or illegal residues may result.
Banvel	Do not harvest or graze corn for dairy or beef feed prior to the ensilage (milk) stage of the crop.
Basagran	Do not graze treated fields for at least 12 days after application.
Bicep	No restrictions on label.
Buctril	Do not cut for feed or graze within 30 days after application.
Buctril + atrazine	Do not cut crop for feed or graze within 30 days after application.
Cinch	No restrictions on label.
Cinch ATZ	No restrictions on label.
Degree	Do not graze or feed for 21 days.
Dual II Magnum	No restrictions on label.
Exceed	Do not graze or feed for 30 days or silage for 4 months.
Glufosinate	Allow 60 days for forage and 70 for fodder.
Glyphosate	Do not harvest or feed treated crops for 8 weeks after application. Allow 14 days following spot treatment or selective equipment use before grazing domestic livestock.
Lexar EZ	Do not graze or feed forage from treated area within 45 days of application.
Outlook/Guardsman Max	May be grazed or fed at 40 or more days after application.
Paraquat	Do not graze treated areas or feed treated forage to livestock.
Peak	Do not graze or feed forage for 30 days following application. Do not harvest for silage for 40 days.
Permit, Permit Plus	Allow 30 days before grazing or feeding.
Prowl	No restrictions on label.
Realm Q	Do not graze or feed treated forage to livestock within 30 days of application.
Resolve Q	Do not graze or feed treated forage to livestock within 30 days of application.
Sodium Chlorate	Do not graze treated field or feed treated fodder, forage or seeds within 14 days of application.

Restrictions are listed as worded on the labels. Feeding and application restrictions for herbicides are generally based on residue tolerances allowed for animal feeding. The restrictions are generally not due to acute toxicity (poisoning) problems. Livestock that are accidentally fed treated crops earlier than allowed may not be harmed, but may have illegal pesticide residues in their meat or milk. If you have fed livestock treated crops within the restricted period, refer to the label, your dealer or herbicide company representative for more information.

Corn and Grain Sorghum Herbicide
Compatibility with Fertilizers as Application Carriers*

Herbicide	Fertilizer	
	Fluid	Dry
Atrazine 4L, 80W, DF	Y	N
Banvel	Y	N
Bicep	Y	Y
Callisto	Y	N
Degree Xtra	Y	Y
Dual II Magnum	Y	Y
Exceed	Y	N
Glyphosate	N	N
Paraquat	Y	N
Permit, Permit Plus	Y	N
Prowl	Y	Y
2,4-D amine	N	N

Y = Yes, N = No

*There are many specific fertilizer incompatibilities and restrictions with most herbicides. Be sure to read the herbicide label for specific mixing or impregnation instructions. Compatibility agents are required for many mixes. A typical compatibility test procedure for mixing herbicides in fluid fertilizers is given on page 4. NOTE: Compatibility with dry fertilizer is listed here from a labeling standpoint. The University of Arkansas only recommends herbicide application on dry fertilizer as a third alternative to spraying in water or in liquid fertilizer.

Rainfall-free Periods for Postemergence Corn and Grain Sorghum Herbicides

Herbicide	Time Before Rainfall*
Accent	4 to 6 hrs
Atrazine	1 to 2 hrs
Banvel	6 to 8 hrs
Basagran	8 hrs
Beacon	4 hrs
Buctril	1 hr
Buctril/Atrazine	1 hr
Callisto	1 hr
Capreno	1 hr
Corvus	1 hr
Glufosinate	4 hrs
Glyphosate	6 hrs
Halex GT	1 hr
Paraquat	30 min
Permit, Permit Plus	4 hrs
2,4-D amine or other	6 to 8 hrs

*This is the interval that must occur prior to a rainfall event in order to maintain maximum weed control.

ATRAZINE AND WATER QUALITY

Atrazine label restrictions regarding mixing, loading and application are discussed below. These restrictions are part of the overall ground and surface water contamination risk reduction measures. Atrazine users are strongly encouraged to follow these guidelines to comply with the label, and to share in the responsibility of preserving the future of this extremely valuable corn herbicide. **These restrictions, and the Restricted Use Pesticide designation, apply to all formulations of atrazine, and all package mix products which contain atrazine.**

Mixing, Loading and Application – Atrazine may not be mixed/loaded or used within 50 feet of all wells, including abandoned wells, drainage wells and sink holes. Atrazine may not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs. Atrazine may not be applied aerially or by ground within 66 feet of the points where field surface runoff enters perennial or intermittent streams and rivers or within 200 feet around natural or impounded lakes and reservoirs. If atrazine is applied to highly erodible land, the 66-foot buffer or setback from runoff entry points must be planted to corn, seeded with grass, or another suitable crop.

Application rates – All soil applications prior to crop emergence –

***Highly Erodible Soils** (as defined by NRCS) – If conservation tillage is practiced (at least 30 percent of residue coverage at planting), apply a maximum of 2 lb a.i./acre. If residue coverage is less than 30 percent, apply a maximum of 1.6 lb a.i./acre.

***Soils Not Highly Erodible** – Apply a maximum of 2 lb a.i./acre.

Postemergence Applications – If no atrazine was applied prior to corn emergence, apply a maximum of 2 lb a.i./acre. If a postemergence treatment is required following an earlier herbicide application, the total atrazine applied may not exceed 2.5 lb a.i./acre/calendar year. Postemergence application to corn must be made before corn exceeds 12 inches in height.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FIELD CORN				
Removing Partial Corn Stands for Replant				
clethodim @ 0.045 lb/A	Corn, including Roundup Ready and Liberty Link.	**Select Max** 0.97 lb/gal, 6 oz/A.	Up to 12-inch corn.	Do not plant corn for 7 days after application.
glufosinate @ 0.6 lb/A	Corn, including Roundup Ready but not Liberty Link.	**Glufosinate (280 formulations)** 32 oz/A.	Good coverage is essential. Adding AMS may enhance control.	Note that corn with the Herculex insecticide trait is tolerant to glufosinate and will not be controlled. Corn may be replanted immediately.
paraquat + metribuzin @ 0.625 + 0.14 lb/A	Corn, including Roundup Ready and Liberty Link.	**Paraquat (2 or 3 lb/gal formulations) + metribuzin 75DF** 40 or 26 oz/A + 3 oz/A.	Good coverage is essential.	Corn may be replanted immediately.
paraquat + diuron @ 0.625 + 0.5 lb/A	Corn, including Roundup Ready and Liberty Link.	**Paraquat (2 or 3 lb/gal formulations) + Direx 4L** 40 or 26 oz/A + 1 pt/A.	Good coverage is essential.	Corn may be replanted immediately.
paraquat + atrazine @ 0.625 + 0.5 lb/A	Corn, including Roundup Ready and Liberty Link.	**Paraquat (2 or 3 lb/gal formulations) + Atrazine 4L** 40 or 26 oz/A + 1 pt/A.	Good coverage is essential.	Corn may be replanted immediately.
Preemergence				
Many herbicide "pre-mixes" exist for field corn – too many to list here. Check the active ingredients and rates for all pre-mixes. Most individual components of these mixes are listed below and in the weed control table (page 68).				
S-metolachlor @ 0.75 to 1.3 lb/A	Annual grasses and pigweed.	**Dual II Magnum 7.64 EC** 0.8 to 1.4 pt/A.	Preplant to preemerge.	
atrazine @ 2 lb/A	Most small-seeded annuals, annual morningglory, cocklebur, velvetleaf, smartweed and sicklepod.	**AAtrex, Atrazine** 2.5 lb/A 80W or 2 qt/A 4L or 2.2 lb/A Nine-0.	At planting.	Do not plant fall cover crops. Do not plant crops other than corn or grain sorghum in treated fields during the same season. Do not apply more than 2.5 lb/A active atrazine per season.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
atrazine @ 1.5 to 2.25 lb/A + 1 to 1.6 lb/A	Annual grasses, pigweed, annual morningglory, common cocklebur, velvetleaf, smartweed and sicklepod.	**Micro-Tech 4L + AAtrex, Atrazine** 1.5 to 2.25 qt/A Lasso + 1.25 to 2 lb/A 80W or 1 to 1.6 qt/A 4L or 1.1 to 1.75 lb/A Nine-0. or **Lariat/Bullet 4F** 2.5 to 3.75 qt/A.	Preemergence or preplant. **Note** – This treatment can be applied to emerged corn before it exceeds 5" tall. However, weed control will be reduced if weeds exceed 2" tall.	Add additional atrazine for improved control of cocklebur and morningglory. Rainfall in 5 to 7 days is necessary for best results. With preplants, shallow incorporate 2 to 3 inches within 7 days of planting.
S-metolachlor + atrazine @ 0.75 to 1.3 lb/A + 1 to 1.6 lb/A	Annual grasses, pigweed, annual morningglory, common cocklebur, velvetleaf, smartweed and sicklepod.	**Cinch or Dual II Magnum 7.64 EC + AAtrex, Atrazine** See label for specific formulations in question. 0.8 to 1.4 pt/A + 1.25 lb/A 80W or 2 pt/A 4L to 2.0 lb 80W or 3.2 pt/A 4L. or **Bicep II Magnum 5.5 L or Cinch ATZ** 1.3 to 2 qt/A.	Preemergence or preplant.	Add additional atrazine for improved control of cocklebur and morningglory. Rainfall in 5 to 7 days is necessary for best results. With preplants, shallow incorporate 2 to 3 inches within 7 days of planting. If concerned about achieving a stand, leave atrazine out as pre and follow with atrazine early post.
dimethenamid + atrazine @ 0.56 to 0.75 lb/A + 0.75 to 2 lb/A	Annual grasses, pigweed, annual morningglory, common cocklebur, velvetleaf and smartweed.	**Outlook 6E + AAtrex, Atrazine** 12 to 16 + 0.75 to 2 qt/A 4L	From 45 days preplant to preemergence up to 8" tall corn.	Same as above. Rates depend on percent organic matter. See label.
dimethenamid + saflufenacil @ 0.31 to 0.62 + 0.044 to 0.088 lb/A	Annual grasses, pigweed, velvetleaf, morningglory and horseweed.	**Verdict** 10 to 12 oz/A.	Burndown up to preemergence. **Do not** apply Verdict over the top of emerged corn.	Rainfall or overhead irrigation is required for activation. Verdict can be used as a burndown that leaves behind residual control. For best burndown activity, tank mix with glyphosate and use MSO 1 pt/A + AMS. On medium to fine soils, the rotation interval to soybeans is 30 days if you were to lose the corn crop. See label for restrictions.
acetochlor @ 1.09 to 1.97 lb/A	Annual grasses and pigweed.	**Surpass NXT** 1.25 to 2.25 pt/A.	Preplant or preeemergence.	
acetochlor + atrazine @ 1.7 lb/A + 0.8 lb/A	Annual grasses, pigweed, morningglory, cocklebur, velvetleaf, smartweed and sicklepod.	**Degree 3.8 SL + Atrazine** 3.5 pt + 0.8 qt/A Atrazine 4L. or **Degree Xtra** 5 pt/A.	Preplant or preemergence.	Add additional atrazine for improved control of cocklebur and morningglory. Rainfall in 5 to 7 days is necessary for best results. With preplants, shallow incorporate 2 to 3 inches within 7 days of planting.
metolachlor + mesotrione + bicyclopyrone + atrazine @ 1.34 + 0.148 + 0.037 + 0.624 lb/A	Annual grasses, yellow nutsedge and broadleaf weeds.	**Acuron** 2.5 qt/A.	Preplant or preemergence.	May be applied up to 28 days before planting. Do not plant crops other than corn in treated area.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FIELD CORN				
Preemergence [cont.]				
acetochlor + atrazine @ 0.85 to 2 lb/A + 0.88 to 1.6 lb/A	Annual grasses, pigweed, morningglory, common cocklebur, velvetleaf, smartweed and sicklepod.	**Keystone NXT** 1.4 to 2.6 qt/A.	Preplant or preemergence.	Add additional atrazine for improved control of morningglory.
acetochlor + clopyralid + flumetsulam @ 0.7 to 1.4 + 0.07 to 0.14 + 0.023 to 0.045 lb/A	Annual grasses and broadleaves, thistles.	**Surestart II** 1.5 to 2.5 pt/A.	Preplant or preemergence.	Optimal weed control will be obtained when applications are as close as possible to planting but before weeds emerge. Applications may be made from 30 days prior to planting till 11 inch tall corn.
mesotrione @ 0.188 to 0.24 lb/A	Annual broadleaf weeds.	**Callisto 4L** 6 to 7.7 oz/A.	Preemergence.	**Do not plant crops other than corn in treated fields during the same season.**
metolachlor + mesotrione + atrazine @ 1.3 + 0.168 +1.3 lb/A	Annual grasses and broadleaf weeds.	**Lexar EZ 3.75 SE** 3 qt/A.	Preemergence.	**Do not plant crops other than corn in treated fields during the same season. Do not exceed 3.5 qt/A per year.**
thiencarbazone + isoxaflutole @ 0.019 to 0.03 + 0.05 to 0.08 lb/A	Annual grasses and broadleaf weeds.	**Corvus 2.63 SC** 3.3 to 5.6 oz/A. See label for soil type restrictions.	Preemergence.	Do not apply to corn treated with Counter, Lorsban or other OP or carbamate insecticides – see label for precautions. Do not plant crops other than corn in treated fields during the same season.
pyroxasulfone @ 0.08 to 0.16 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass.	**Zidua** 1.5 to 3 oz/A**.**	Preemergence.	Add atrazine for improved control of cocklebur and morningglory. Rates vary based on soil type. Do not apply more than one application to corn in the spring.
pyroxasulfone + fluthiacet-methyl @ 0.11 to 0.16 lb/A + 0.003 to 0.005 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass.	**Anthem Maxx** 2.5 to 5 oz/A**.**	Preemergence.	Add atrazine for improved control of cocklebur and morningglory. Rates vary based on soil type. Do not apply more than one application to corn in the spring.
pyroxasulfone + fluthiacet-methyl + atrazine @ 0.1 to 0.15 lb/A + 0.003 to 0.005 lb/A + 0.88 to 1.25 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass, with improved control of pigweed, morningglory, cocklebur, velvetleaf, smartweed and sicklepod.	**Anthem ATZ** 1.75-2.5 pt/A**.**	Preemergence.	Add atrazine for improved control of cocklebur and morningglory. Rates vary based on soil type. Do not apply more than one application to corn in the spring.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Postemergence				
atrazine @ 2 lb/A	Most small-seeded annuals. More effective on broadleaf weeds, red rice and sicklepod.	**AAtrex, Atrazine** 2.5 lb/A 80W or 2 qt/A of 4L or 2.2 lb/A Nine-0. Select rate according to soil texture. No surfactant recommended on label. Dual, Lasso or Outlook may be added if no soil-applied grass herbicide was used. **AAtrex, Atrazine + oil** 2.5 lb/A 80W or 2 qt/A 4L or 2.2 lb/A Nine-0 + 1 qt/A oil concentrate.	After corn emergence, before grass weeds reach ½ inch or broadleaf 1½ inches.	Do not apply if corn is taller than 12 inches. Do not plant crops other than corn or grain sorghum in treated field until following season. After June 10, do not plant any crop other than corn or grain sorghum the following year. Do not apply more than 2.5 lb/A active atrazine per season.
metolachlor @ 0.95 to 1.9 lb/A	Annual grass and some small-seeded broadleaf weeds.	**Dual II Magnum 7.62 EC or Cinch** 1 to 2 pt/A.	Apply before weeds emerge or tank mix with a postemergence herbicide like glyphosate or Liberty.	Do not apply more than 3.9 pints of Dual Magnum per acre per year.
2,4-D amine @ 0.5 lb/A	Morningglory, cocklebur and most other young broadleaf weeds.	**2,4-D amine** 1 pt/A of 4 lb/gal 2,4-D + 0.25% NIS.	Apply when weeds are small and corn is under 12 inches; however, effective results can be obtained with later application.	After corn is more than 12 inches, apply spray directly on weeds with a drop-type nozzle between the corn row and not on the terminal growth of corn. **AVOID DRIFT to cotton and soybeans. Follow all State Plant Board Regulations.**
dicamba @ 0.25 lb/A	Same as above.	**Clarity 4 SL** 0.5 pt/A + 0.25% NIS.	From corn emergence up to 15 inches tall.	Ground application only. **Drift is extremely toxic to soybeans.** Do not apply after soybeans begin to emerge in general area. Less toxic than 2,4-D to cotton. **Follow all State Plant Board regulations.**
dicamba + diflufenzopyr	Pigweed, morningglory and most other annual broadleaf weeds.	**Status** 5 to 10 oz/A + 0.25% NIS.	Apply on 4-inch to 36-inch-tall corn.	Status requires an NIS at 0.25% v/v. Do not tank mix with 2,4-D or clopyralid-containing products. Ground application only. **Drift is extremely toxic to soybeans. Do not apply after soybeans begin to emerge in general area. Less toxic to cotton than 2,4-D.** Follow all State Plant Board regulations.
bentazon @ 0.75 to 1 lb/A	Cocklebur, ragweed, jimsonweed, smartweed, prickly sida, velvetleaf and yellow nutsedge.	**Basagran 4 SL** 0.75 to 1 qt/A. **Can be tank mixed with 0.5 to 0.75 lb/A active atrazine.**	Postemergence. See label for specific timing for weed desired. Corn tolerant at all stages.	May be tank mixed with atrazine. See label. Best treatment for smartweed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FIELD CORN				
Postemergence [cont.]				
nicosulfuron @ 0.031 lb/A	Johnsongrass, broadleaf signalgrass, foxtail and shattercane.	**Accent Q 54.5 DF** Accent Q + nonionic surfactant (80%) or crop oil concentrate and 28% or 32% UAN liquid fertilizer (optional). 0.5 oz/A + 2 pt/100 gal or 1 gal/100 gal and 4 gal/100 gal. Tank mix with atrazine for broadleaf weeds.	Apply to 4- to 10-inch seedling and 8- to 12-inch rhizome johnsongrass. If regrowth occurs, apply a second application when johnsongrass is 8 to 10 inches tall. 1- to 2-leaf broadleaf signalgrass. May be applied to 2- to 6-leaf stage of corn.	Repeat application may be required to control regrowth. **Do not apply to corn treated with Counter or Counter 20CR insecticide unless IT (Clearfield) corn is planted. See label for restrictions with other organo-phosphate insecticides and postemergence herbicides.** **Do not apply during cool, cloudy weather.**
halosulfuron @ 0.063 lb/A or halosulfuron + thifensulfuron @ 0.031 + 0.004	Nutsedge, cocklebur. See label for tank mixes to broaden weed spectrum.	**Halomax, Permit 75 WG, or Permit Plus** 1 to 1.33 oz/A for nutsedge. Add a nonionic surfactant or crop oil concentrate. May use two applications not to exceed 2.67 oz/A total rate. Use 0.75 oz Permit Plus.	Postemergence from corn spike through layby. 4- to 12-inch nutsedge 1- to 9-inch cocklebur	See label for mixtures and other precautions. Clean tank with ammonia. Do not use Permit Plus after 5 collars or 6 leaf.
halosulfuron + dicamba @ 0.075 + 0.2 lb/A	Ragweed, horseweed, nutsedge and broadleaf weeds.	**Yukon 67.5 DG** 6 oz/A.	From corn emergence to 15 inches.	Ground application only. **Drift is extremely toxic to soybeans.** Do not apply after soybeans begin to emerge in general area. Less toxic than 2,4-D to cotton. **Follow all State Plant Board regulations.**
rimsulfuron + thifensulfuron @ 0.014 + 0.003 lb/A	Some grass and broadleaf weeds.	**Resolve Q 22.4 DG** 1.25 oz/A.	Early postemergence to corn V6 stage of growth or earlier, or up to 20-inch corn, whichever is more restrictive.	**Some hybrids are sensitive to rimsulfuron. Consult with seed supplier for sensitivity prior to applying.**
nicosulfuron + rimsulfuron @ 0.023 + 0.012 lb/A	Annual grass and broadleaf weeds.	**Steadfast Q 37.7 DG** 1.5 oz/A. Add a crop oil concentrate.	Apply to small weeds. Early post to corn, V6 or up to 20-inch corn, whichever is more restrictive.	**Some hybrids are sensitive to rimsulfuron. Consult with seed supplier for sensitivity rating prior to applying.** Do not apply to corn treated with Counter or Counter 20 CR insecticides. See label for other precautions.
mesotrione @ 0.094 lb/A	Annual broadleaf weeds.	**Callisto 4L** 3 oz/A. Add surfactant.	May be applied up to 30 inches or 8-leaf stage of corn for extended morningglory control.	Do not apply to corn treated with Counter or Lorsban insecticides. See label.
thiencarbazone + tembotrione @ 0.013 + 0.068 lb/A	Annual grass and broadleaf weeds.	**Capreno 3.45L** 3 oz/A. Add surfactant.	Apply when corn has between 1 and 5 collars.	**Some hybrids are sensitive to ALS-inhibiting herbicides. Consult with seed supplier for sensitivity rating prior to use.** Do not apply to corn treated with Counter or Lorsban insecticides.
metolachlor + mesotrione + bicyclopyrone + atrazine @ 1.34 + 0.148 + 0.037 + 0.624 lb/A	Grasses and broadleaf weeds.	**Acuron** 2.5 qt/A.	From corn emergence up to 12 inches.	Do not plant crops other than corn in treated area.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
S-metolachlor + mesotrione + atrazine @ 1.3 + 0.168 + 1.3 lb/A	Annual grasses and broadleaf weeds.	**Lexar EZ 3.75 SE** 3 qt/A.	Early postemergence.	**Do not plant crops other than corn in treated fields during the same season. Do not exceed 3.5 qt/A per year.**
thiencarbazone + isoxaflutole @ 0.019 to 0.03 + 0.05 to 0.08 lb/A	Annual grasses and broadleaf weeds.	**Corvus 2.63 SC** 3.3 to 5.6 oz/A. See label for soil type restrictions.	Early postemergence.	Do not apply to corn treated with Counter, Lorsban or other OP or carbamate insecticides – see label for precautions. Do not plant crops other than corn in treated fields during the same season. The addition of atrazine improves control of pigweed and morningglory.
pyroxasulfone @ 0.08 to 0.16 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass.	**Zidua** 1.5 to 3 oz/A.	Apply before weeds emerge or tank mix with a postemergence herbicide like glyphosate or Liberty. Emergence to V4.	Do not apply more than one application to corn in the spring. See label for maximum use rates.
pyroxasulfone + fluthiacet-methyl @ 0.08 to 0.16 lb/A + 0.003 to 0.005 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass.	**Anthem Maxx** 2.5 to 5 oz/A.	Apply before weeds emerge or tank mix with a postemergence herbicide like glyphosate or Liberty. Emergence to V4.	Do not exceed a maximum of 8.15 oz per season.
pyroxasulfone + fluthiacet-methyl + atrazine @ 0.1 to 0.15 lb/A + 0.003 to 0.005 lb/A + 0.88 to 1.25 lb/A	Annual grasses, pigweed, glyphosate-resistant ryegrass, with improved control of pigweed, morningglory, cocklebur, velvetleaf, smartweed and sicklepod.	**Anthem ATZ** 1.75 to 2.5 pt/A.	Emergence to V4.	Maximum of 4.3 pt per season.
mesotrione + rimsulfuron @ 0.078 + 0.019 lb/A	Annual grass and broadleaf weeds.	**Realm Q 38.75 DG** 4 oz/A. Add surfactant.	Early postemergence to corn V6 stage of growth or up to 20 inches, whichever is more restrictive.	**Some hybrids are sensitive to rimsulfuron. Consult with seed supplier for sensitivity rating prior to applying.** Do not apply to corn treated with Counter or Counter 20 CR insecticides. See label for other precautions.
topramezone + atrazine @ 0.0164 lb/A + 1 lb/A	Pigweed, horseweed, velvetleaf, morningglory, barnyardgrass, fall panicum and broadleaf signalgrass.	**Armezon or Impact + Atrazine** 0.75 oz/A + 1 qt/A. COC or MSO at 1% v/v.	Postemergence up to 45 days from harvest.	Apply to corn when weeds are small and actively growing. Use an MSO at 1% v/v and tank mix with atrazine for larger weeds and best results.
topramezone + dimethenamid @ 0.016 lb/A + 0.82 lb/A	Pigweed, horseweed, velvetleaf, morningglory, barnyardgrass, fall panicum and broadleaf signalgrass.	**Armezon PRO** 20 oz/A.	Emergence through V8 or 30-inch corn.	Apply to corn when weeds are small and actively growing. Use an MSO at 1% v/v and tank mix with atrazine for larger weeds and best results.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FIELD CORN				
HERBICIDE-TOLERANT CULTIVARS – Check suitability of available hybrids with county agent.				
glyphosate @ 0.75 to 1 lb/A	Most annual grass and broadleaf weeds and Johnsongrass.	**Glyphosate (4 lb/gal formulations)** 2 pt/A.	May be applied up to 30 inches or 8-leaf stage of corn.	Apply only to Roundup Ready corn. Single in-crop applications not to exceed 1 lb/A and multiple in-crop applications not to exceed 2 lb/A total. See label for tank mixes.
glyphosate + atrazine @ 0.75 to 1 lb/A + 1 lb/A	Same as above plus residual control of broadleaf weeds. Improved morningglory control.	**Glyphosate (4 lb/gal formulations) + AAtrex** 2 pt/A + 1 qt/A.	Prior to 12-inch corn.	Apply only to Roundup Ready corn. Single in-crop applications not to exceed 1 lb/A and multiple in-crop applications not to exceed 2 lb/A total. See label for tank mixes.
glyphosate + atrazine + thifensulfuron/rimsulfuron @ 0.75 to 1 lb/A + 1 lb/A + 0.014 lb/A	Most annual grass and broadleaf weeds. Improved residual control of annual grass.	**Glyphosate (4 lb/gal formulations) + AAtrex + Resolve Q** 2 pt/A + 2 pt/A + 1.25 oz/A or **Realm Q** 2 pt/A + 2 pt/A + 4 oz/A.	Prior to 12-inch corn or 7 collar, whichever comes first.	Apply only to Roundup Ready corn. Single in-crop applications not to exceed 1 lb/A and multiple in-crop applications not to exceed 2 lb/A total. See label for tank mixes. **Some hybrids are sensitive to rimsulfuron. Consult with seed supplier for sensitivity rating prior to applying.**
glyphosate + mesotrione @ 0.75 to 1 lb/A + 0.094 lb/A	Annual grass and broadleaf weeds with residual activity.	**Glyphosate (4 lb/gal formulations) + Callisto 4L** 2 pt/A + 3 oz/A.	May be applied up to 30 inches or 8-leaf stage of corn.	Apply only to Roundup Ready corn. Single in-crop applications not to exceed 1 lb/A and multiple in-crop applications not to exceed 2 lb/A total. See label for tank mixes. Do not apply to corn treated with Counter or Lorsban insecticides.
glufosinate @ 0.4 lb/A	Most annual grass and broadleaf weeds.	**Glufosinate (280 formulations)** 22 oz/A.	May be applied to corn through the V7 growth stage. May be tank mixed with other corn herbicides for residual control.	**Apply only to Liberty Link corn varieties or those containing Herculex or Smartstax traits.** Do not apply more than 44 ounces of glufosinate per season.
glyphosate + *S*-metolachlor + mesotrione @ 0.94 + 0.94 + 0.094 lb/A	Most annual grass and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + Dual Magnum II 7.64 EC or Cinch 7.64 EC + Callisto 4L** 30 oz + 16 oz + 3 oz/A. or **Halex GT** 3.6 pt/A.	From corn emergence to 30" or 8-leaf corn.	Tank mix with atrazine will improve residual morningglory control. Sequence at 2.5 to 3.5 pt/A contains glyphosate and metolachlor. The Halex GT rate is 3.6 to 4 pt/A.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Preharvest				
carfentrazone @ 0.0312 lb/A	Morningglory desiccation.	**Aim 2 EC** 2.0 oz/A. Add 1% crop oil concentrate.	7 days prior to harvest.	Good coverage is critical to Aim activity. 10 gpa is recommended.
sodium chlorate @ 4.5 to 6 lb/A	Desiccation of green vegetation.	**Sodium Chlorate** Several brands and trade names available. 2 gal of 3 lb/gal or 1 gal of 6 lb/gal.	7 to 10 days prior to harvest.	Use a labeled brand and follow label directions.
Post Harvest				
paraquat + flumioxazin @ 0.625 + 0.063 lb/A	Pigweed.	**Paraquat (2 or 3 lb/gal formulations) + Valor 51 WDG** 40 or 27 oz/A + 2.0 oz/A. Add 1% COC.	Apply to small pigweed after harvest.	Apply 30 days prior to planting wheat.
paraquat + *S*-metolachlor @ 0.625 + 0.95 lb/A	Pigweed and annual grass.	**Paraquat (2 or 3 lb/gal formulations) + Dual Magnum 7.62 EC** 40 or 27 oz/A + 1 pt/A. Add 1% COC.	Apply to small pigweed after harvest.	Apply to acres that **will not be** planted to small grains (wheat). Follow Dual label on total use rates.
paraquat + metribuzin @ 0.625 + 0.141 lb/A	Volunteer corn, pigweed and other weeds.	**Paraquat (2 or 3 lb/gal formulations) + metribuzin 75 DF** 40 or 27 oz/A + 3 oz/A. Add 1% COC. **OR** **Boundary** 2 pt/A.	Apply to 6-inch volunteer corn. 3- to 4-inch ryegrass. September through November.	If planting wheat, use a metribuzin-tolerant variety. Add gramoxone 48 oz/A. Section 24C.
2,4-D amine @ 0.75 lb/A	Pigweed and other broadleaf weeds.	**2,4-D amine** 1.5 pt/A of 4 lb/gal 2,4-D.	Apply to 4- to 6-inch pigweed.	Avoid drift to cotton and soybeans. Be aware of state regulations on 2,4-D. 7-day plant-back to wheat. Due to potential off-target movement to maturing soybeans, dicamba is not recommended for use post-harvest in corn.
saflufenacil @ 0.022 to 0.044 lb/A	Pigweed and other broadleaf weeds.	**Sharpen 2.85 SC** 1.0 oz/A + 1% v/v MSO.	Apply to 4- to 6-inch pigweed.	Avoid off-target drift to soybean.

WEED RESPONSE RATINGS FOR GRAIN SORGHUM HERBICIDES

(See Explanation of Rating Tables on Page 3.)

HERBICIDES	MODE OF ACTION	GRASSES												BROADLEAVES													SEDGES
		Barnyardgrass	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Foxtail	Goosegrass	Red Rice	Rhizome Johnsongrass	Ryegrass	Seedling Johnsongrass	Shattercane	Texas Panicum	Bigroot Morningglory	Cocklebur	Common Ragweed	Honeyvine Milkweed	Horsenettle	Lambsquarters	Morningglory	Pigweed sp.	Prickly Sida	Purslane	Sicklepod	Smartweed	Velvetleaf	Yellow Nutsedge
Preemergence																											
Atrazine	5	6	4	7	3	6	6	8	0	-	2	0	3	4	9	9	6	5	9	8	9	9	9	8	9	8	0
Verdict	14, 15	8	7	8	7	8	8	7	0	-	-	-	0	5	-	-	-	-	7	8	9	7	-	5	-	-	-
Dual Magnum/Outlook	15	8	8	9	9	9	9	7	0	9	6	7	0	2	0	7	-	3	6	2	8	6	6	0	5	4	9
Dual II Magnum + Atrazine	15, 5	8	8	9	9	9	9	9	0	9	4	7	3	4	8	9	6	3	9	8	9	9	9	8	4	7	7
Degree + Atrazine	15, 5	9	7	9	9	9	9	8	0	8	6	7	3	4	8	9	6	3	9	8	9	9	9	8	4	7	7
Micro-Tech + Atrazine	15, 5	8	7	9	8	9	9	9	0	8	3	7	3	3	8	9	5	3	9	8	9	9	9	8	8	6	6
Outlook + Atrazine	15, 5	9	8	9	9	9	9	8	0	8	6	7	3	4	8	9	6	3	9	8	9	9	9	8	6	6	7
Lexar	15, 5, 27	9.5	9.5	9.5	8	8	7	8	0	9	3	5	-	4	9	9	7	3	9	9	10	9.5	9	9	9	10	7
Postemergence																											
Peak	2	0	0	0	0	0	0	0	0	0	0	0	0	-	3	8	-	-	8	8	4	8	-	8	8	8	0
Permit	2	0	3	3	3	0	3	0	3	-	3	0	0	-	-	5	-	-	5	5	0	7	7	4	6	6	9
Yukon	2,4	0	3	3	3	0	3	0	3	0	3	0	0	8	8	9	9	6	9	9	9	8	8	8	9	8	9
2,4-D	4	0	0	0	0	0	0	0	0	0	0	0	0	3	9	9	9	4	8	9	8	8	9	8	5	8	0
Banvel or Clarity	4	0	0	0	0	0	0	0	0	0	0	0	0	8	8	9	9	6	9	9	9	-	-	8	9	8	0
Facet L	4	8	9	7	6	7	6	0	0	-	0	0	2	4	-	6	-	-	6	8	4	-	-	-	0	6	0
Facet L+ Atrazine	4, 5	8	9	8	6	8	7	8	0	6	4	0	3	4	9	8	6	4	8	9	9	8	9	8	9	7	5
Atrazine + oil	5	6	6	6	5	7	6	9	0	5	3	0	2	4	9	8	6	4	8	8	9	8	9	8	9	7	5
Basagran	6	0	0	0	0	0	0	0	0	0	0	0	0	3	9	8	5	0	5	4	0	7	7	0	9	8	7
Buctril	6	0	0	0	0	0	0	0	0	0	0	0	0	7	9	7	7	4	8	7	5	-	-	3	9	7	0
Huskie + Atrazine	6, 27	6	6	6	5	7	6	8	0	0	0	0	2	7	9	8	7	5	9	9	9	9	-	8	9	8	5
Paraquat directed or Hood	22	9	9	9	8	8	9	9	0	7	8	0	6	-	4	8	-	7	9	4	9	3	8	9	5	7	3

*Rating will be 0 on ALS inhibitor-resistant weeds (Group 2).
**Repeat application may be needed to achieve these ratings.

Rating scale – 0 = No Control 10 = 100% Control.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
GRAIN SORGHUM				
Preplant				
glyphosate @ 1 lb/A	Emerged weeds.	**Glyphosate (4 lb/gal formulations)** 32 oz/A.	Preplant for vegetation knockdown.	Apply in low volume – 5 to 10 gpa.
glyphosate + 2,4-D @ 1.0 + 0.50 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations) + 2,4-D** 32 oz/A + 1 pt/A of 4SL 2,4-D amine.	Same as above.	Improved control of horseweed, curly dock and primrose.
S-metolachlor @ 0.9 to 1.4 lb/A	Red rice, yellow nutsedge, annual grasses and pigweed.	**Dual Magnum 7.64 EC or Cinch 7.64 EC** 1 to 1.6 pt/A.	Incorporate thoroughly in top 2 inches within 14 days before planting.	**Use with Concep-treated sorghum seed only.** If broadleaf weeds emerge, use 2,4-D or atrazine postemergence.
dimethenamid @ 0.56 to 0.98 lb/A	Red rice, yellow nutsedge, annual grasses and pigweed.	**Outlook 6 E** 12 to 21 oz/A.	Apply up to 45 days preplant.	**Use with Concep-treated seed only.**
Preemergence				
S-metolachlor @ 0.95 to 1.9 lb/A	Annual grasses and pigweed. For red rice or yellow nutsedge use ppi treatment above.	**Dual Magnum 7.64 EC or Cinch 7.64 EC** 1 to 2 pt/A.	At planting.	**Use with Concep-treated sorghum seed only.** May be tank mixed with atrazine according to label directions or may be followed with atrazine or 2,4-D for broadleaf control as recommended below.
S-metolachlor + atrazine @ 1.25 + 1 lb/A	Annual grasses and broadleaf weeds. For red rice or yellow nutsedge, use Dual Magnum ppi above.	**Bicep II Magnum 5.5 L or Cinch ATZ 5.5 F** 1.3 qt/A.	At planting.	**Use with Concep-treated seed only.** Good treatments for average weed infestations. However, if red rice is a problem, use Dual ppi and atrazine early post if needed. If heavy cocklebur and morningglory pressure exists, use atrazine preemergence at preemergence rates below or use atrazine early post as listed below.
atrazine @ 1 lb/A	Germinating annual grasses and most annual broadleaf weeds, including cocklebur, annual morningglory and sicklepod.	**Atrazine** 1 qt/A 4L or 1.1 lb/A Nine-0.	At planting.	Do not plant fall cover crops. Do not plant crops other than corn in treated fields during the same season. Thoroughly till soil before planting any spring crop other than corn or sorghum. Planting deeper than 1 inch will increase safety margin. Do not use on coarse-textured soils (sand, loamy sand, sandy loam) or on any soil with less than 1% o.m. For sandy soils, see AAtrex + oil below. All atrazine labels have been revised because of surface and groundwater concerns. Special precautions are required on new labels.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
GRAIN SORGHUM				
Preemergence [cont.]				
saflufenacil @ 0.022 to 0.044 lb/A	Pigweed, velvetleaf, morningglory and horseweed.	**Sharpen** 1 to 2 oz/A.	Burndown up to preemergence. **Do not** apply Sharpen over the top of emerged sorghum.	For best burndown results, tank mix with glyphosate or paraquat. An MSO and AMS must be used for burndown. See label for further recommendations and restrictions.
dimethenamid + saflufenacil @ 0.31 to 0.62 + 0.044 to 0.088 lb/A	Annual grasses, pigweed, velvetleaf, morningglory and horseweed.	**Verdict** 10 oz/A.	Burndown up to preemergence. **Do not** apply Verdict over the top of emerged grain sorghum.	Rainfall or overhead irrigation is required for activation. Verdict can be used as a burndown that leaves behind residual control. For best burndown activity, tank mix with glyphosate and use MSO 1 pt/A + AMS. On medium to fine soils, the rotation interval to soybeans is 30 days if you were to lose the grain sorghum crop. Use with Concep-treated seed. See label for restrictions.
dimethenamid 0.56 to 0.98 lb/A	For annual grasses and pigweed. For red rice or yellow nutsedge, use ppi treatment.	**Outlook 6E** 12 to 21 oz/A.	At planting.	**Use with Concep-treated seed only. Rates depend on percent organic matter. See label.**
dimethenamid + atrazine package mix	Annual grasses and broadleaf weeds. For red rice or yellow nutsedge, use ppi treatment.	**Guardsman Max 5L** 2.5 pt/A.	At planting.	**Use with Concep-treated seed only.**
Postemergence				
2,4-D amine @ 0.5 lb/A	Most broadleaf weeds such as morningglory, cocklebur and sicklepod.	**2,4-D amine** 1 pt/A of 4 lb/gal 2,4-D amine. Do not use a surfactant or oil.	Apply when weeds are small and sorghum 6 to 12 inches.	May be applied broadcast overtop to sorghum not over 8 inches. Directed applications later with drop nozzles. Do not treat when sorghum is in bloom. AVOID DRIFT. Do not apply during very active growth, i.e., when combination of good moisture, warm temperatures and high nitrogen exist, or excessive injury may result. **Follow all State Plant Board regulations.**
dicamba @ 0.25 lb/A	Most broadleaf weeds such as morningglory, cocklebur and sicklepod.	**Banvel or Clarity 4 SL** 0.5 pt/A. Do not use a surfactant or oil.	From grain sorghum emergence up to 8 inches tall. Best results on weeds 3 inches or less.	Ground application only. Drift is extremely toxic to soybeans. Do not apply after soybeans begin to emerge in general area. Less toxic than 2,4-D to cotton. **Follow all State Plant Board regulations.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
atrazine @ 1 to 2 lb/A	Most small-seeded annuals. More effective on broadleaf weeds. Good control of pigweed, cocklebur, annual morningglory, velvetleaf, spurred anoda, prickly sida, smartweed, sicklepod and red rice.	**AAtrex, Atrazine** 1.25 to 2.5 lb/A 80W or 1 to 2 qt/A 4L or 1.1 to 2.2 lb/A Nine-0. Use low rate on silt loam soil and high rate on clay soil. No surfactant is recommended on label.	Apply from sorghum emergence up to "close in". Apply before weeds exceed 1½ inches in height. **Best grass control obtained before grass weeds exceed ½ inch.**	Do not apply if grain sorghum is taller than 12 inches. Do not graze treated areas or feed forage from treated land within 21 days of application. After June 10, do not plant crops other than corn or grain sorghum the following year. **Do not use on sands or sandy loam soils. For these soils, use atrazine and crop oil concentrate below.** Do not apply more than 2.5 lb/A active atrazine per season.
atrazine @ 1.2 lb/A + oil concentrate	Same as above.	**AAtrex, Atrazine + Crop Oil Concentrate** 1.5 lb/A 80W or 1.2 qt/A 4L or 1.33 lb/A Nine-0 + 1 qt/A oil concentrate.	Same as above.	Same as above but may be used on sandy loam soil. Less likely to cause injury to milo or carryover to sensitive follow crops.
S-metolachlor + atrazine @ 0.75 to 1.3 lb/A + 1 to 1.2 lb/A	Annual grasses, pigweed, annual morningglory, velvetleaf, smartweed and sicklepod.	**Dual Magnum + Aatrex** 0.8 to 1.4 pt/A + 1/2 qt/A.	Before sorghum reaches 12 inches tall. Best grass control obtained before grass weeds exceed ½ inch.	Some injury may occur with higher rates on lighter soils.
halosulfuron @ 0.047 lb/A	Yellow nutsedge, flatsedge and hemp sesbania.	**Permit or Halomax 75 WG** 1 oz/A. Add a nonionic surfactant or crop oil concentrate.	Apply to emerged weeds. 2 leaf to layby.	Aerial or ground application. Avoid drift to soybeans.
halosulfuron + dicamba @ 0.05 + 0.13 to 0.075 + 0.2 lb/A	Ragweed, horseweed, nutsedge and broadleaf weeds.	**Yukon 67.5 DG** 4 to 6 oz/A.	From sorghum emergence up to 8 inches tall. Best results on weeds 3 inches or less.	**Drift is extremely toxic to soybeans.** Do not apply after soybeans begin to emerge in general area. Less toxic than 2,4-D to cotton. **Follow all State Plant Board regulations.**
prosulfuron @ 0.027 lb/A	Most broadleaf weeds including triazine-resistant biotypes.	**Peak 57 WDG** 0.75 oz per acre. Add 0.25% nonionic surfactant.	Apply to actively growing sorghum between 5 and 20 inches in height and before head emergence.	Will not control ALS-resistant weeds. See crop rotation section for precautions about rotational crops. Do not apply to sorghum under stress from moisture or cold weather. Do not apply to sorghum that has been treated with an organophosphate insecticide at planting or within 15 days of a post-emergence organophosphate insecticide application.
bentazon @ 0.75 to 1 lb/A	Cocklebur, ragweed, jimsonweed, smartweed, prickly sida, velvetleaf and yellow nutsedge.	**Basagran 4 S** 0.75 to 1 qt/A.	Postemergence. See label for specific timing for weed desired.	May be tank mixed with atrazine. See label. Best treatment for smartweed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
GRAIN SORGHUM				
Postemergence [cont.]				
bentazon + atrazine @ 0.5 to 0.75 + 0.5 to 0.75 lb/A	Most broadleaf weeds.	**Basagran + Atrazine** 1 to 1.5 pt/A + 1 to 1.5 pt/A 4L or 0.6 to 0.9 lb/A 80W or 0.55 to 0.8 lb/A 90DF. Add crop oil concentrate. Package mix is **Laddock**. 2½ pt/A Laddock = 0.5 to 0.5 lb/A a.i. rate.	Postemergence from emergence to boot.	Use low rate on small weeds and higher rate on larger weeds. All atrazine labels have been revised because of surface and groundwater concerns. Special precautions are required on new labels.
bromoxynil @ 0.25 to 0.375 lb/A	Cocklebur, smartweed, morningglories and pigweed.	**Buctril 2 E** 1 to 1½ pt/A. On larger weeds, tank mix with 0.5 lb/A active Atrazine.	Postemergence to weeds in seedling (2- to 4-leaf) stage.	Use high rate on morningglories and pigweed. **Weeds must be small.** Expect some temporary burn.
bromoxynil + pyrasulfotole @ 0.175 to 0.22 lb/A + 0.03 to 0.39 lb/A	Annual broadleaves including pigweed and morningglories.	**Huskie** 12.8 to 16 oz/A. Add 0.25% NIS.	Apply on or after 3-leaf stage until grain sorghum reaches 30 inches tall, or flag leaf emerges.	Use high rate on morningglories and pigweed. **Weeds must be small.** Expect some temporary injury if tank mixed with atrazine.
paraquat @ 0.5 lb/A	Annual grasses and broadleaf weeds.	**Paraquat (2 or 3 lb/gal formulations)** 32 or 21 oz/A. Add 0.25% nonionic surfactant.	After sorghum is 12 inches.	**Directed spray with hoods. Spray must not touch more than lower 3 inches of stalk. Some injury will occur.**
quinclorac @ 0.25 to 0.375 lb/A	Annual grasses and broadleaf weeds.	**Facet L** 22 to 32 oz/A.	Apply to weeds less than 2 inches tall.	Apply prior to 12-inch grain sorghum. Tank mix with 1 lb/A atrazine for improved control. Do not drift on cotton or tomatoes.
Preharvest				
sodium chlorate @ 4.5 to 6 lb/A	Desiccation of green vegetation.	**Sodium Chlorate** Several brands and trade names available. 2 gal of 3 lb/gal or 1 gal of 6 lb/gal.	7 to 10 days prior to harvest.	Use a labeled brand and follow label directions.
carfentrazone @ 0.016 lb/A	Desiccation of morningglories.	**Aim 2 EC** 1 oz/A.	3 days prior to harvest.	Coverage is important. Use 10 gallons of spray solution per acre. Can be tank mixed with sodium chlorate.
glyphosate @ 1 to 1.3 lb/A	Desiccation of green vegetation.	**Glyphosate (4 lb/gal formulations)** 32 to 40 oz/A.	7 days prior to harvest.	Coverage is important. Use 10 gallons of spray solution per acre. Can be tank mixed with sodium chlorate.
glyphosate + carfentrazone @ 1 lb/A + 0.016 lb/A	Improved desiccation of vines/ morningglories.	**Glyphosate (4 lb/gal formulations) + Aim 2 EC** 32 oz/A + 1 oz/A.	7 days prior to harvest.	Coverage is important. Use 10 gallons of spray solution per acre. Can be tank mixed with sodium chlorate.

Forage, Feed and Grazing Restrictions for Wheat Herbicides

Herbicide	Restrictions
2,4-D	Do not permit dairy animals or meat animals being finished for slaughter to forage treated grain fields within 2 weeks after treatment. Do not feed treated straw to livestock if a preharvest or emergency treatment is used. See label.
Anthem Flex	Do not harvest or graze for 7 days.
Axial	Do not graze treated fields for 50 days following application.
Axiom	Do not graze wheat within 14 days following application.
Banvel	Do not graze or harvest for livestock feed prior to crop maturity.
Beyond	Do not graze for 30 days following application.
Express	Do not graze for 7 days following application.
Finesse Grass and Broadleaf	No grazing, forage or hay restrictions.
Finesse G&B	No grazing, forage or hay restrictions.
Harmony Extra	Do not graze for 7 days following application.
Hoelon	Do not allow livestock to graze on treated field for 28 days. Do not harvest forage, hay or straw from treated fields prior to grain harvest.
Metribuzin	Do not graze wheat within 14 days following application.
Osprey	Do not apply within 30 days of harvesting forage or 60 days for hay, grain or straw.
Paraquat	Do not graze or harvest for feed.
Peak	Do not graze within 30 days following application.
PowerFlex HL	Do not graze for 7 days; do not cut for hay for 28 days.
Prowl H_2O	Do not apply Prowl within 60 days of wheat harvest, 28 days for hay, and 11 days for wheat forage.
Zidua	Do not harvest or graze for 7 days.

Restrictions are listed as worded on the labels. Feeding and application restrictions for herbicides are generally based on residue tolerances allowed for animal feeding. The restrictions are generally not due to acute toxicity (poisoning) problems. Livestock that are accidentally fed treated crops earlier than allowed may not be harmed, but may have illegal pesticide residues in their meat or milk. If you have fed livestock treated crops within the restricted period, refer to the label, your dealer, or herbicide company representative for more information.

Wheat Herbicide

Compatibility with Fertilizers as Application Carriers

	Fertilizer	
Herbicide	Fluid	Dry
2,4-D amine	N	N
2,4-D ester	Y	N
Anthem Flex	Y	Y
Axial	N	N
Axiom	N	N
Banvel	Y	N
Beyond	N	N
Finesse	Y	N
Harmony Extra or Express	Y	N
Hoelon	N	N
Metribuzin	N	N
Osprey	N	N
PowerFlex	Y	N
Prowl H_2O	Y	Y
Zidua	Y	Y

Y = Yes, N = No

There are many specific fertilizer incompatibilities and restrictions with most herbicides. Be sure to read the herbicide label for specific mixing or impregnation instructions. Compatibility agents are required for many mixes. A typical compatibility test procedure for mixing herbicides in fluid fertilizers is given on page 4. NOTE: Compatibility with dry fertilizer is listed here from a labeling standpoint. The University of Arkansas only recommends herbicide application on dry fertilizer as a third alternative to spraying in water or in liquid fertilizer.

Crop Replant and Rotation Guide for Wheat Herbicides

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
2,4-D	All	90 days	90 days or until dissipated.
Anthem Flex	C, CT, S, W P, SF R, SG All	I 4 months 10-11 months 18 months	
Axial	W All others	I 4 months	
Axiom	S† AL, C, FG, W, B CT, R All (except root crops)†† Root crops	I 4 months 8 months 12 months 18 months	† Waiting period for replanting soybeans depends on the rate of metribuzin used. See specific label for more information. Add 2 months to time intervals if pH of soil is above 7.5. †† Cover crops may be planted anytime, but stand reductions may occur.
Beyond	S A, W C, GS, CT, SF All others	I 3 months 9 months 18 months	For CL wheat only.
Express	W, O CA All	I 60 days 45 days	
Finesse	Follow only with STS or BOLT soybeans the next year.		
Harmony Extra	W, O CA All	I 60 days 45 days	
Hoelon	W, B All	I FY	
Osprey	W B, SF S, CT, R, P C All others	7 days 30 days 90 days 12 months 10 months	Under cold temperature or drought, degradation may be slower.
Peak	W C, GS R, S, CT All others	I 1 month 10 months 18 months	Apply to soils below pH 7.8 if rice, soybeans or cotton in rotation.
PowerFlex HL	S, CT W C, O, GS, CA, SF, P R	90 days 1 month 9 months 12 months	
Prowl H_2O	CT, S W, B All	I 4 months FY	Do not rework soil deeper than treated zone.
Metribuzin	S† AL, C, FG, W, B CT, R All (except root crops)†† Root crops	I 4 months 8 months 12 months 18 months	† Waiting period for replanting soybeans depends on the rate of metribuzin used. See specific label for more information. Add 2 months to time intervals if pH of soil is above 7.5. †† Cover crops may be planted anytime, but stand reductions may occur.
Zidua	C, CT, S P, SF R W	I 4 months 12 months 30 days	

Key

Crop

All = All crops not specified
B = Barley
C = Corn
CA = Canola
CT = Cotton
FG = Forage Grasses
GS = Grain Sorghum
O = Oat
P = Peanuts
R = Rice
S = Soybeans
SF = Sunflower
SG = Small Grains
W = Wheat

Timing

I = Immediately
FY = Following year (usually spring)

WEED RESPONSE RATINGS FOR WHEAT HERBICIDES

(See Explanation of Ratings Tables on Page 3.)

HERBICIDES	HERBICIDE FAMILY	WEEDS																	
		Annual Bluegrass	An. Mustard sp.	Buttercup	Carolina Foxtail	Cheat	Chickweed	Coreopsis	Curly Dock	Cutleaf Eveningprimrose	Henbit	Horseweed	Little Barley	Mayweed	Ryegrass - Hoelon-Resistant	Shepherdspurse	Vetch	V. Pepperweed	Wild Garlic
2,4-D	4	0	8	9	0	0	4	8	6	9	4	9	0	6	0	7	9	9	7
Axial XL	1	0	0	0	3	4	0	0	0	0	0	0	0	0	8	0	0	0	0
Axiom	14,5	9	9	8	0	5	8	-	2	2	8	9	2	-	6	8	5	-	0
Beyond	2	7	5	0	5	8	5	-	2	0	7	3	8	6	8	8	0	-	0
Express	2	0	6	8	0	0	8	-	8	7	7	5	0	9	0	7	7	-	5
Finesse	2	6	8	8	8	6	8	8	8	8	8	7	5	9	7	8	7	8	7
Harmony Extra	2	0	9	9	0	0	8	6	8	6	7	8	0	9	0	9	6	8	8
Metribuzin	5	9	7	8	6	7	9	6	0	0	7	8	7	5	3	4	0	9	0
Osprey	2	9	5	7	9	3	6	-	0	0	5	4	5	3	9	7	7	-	0
Peak	2	4	6	8	0	0	8	-	8	8	8	7	0	8	0	7	8	-	8
PowerFlex HL	2	5	9	8	8	8	9	8	7	0	9	3	5	9	9	8	8	8	0
Prowl H_2O	3	3	8	8	6	3	8	2	0	4	8	5	3	0	6	8	0	-	0
Zidua/Anthem Flex	15	9	-	-	9	9	-	-	-	-	-	8	9	-	9	-	0	-	0

[1]Some ryegrass and mayweed populations in Arkansas have been found to be resistant to ALS herbicides (Finesse, Osprey, PowerFlex).

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
WHEAT				
chlorsulfuron/metsulfuron @ 0.023 lb/A	Mustards, henbit, chickweed, mayweed, buttercup, coreopsis, primrose, dock, and suppression of ryegrass, Hoelon-resistant ryegrass, cheat and garlic.	**Finesse 75 DF** 0.5 oz/A.	Immediately after planting. Add glyphosate or paraquat if emerged vegetation present.	**Note: May only be followed with STS soybean in spring if pH is 7.5 or less. Carryover will injure non-STS soybean varieties.**
pyroxasulfone + carfentrazone @ 0.47 + 0.033 to 0.93 + 0.066 lb/A	Ryegrass, other grass weeds, and some small-seeded broadleaves.	**Anthem Flex 4L** 2 to 4 oz/A. Rate depends on soil type.	Apply from delayed pre to early post.	Do not apply delayed pre until wheat has germinated.
pyroxasulfone @ 0.038 to 0.15 lb/A	Ryegrass, other grass weeds, and some small-seeded broadleaf weeds.	**Zidua 0.85 WG** 0.7 to 2.5 oz/A. Rate depends on soil type and timing.	Apply from delayed pre to early post.	Do not apply delayed pre until wheat has germinated.
flufenacet/metribuzin @ 0.55 to 0.92 lb/A	Annual bluegrass and broadleaf weeds. Ryegrass suppression.	**Axiom 68 DF** 6 to 10 oz/A. See label for soil type restrictions.	Spike to 2-leaf wheat.	Apply early. Some varieties may be injured by metribuzin (see metribuzin, page 89). Will suppress ryegrass, but must follow with post application of Axial XL, Osprey or PowerFlex.
penoxaden @ 0.053 lb/A	Ryegrass.	**Axial XL 0.42 EC** 16.4 oz/A.	Apply to 1-leaf to 2-tiller ryegrass. Apply from 2-leaf wheat to pre-boot. 60 day PHI.	Do not use on oats. Do not tank mix with 2,4-D.
mesosulfuron-methyl @ 0.013 lb/A	Ryegrass, wild oat, annual bluegrass and **Hoelon-resistant ryegrass**.	**Osprey 4.5 WDG** 4.75 oz/A. Follow label recommendation for adjuvant and fertilizer carrier.	Apply to winter wheat only from emergence up to joint stage. Do not apply more than 4.75 oz/A on one wheat crop.	Apply to small actively growing ryegrass in the 4-leaf to 2-tiller growth stage. Osprey will control larger ryegrass under good conditions as a salvage treatment, but significant yield loss from ryegrass competition will occur if it is not controlled early. Rainfast in 4 hours. Cold weather following an application may reduce effectiveness. For spring applications, avoid simultaneous activation of topdress nitrogen and Osprey. See label for nitrogen restrictions.

FOR SEVERE RYEGRASS INFESTATIONS/ALS/HOELON-RESISTANT RYEGRASS

Where ryegrass populations are most severe, especially resistant ryegrass, it may be necessary to take a program approach. This may include a full tillage program following the first “flush” of ryegrass followed by a post-applied herbicide prior to planting (glyphosate or paraquat) followed by a sequential program of Axiom (or Axiom plus Prowl or Zidua/Anthem Flex) in the fall (1- to 2-leaf wheat), followed by a spring application of Axial. In addition, one year of fallowing a field and not allowing ryegrass to go to seed will typically eliminate 95% of ryegrass seed in the soil seed bank.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
pendimethalin @ 1.0 lb/A	Residual only. Suppression of ryegrass. Good control of small-seeded winter annual weeds.	**Prowl H_2O 3.8 CS** 2.1 pt/A.	After wheat has 1 leaf, until 4 tillers. Prior to weed germination.	Emerged weeds will not be controlled. University testing has shown good crop safety both pre and delayed pre (in cases of poor stand) as long as seed is covered by at least 0.5 inch of soil. Prowl H_20 can be tank mixed with Axial, Hoelon, PowerFlex or Osprey to provide around 30 days of residual ryegrass control.
pyroxsulam @ 0.016 lb/A	Ryegrass, henbit, vetch, chickweed, curly dock and others.	**PowerFlex HL 13 DG** 2 oz/A. Add 0.5% nonionic surfactant or 1 to 1.25% crop oil concentrate or 1% MSO.	Apply from 3-leaf to joint, after ryegrass has emerged.	Do not apply more than 2 oz/A per year. Do not use on oats. Do not harvest within 60 days. See label for nitrogen restrictions.
metribuzin @ 0.094 to 0.141 lb/A	Cheat, bluegrass and little barley.	**Metribuzin 75 DF** 2 to 3 oz/A.	After wheat plants have 2 leaves and 1 inch secondary roots.	**Do not use on oats.** Best cheat control with fall application. **Soft Red Winter Wheat Reaction to Metribuzin: Some wheat varieties are tolerant to metribuzin** and some will be injured. For a list of metribuzin-tolerant wheat varieties, go to www.uaex.edu. Avoid use on sandy soils.
2,4-D amine or LV esters @ 0.5 to 0.75 lb/A	Mustard, thistles, buttercup, dock seedlings, horseweed seedlings, vetch and winter peas.	**2,4-D amine or LV esters** 1 to 1.5 pt/A of 4 lb/gal 2,4-D.	In spring after the wheat plants have tillered and are 4 to 8 inches tall to the time the joint begins to elongate. (Growth stages 3 to 5.)	Apply when temperature is above 60°F and when no rain is expected for 12 hrs. Do not graze lactating dairy animals until 7 days after application. AVOID DRIFT.
2,4-D LV esters @ 0.75 to 1 lb/A	Wild onion or garlic.	**2,4-D LV esters** 1½ to 2 pt/A of 4 lb/gal formulation. Add a surfactant. Use 2 pt rate only if severe infestations and if some injury can be tolerated. See right column for addition of **Banvel**.	In spring after the wheat plants have tillered and are 4 to 8 inches tall to the time the joint begins to elongate. (Growth stages 3 to 5.) The LV esters can be applied in liquid N **if** the optimum timing for the two applications coincide.	Prevents seed and aerial bulblets but will not completely control. Do not graze lactating dairy animals until 14 days after application. AVOID DRIFT. Banvel can be added at the rate of 4 oz/A of 4 lb/gal or 8 oz/A of 2 lb/gal Banvel. This may increase garlic suppression. It is less selective and should not be used unless some injury can be tolerated. Do not add Banvel if any joint movement has occurred in wheat.
thifensulfuron/tribenuron @ 0.023 to 0.028 lb/A	Wild garlic, buttercup, mayweed, dock, chickweed, primrose, and suppression of vetch.	**Harmony Extra 75 SG** 0.75 to 0.9 oz/A. Surfactant required for both water and liquid N carriers.	In early to mid-March when wild garlic is 6" to 12" tall.	Apply to actively growing weeds. May be tank mixed with liquid N if slurried in water first. Thorough spray coverage is necessary; coarse spray is not recommended. May be used on oats after 3-leaf but prior to jointing. Do not use on Ogle Premier or Porter oat varieties.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
WHEAT [cont.]				
thifensulfuron/tribenuron + 2,4-D @ 0.023 to 0.75 lb/A	Horseweed.	**Harmony Extra 50 SG + 2,4-D LV ester** 0.75 oz/A + 1.5 pt/A of 4 lb/gal formulations. Add surfactant.	See 2,4-D above.	For severe horseweed infestations, add 4 oz of Clarity. Effective treatment when intentions are to plant soybeans after harvest.
tribenuron @ 0.008 to 0.016 lb/A	Buttercup, mayweed, chickweed. Suppression of vetch and curly dock.	**Express 50 SG** 0.25 to 0.50 oz/A. Surfactant required for both water and liquid N carriers.	Apply before flag leaf emergence.	Same as above.
prosulfuron @ 0.009 to 0.018 lb/A	Wild garlic, vetch, chickweed, henbit.	**Peak 57 WG** 0.25 to 0.5 oz/A. Add a surfactant.	After wheat plants have developed 3 leaves and before second node is detectable.	**Expect slow results. Use high rate for garlic. (10-month minimum plant back interval for soybeans.)**
Preharvest				
glyphosate @ 1 lb/A	Annual broadleaf and grass weeds and johnsongrass.	**Glyphosate (4 lb/gal formulations)** 2 pt/A.	Timing after hard dough stage (30% or less moisture) and at least 7 days prior to harvest.	Apply in spray volume of 3 to 10 GPA. Not recommended for use on wheat grown for seed because reduction in germination and vigor can occur.
carfentrazone @ 0.0312 lb/A	Morningglory desiccation.	**Aim 2 EC** 2.0 oz/A. Add 1% crop oil concentrate.	7 days prior to harvest.	Good coverage is critical to Aim activity. 10 gpa is recommended.
Clearfield Wheat				
imazamox @ 0.032 to 0.047 lb/a	Ryegrass, cheat and winter annual weeds.	**Beyond 1 AS** 4 to 6 oz/A. Surfactant and liquid nitrogen or ammonium sulfate required as adjuvants.	Apply from 2- to 4-leaf ryegrass.	Apply on Clearfield wheat hybrids only.

WEED RESPONSE RATINGS FOR RICE HERBICIDES

(See Explanation for Ratings Tables on Page 3.)

HERBICIDES	HERBICIDE FAMILY	GRASSES								BROADLEAF WEEDS																SEDGES			
		Barnyardgrass[1]	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Red Rice	Rice Cutgrass	Sprangletop (loosehead) (bearded sprangletop)	Sprangletop (tighthead) (Amazon)	Ammania (red stem)	Dayflower	Ducksalad	Eclipta	False Pimpernel	Gooseweed	Groundcherry	Hemp Sesbania (coffeebean)	Indian Jointvetch	Northern Jointvetch (curly indigo)	Palmleaf Morningglory	Pigweed, Palmer	Pitted Morningglory	Smartweed	Texasweed	Water Hyssop	Flatsedges	Spikerush	Umbrella Sedge	Yellow Nutsedge
Preemergence																													
League	2	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	9	7	7	2	0	2	-	8	-	8	-	0	8
Prowl delayed pre	3	8	6	8	7	0	0	6	6	0	0	4	0	0	0	-	0	0	0	0	6	0	0	0	0	0	0	0	0
Facet pre/delayed pre	4	9	9	9	9	0	0	0	0	3	5	3	8	3	3	8	6	7	7	7	4	7	0	0	6	5	-	0	0
Facet + Prowl delayed pre	4,3	9	9	9	9	0	0	7	7	3	5	3	8	3	3	-	7	7	7	8	6	8	0	0	6	5	-	0	0
Facet + Bolero delayed pre	4,8	9	9	9	9	0	0	8	8	6	7	7	9	7	5	-	8	8	8	8	5	8	5	-	6	8	7	4	0
Command + quinclorac	4,13	10	10	10	10	0	0	9	9	3	6	3	8	3	4	8	7	8	8	8	4	8	6	0	6	5	7	-	0
Bolero delayed pre	8	7	5	7	7	0	0	7	7	7	8	7	8	8	6	-	5	5	5	5	-	5	5	-	7	7	7	4	4
Bolero – Water seeded	8	8	7	7	-	8*	0	8	8	3	6	6	-	5	6	-	-	-	-	-	-	-	-	-	5	7	5	3	3
Command pre/delayed pre	13	9	9	9	9	0	0	9	9	0	3	3	3	-	0	-	2	3	3	4	0	3	2	0	0	0	0	0	0
Early Postemergence																													
Clincher	1	8	9	5	9	0	2	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ricestar HT	1	9	9	8	7	0	2	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grasp	2	8	0	0	0	0	6	0	0	7	8	9	8	-	-	8	8	8	8	4	0	5	7	7	8	9	8	0	6
Londax early post flood	2	0	0	0	0	0	0	0	0	9	7	9	8	9	9	0	6	6	6	5	0	5	6	0	9	8	8	0	6
Newpath fb Newpath/Beyond	2	9	9	9	9	9.5	9	8	7	8	5	7	0	0	5	9	0	0	0	5	0	7	9	5	0	9	9	0	8
Permit	2	0	0	0	0	0	5	0	0	5	8	3	5	-	4	6	9	3	6	0	0	4	4	5	-	8	-	0	9
Permit Plus	2	0	0	0	0	0	5	0	0	8	9	7	7	-	4	8	9	5	7	3	0	5	8	5	-	8	-	0	9
Regiment	2	8	0	0	0	0	7	3	2	6	9	9	7	-	0	-	8	7	7	4	0	5	10	7	6	8	-	3	5
Strada	2	0	0	0	0	0	0	0	0	8	7	6	7	-	-	4	9	8	9	3	0	4	5	6	-	9	-	0	7
Facet early post	4	8	9	7	6	0	2	0	0	3	3	3	9	3	3	8	8	8	8	8	4	8	0	0	3	5	-	0	0
Grandstand + Permit	4,2	0	0	0	0	0	0	0	0	8	8	4	5	-	-	4	8	9	9	9	4	9	7	9	-	9	-	3	9
Facet + propanil early post	4,7	9	9	7	9	0	2	4	5	6	5	6	9	7	5	8	9	9	9	8	8	8	6	6	8	9	9	3	5
Grandstand + propanil early	4,7	9	9	7	9	0	0	4	5	9	5	8	9	8	8	4	9	9	9	9	9	9	7	8	8	9	9	3	5
Basagran early	6	0	0	0	0	0	0	0	0	8	9	6	8	7	7	0	3	3	3	8	0	3	7	0	8	8	8	7	6
Basagran + propanil early	6,7	9	9	7	9	0	2	4	5	9	9	7	9	8	7	4	9	9	9	8	7	5	8	6	9	9	9	8	7
Propanil early (weeds less than 2")	7	9	9	7	9	0	1	4	5	6	5	7	8	7	5	-	9	9	9	4	7	4	6	6	8	9	9	5	4
Propanil fb propanil	7	9	9	7	9	0	2	7	8	6	6	7	9	7	5	-	9	9	9	5	9	5	8	6	8	9	9	6	6
Propanil + Londax or Duet prior to flood	7,2	9	9	7	9	0	2	4	5	9	8	7	9	8	9	0	9	9	9	9	7	9	8	5	8	9	9	6	8
Propanil + Permit	7,2	9	9	7	9	0	1	4	5	6	9	7	8	7	5	6	10	9	9	4	7	4	6	5	8	9	9	3	9
Propanil + Prowl early	7,3	9	9	7	9	0	1	9	9	7	5	7	9	7	6	-	9**	9**	9**	5	7	5	6	4	7	9	7	3	5
Propanil + Bolero early	7,8	9	9**	7	9	0	2	9	9	8	8	8	9	9	6	-	9**	9**	9**	5	0	5	6	4	9	9	9	8	5
Aim	14	0	0	0	0	0	0	0	0	6	7	5	7	-	-	8	9	6	6	10	6	10	9	3	7	0	0	3	0
Sharpen	14	0	0	0	0	0	0	0	0	8	7	5	9	-	7	8	9	9	9	9	9	10	-	8	8	8	-	6	6
Ultra Blazer + propanil early	14,7	8	8	7	8	0	1	4	5	6	5	7	8	7	5	8	9	6	9	8	9	8	7	3	8	8	8	2	5

*Water seed pin-point flood culture. **Postemergence control only.

[1]Some biotypes of barnyardgrass in Arkansas are resistant to Command, propanil, Facet or both (Facet + propanil), and Newpath, Grasp, and Regiment.

Rating Scale – 0 = No Control 10 = 100% Control.

(Cont. on page 92)

WEED RESPONSE RATINGS FOR RICE HERBICIDES (cont.)

(See Explanation for Ratings Tables on Page 3.)

HERBICIDES	HERBICIDE FAMILY	GRASSES								BROADLEAF WEEDS																SEDGES			
		Barnyardgrass[1]	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Red Rice	Rice Cutgrass	Sprangletop (loosehead) (bearded sprangletop)	Sprangletop (tighthead) (Amazon)	Ammania (red stem)	Dayflower	Ducksalad	Eclipta	False Pimpernel	Gooseweed	Groundcherry	Hemp Sesbania (coffeebean)	Indian Jointvetch	Northern Jointvetch (curly indigo)	Palmleaf Morningglory	Pigweed, Palmer	Pitted Morningglory	Smartweed	Texasweed	Water Hyssop	Flatsedges	Spikerush	Umbrella Sedge	Yellow Nutsedge
Midseason																													
2,4-D	4	0	0	0	0	0	0	0	0	9	9	9	9	9	6	5	9	5	5	9	8	9	6	0	9	8	8	3	5
2,4-D + propanil for levees	4,7	6	6	2	6	0	0	6	6	9	9	8	9	9	8	5	9	8	8	8	9	9	7	0	9	8	8	3	6
Grandstand + propanil	4,7	4	4	4	4	0	0	0	0	9	-	6	6	8	7	3	9	8	9	9	7	9	5	0	8	5	8	5	3
Propanil	7	4	4	4	4	0	0	0	0	4	0	3	4	4	0	4	8	5	5	3	6	0	3	0	8	5	7	5	3
Propanil + Ultra Blazer	7,14	5	5	5	5	0	0	0	0	5	2	4	5	5	2	5	9	6	6	7	7	8	7	0	8	6	7	5	4
Ultra Blazer	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9	0	0	3	6	3	6	0	0	0	0	0	0

*Water seed pin-point flood culture. **Postemergence control only. [1]Some biotypes of barnyardgrass in Arkansas are resistant to Command, propanil, Facet or both (Facet + propanil), and Newpath, Grasp, and Regiment.
Rating Scale – 0 = No Control 10 = 100% Control.

Rainfall-free Periods for Postemergence Rice

Herbicide	Time Before Rainfall	Herbicide	Time Before Rainfall
2,4-D	6 hrs	Newpath	4 hrs
Aim	1 hr	Permit/Permit Plus	1 hr
Basagran	8 hrs	Propanil	6 hrs
Beyond	4 hrs	Regiment	8 hrs
Bolero	nothing on label	Ricestar HT	1 hr
Clincher	1 hr	Sharpen	1 hr
Facet	nothing on label	Storm	8 hrs
Grasp	1 hr	Strada	6 hrs
League	6 hrs	Ultra Blazer	4 hrs

Crop Replant and Rotation Guide for Rice Herbicides

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
2,4-D	All	90 days	90 days or until sufficiently dissipated.
Aim	AL, CL All other	12 months I	
Basagran	All	I	
Beyond	S A B, CT, GS, O, SF, P, C, R CA	I 3 months 9 months 18 months	
Bolero	All*		* Do not plant subsequent crops in treated fields within 6 months of last application. Do not use in fields where fall farming of crayfish will be practiced. Do not apply to second stubble rice crop.
Clincher	All	3 months	No more than 25 oz per growing season. Keep away from peach trees.
Command	S W	I 4 months	
Facet	R All	I 309 days	Do not plant tomatoes or carrots within 2 years. Do not use in fields for fish farming or where fall farming of crayfish will be practiced.
Grandstand	All	6 months	
Grasp	All	3 months	
League	R CT C, S, GS	I 8 months 12 months	* See label for vegetables and other crops.
Londax	All	120 days	
Newpath	S, P, Clearfield Corn, Clearfield Rice W C CT, GS, Non-Clearfield Rice	I 4 months 8.5 months 18 months	Wheat rotation is longer if more than 8 oz/year is used.
Obey	R All	I 309 days	Do not plant tomatoes or carrots for 2 years. Do not use in fields where fish or crayfish will be farmed.
Permit, Permit Plus or Halomax	R W, C, GS CT, P S SF	I 2 months 6 months 9 months 18 months	Preplant to rice up to pH 8.
Propanil	All	I	
Prowl	CT, S All B, W	I FY 120 days*	* 90 days after a post incorporated application in irrigated field corn or grain sorghum. Do not plant following irrigation if crop failure occurs. Do not plant following no-till practices. Do not plant following higher Prowl rates for rhizome johnsongrass or red rice.
Regiment	R All	I FY	
Ricestar HT	C, CT, GS, S SG	30 days 120 days	
Ultra Blazer	P, S All*	I FY	* Root crops (such as carrots, turnips, sweet potatoes, etc.) must not be planted in treated fields for a period of 18 months following treatment.
Sharpen	C, R, GS, SG, S CT All	I 1.5 months 4 months	Sweet corn plant back is 0.5 months.
Storm	All	Fall	
Strada	R C, SG C, S All others	I 3 months 6 months 12 months	

* This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

Key

Crop

All = All crops not specified
B = Barley
C = Corn
CA = Canola
CT = Cotton
GS = Grain Sorghum
O = Oat
P = Peanuts
R = Rice
S = Soybeans
SF = Sunflowers
SG = Small Grains
W = Wheat

Timing

I = Immediately
FY = Following year (usually spring)

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE **For additional information on burndown herbicides see p. 23, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.** **Preplant-Vegetation Knockdown**				
glyphosate @ 1.0 lb/A	Emerged weeds.	**Glyphosate (4 lb/gal formulations)** 32 oz/A.	Apply at least 7 days before seedbed preparation.	Field must be free of standing water.
saflufenacil @ 0.022-0.044 lb/A	Pigweed, mare's tail, morningglory and small-seeded broadleaves.	**Sharpen** 1 to 2 oz/A. Must use a minimum of 1 pt/A MSO + AMS.	Prior to rice emergence. Timing to small weeds or prior to weed emergence.	Tank mix with glyphosate or paraquat. Use high water volumes for best coverage. See label for crop specific restrictions and limitations.
glyphosate + thifensulfuron + tribenuron @ 1.0 + 0.016 to 0.025 lb/A	Improved control of curly dock, smartweed, henbit and garlic.	**Glyphosate (4 lb/gal formulations) + FirstShot 50 SG** 32 oz/A + 0.5 to 0.8 oz/A.	Prior to planting	Field must be free of standing water.
glyphosate + bensulfuron @ 1.0 + 0.023 lb/A	Improved control of yellow nutsedge, morningglory and hemp sesbania.	**Glyphosate (4 lb/gal formulations) + Londax 60 DF** 32 oz/A + 0.5 oz/A.	Apply at least 7 days before seedbed preparation or planting.	Field must be free of standing water.
glyphosate + clomazone @ 1.0 lb + 0.3-0.6 lb/A	Emerged weeds plus residual grass.	**Glyphosate (4 lb/gal formulations)** 32 oz **+ Command 3 ME** 0.8-1.6 pt/A Medium (Silt Loam) 0.8-1.1 pt/A Fine (Clay) 1.3-1.6 pt/A Research has shown very little difference in grass control among rates within each soil type. **Note: On thin soils, especially those that have been leveled, consider rates as low as 0.5 pt/A.**	Up to 14 days prior to planting.	Field must be free of standing water. Antagonism has been documented with this tank mix. Always use full rate of glyphosate.
glyphosate + halosulfuron + thifensulfuron @ 1.0 lb + 0.065 lb/A or 1.015 + 0.031 + 0.004 lb/A	Emerged weeds + enhanced sedge control. Will suppress other broadleaves.	**Glyphosate (4 lb/gal formulations) + Permit 75 WG or Permit Plus** 32 oz/A + 1 oz/A or 0.75 oz/A.	Up to 14 days prior to planting.	Field must be free of standing water. Avoid glyphosate drift to corn. pH must be less than 8.0.
paraquat @ 0.625 lb/A	Emerged weeds.	**Paraquat (2 or 3 lb/gal formulations)** 40 or 26 oz/A. Add 0.25% v/v nonionic surfactant.	Use high rate on weeds larger than 2 inches.	Provides rapid desiccation of existing vegetation. Paraquat is sensitive to off-target movement; therefore, drift control is necessary. Refer to label for precautions and tank-mix instructions.
2,4-D amine @ 0.5 to 1 lb/A	Emerged broadleaf weeds.	**2,4-D** **Various formulations** 1 to 2 pt/A. Add 0.25% v/v nonionic surfactant.	See label for plant-back intervals.	Some plants are sensitive to off-target movement. Therefore, avoid drift. May be tank-mixed with Roundup.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Clearfield Rice System				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Red rice, barnyardgrass, broadleaf signalgrass, sprangletop, fall panicum, yellow nutsedge. Suppression of some aquatic broadleaf species.	**Newpath 2 AS** 4 to 6 oz/A ppi. Follow with 4 to 6 oz/A post-emergence. Add a nonionic surfactant to post-application. The 6-oz rate may provide longer residual from a single application. However, rates higher than 4 followed by 4 oz/A have not improved weed control when properly timed.	Preplant incorporated or preemergence followed by postemergence. Apply 4 oz/A preplant incorporated up to 7 days prior to planting or preemergence immediately following planting. Apply postemergence treatment when rice is in 3- to 5-leaf stage. Do not exceed 6 oz/A per application on conventional CL varieties and 4 oz/A per application on CL hybrids. Under cloudy, cool, wet conditions, Newpath may injure hybrid rice.	Use on Clearfield rice varieties only. Preferred method for soil application is preplant incorporated at the time of final seedbed preparation. Incorporate during final seedbed preparation pass. Flush for activation if rainfall does not occur within a few days of planting. Repeat flushing as needed to keep soil-applied treatment active. Tank mixing with propanil or other suitable products will be required for control of weeds such as hemp sesbania, northern jointvetch and eclipta. To prevent outcrossing between Clearfield rice and red rice, strive to achieve 100 percent red rice control, allowing no escapes. Avoid post applications to hybrids when cool temperatures persist. **The University of Arkansas recommends growing Clearfield rice in the same field only one year in a row. Conventional rice varieties cannot be planted the year following Clearfield rice due to carryover of the Newpath injuring the conventional rice.**
Sequential Post Program				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Same as above. Suppression of sprangletop. Improved control of barnyardgrass and red rice on heavy clays and reduced/no-till or chicken litter fields.	**Newpath 2 AS** 4 to 6 oz/A followed by 4 to 6 oz/A. Add nonionic surfactant at 0.25% v/v.	4 oz/A on 1-leaf to 2-leaf red rice followed by 4 oz/A approximately 14 days later.	Same as above. A soil-applied herbicide, such as Command, should be used for sprangletop control and to aid in the control of annual grass. Most aquatic suppression will be lost, so be prepared to make appropriate tank-mixtures.
imazethapyr/quinclorac @ 0.063 + 0.30 lb/A followed by imazethapyr @ 0.063 to 0.095 lb/A	Same as above with improved barnyardgrass, hemp sesbania and northern jointvetch control.	**Clearpath followed by Newpath** 0.5 lb/A followed by 4 to 6 oz/A. Add 1% v/v crop oil concentrate with Clearpath on enhanced tolerance varieties.	Preemergence followed by postemergence or same as above.	Same as above. See Facet Restrictions and Precautions.
imazamox @ 0.04 lb/A	Late-season suppression of red rice.	**Beyond 1 AS** 5 oz/A. Surfactant or crop oil concentrate required.	After Newpath or Clearpath has been applied. Apply to red rice prior to seedhead emergence. **Apply to conventional Clearfield rice no later than 14 days past panicle initiation. Apply to hybrid Clearfield rice no later than panicle initiation.**	Late application of Beyond may help prevent red rice outcrossing with Clearfield rice varieties. Do not apply more than 10 ounces per year.

In order to prevent the development of ALS-resistant barnyardgrass, the University recommends using an additional barnyardgrass herbicide with a different mode of action (see table on pages 91-92).

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE [cont.]				
Preplant Non-incorporated [Water Seeded Rice Only]				
thiobencarb @ 4 lb/A	Red rice.	**Bolero 8E** 4 pt/A.	After final seedbed preparation.	Flood within 2 to 3 but no sooner than 1 day after Bolero application. If pin-point flood management is used, reflood within 3 to 5 days to prevent loss of Bolero. **Use pregerminated seed.** **Severe injury has occurred in some cases with this recommendation. Contact company for full instructions before using.**
Preemergence [Dry Seeded Rice Only]				
quinclorac @ 0.25 to 0.5 lb/A	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, northern jointvetch.	**Facet 75 DF or Facet L** 0.33 to 0.67 lb/A or 22 to 43 oz/A **Facet DF rate by Soil Type** Coarse (sand) 0.33 — Medium 0.5 — Fine (clay) 0.67 After planting. **Facet L rates** Coarse (sand) 22-28 oz/A — Medium 32 oz/A — Fine (clay) 43 oz/A	Apply to smooth seedbed with rice seed covered by soil. Rice seed exposed to the spray may be severely injured. Use the lower rate on sandy soils; use the higher rate on clays.	**Tomatoes and cotton are extremely sensitive to Facet.** For more consistent results, follow the Delayed Preemergence instructions below. If weeds emerge after application, rainfall or flushing may be required for activation and reactivation. Fields treated with Facet should be scouted for smartweed, nutsedge and sprangletop and treated if necessary. Common purslane will not be controlled by Facet. However, it should be controlled by the flood.
clomazone @ 0.3 to 0.6 lb/A or glyphosate + clomazone @1 lb/A + 0.3 to 0.6 lb/A or paraquat + clomazone @ 0.625 + 0.3 to 0.6 lb/A or quinclorac + clomazone @ 0.25 to 0.5 + 0.3 to 0.6 lb/A or quinclorac + clomazone @ 0.25 + 0.25 to 0.5 + 0.5 lb/A	Barnyardgrass, broadleaf signalgrass, sprangletop and other annual grasses.	**Command 3 ME** 0.8 to 1.6 pt/A. Medium (Silt Loam) 0.8 to 1.1 pt/A — Fine (Clay) 1.3 to 1.6 pt/A Research has shown very little difference in grass control among rates within each soil type. or **Glyphosate (4 lb/gal formulations) + Command** or **Paraquat (3 lb/gal formulations) + Command 3 ME** or **Command 3 ME + Facet** or **Obey 2.5L** 26 to 52 oz/A.	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. **Injury may increase with lower seeding rates**. May be used in conventional, stale seedbed and no-till culture. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. **Using less glyphosate can result in failure due to tank mix antagonism.** *Add Permit or Permit Plus for emerged sedges.	If grasses emerge after application, rainfall or flushing may be needed for activation and reactivation. Grasses may emerge white, however usually die off after emergence. **Application on newly cut ground can result in severe injury and stand loss.** Rice in low areas of the field, or where water is prone to stand, may show more injury. Fields treated with Command should be scouted for nutsedge and flatsedge species and other broadleaf weeds and treated if necessary. Command is not a stand-alone herbicide. It should be used in a herbicide program to control these species. Scout carefully for escaped grasses prior to flooding. Do not exceed 0.8 lb ai/A per year of clomazone. Command plus glyphosate can be applied up to 14 days prior to planting. However, sequential post grass herbicides may be needed due to shorter residual.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
clomazone @ 0.3 to 0.6 lb/A + imazosulfuron @ 0.304 lb/A	Grasses plus nutsedge and other broadleaves.	**Command 3 ME + League 75 WG** 0.8 to 1.6 pt/A + 6.4 oz/A.	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. May be used in conventional, stale seedbed and no-till culture. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. **Using less glyphosate can result in failure due to tank mix antagonism.**	Keep away from soybeans and ground to be planted to soybean. Do not exceed 6.4 oz League per season. May carry over to soybean on very high pH soils.
Delayed Preemergence [Dry Seeded Rice Only]				
thiobencarb @ 4 lb/A	Sprangletop, barnyardgrass and aquatic weeds.	**Bolero 8E** 4 pt/A.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. Rice seed must have imbibed its germination water prior to application.	Bolero delayed preemergence will usually require follow-up treatment for complete grass control prior to flooding. Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain surface water before application. Rainfall or flush required for activation if soil begins to crack or if grass begins to germinate. Does not control broadleaf signalgrass. If barnyardgrass or sprangletop has emerged, use tank mix with propanil.
quinclorac @ 0.25 to 0.5 lb/A	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, northern jointvetch.	**Facet 75 DF or Facet L** 0.33 to 0.67 lb/A or 22 to 43 oz/A. Add 1 qt/A crop oil concentrate if weeds have emerged. Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting.	Apply before or after rain or flushing. Rice seed that is exposed to the spray may be severely injured. Best weed control is obtained if soil surface is smooth and wet, especially on clays.	If weeds emerge after application, rainfall or flushing may be required for activation and reactivation. Fields treated with Facet should be watched for smartweed, nutsedge and sprangletop and treated if necessary. Common purslane will not be controlled by Facet. However, it should be controlled by the flood. **Tomatoes and cotton are extremely sensitive to Facet drift.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Delayed Preemergence [Dry Seeded Rice Only] [cont.]				
quinclorac + thiobencarb @ 0.25 to 0.5 + 3 to 4 lb/A	Barnyardgrass, broadleaf signalgrass, sprangletop, morningglory, hemp sesbania, northern jointvetch.	**Facet 75 DF + Bolero 8E** 0.33 to 0.67 lb/A + 3 to 4 pt/A. Research has shown 2 pt/A Bolero effective if sprangletop is only target weed for the Bolero in this mixture, and sprangletop density is light.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. May be applied early postemergence later than Bolero applied alone. Rice seed exposed to the spray may be severely injured. Rice seed must have imbibed germination water prior to application.	Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain surface water before application. Rainfall or flush required for activation and reactivation if soil begins to crack or if grass begins to germinate. **Tomatoes and cotton are extremely sensitive to Facet drift.**
quinclorac + pendimethalin @ 0.25 to 0.5 + 1 lb/A	Barnyardgrass, broadleaf signalgrass, sprangletop, morningglory, hemp sesbania, northern jointvetch.	**Facet 75 DF + Prowl H_2O 3.8 CS** 0.33 to 0.67 lb/A + 2.1 pt/A.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. May be applied early postemergence later than Bolero applied alone. Rice seed exposed to the spray may be severely injured. Rice seed must have imbibed germination water prior to application.	Dry drill-seeded rice only. Apply to soil that has been sealed by rain or flush. Drain surface water before application. Rainfall or flush required for reactivation. This has been an excellent broad spectrum program in University trials. **Tomatoes and cotton are extremely sensitive to Facet drift.**
glyphosate + thiobencarb @ 1.0 + 4 lb/A	Emerged weeds, residual control of sprangletop, barnyardgrass, and aquatic weeds.	**Glyphosate (4 lb/gal formulations) + Bolero** 2 pt/A + 4 pt/A.	Same as above.	EMERGED RICE WILL BE KILLED.
pendimethalin @ 0.75 to 1 lb/A	Barnyardgrass, sprangletop, broadleaf signalgrass, crabgrass.	**Prowl H_2O 3.8 CS** 1.6 to 2.1 pt/A. Use low rate for sandy loam soils and high rate for all others.	Apply 1 to 5 days before emergence or about 5 to 9 days after planting. **DO NOT** apply preplant incorporated or immediately after planting. Rice seed must have imbibed germination water prior to application.	**Dry drill-seeded rice only.** Rice seed must have imbibed germination water. Apply after rain or flush to seal soil. If grass weeds have emerged, add propanil or follow with propanil.
pendimethalin + thiobencarb @ 1 + 3 lb/A	Barnyardgrass, sprangletop, broadleaf signalgrass, and suppression of aquatics.	**Prowl H_2O 3.8 CS + Bolero 8 EC** 2.1 + 3 pt/A.	Apply 1 to 5 days before rice emergence, usually about 5 to 9 days after planting. Rice seed must have imbibed its germination water prior to application.	This treatment is an option to consider in areas where drift to sensitive plantings is a problem.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Early Postemergence				
propanil @ 3 to 4 lb/A	Barnyardgrass (millet, blue-stem, watergrass), fall panicum, broadleaf signalgrass, hemp sesbania (coffeebean), northern jointvetch (curly indigo), spike rushes, flatsedges, giant foxtail, eclipta, false pimpernel, morningglory, volunteer milo, aquatics. (Refer to rating table for more detail.)	**4 lb Propanil Formulations** 3 to 4 qt/A.	Weed / In. / No. Leaves Barnyardgrass 1-4 1-4 Fall panicum 1-4 1-4 Broadleaf signalgrass 1-4 1-4 Sprangletop 1/2 1-2 Morningglory 3 2-3 Ducksalad 1 2 Redstem 1 2-4 Smartweed 2 2-4 Volunteer milo 5 4-6 Northern jointvetch 6 -- Hemp sesbania 12 -- Use 4 lb rate if 4-leaf barnyardgrass is present or on larger stages of weeds listed above.	Dry- or water-seeded rice. Weed foliage must not be covered with water at time of application. Repeat treatment if necessary. Two applications 5 to 7 days apart will be necessary for hard-to-kill weeds such as smartweed, volunteer milo or sprangletop.
Barnyardgrass from some fields in Arkansas has been shown to be resistant to propanil, Command, Facet and ALS (Newpath, Regiment, etc.) herbicides. (See Weed Resistance to Herbicide, pages 11 and 12.)				

GENERAL INFORMATION FOR PROPANIL: Avoid drift to susceptible crops. NOTE: Under certain conditions propanil drift to cotton fields before crop emergence can cause injury after emergence. Soybeans are very sensitive to propanil drift. Apply 10 gallons spray mixture for aerial spraying or 15 to 20 gallons for ground spraying. Flush and drain the fields 2 to 3 days before applying propanil to improve weed control if the field is dry and grass is growing slowly. Shallow flood field starting 24 hours after treatment and complete within 4 days after treatment to prevent grass reinfestation. Rice may turn yellow but recovers quickly. When applied during prolonged periods of high temperatures (100°F or above), seedling rice may be severely injured or killed.

Preferred cutoff date is ½-inch internode elongation. The absolute cutoff date is 56 days prior to harvest. The actual dates are provided in the DD50 program.

NOTE: Adding surfactants, petroleum oils, vegetable oils or other additives does not increase efficacy of EC propanil formulations.

DO NOT (a) mix with insecticides, (b) apply within 14 days before or after applying ethyl parathion or carbaryl (Sevin) or anytime after applying carbofuran (Furadan), (c) apply within 7 days before or after methyl parathion, EC or encapsulated formulations, (d) exceed 6 lb/A per application or 8 lb/A per season, (e) apply when rain is expected within a 12-hour period, (f) apply during cool weather (low night temperatures below 50°F and high daytime temperatures below 70°F).

clomazone @ 0.3 to 0.6 lb/A + cyhalofop @ 0.28 lb/A or fenoxaprop @ 0.11 lb/A or propanil @ 3 to 4 lb/A or	Barnyardgrass and other annual grasses. Certain broadleaf weeds.	**Command 3 ME** 0.8 to 1.6 pt/A. + **Clincher 2.38 EC** 15 oz/A. Add 1 qt/A of COC. or **Ricestar HT 0.58 EC** 24 oz/A. or **4 lb propanil formulations** 3 to 4 qt/A.	Prior to 3-leaf rice.	Apply to small, actively growing weeds. If soil moisture is low and the field is hard to flush, Facet is recommended as tank-mix partner with Command 3 ME.
quinclorac @ 0.25 to 0.5 lb/A	Adds residual jointvetch and hemp sesbania control.	**Facet 75 DF or Facet L (or substitute Obey 2.5L)** 0.33 to 0.67 lb/A or 22 to 43 oz/A. Add 1% v/v COC.		See Obey rates above (p. 96).
or penoxsulam @ 0.031 lb/A	Adds postemergence and 2 weeks residual control of hemp sesbania and rice flatsedge.	or **Grasp 2 SC** 2 oz/A. Add 1 qt/A crop oil concentrate or MSO.	Early postemergence.	In water-seeded rice, rice roots should be well established prior to application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE [cont.]				
Postemergence				
fenoxaprop @ 0.11 lb/A	Barnyardgrass, broadleaf signalgrass, fall panicum, loosehead sprangletop, seedling johnsongrass. Suppression of rhizome johnsongrass.	**Ricestar HT 0.58 EC** 24 oz/A.	Small, actively growing weeds.	Excellent soil moisture is critical for good activity. Tank mixing with broadleaf and sedge herbicides can result in loss of grass activity. The greatest antagonism has been observed with Aim and Permit. This treatment is most effective on small, actively growing grasses. It is not an effective salvage herbicide.
quinclorac + cyhalofop @ 0.25 lb/A + 0.28 lb/A	Barnyardgrass, sesbania, eclipta and johnsongrass.	**Facet 75DF + Clincher 2.38 EC** 0.33 lb/A + 15 oz/A. Add 1 qt/A of COC.	Small, actively growing weeds.	Do not drift on cotton or tomatoes. Follow State Plant Board recommendations. Excellent soil moisture is needed for good activity. Do not add Facet if sprangletop is present.
quinclorac + fenoxaprop @ 0.25 lb/A + 0.11 lb/A	Annual grasses, sesbania, eclipta, and johnsongrass.	**Facet 75 DF + Ricestar HT 0.58 EC** 0.33 lb/A + 24 oz/A.	Small, actively growing weeds.	Do not drift on cotton or tomatoes. Follow State Plant Board recommendations.
propanil + bensulfuron methyl @ 3 to 4 lb/A + 0.028 to 0.038 lb/A	Yellow nutsedge, rice flatsedge, morninglories, hemp sesbania, northern jointvetch, redstem eclipta.	**Propanil (4 lb/gal) + Londax 60DF** 3 to 4 qt/A + 0.75 to 1 oz/A. Use 0.5 oz/A if applying sequentially with propanil. or **Duet 4.03 EC** 3 to 4 qt/A. **For increased control of nutsedge, add 0.25 oz/A of Permit.**	Apply 1 to 7 days prior to establishment of permanent flood.	For best results, maintain permanent flood and keep water as static as possible.
halosulfuron @ 0.047 lb/A	Yellow nutsedge, flatsedge and hemp sesbania. May be used for late-season seedhead suppression of northern jointvetch and hemp sesbania.	**Permit or Halomax 75 WG** 1 oz/A. Add a nonionic surfactant or crop oil concentrate.	Apply to emerged weeds from prior to rice emergence until 48 days prior to harvest.	Aerial or ground application. Avoid drift to non STS/BOLT soybeans. Do not apply within 48 days of harvest.
halosulfuron + thifensulfuron @ 0.031 + 0.004 lb/A	Same as Permit with better control of smartweed and other broadleaf weeds.	**Permit Plus 75 WG** 0.75 oz/A. Add 1% crop oil concentrate.	Apply to emerged weeds from prior to rice emergence until 48 days prior to harvest.	Aerial or ground application. Avoid drift to non STS/BOLT soybeans. Do not apply within 48 days of harvest.
orthosulfamuron @ 0.065 lb/A	Hemp sesbania, flatsedge and northern jointvetch. May be used for late-season seedhead suppression of northern jointvetch and hemp sesbania.	**Strada 50 WG** 2.1 oz/A. Add surfactant.	From early postemerge until after permanent flood is established	Apply in a tank mix with propanil, Command or Newpath for best results. Do not apply past ½-inch internode.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
propanil + halosulfuron @ 3 to 4 lb/A + 0.031 to 0.063 lb/A	Yellow nutsedge, flatsedges, morninglories, eclipta, hemp sesbania and northern jointvetch.	**Propanil + Permit** 3 to 4 qt/A or equivalent + 0.67 to 1 oz/A Permit.	Apply to emerged weeds. Follow any Permit and propanil restrictions.	See propanil or Permit above.
propanil + thiobencarb @ 3 + 3 lb/A	Barnyardgrass, sprangletop, broadleaf signalgrass, flatsedge and aquatic weeds. (Refer to rating table for more detail.)	**Propanil + Bolero 8E** 3 qt/A + 3 pt/A. or **RiceBeaux 6 SC** 4 qt/A.	Refer to above table (p. 99) on propanil for optimum timing according to weed size. **If rice is water seeded, apply only after rice is well rooted and usually in the 2-leaf stage. Best results if applied prior to 3-leaf rice.**	Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain any flood or surface water from field. Rainfall or flush will be needed for activation if soil begins to crack or weeds begin to germinate. Provides up to 3 weeks residual.
propanil + thiobencarb @ 3 + 3 lb/A fb propanil + bentazon @ 1 + 0.75 lb/A	**ALS-resistant sedges.**	**RiceBeaux fb propanil + Basagran** 4 qt fb 1 qt + 1.5 pt/A.	Apply RiceBeaux at 1- to 2-leaf rice fb propanil + Basagran on 4-inch sedges.	Best option for Permit-resistant nutsedge.
propanil + thiobencarb fb propanil + thiobencarb @ 2 to 3 + 2 fb 2 to 3 + 2 lb/A	Same as above.	**Propanil + Bolero** 2 to 3 qt/A + 2 pt/A followed by 2 to 3 qt/A + 2 pt/A.	Time first application according to early propanil timing above. Repeat the application immediately prior to flooding.	See above comments. In addition, this treatment will provide an extended period of residual control often needed with semi-dwarf rice varieties.
propanil + pendimethalin @ 3 to 4 lb/A + 0.75 to 1 lb/A	Same as above.	**Propanil + Prowl H_2O 3.8 CS** 3 to 4 qt/A + 2.1 pt/A.	Apply to rice in spiking to 3-leaf stage. Refer to table (p. 99) for propanil for optimum timing according to weed size.	Dry-seeded rice only. Soil should be sealed by rain or flush. Drain any surface water. Rainfall will be needed for activation. Gives residual control up to 2 weeks. Residual control from Prowl reduced after flooding, flushing or several days of heavy rainfall.
quinclorac + propanil @ 0.25 to 0.5 + 3 to 4	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, northern jointvetch.	**Facet 75 DF + Propanil** 0.33 to 0.67 lb/A + 3 to 4 qt/A.	Apply to small, actively growing weeds. Follow adjuvant recommendation on label for propanil formulation used.	Rainfall or flushing may be required for activation or reactivation. Fields treated with Facet should be scouted for smartweed, nutsedge and sprangletop and treated if necessary. **Tomatoes and cotton are extremely sensitive to Facet drift.**
bispyribac @ 0.02 to 0.032 lb/A	Barnyardgrass, smartweed, ducksalad and johnsongrass.	**Regiment 80 WP** 0.4 to 0.63 oz/A. See label for approved surfactants. Must use proper adjuvants.	From 4-leaf rice to joint movement. **Do not apply past joint movement.**	May cause root pruning and stunting, especially if higher than labeled rates are applied. Studies have shown that the addition of UAN liquid fertilizer can improve weed control.
penoxsulam @ 0.031 to 0.036 lb/A	Ducksalad, rice flatsedge, barnyardgrass, jointvetch and hemp sesbania. May be used for late-season seedhead suppression of northern jointvetch and hemp sesbania.	**Grasp 2 EC** 2 to 2.3 oz/A. Add 1 qt/A crop oil concentrate or methylated seed oil.	Apply early postemergence. Make only 1 application per year. *Water-seeded rice should be well-rooted prior to application. Do not apply within 60 days of harvest.	May cause root pruning and stunting, especially if higher than labeled rates are applied. Avoid high pH soils (>7.8) and soils with salt-related problems. Delay flooding for 3 days after application.
penoxsulam + triclopyr @ 0.03 to 0.035 lb/A + 0.26 to 0.29 lb/A	Barnyardgrass, rice flatsedge, morninglories, pigweed, ducksalad, dayflower, hemp sesbania, jointvetch, eclipta, smartweed and other broadleaf weeds.	**Grasp Xtra** 16 to 18 fl oz/A. Use of COC or MSO at 1 qt/A recommended.	From 2- to 3-leaf rice to ½-inch internode.	Avoid high pH soils (>7.8) and soil with salt-related problems. Clearfield varieties/hybrids have slightly higher tolerance compared to non-Clearfield varieties/hybrids. Delay flooding for 3 days after application to dry soil.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Postemergence [cont.]				
saflufenacil @ 0.022 lb/A	Pigweed and other broadleaf weeds.	**Sharpen** 1 oz/A +1% v/v COC.	2- to 3-leaf rice. Up to PI. Do not apply earlier than fully emerged second leaf.	Increased crop injury will occur under high soil moisture conditions and when applications are made prior to dew drying. Do not use MSO in crop. Avoid excessive tank mixes.
orthosulfamuron @ 0.053 to 0.065 lb/A	Hemp sesbania, flatsedge and northern jointvetch.	**Strada 50 WG** 1.7 to 2.1 oz/A. Add surfactant.	Apply to emerged weeds from prior to rice emergence until after permanent flood establishment.	Apply in a tank mix with propanil, Command or Newpath for best results. Do not apply past ½-inch internode.
orthosulfamuron + halosulfuron @ 0.055 to 0.066 + 0.0155 to 0.0186 lb/A	Yellow nutsedge, hemp sesbania, flatsedge and northern jointvetch.	**Strada PRO 54 WG** 2.08 to 2.5 oz/A. Add surfactant.	Apply to emerged weeds from prior to rice emergence until after permanent flood establishment.	Apply in a tank mix with propanil, Command or Newpath for best results. Do not apply past ½-inch internode.
orthosulfamuron + quinclorac @ 0.0406 to 0.0625 + 0.2438 to 0.375 lb/A	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, flatsedge and northern jointvetch.	**Strada XT^2 70 WG** 6.5 to 10 oz/A. Add surfactant.	Apply before or after rain or flushing. Rice seed exposed to spray may be severely injured. Best weed control is obtained if soil surface is smooth and wet, especially on clays.	If weeds emerge after application, rainfall or flushing may be required for activation and reactivation. Fields treated with Strada XT^2 should be watched for smartweed, nutsedge and sprangletop and retreated if necessary. Tomatoes and cotton are extremely sensitive to Strada XT^2 drift.
Early Postemergence [Specialty Use]				
propanil + bentazon @ 3 to 5 lb/A + 3/4 lb/A	Barnyardgrass, smartweed, cocklebur, redstem, yellow nutsedge, flatsedge, dayflower and spikerush.	**Propanil + Basagran** 3 to 5 qt/A + 1½ pt/A. If grass weeds are not present, **Basagran alone** at 1½ to 2 pt/A will control broadleaf weeds such as cocklebur or smartweed. Refer to rating table for comparison.	Apply up to 6-inch broadleaf weeds on all except cocklebur (10 inches), redstem (4 inches), and nutsedge (4 to 6 inches). Propanil timing for grasses should be applied as for propanil alone.	Dry- or water-seeded rice. See general propanil and follow information on state label. No residual control. Control of yellow nutsedge erratic.
propanil + acifluorfen @ 3 lb/A + 0.2 lb/A	Morningglory, pigweed and hemp sesbania.	**Propanil + Ultra Blazer** 3 qt/A + 0.8 pt/A Ultra Blazer	When hemp sesbania is 1 to 5 feet and morningglory runners are less than 1 foot.	May cause tip burn on rice, but symptoms will be quickly outgrown. Do not apply more than 1 pt/A per season. The addition of Ultra Blazer reduces propanil activity on grasses. Do not apply past boot stage.
propanil + bentazon/acifluorfen @ 3 to 5 lb/A + 0.5 + 0.25 lb/A	Barnyardgrass, cocklebur, hemp sesbania, morningglory, redstem, smartweed and eclipta.	**Propanil + Storm** 3 to 5 qt/A + 1½ pt/A. (If grass weeds are not present, Storm alone will control broadleaf weeds such as cocklebur, morningglory and hemp sesbania.)	Apply to small, actively growing weeds, except cocklebur (10 inches), hemp sesbania (1 to 4 feet), and redstem (4 inches).	Dry- or water-seeded rice. No residual control. Storm contains the same active ingredient as in Ultra Blazer; therefore, reduced propanil activity on grasses may occur.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
propanil + triclopyr @ 3 to 4 + 0.125 to 0.25 lb/A	Barnyardgrass, morningglories, hemp sesbania, northern jointvetch, eclipta, pigweed, redstem and cocklebur.	**Propanil + Grandstand 3 SL** 3 to 4 qt/A + ½ to ⅔ pt/A. Surfactant not required when tank-mixing Grandstand and propanil. **If no grasses are present, the rate of propanil may be reduced to 1 to 2 qt/A.**	Apply after rice reaches 2- to 3-leaf stage, and before weeds exceed 6 inches in height. Use no more than ½ pt/A if applying to 2- to 3-leaf rice and up to ⅔ pt/A if after 4-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application.
carfentrazone @ 0.016 lb/A	Morningglories, hemp sesbania, groundcherry and smartweed.	**Aim 2 EC** 1.0 oz/A. Add a nonionic surfactant.	Apply after rice reaches 2-leaf stage to small, actively growing weeds. Avoid applications from flag leaf emergence through harvest aid applications.	Thorough mixing and excellent sprayer agitation required. Avoid drift to cotton. Can burn or speckle rice, especially if foliage is wet. Symptoms are cosmetic and quickly outgrown.
carfentrazone + quinclorac @ 0.016 to 0.02 + 0.19 to 0.25 lb/A	Barnyardgrass, morningglories, hemp sesbania, groundcherry and other grass and broadleaf weeds.	**Aim 2 EC + Facet 75 DF** 1 to 1.25 oz/A + 0.25 to 0.33 lb/A. Add crop oil concentrate at 1% v/v.	Apply after rice reaches 2-leaf stage.	See Aim and Facet precautions.
carfentrazone + halosulfuron @ 0.047 lb/A	Smartweed early, morningglories, sedges and other broadleaves.	**Aim 2 EC + Permit 75 WG** 1.0 oz/A + 1.0 oz/A. Add surfactant.	Apply after rice reaches 2-leaf stage.	Possible antagonism on hemp sesbania.
triclopyr + propanil @ 0.25 to 0.375 lb ai/A + 1 lb/A	Morningglories, jointvetch, cocklebur, alligatorweed, eclipta, redstem and sicklepod.	**Grandstand 3 SL + Propanil** 2/3 to 1 pt/A + 1 qt/A.	After rice reaches 3- to 4-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application.
triclopyr + acifluorfen @ 0.19 to 0.25 + 0.2 lb/A	Morningglories, jointvetch, hemp sesbania and cocklebur.	**Grandstand 3 SL + Ultra Blazer 2L** ½ to ⅔ pt/A + 0.8 pt/A. NIS required with tank mix.	Apply after rice reaches 2- to 3-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application. **Do not apply past ½ inch internode.**
triclopyr + halosulfuron @ 0.25 lb ai/A + 0.031 to 0.063 lb/A	Morningglories, jointvetch, hemp sesbania, cocklebur and nutsedge.	**Grandstand 3 SL + Permit 75 WG** 0.67 pt/A + 0.67 to 1 oz Permit.	From 2-leaf stage until after field is flooded.	Same as above. Do not apply within 48 days of harvest.
Postemergence [After Flooding]				
cyhalofop @ 0.28 lb/A	Barnyardgrass, fall panicum and other annual grasses.	**Clincher 2.38 EC** 15 oz/A + 1 qt/A of COC or MSO.	Do not apply within 60 days of harvest. Apply to grasses in shallow flood. Best results have been achieved when applications are made no later than 7 days after flooding with 70% of the foliage exposed.	**Do not apply within 60 days of harvest.** Maintain flood after application. Do not tank-mix with broadleaf herbicides. (Later than 7 days after flood, **adding 0.25 to 0.50 lb/A of Facet will improve control and consistency.**) In salvage situations, 15 oz/A of Clincher can be followed by 10 oz/A of additional product. Apply approximately 10 days apart, preferably in an alternative spray pattern. Do not use more than 25 oz per year. Do not add Facet if sprangletop is present.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Postemergence [After Flooding] [cont.]				
penoxsulam @ 0.044 lb/A	Suppression of barnyardgrass, jointvetch, hemp sesbania, eclipta and rice flatsedge.	**Grasp 2 SC** 2.8 oz/A + 1 qt/A COC or MSO.	Apply 7 to 10 days after flood. Not a salvage treatment.	At least 70% of target weed should be exposed (above flood). Good coverage is essential. Do not apply within 60 days of harvest.
quinclorac @ 0.375 lb/A + propanil @ 4 lb/A	Salvage barnyardgrass and broadleaf signalgrass.	**Facet 75 DF + Propanil** 0.5 lb/A + 4 qt/A + COC 1% v/v.	Apply to barnyardgrass before rice heads to desiccate barnyardgrass to minimize lodging and open up the canopy.	Broadcast aerially in 5 gallons of spray mixture to flooded field. An application of 20 to 30 lb/A of nitrogen 4 to 7 days later will stimulate rice recovery. NOTE: the newer formulations of Liquid N have less free ammonia than in early years. This often results in less effectiveness. Grower's risk treatment. Do not apply within 40 days of harvest.
penoxsulam + cyhalofop @ 0.031 to 0.039 lb/A + 0.22 to 0.28 lb/A	Barnyardgrass, fall panicum, ducksalad, rice flatsedge, dayflower, eclipta and suppression of other broadleaf weeds.	**Rebel EX** 16 to 20 fl oz/A. Use of COC or MSO at 1 qt/A recommended.	Emergence to 60 days preharvest.	Delay flooding for 3 days if applied to dry soil.
GENERAL INFORMATION ON PHENOXY HERBICIDE. **Follow State Plant Board Regulations.** Drain field or lower flood sufficiently to expose weeds to herbicides before treatment. Phenoxy herbicides are hazardous to cotton and soybeans. AVOID DRIFT. Cotton is extremely sensitive to 2,4-D and MCPA. Rain 1 to 6 hours after treatment may reduce effectiveness. Do not apply nitrogen during the 7 to 21 days before phenoxy herbicide application, since the nitrogen stimulates the rice plant growth, making it more susceptible to phenoxy treatment injury. **Note: Not all brands of 2,4-D and MCPA are labeled for use on rice. Choose a brand labeled for the intended use.**				
bensulfuron methyl @ 0.0375 to 0.063 lb/A	Ducksalad, redstem, eclipta, false pimpernel, gooseweed, dayflower, flatsedge, water hyssop, arrowhead and emerged yellow nutsedge.	**Londax 60 DF** 1 to 1.67 oz/A. Add 1% crop oil concentrate for emerged weeds.	For aquatics, apply within 5 days after flooding when target weeds are small and maintain flood at least 7 days. For water-seeded rice, apply as soon as possible after rice has pegged and flood stabilized. For emerged yellow nutsedge, when leaves are 3 to 4 inches above water surface.	Londax is highly water soluble, which requires non-moving water. Avoid pumping for 7 days after treatment, if possible. Activity is slow. Most consistent results are obtained on aquatics before or just at emergence.
2,4-D amine @ 1 to 1.5 lb/A	Broadleaf and aquatic weed control. Refer to rating table.	**2,4-D amine** 2 to 3 pt/A of 4 lb/gal.	Apply at correct DD50 threshold or when the first elongating internode begins movement to ½ inch long. Do not apply when internode exceeds ½ inch.	If rice injury occurs, apply 20 to 30 pounds of nitrogen within 5 days after phenoxy herbicide treatment. Apply additional nitrogen 10 to 14 days after the recommended mid-season stage for the variety. For specific nitrogen rates and timing, consult your county Extension agent. If for some reason nitrogen is applied first, a phenoxy herbicide can be safely applied 5 days after the nitrogen application, providing the first elongating internode is not longer than ½ inch. **Application of 2,4-D is restricted in some counties.**
acifluorfen @ 0.125 to 0.25 lb/A	Hemp sesbania (coffeebean).	**Ultra Blazer 2L** ½ to 1 pt/A. Add a surfactant.	When hemp sesbania is 1 to 5 feet tall. See DD50 program for specific begin and end dates.	**Do not apply past the boot stage of rice.** May cause tip burn on rice, but symptoms will be quickly outgrown. Do not apply more than 1 pt/A per season.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
triclopyr + propanil @ 0.25 + 1 lb/A	Morninglories, hemp sesbania and northern jointvetch.	**Grandstand 3 SL + Propanil** ⅔ pt/A + 1 qt/A. Surfactant not required when tank-mixing with propanil.	Apply prior to ½" internode elongation. See DD50 program for details.	For the midseason applications, research has shown significant yield reductions when applied soon after ½ inch internode elongation. Also, make sure flood water covers soil surface and root area of plants. Note: This is in contrast to the recommendation for the early season application.
Colletotrichum gloeosporioides f sp. aeschynomene	Northern jointvetch (curly indigo).	**LockDown** 75 billion spores/A. See label for specific instructions.	Apply when northern jointvetch averages 8 to 24 inches tall and when plants have emerged through rice canopy. See DD50 printout for specific beginning and ending dates.	Expect slow results. Special sprayer cleanup and mixing instructions must be used. Refer to LockDown label for details. Late application near blooming stage of northern jointvetch may not allow enough time to prevent seed production or kill weeds before harvest. Does not control Indian jointvetch. Do not apply Benlate within 14 days before or after a LockDown application. If possible, do not apply Quadris, Tilt or Moncut within 14 days of LockDown, but applications down to 7 days before or after Lockdown likely will not reduce overall effectiveness. Very late afternoon to early evening or just prior to rainfall are optimal for application.
propanil + 2,4-D @ 3 to 4 lb/A + 0.75 to 1.25 lb/A	Barnyardgrass, broadleaf and aquatic weeds on levees.	**Propanil + 2,4-D** 3 to 4 qt/A + 1.5 to 2.5 pt/A.	Apply at correct DD50 date or when the first elongating internode begins movement to ½ inch long. Do not apply when internode exceeds ½ inch.	Use 5 gpa by air and 10 to 20 gpa by ground. **Grower's risk treatment (see inside cover for explanation). Application of 2,4-D is restricted in some counties.** Follow all phenoxy regulations.
propanil + acifluorfen @ 3 to 4 lb/A + 0.25 lb/A	Barnyardgrass, broadleaf and aquatic weeds on levees.	**Propanil + Ultra Blazer 2L** 3 to 4 qt/A + 1 pt/A.	See DD50 printout for specific beginning and ending dates.	Less effective than propanil + 2,4-D, but is safer to use when cotton is grown nearby. Reduced activity on morninglories with runners greater than 1 foot.
propanil + bentazon/acifluorfen @ 3 to 4 lb/A + 0.5 + 0.25 lb/A	Barnyardgrass, cocklebur, hemp sesbania, morningglory, redstem, smartweed, dayflower and eclipta.	**Propanil + Storm** 3 to 5 qt/A + 1½ pt/A. [If grass weeds are not present, Storm alone will control broadleaf weeds such as cocklebur, morningglory and hemp sesbania.]	See DD50 printout for specific beginning and ending dates.	Less effective than propanil + 2,4-D, but is safer to use when cotton is grown nearby. Reduced activity on morninglories with runners greater than 1 foot.
triclopyr + propanil @ 0.25 + 4 lb/A	Jointvetch, barnyardgrass and other broadleaves.	**Grandstand + Propanil** ⅔ pt + 4 qt/A.	See Grandstand.	See Grandstand restrictions.
carfentrazone + propanil @ 0.016 + 4 lb/A	Pigweeds, morninglories and other broadleaves.	**Aim 2 EC + Propanil** 1.0 oz + 4 qt/A.	When pigweeds are 2 inches tall.	See Aim and propanil restrictions.
carfentrazone + quinclorac @ 0.016 + 0.375 lb/A	Groundcherry, morningglory and other broadleaf weeds.	**Aim 2 EC + Facet 75 DF** 1.0 oz + 0.5 lb/A.	Less than 6-inch weeds on levees.	See Aim and Facet restrictions.
halosulfuron @ 0.63 or halosulfuron + thifensulfuron @ 0.031 + 0.004 lb/A	Hemp sesbania and jointvetch.	**Halomax/Permit or Permit Plus 75 WG** 1.33 or 0.75 oz/A.	48 day PHI.	Suppression only.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions

Levee Application

LEVEE WEED CONTROL (LARGER WEEDS)*

		Grasses					Broadleaf Weeds								
HERBICIDES	Herbicide Family	Barnyardgrass	Bermudagrass	Broadleaf Signalgrass	Crabgrass	Foxtail sp.	Entire/Ivyleaf Morningglory	Groundcherry	Hemp Sesbania (coffeebean)	Northern Jointvetch	Palmer Amaranth	Palmleaf Morningglory	Prickly Sida (Teaweed)	Sicklepod	Smartweed
Clincher	1	7	3	6	0	6	0	0	0	0	0	0	0	0	0
Ricestar	1	6	2	4	3	8	0	0	0	0	0	0	0	0	0
Beyond	2	7	0	7	4	4	4	3	0	0	0	4	4	0	6
Grasp	2	7	2	0	0	-	6	-	5	7	-	4	0	5	5
Permit	2	0	0	0	0	0	5	0	8	6	0	3	2	5	6
Permit Plus	2	0	0	0	0	0	6	0	8	7	0	4	3	5	8
Strada	2	0	0	0	0	-	3	-	5	5	0	-	-	4	0
Regiment	2	8	0	0	0	-	4	-	7	7	-	0	2	6	9
2,4-D	4	0	0	0	0	0	8	6	9	5	8	9	9	9	9
Facet	4	6	0	5	3	4	6	6	7	5	0	5	4	3	7
Grandstand	4	0	0	0	0	0	9	5	9	9	4	9	3	6	7
Basagran	6	0	0	0	0	0	4	2	2	0	0	4	4	0	5
Propanil	7	6	4	6	3	0	4	3	9	8	6	3	2	4	7
Aim	14	0	0	0	0	0	8	3	6	3	3	8	2	3	7
Sharpen	14	0	0	0	0	0	9	7	8	8	8	8	6	6	-
Ultra Blazer	14	0	0	0	0	0	7	3	9	0	4	6	2	0	6

*For good levee broadleaf weed control, a combination of products is needed, especially where 2,4-D cannot be used. Applying Facet or other residuals prior to weed emergence is recommended in 2,4-D-restricted areas. **Ratings based on maximum use rates.**

Preharvest

sodium chlorate @ 6 lb/A	Desiccating green weed foliage.	**Sodium Chlorate** Several brands and trade names are available. 2 gal/A of 3 lb/gal or 1 gal/A of 6 lb/gal.	When average moisture is 25% or below.	See label for details. **Harvest within 5 days after application to prevent overdrying, and potential milling quality reduction.**
carfentrazone @ 0.025 lb/A	Morningglories.	**Aim 2 EC** 1.5 oz/A. Add 1% COC.	When average moisture is 25% or below.	Aim has a 3-day PHI. Can be tank-mixed with sodium chlorate.

Control of Common Weeds in Pastures

Read This First

These recommendations are based on results obtained in Arkansas field trials. In our research plots, broadcast applications are applied at 15 gal/A using a boom sprayer equipped with Spraying Systems 8002 flat fan nozzles on 20-inch spacing. We add 0.25% nonionic surfactant to the spray mix. **Use a boom sprayer when precise application is critical.** Boomless nozzles (Boom Buster, Boominator, Boomjet, etc.) are not as accurate as a boom sprayer. When making broadcast herbicide applications, use a water volume between 10 and 40 gal/A. In our individual plant treatment brush trials, soil spot treatments are applied with a Spraying Systems Meterjet applicator. Leaf spraying is done with a Conejet 5500 X-6 or X-8 nozzle. Basal bark and stump applications are done with a Conejet 5500 X-2 nozzle using commercial basal oil.

Banvel, Cimarron Plus, Cimarron Max, Clarity, Grazon P+D, GrazonNext HL, metsulfuron 60 DF, PasturAll, PastureGard HL, Remedy Ultra, Surmount, Tordon 22K and Weedmaster will kill all clover. White clover has some tolerance for 2,4-D amine at rates up to 1 lb ai/A. Other clovers (red, crimson, arrowleaf, etc.) do not.

Metsulfuron 60 DF, Pastora, Chaparral and Cimarron Plus are intended for use in bermudagrass. They will damage tall fescue, ryegrass and bahiagrass.

Bahiagrass (*Paspalum notatum*)

This recommendation is for use in established bermudagrass to control 'Pensacola' bahiagrass. In late May, apply 60 DF metsulfuron or Cimarron Plus at 0.5 to 1 oz/A plus 0.25% surfactant. Make a second application three to four weeks later. It is important to follow up the herbicide application with a fertility program to encourage the bermudagrass growth. Metsulfuron is safe on bermudagrass and has no grazing or haying restrictions. Metsulfuron also controls many broadleaf weeds and some brush species. Chaparral and Pastora contain metsulfuron and will control bahiagrass.

Bitterweed (*Helenium autumnale*)

Spray bitterweed before it flowers. Bitterweed is readily controlled with 2,4-D amine at 1 to 2 pt/A applied in May or early June. Cimarron Plus, metsulfuron 60 DF, Grazon P+D, GrazonNext HL and Dicamba + 2,4-D also control bitterweed.

Blackberry and Dewberry (*Rubus* spp**)**

Use metsulfuron 60 DF or Cimarron Plus at 0.5 to 1 oz/A plus 0.25% nonionic surfactant. Apply in May or June while blackberry and dewberry are actively growing. Remedy Ultra at 3 pt/A applied during or after bloom has been effective for blackberry and dewberry. Chaparral at 3.3 oz/A or Surmount at 2 qt/A are other options. Apply after fruit drop. Do not mow during the year of application. Regardless of treatment choice, plan on making a follow-up treatment the next year to control escapes.

Brush, Mixed

Apply a mixture of 0.25% Remedy Ultra plus 1% Grazon P+D as a leaf spray to individual plants. Add 0.25% v/v nonionic surfactant. Spray between May and October while brush is actively growing. Picloram-free combinations include GrazonNext HL + Remedy Ultra or Chaparral + PastureGard HL.

Buttercup (*Ranunculus* spp)

Spray buttercup in late February or early March before it flowers. This weed is easily controlled with 2,4-D amine at 1 to 2 pt/A. Metsulfuron 60 DF, Cimarron Plus, Grazon P+D, GrazonNext HL and dicamba + 2,4-D also control buttercup. In dormant bermudagrass, either glyphosate or paraquat will control buttercup at normal use rates.

Cedar, Eastern Red (*Juniperus virginiana*)

Apply undiluted Tordon 22K to the soil prior to periods of expected rainfall. Apply directly to the soil within the drip line and on the upslope side of the tree. Application to trees taller than 12 feet is not recommended. Apply 3 to 4 mls (ccs) per 3 feet of plant height in either spring (April-May) or fall (September-October). Soil spot treatments with Velpar are also effective on cedar less than 6 feet tall. Use a Spraying Systems Meterjet applicator or a livestock worming gun to apply a precise amount of the herbicide. DuPont offers a spot gun that will attach directly to the Velpar jug. Leaf sprays of Surmount or Tordon 22K will control cedar.

Crabgrass (*Digitaria sanguinalis*)

Glyphosate may be applied between cuttings to control crabgrass in established bermudagrass hayfields. Apply 4 to 8 fl oz/A of 3 lb/ae/gal glyphosate as soon as the hay is removed after cutting. Be warned that glyphosate should not be used in this manner unless bermudagrass stunting, yield reduction and possible stand reduction can be tolerated. Applications made after regrowth is well under way will result in increased damage to the bermudagrass. We have tested this practice many times, and the amount of bermudagrass injury is unpredictable. Injury ranged from almost none up to 50% stunting. 'Tifton 44' bermudagrass seems to be more susceptible to glyphosate damage. These rates are not effective on big sandbur and foxtail. Broadleaf signalgrass and barnyardgrass will be partially controlled. No waiting period is required between application and grazing or harvesting for feed.

Dallisgrass (*Paspalum dilatatum*)

There is a period in late fall to early winter when bermudagrass is dormant and dallisgrass remains green. During this time, 16 fl oz/A of 4 lb/gal glyphosate provides fair to good dallisgrass control. Bermudagrass injury varies. Timing and calibration are important. Once frost occurs, the bermudagrass should be checked frequently so that the application can be made as soon as it is completely dormant. If glyphosate products with higher concentrations are used, the rate should be adjusted.

Dogfennel (*Eupatorium capillifolium*)

Spray dogfennel when it is 6 to 12 inches tall. At this height, Grazon P+D or Weedmaster at 1 qt/A will give 90 to 100% control. Research has shown that Remedy Ultra (triclopyr) and PastureGard HL (triclopyr + fluroxypyr) are also highly effective for controlling dogfennel. PastureGard HL at 3 pt/A is the preferred treatment for dogfennel that is more than 3 feet tall.

Hemp Dogbane (*Apocynum cannabium*)

Surmount at 3 to 6 pt/A is the best treatment we have found for hemp dogbane. Apply when the weeds are 18 to 24 inches tall. Add 0.25% nonionic surfactant. In areas where picloram cannot be used, apply 2 qt/A Weedmaster + 1 oz/A metsulfuron 60 DF plus 0.25% nonionic surfactant. Another cheaper option is metsulfuron 60 DF at 1 ounce of product per acre plus 0.25% nonionic surfactant. Follow up next spring to control escapes.

Honeylocust (*Gleditisia triancanthos*)

Spray the leaves with a 1% solution of Remedy Ultra. Add 0.25% nonionic surfactant. Apply after full leaf-out when conditions are favorable for plant growth. Make a follow-up application the next spring.

Honeysuckle (*Lonicera* spp)

Metsulfuron 60 DF or Cimarron Plus at 1 oz/A provides excellent honeysuckle control. For individual plant treatment, add 1 ounce of product per 100 gallons of water and spray to wet. A 2% solution of 3 lb/ae/gal glyphosate or 4 lb/gal triclopyr, applied in the fall, also controls honeysuckle. Follow-up treatments will be needed.

Horsenettle (*Solanum carolinense*)

Grazon P+D (3 to 4 pt/A) or GrazonNext HL (2 pt/A) are good choices for horsenettle control. Time herbicide applications to occur between bloom and fruit set. Complete horsenettle control will not be achieved with a single herbicide application. Spray for three consecutive years to reach the 90 to 100% control range.

Horseweed (*Conyza canadensis*)

Spray horseweed when it is less than 12 inches tall. A properly timed application of Grazon P+D or Weedmaster at 1 qt/A will give 90 to 100% control. Metsulfuron 60 DF or Cimarron Plus at 0.5 oz/A will also provide 90 to 100% control.

Foxtail, Knotroot (*Setaria geniculata)*

Foxtail is a late-germinating summer grass that becomes obvious in July. One option is to apply 8 to 10 fl oz per acre of 4 lb/gal glyphosate as soon as the hay is off the field. Panoramic at 4 to 6 fl oz/A does a fair job of foxtail control if it is in the seedling stage. Add 0.25% nonionic surfactant. Control of large plants will be poor. Application timing will typically be from late May to early June. Panoramic (imazapic) will stunt bermudagrass. Damage varies, but the loss of one hay cutting is typical. Expect 30 to 45 days of bermudagrass suppression after application. Do not apply to drought-stressed bermudagrass. Do not apply during spring transition. Do not apply to newly sprigged or seeded bermudagrass or to Jiggs or World Feeder varieties.

Groundsel (*Senecio* spp)

Metsulfuron 60 DF or Cimarron Plus at 0.5 to 1 oz/A has proven to be the most effective herbicide for groundsel control. Apply in May. Add 0.25% nonionic surfactant. Grazon P+D at 2 to 3 qt/A provides partial control.

Johnsongrass (*Sorghum halepense*)

Use 1.33 oz/A of Outrider with 0.25% nonionic surfactant in 10 to 40 gallons of water per acre as a broadcast application. Apply to actively growing johnsongrass that is at least 18 to 24 inches tall and up to the heading stage. Weeds to be treated should not be mowed or grazed for two weeks before or after application. Bermudagrass may be harvested after the two-week period without any effect on Outrider performance. Weed response to Outrider is very slow. It may require up to one month for weeds to become brown. Tank mixing Outrider with herbicides formulated as amines (including 2,4-D) may decrease the effectiveness of Outrider on johnsongrass. For spot treatment, mix 1.33 oz/A of Outrider in 100 gallons of water with 0.25% nonionic surfactant. Apply this as a spray to wet application. Panoramic at 4 fl oz/A plus 0.25% nonionic surfactant will provide about 80% johnsongrass control. Panoramic will stunt bermudagrass. Damage varies, but the loss of one hay cutting is typical. Pastora is effective for johnsongrass control. See the label for instructions.

Maypop, Passion Flower (*Passiflora incarnata*)

Control data is scarce for maypop. One greenhouse study indicates that Remedy Ultra or 2,4-D amine at 2 qt/A will provide good initial control. Clarity at 1 pt/A also performed well in this trial. Expect regrowth the next year.

Oaks (*Quercus* spp)

It is possible to achieve partial control of some oak species using 2,4-D alone at 2 qt/A. Improved control can be achieved by using a mixture of 1% Grazon P+D plus 0.25% Remedy Ultra as an individual plant leaf spray. Add 0.25% nonionic surfactant. Basal bark treatments are very effective on oaks with stem diameters of 4 inches or less. Mix 1 quart Remedy Ultra with 3 quarts commercial basal oil and apply to the lower 18 inches of the stems with a Conejet 5500 X-2 nozzle.

Osage Orange (*Maclura pomifera*)

Apply 1% Remedy Ultra plus 0.25% surfactant as a leaf spray to individual plants. For Osage Orange with stems less than 4 inches in diameter, mix 1 quart Remedy Ultra with 3 quarts commercial basal oil and apply to the lower 18 inches of the stems with a Conejet 5500 X-2 nozzle. Agitate the mixture before spraying.

Palmetto, Dwarf (*Sabal minor*)

Apply a 4% solution of Remedy Ultra as an individual plant treatment. Add 0.25% v/v nonionic surfactant. Be patient.

Perilla mint (*Perilla frutescens*)

Grazon P+D at 1 qt/A or Weedmaster at 1 qt/A will control perilla mint. Apply in late May or early June when weeds are actively growing. Spray before the weeds are 12 inches tall. Add 0.25% nonionic surfactant to the spray mix. Bush hog large plants that have already formed flowers.

Persimmon (*Diospyros virginiana*)

Persimmon is one of the more difficult brush species to control. The most effective treatment is undiluted Tordon 22K applied to the soil as a spot concentrate prior to periods of expected rainfall. Apply directly to the soil within the drip line and on the upslope side of the tree. Application to trees taller than 12 feet is not recommended. Apply 2 to 4 mls (ccs) per inch of stem diameter in spring (April-May). Use a Spraying Systems Meterjet applicator or a livestock worming gun to apply a precise amount of the herbicide. A leaf spray using a 1% Surmount solution is less effective.

Pigweed (*Amaranthus* spp)

Pigweeds are prolific seed producers. Single plants are capable of producing thousands of seeds. Given adequate rainfall, pigweed seeds germinate throughout the summer. All emerged pigweed may be killed by a herbicide treatment only to be replaced by another flush of seedlings. Repeat applications will be needed for full-season control. Spray when the pigweeds are less than 12 inches tall. Cimarron Plus, metsulfuron 60 DF, Grazon P+D, GrazonNext HL and dicamba + 2,4-D, and 2,4-D amine all provide good control of seedling pigweed.

Plantain, Buckhorn (*Plantago lanceolata*)

Two proven treatments for buckhorn plantain are Grazon P+D at 1.5 qt/A or Cimarron Max at 1 qt/A + 0.25 oz/A. These products provided 90 to 100% control of buckhorn plantain. Add 0.25% nonionic surfactant to the spray mix. Apply in late May or early June when weeds are actively growing. Metsulfuron 60 DF or Cimarron Plus at 0.5 oz/A are also effective herbicides for this weed.

Poison Hemlock (*Conium maculatum*)

Spray poison hemlock when it is less than 18 inches tall and before it flowers. Grazon P+D and GrazonNext HL at 1 qt/A are very effective for poison hemlock control when applied in May or early June.

Pricklypear (*Opuntia* spp)

Employing individual plant treatment, spray pricklypear with a 1% Surmount solution plus 0.5% nonionic surfactant. Use of Hi-Lite Blue Dye will help avoid spraying the same plant twice and show the extent of the coverage on treated plants. Apply during active growth. Do not spray under desirable trees. Do not spray wet pads. Be patient, Surmount works very slowly. It may take one to three years for complete control.

Ragweed, Common and Lanceleaf (*Ambrosia* spp)

The key to effective ragweed control is spraying when the weeds are small (2 to 4 inches tall). Small ragweeds are readily controlled with 2,4-D amine at 1 qt/A. Grazon P+D, GrazonNext HL and Dicamba + 2,4-D also control ragweeds at 1 qt/A. Cimarron Plus and metsulfuron are not effective on ragweed.

Red Sorrel (*Rumex acetosella*)

Grazon P+D at 1 qt/A provides excellent control of red sorrel. Metsulfuron or Cimarron Plus at 0.5 oz/A is also very good. Treat anytime the red sorrel is actively growing. Remedy Ultra is not effective on red sorrel.

Rose, Wild (*Rosa* spp)

Spray the leaves with a 1% solution of Grazon P+D. Add 0.25% nonionic surfactant. Apply after full leaf-out when conditions are favorable for plant growth.

Ryegrass (*Lolium* spp)

Glyphosate must be applied in January or February while the ryegrass is small to achieve effective control in dormant bermudagrass. A good rule of thumb is waiting for the high to reach 50 degrees three days in a row. Glyphosate works very slowly in cold weather. Delaying application into March and April results in big ryegrass that is very difficult to control regardless of the rate applied. In two years of testing at six locations, we have gotten excellent ryegrass control with glyphosate at 1.0 lb/ai/A applied in January or February. Another important factor in ryegrass control is adequate spray coverage. Our research herbicides are applied with a boom sprayer at 15 gal/A using 8002 flat fan nozzles on 20-inch spacing.

Sandbur (*Cenchrus longispinus*)

Three options for early postemergence sandbur control include Pastora at 1.5 oz/A, Roundup Weathermax at 11 fl oz/A or Panoramic (imazapic) at 6 fl oz/A. Apply after the first hay cutting as soon as the hay is removed from the field. Add 0.25% nonionic surfactant. Panoramic will stunt bermudagrass. Damage varies, but the loss of one hay cutting is typical. Expect 30 to 45 days of bermudagrass suppression after application. Do not apply to drought-stressed bermudagrass. Do not apply during spring transition. Do not apply to newly sprigged or seeded bermudagrass. Fertilization of bermudagrass is a key part of sandbur control.

Sawbrier or Greenbrier (*Smilax* spp)

Greenbrier control is difficult regardless of the methods or herbicides used. Broadcast herbicide applications are not effective. For individual plant treatment, mix 1 quart Remedy Ultra with 3 quarts of commercial basal oil. Apply this mix to the lower 12 inches of the greenbrier stems with a Conejet 5500 X-2 nozzle. Agitate the mixture before spraying. Best results are achieved in the winter when more basal stems are exposed. Expect about 75% control one year after treatment. Follow-up applications are essential.

Sedges (*Cyperus* spp)

Use 1.33 oz/A of Outrider or Permit with 0.25% nonionic surfactant in 10 to 40 gallons of water per acre as a broadcast application. Permit may be used on all grasses. Use Outrider on bermudagrass only. Apply to actively growing sedges with enough leaf area to intercept the spray. Weeds to be treated should not be mowed or grazed for two weeks before or after application. Hay may be harvested after the two-week period without any effect on efficacy. Weed response to Outrider and Permit is slow. Tank mixing Outrider with herbicides formulated as amines (including 2,4-D) may decrease the effectiveness of Outrider on sedges. Permit may be tank mixed with Grazon P+D or Weedmaster.

Sericea lespedeza (*Lespedeza cuneata*)

Apply 1.5 pt/A PastureGard HL in the late spring to early summer before bloom. The plants should be 12 to 15 inches tall with fully developed leaves. Increase the rate to 2 pints per acre for dense stands or later stages of growth. Use a minimum spray volume of 10 gallons per acre. Higher application volumes are preferred. For spot application, mix 6 pints PastureGard HL per 100 gallons of water or 1 fluid ounce PastureGard HL per gallon of water. Apply the spray uniformly and thoroughly wet the Sericea lespedeza foliage. Metsulfuron 60 DF at 1.0 oz/A plus 0.25% nonionic surfactant is an excellent treatment for sericea control.

Sumac (*Rhus* spp)

Sumac is one of the few brush species that is readily controlled with 2,4-D amine. Apply at the rate of 1.5 to 2 qt/A. Other herbicides effective for sumac include Chaparral, Grazon P+D, Remedy Ultra, PastureGard HL and Surmount.

Thistles (*Carduus*, *Cirsium* spp)

The key to effective thistle control is spraying while the thistles are in the rosette stage of growth (before the flower stalk appears). Biennial thistles in Arkansas are readily controlled with a properly timed application of 2,4-D amine at 1.5 qt/A. Spring applications should be made from late February to early March. Fall applications from late October through November will enhance a thistle control program. Grazon P+D, GrazonNext HL and dicamba + 2,4-D also provide excellent control of thistles at 1 qt/A.

Trumpetcreeper (*Campsis radicans*)

As with many perennial vines, it is virtually impossible to control trumpetcreeper with a single herbicide application. Banvel or Clarity at 2 qt/A, or the combination of 2,4-D with a lower rate of Banvel or Clarity, will provide from 60 to 100% control of this weed. Spot treatments of a 2% glyphosate solution are also an effective means of controlling small infestations of trumpetcreeper.

Wild Garlic (*Allium vineale*)

In tall fescue, 2, 4-D ester at 2 qt/A will provide fair wild garlic control. Apply from December to March. Repeat the application the following year. In bermudagrass, metsulfuron 60 DF or Cimarron Plus at 0.5 oz/A is the preferred treatment. Add 0.25% nonionic surfactant to the spray mix.

Woolly Croton (*Croton capitatus*)

Along with bitterweed and buttercup, woolly croton is one of the easiest pasture weeds to control with herbicides. Apply 2,4-D amine at 1 to 2 pt/A in May or early June when woolly croton is less than 12 inches tall. Cimarron Plus, metsulfuron 60DF, Grazon P+D, GrazonNext HL and dicamba + 2,4-D also control woolly croton.

WEED RESPONSE RATINGS FOR FORAGE HERBICIDES

HERBICIDES \ WEEDS	Cancerweed	Crabgrass	Foxtail	Cheat	Little Barley	Horseweed	Smooth Pigweed	Smartweed	Bullthistle	Curly Dock	Buttercup	Goldenrod	Horsenettle	Wild Garlic	Dogfennel	Bitterweed	Red Sorrel	Common Ragweed	Lanceleaf Ragweed	Chickweed	Henbit	Tall Fescue	Bahiagrass	Mullein	Groundsel	Crotons	Coreopsis	Prickly Pear Cactus	Johnsongrass	Nutsedge	Sandbur	Virginia Buttonweed
Preemergence																																
Kerb	N	R	R	R	R	N	N	N	N	N	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Prowl H_2O	N	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N	
Sinbar	N	H	H	H	H	N	N	N	N	N	N	N	N	N	N	N	N	N	N	H	H	N	N	N	N	N	N	N	N	N	N	N
Postemergence																																
2,4-D	N	N	N	N	N	R	R	R	H	R	H	R	R	R	R	H	N	H	R	R	N	N	N	N	N	H	R	N	N	N	N	R
2,4-DB	N	N	N	N	N	N	R	N	R	R	R	N	N	N	N	R	N	R	N	H	N	N	N	N	N	R	N	N	N	N	N	N
Banvel	N	N	N	N	N	H	H	H	H	H	H	H	R	R	H	H	H	H	R	H	H	N	N	N	N	H	R	N	N	N	N	N
Buctril	N	N	N	N	N	N	N	R	N	N	R	N	N	N	N	N	R	R	N	R	N	N	N	N	N	N	N	N	N	N	N	N
Chaparral	R	N	N	N	N	R	R	R	R	R	R	N	R	N	R	R	R	R	R	R	R	N	R	R	R	R	R	N	N	N	N	R
Cimarron Max	H	N	N	N	N	H	H	H	H	H	H	H	R	H	H	H	H	H	H	H	H	R	H	H	H	H	H	N	N	N	N	R
Cimarron Plus	H	N	N	N	N	R	R	H	R	H	H	N	R	H	R	H	H	N	N	H	H	N	H	H	H	N	N	N	N	N	N	R
Crossbow	N	N	N	N	N	H	H	H	H	H	H	H	R	R	R	H	R	H	R	R	R	N	N	N	N	H	R	N	N	N	N	N
Glyphosate	R	R	R	R	R	R	R	R	N	R	R	N	N	H	R	R	R	R	N	R	N	H	H	N	N	H	R	N	R	R	R	N
GrazonNext HL		N	N	N	N	R	R	H	R	R	H	H	H			H		H	H	R	R	N	N			H		N	N	N	N	R
Grazon P + D	R	N	N	N	N	H	H	H	H	H	H	H	H	R	H	H	H	R	R	R	R	N	N	R	R	H	R	H	N	N	N	R
Karmex	N	R	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N	N	N	N	N	N	R	N	N	N	N	R	N
Metribuzin	N	N	N	R	R	R	R	N	N	N	R	N	N	N	N	N	N	N	N	R	R	N	N	N	N	N	N	N	N	N	N	N
Milestone		N	N	N	N	R	R	H	R	R	R		H			H				R	R	N	N					N	N	N	N	R
Outrider	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	H	H	N	N
Panoramic	N	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N	N	N	N	N	N	R	R	R	N
Paraquat	N	N	H	H	H	N	N	N	N	N	H	N	N	H	N	N	N	R	N	H	H	H	N	N	N	R	N	N	N	N	N	N
Pastora	N	R	R	R	R	R	R	R	N	R	R	N	N	R	N	R	R	N	N	R	R	N	R	R	N	R	N	N	R	N	R	N
PasturAll HL	N	N	N	N	N	R	R	R	H	R	H	R	R	R	R	H	N	H	R	R	N	N	N	N	N	H	R	N	N	N	N	N
Permit	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	H	N	N
Poast/Poast Plus	N	R	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N	N	N	N	R	N	N	N	N	N
Pursuit	N	R	H	R	N	N	R	N	N	R	N	N	N	N	N	N	N	R	N	R	R	R	N	N	N	N	N	N	N	N	N	N
Raptor	N	R	R	R	N	N	R	N	N	R	N	N	N	N	N	N	N	N	R	R	N	N	N	N	N	N	N	N	N	N	N	N
Select	N	H	H	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N	N	N	N	N	N	N	N	N	N
Telar	N	N	N	N	N	R	R	N	R	R	N	N	N	N	N	N	N	N	N	R	R	N	N	N	R	N	N	N	N	N	N	R
Tordon 22K	R	N	N	N	N	R	R	R	H	R	N	R	H	N	R	N	R	R	R	N	N	N	N	N	R	N	N	H	N	N	N	R
Velpar	N	N	N	N	N	N	N	N	N	N	R	N	N	N	N	N	N	N	N	R	R	N	N	N	N	N	N	N	N	N	N	N
Weedmaster	N	N	N	N	N	H	H	H	H	H	H	H	R	R	H	H	R	H	H	H	H	N	N	R	N	H	R	N	N	N	N	R

NH = Highly recommended
R = Recommended
N = Not recommended

RESTRICTIONS FOR FORAGE HERBICIDES

Herbicide	Crops	Waiting Interval in Days After Treatment Before:				
		Grazing Beef or Dry Dairy Cattle	Grazing Lactating Dairy Cattle	Hay for Lactating Dairy Cattle	Hay for Beef or Dry Dairy Cattle	Slaughter
2,4-D (Weedar 64-A)	grass pastures	0	14	30	30	7
Arsenal	pastures	0	0	0	0	0
Atrazine	forage sorghum	21	21	21	21	no information
Bicep	forage sorghum					
Buctril	forage sorghum	30	30	30	30	no information
Buctril	alfalfa					
Butyrac 200 (2,4-DB)	seedling alfalfa, clovers					60
Butyrac 200 (2,4-DB)	established alfalfa, clovers	30	30	30	30	30
Chaparral	grass pasture	0	0	0	0	0
Cimarron Plus	bermudagrass	0	0	0	0	0
Cimarron Max	grass pastures	0	7	37	37	30
Clarity, Banvel	grass pastures	0	7 to 40, interval depends on rate	37 to 70	37 to 70	30
Glyphosate, 2 qt/A or less	broadcast	0	0	0	0	no information
Grazon P+D	grass pastures	0	7	30	30	3
GrazonNext HL	grass pastures	0	0	7	7	no information
Journey	bermudagrass	0	0	0	7	0
Kerb	alfalfa, clovers[1]	3 lb/A or less 25 days	3 lb/A or less 25 days	3 lb/A or less 25 days	3 lb/A or less 25 days	no information
Milestone	grass pastures	0	0	0	0	0
Outrider	bermudagrass	0	0	14	14	no information
Paraquat	dormant bermuda	no information	no information	40	40	no information
Pastora	bermudagrass	0	0	0	0	0
PasturAll HL	0	0	0	0	0	0
PastureGard HL	grass pastures	0	365	14	14	3
Permit	grass pastures	0	0	37	37	0
Poast, Poast Plus	alfalfa, clover	7	7	7	7	20
Pursuit	alfalfa	30	30	30	30	no information
Raptor	alfalfa	20	20	20	20	20
Remedy Ultra	grass pastures	0	14	365	7	3
Select	alfalfa	15	15	15	15	15
Metribuzin/Lexone	alfalfa	28	28	28	28	28
Sharpen	grass pastures	0	0	0	0	0
Sinbar	alfalfa	70	no information	no information	70	no information
Spike 20P	grass pastures	0	0	365	365	no information
Surmount	grass pastures	0	14	7	7	3
Telar	grass pastures	0	0	0	0	0
Tordon 22K	grass pastures	0	14	14	14	3
Velpar, do not exceed 1/3 gal/A	grass pastures	30	30	30	30	30
Velpar	alfalfa	30	30	30	30	30
Weedmaster, Range Star, Brash	grass pastures	0	7	37	37	30

[1]All crops except alfalfa, 125 days.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FORAGE				
Established grass pasture and hay crops				
2,4-D amine @ 0.5 to 2 lb/A	Bitter sneezeweed, buttercup, common ragweed, cocklebur, curly dock, goatweed, lanceleaf ragweed, pigweed, thistles.	**2,4-D amine** 1 to 4 pt/A of 4 lb/gal 2,4-D. Use the higher rate for late applications and on the more resistant weeds.	**Early Treatment** South Arkansas March 15 to April 15 North Arkansas April 15 to May 15	Delayed treatment is more effective on late spring weeds. All legume species except established white clover and lespedeza (more than 2") are severely injured or killed. See animal restrictions.
2,4-D LV esters @ 0.5 to 2 lb/A	Bitter sneezeweed, buttercup, common ragweed, cocklebur, curly dock, goatweed, lanceleaf ragweed, pigweed, thistles, wild garlic.	**2,4-D ester** 1 to 4 pt/A of 4 lb/gal 2,4-D.	Same as above except garlic which should be treated in November or December and repeat in late February or early March.	Tends to be 10 to 20% more active than amine formulation due to greater leaf penetration. More effective on larger weeds and most perennials. Add a surfactant for garlic.
dicamba @ 0.5 to 8 lb/A	Most 2,4-D weeds and dogfennel, red sorrel and smartweed.	**Banvel, Clarity** 1 pt to 2 gal/A of 4 lb/gal.	For annuals, apply when weeds are 2 to 4 inches tall and actively growing. Thistles: rosette stage. Dogfennel: 12 to 18 inches. Other perennials: at or near bloom.	May be tank mixed with 2,4-D to improve control of thistles, red sorrel and smartweed. Do not apply to legumes.
2,4-D + picloram @ 0.063 + 0.25 to 0.54 + 2 lb/A	Bitterweed, buttercup, cocklebur, docks, dogfennel, thistles, horsenettle, horseweed, prickly lettuce, prickly pear, ragweed, woolly croton, red sorrel and smartweed.	**Grazon P + D** 1 to 4 pt/A.	Apply when broadleaf annual weeds are small and actively growing. Spray horsenettle at bloom stage. Treat prickly pear in early May.	**Check label for groundwater advisory.** The county Extension office has information on the leachability of the soil types on your land. Use higher rates for perennials. Do not use on or near land to be planted in legumes.
2,4-D + dicamba @ 0.375 + 0.125 lb to 0.75 + 0.25 lb/A	Dogfennel (cypressweed), smartweed, horsenettle, thistles, dock and all weeds listed for 2,4-D alone.	**Brash, KambaMaster, Weedmaster, Range Star** 1 to 4 pt/A. High rate for horsenettle and thistles.	See instructions for Banvel.	1 lb of Banvel and 2.87 lb of 2,4-D amine per gallon. Controls a broader spectrum of weeds than 2,4-D. May severely injure or kill legumes.
aminopyralid @ 0.046 to 0.1 lb/A	Cocklebur, thistle, horsenettle, buttercup, bitterweed, horseweed, smartweed and others.	**Milestone 2L** 3 to 7 fl oz/A.	Postemergence to actively growing weeds. See label for specifics.	No grazing or haying restrictions. Will kill legumes. Do not exceed 7 ounces per acre per year. See label for crop rotation restrictions. Urine and manure of animals grazing treated pastures may contain enough aminopyralid to damage sensitive crops. See label for details.
aminopyralid + 2,4-D @ 0.55 to 0.99 lb/A	Many broadleaf herbaceous and woody plants.	**GrazonNext HL** 19 to 34 fl oz/A.	Postemergence.	A more concentrated version of GrazonNext. Do not use more than 2.1 pt/A in a single growing season. See label restrictions on movement of treated hay off farm and manure use. Do not harvest hay for 7 days after application.
aminopyralid + triclopyr @ 0.83 to 1.23 lb/A	Many herbaceous and woody broadleaf weeds.	**Capstone** 6 to 9 pt/A.	Postemergence to actively growing weeds.	No grazing or haying restrictions. Do not use treated hay for mulch. Do not use manure from animals grazing treated pastures around sensitive plants.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
2,4-D + aminopyralid @ 0.5 to 1.0 + 0.014 to 0.028 lb/A	Many broadleaf weeds.	**PasturAll HL** 1.0 to 4.5 pt/A.	Postemergence to small weeds.	Manure or urine from livestock grazing PasturAll-treated field may damage sensitive plants. There are no grazing or haying restrictions.
metsulfuron + chlorsulfuron @ 0.0011 + 0.0038 + 0.012 + 0.038 lb/A	Bahiagrass, bitter sneezeweed, buckbrush, buttercup, chickweed, common mullein, curly dock, groundsel, musk thistle, red sorrel, wild garlic.	**Cimarron Plus** 0.125 to 1.25 oz/A.	Apply to small, actively growing weeds. Bahiagrass should be treated when actively growing. Good coverage is important.	Bermudagrass, orchardgrass, bromegrass and timothy have good tolerance. May cause yellowing and stunting and seedhead suppression of fescue. One cutting of fescue may be lost. Do not treat ryegrass or legume pastures. Desirable grasses should be established for 60 days. Do not use on grasses grown for seed. Apply before weeds are 4 inches tall. Use the high rate for garlic and bahiagrass. See label for other use rates and crop rotation restrictions. Add 0.25% nonionic surfactant.
2,4-D + dicamba + metsulfuron @ 0.35 to 1.5 + 0.125 to 0.5 + .009 to .038 lb/A	Most broadleaf weeds and bahiagrass.	**Cimarron Max** 0.25 to 1 oz + 1 to 4 pt/A.	Postemergence to actively growing weeds.	Good on tough weeds such as groundsel (*Senecio* sp.) and cancerweed (*Salvia lyrata*). Tank mix of three effective herbicides that control many broadleaf weeds.
aminopyralid + metsulfuron methyl @ 0.039 + 0.006 to 0.013 + 0.019 lb/A	Many broadleaf weeds including blackberry, sumac, buckbrush. Suppresses Virginia buttonweed.	**Chaparral 72 DF** 1.0 to 3.3 oz/A.	Postemergence to actively growing weeds.	Chaparral will kill or injure bahiagrass and ryegrass. Manure or urine from animals eating Chaparral-treated forage may damage sensitive plants. Do not mulch plants with Chaparral-treated forage.
chlorsulfuron @ 0.011 to 0.04 lb/A	Chickweed, henbit, pigweed, thistle, curly dock, poison hemlock, white clover.	**Telar 75 DF** 0.25 to 1.0 oz/A.	Postemergence to actively growing weeds.	In Arkansas pastures, chlorsulfuron does not control as broad a weed spectrum as metsulfuron (Ally).
imazapic @ 0.063 to 0.19 lb/A	Johnsongrass, crabgrass, sandbur, sedges, barnyardgrass, broadleaf signalgrass, foxtail.	**Panoramic 2 SL** 4 to 12 fl oz/A.	When bermudagrass is fully green and actively growing. Do not apply during transition. Do not apply to drought-stressed bermudagrass, newly aerated fields for 30 days, or to newly sprigged or seeded bermudagrass.	**Do not use this product unless you can tolerate 30 to 45 days of bermudagrass suppression after application. Start with the 4 oz rate.** Panoramic 2 SL may be applied to common and coastal bermudagrass varieties. Jiggs bermudagrass is more sensitive than other types. Do not apply to World Feeder bermudagrass varieties. Use the 6 oz rate for sandbur.
sulfosulfuron @ 0.062 lb/A	Johnsongrass, sedges.	**Outrider 75DF** 1.33 oz/A.	Postemergence.	For use in bermudagrass. Add 0.25% v/v of a nonionic surfactant in 10 to 40 gallons per acre as a broadcast application. Apply to actively growing johnsongrass that is at least 18-24 inches tall and up to the heading stage. Sedges should be actively growing with sufficient leaf area developed to intercept the herbicide. Weeds to be treated should not be mowed or grazed for two weeks before or after application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FORAGE				
Established grass pasture and hay crops [cont.]				
saflufenacil @ 0.022 to 0.044 lb/A	Annual broadleaf weeds.	**Sharpen** 1 to 2 oz/A.	Postemerge on small weeds.	Add MSO @ 1% v/v. Use only 1 oz/A in bermudagrass and switchgrass.
halosulfuron @ 0.062 lb/A	Nutsedge and some broadleaf weeds.	**Permit 75DF** 1.33 oz/A.	Treat actively growing nutsedge at the 3- to 5-leaf stage.	Safe on all grasses. Add nonionic surfactant one to two quarts per 100 gallons. May be tank mixed with 2,4-D, Weedmaster or Grazon P+D. A second application may be necessary for full-season nutsedge control.
metsulfuron + nicosulfuron @ 0.014 to 0.028 + 0.035 to 0.05 lb/A	Many broadleaf weeds and grasses including johnsongrass.	**Pastora 75DF** 1.0 to 1.5 oz/A.	Postemergence to small weeds.	Will stunt bermudagrass temporarily. There are no grazing or haying restrictions. May be tank mixed with 6 fl oz of 4 lb/gal glyphosate per acre for improved grass control. Use on established bermudagrass only. Add 0.25% surfactant. Tank mix with 1 qt/A 2,4-D to improve control of thistle, ragweed and plantain.
metsulfuron @ 0.0038 to 0.038 lb/A	Broadleaf weeds, wild garlic and bahiagrass, weak on ragweed and thistle.	**Patriot, Valuron, Martin's Clean Pasture 60DF** 0.1 to 1.0 oz/A.	Postemergence.	Add 0.25% nonionic surfactant. Will stunt fescue. Do not spray ryegrass or legume pastures.
Dormant Bermudagrass Pastures				
paraquat @ 0.25 to 0.5 lb/A	Tall fescue, annual grassy weeds such as little barley and broadleaf weeds such as buttercup.	**Paraquat (3 lb/gal formulations)** 0.7 to 1.3 pt/A.	During active weed growth when there is good soil moisture. Tall fescue: fall, fescue 4 inches tall. Dormant bermuda: February-March before mid-boot stage of little barley.	Two to three applications may be needed for fescue control. When converting to non-endophyte fescue, an intervening crop should be planted before planting the endophyte-free fescue. Do not graze or cut for hay for 40 days after treatment.
glyphosate @ 0.25 lb/A	Annual grasses such as crabgrass, foxtail and sandbur and small broadleaf weeds. Seedling weeds are easier to control.	**Glyphosate (4 lb/gal formulations)** 16 oz/A.	Late winter or early spring to dormant bermudagrass or immediately after first cutting.	May be applied to **dormant** bermudagrass or **immediately** after the first cutting. **Applying Roundup to partially green bermudagrass in the spring or regrown bermudagrass after the first cutting will result in crop injury.** Do not graze or cut for hay for 60 days following a dormant application. When applying after first cutting, wait 28 days before grazing or harvesting. Roundup cannot be applied to dormant bermudagrass and after the first cutting in the same year. Remove livestock before applying.
saflufenacil @ 0.022 to 0.044 lb/A	Annual broadleaf weeds.	**Sharpen** 1 to 2 oz/A.	Postemerge on small weeds.	Add MSO @ 1% v/v. Use only 1 oz/A in bermudagrass and switchgrass.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Sod Suppression				
paraquat @ 0.25 to 0.5 lb/A	Sod suppression.	**Paraquat (3 lb/gal formulations)** 0.7 to 1.3 pt/A.	Postemergence in late summer or early fall to sod not greater than 3 inches tall. Apply before or at the time of seeding winter annuals.	Do not graze treated areas until 60 days after treatment or until winter annual seedlings are 9 inches tall. Add a surfactant.
Newly Sprigged Bermudagrass				
2,4-D + dicamba @ 0.7 to 1.4 + 0.25 to 0.5 lb/A	Annual grasses and annual broadleaf weeds.	**Brash, KambaMaster, Weedmaster, Range Star** 1 to 2 qt/A.	As weeds begin to emerge, typically 7 to 10 days after planting, but the timing may vary with environmental conditions.	For use after sprigging bermudagrass. Control will be reduced if the weeds are allowed to reach 1 inch in height or emergence occurs 10 days after application.
diuron @ 1.0 to 1.5 lb/A	Many grass and broadleaf weeds.	**Diuron 4L** 1.0 to 1.5 qt/A.	Preemergence or early postemergence.	Apply after planting and before emergence of bermudagrass or weeds. Alternatively, for control of emerged annual weeds up to 4 inches in height, apply 0.4 to 0.8 quart per acre, add 0.25% nonionic surfactant. If bermudagrass has emerged at time of treatment, temporary burn of exposed plant parts may occur. Plant sprigs 2 inches deep in a well-prepared seedbed; do not treat areas where sprigs are planted less than 2 inches deep as crop injury may result. Do not graze or feed foliage from treated areas to livestock within 70 days after application. Never use diuron on “Tifway” or “419” turf-type hybrid bermudagrass.

WEED RESPONSE RATINGS FOR PASTURE BRUSH CONTROL HERBICIDES

HERBICIDES / WEEDS	Blackberry	Black Locust	Buckbrush	Cedar	Cherry	Elm	Greenbrier	Hawthorn	Honey-locust	Honeysuckle	Kudzu	Oaks	Osage Orange	Persimmon	Pine	Poison Ivy	Pricklypear Cactus	Rose, Wild	Sassafras	Sericea Lespedeza	Sumac	Sweetgum	Willow
2,4-D	N	H	H	N	N	N	N	H	N	N	N	R	N	N	N	N	N	N	N	N	H	N	H
Arsenal	N	R	R	N	R	R	R	R	R	R	N	H	H	H	N	H	N	R	H	N	R	H	H
Banvel	R	N	N	N	N	N	N	N	N	N	H	N	N	R[4]	N	N	N	R	N	R	N	N	N
Chaparral	H	H	H	N	N	N	N	N	H	H	H	R	N	N	N	N	N	H	N	H	H	N	H
Chaparral + PastureGard HL	H	H	H	N	R	R	R	R	H	H	R	H	R	R	R	H	N	H	R	H	H	R	H
Cimarron Plus	H	H	R	N	R	R	N	R	H	R	H	N	R	N	N	N	N	R	N	H	N	N	R
Crossbow	R	R	R	N	R	R	N	R	R	R	R	R	N	N	N	R	N	N	N	R	R	R	R
Glyphosate	H[2]	R	N	N	R	R	N	R	R	H[2]	R	R	N	N	N	H[2]	N	H	N	N	N	R	H
Grazon P+D	R	R	R	N	R	R	R[3]	R	H	R	R	R	N	R	N	N	H	R	N	R	R	R	R
GrazonNext HL + Remedy Ultra	H	H	H	N	R	R	R	R	H	H	R	H	H	R	R	H	N	H	R	H	H	R	H
Metsulfuron	H	H	R	N	R	R	N	R	H	R	H	N	R	N	N	N	N	R	N	H	N	N	R
PastureGard HL	H	R	R	N	R	R	R	R	R	N	R	R	H	N	N	R	N	R	N	H	R	H	R
Remedy Ultra	H	R	R	N	R	R	R[3]	R	H	N	R	R	H	N	R	R	N	N	N	H	R	H	R
Spike	R	R	R	R[1]	R	H	N	R	R	H	R	R	N	N	H	R	N	H	N	N	N	R	R
Surmount	R	N	N	R	N	N	N	N	H	N	H	N	N	R	N	R	H	R	R	R	R	N	N
Tordon 22K	R	N	N	R[4]	N	N	N	N	H	N	H	N	N	R[4]	R	N	H	R	R	R	N	N	N
Velpar	R	R	R	R[1]	R	R	N	R	H	H	R	R	N	N	N	R	N	H	N	N	N	R	R
Weedmaster	R	N	R	N	N	R	N	R	R	R	R	R	N	N	N	R	N	N	N	R	R	N	R

Small red cedar[1] September application[2] Suppression only[3] Soil application[4]

H = Highly recommended, has been shown to be effective if used properly.

R = Recommended, intermediately susceptible or listed by the manufacturer on the label.

N = Not recommended, has not performed in research or is not listed on the label.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
BRUSH CONTROL				
Imazapyr @ 0.25 to 0.75 lb/A	Persimmon, sassafras, oak, hickory, sweetgum.	**Arsenal** 1% solution.	May to September.	Add 0.5% surfactant. No grazing restrictions. Will kill grass. Do not exceed 48 oz per acre.
metsulfuron + chlorsulfuron @ 0.0011 + 0.0038 + 0.012 + 0.038 lb/A	Blackberry, buckbrush, dewberry, multiflora rose, honeysuckle, kudzu.	**Cimarron Plus** 1.5 oz per 100 gal water.	At full leaf-out in May. Blackberry flowering, leaves should be fully developed.	May be applied with hand equipment. Add 1 oz per 100 gallons of water and 0.25% nonionic surfactant. Spray to runoff. Do not exceed 75 gallons per acre. Ally is not a broad spectrum brush control material.
2,4-D + picloram @ 2 + 0.54 lb/A	Buckbrush, honeylocust, multiflora rose, some oaks, persimmon, prickly pear cactus.	**Grazon P+D** 4 qt/A.	At full leaf-out in May or June.	Use high rate for prickly pear control. Results are very slow. Evaluate one year after application. Add 0.5% nonionic surfactant. Tank mix Grazon P+D with 1 qt/A or 0.5% Remedy or for broad spectrum mixed brush control. Adding Remedy may improve honeylocust control. Use 1 to 2% solutions for hand-held equipment.
picloram @ 0.25 to 0.5 lb/A	Prickly pear cactus, persimmon, honeylocust.	**Tordon 22K** 1 to 2 pt/A.	Treat prickly pear in early May. Treat persimmon or honeylocust in May or June.	Read the entire label carefully before using picloram. We recommend that it be used as a spot treatment (see label) rather than broadcast application. Do not exceed 1 quart of Tordon 22K per acre per season. Picloram is a chemical which can travel (seep or leach) through soil and under certain conditions has the potential to contaminate groundwater which may be used for irrigation and drinking purposes. Users are advised not to apply picloram where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow or to soils containing sinkholes over limestone bedrock, severely fractured surfaces and substrates which would allow direct introduction into an aquifer. Your local county Extension office can provide further information on the type of soil in your area and the location of groundwater.
picloram + fluroxypyr @ 0.22 + 0.18 to 0.9 to 0.72 lb/A	Horsenettle, hemp dogbane, ragweed, thistles, etc., and also for many brush species, including blackberry and multiflora rose. Will not control any grass weeds or sedges.	**Surmount** 1.5 to 2 pt/A for general broadleaf control. 3 to 6 pt/A for brush control.	During active weed growth. Blackberry and multiflora rose are best controlled when they have not been mowed for at least one year.	New legume seedlings may not be successful if planted within 1 year after applying herbicide. Consult label for specific recommendations. Using a surfactant will improve the performance of this herbicide.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
BRUSH CONTROL [cont.]				
aminopyralid + triclopyr @ 0.83 to 1.23 lb/A	Many herbaceous and woody broadleaf weeds.	**Capstone** 6 to 9 pt/A.	Postemergence to actively growing weeds.	No grazing or haying restrictions. Do not use treated hay for mulch. Do not use manure from animals grazing treated pastures around sensitive plants.
triclopyr @ 0.75 to 1.5 lb/A	Blackberries, buckeye, oaks, willow, pine, sumac, osage orange, sweetgum, mixed brush.	**Remedy Ultra** 1.5 to 3 pt/A.	Apply during good growing conditions. Blackberries: flowering through mid-July, leaves must be fully developed on fruiting canes. May through June for general foliar use. Treat cut stumps when fresh, make basal bark applications during dormant season.	Use a 0.5 to 1% solution for hand equipment applications. Add 0.5% nonionic surfactant. Follow-up applications will be needed for control of most species. Tank mix with 1 gallon per acre or 2% Grazon P+D for broader spectrum brush control.
triclopyr	Most woody species.	**Pathfinder II** Triclopyr + oil.	Basal bark and cut stumps: any time. Streamline basal bark: late spring-early summer.	Apply undiluted with a backpack or knapsack sprayer to bark or cut stumps. Use low pressure and a flat fan or solid cone nozzle. See label for detailed instructions covering the various application methods.
metsulfuron @ 0.038 lb/A	Blackberry, dewberry, *Sericea lespedeza*, honeysuckle.	**Patriot, Valuron, Martin's Clean Pasture 60DF** 1.0 oz/A.	Postemergence.	Add 0.25% nonionic surfactant. Will stunt fescue. Do not spray ryegrass or legume pastures.
fluroxypyr + triclopyr @ 0.5 to 2.0 lb/A	Many broadleaf herbaceous and woody plants.	**PastureGard HL** 1 to 4 pt/A.	Postemergence.	A more concentrated version of PastureGard. Do not use more than 2 qt/A in a single growing season. Do not harvest hay for 14 days after application. Do not graze lactating dairy cows during the growing season of application. Withdraw animals from treated pasture 3 days before slaughter.
metsulfuron + aminopyralid + triclopyr + fluroxypyr @ 0.019 + 0.1 + 0.38 + 0.125 lb/A	Many brush species and broadleaf weeds.	**Chaparral + PastureGard HL** 3.3 oz + 1 pt/A	May to September.	Will kill bahiagrass. Does not contain picloram. Add 0.5% nonionic surfactant.
aminopyralid + 2,4-D + triclopyr ester @ 0.1 + 0.8 + 1.0 lb/A	Many brush species and broadleaf weeds.	**GrazonNext HL + Remedy Ultra** 2.0 + 2.0 pt/A	May to September.	Provides brush control without the use of picloram. Add 0.5% nonionic surfactant.
glyphosate @ 2 to 5 lb/A	Blackberry, honeysuckle, kudzu, multiflora rose, poison ivy, trumpetcreeper.	**Glyphosate (4 lb/gal formulations)** 2 to 5 qt/A.	Late fall to early summer before leaf color changes. Do not apply to drought-stressed or dusty brush.	Use a 2% solution for spot treatment. Add 0.5% nonionic surfactant. Follow-up treatment will be needed. Will kill grass.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
tebuthiuron @ 2 to 4 lb/A	Buckbrush, red cedar, elms, hickory, honeylocust, honeysuckle, oaks, pines, sweetgum.	**Spike 20P** 10 to 20 lb/A.	Can be applied any time. Late winter and early spring applications perform the best. Needs rainfall for activation.	Soil-applied only. May take up to 3 years for complete kill. Do not use on soils with a high clay content. Persimmon and sassafras are not controlled. Do not apply where the roots of desirable vegetation extend. Root spread of trees may be triple the crown width. Will injure grass. Apply during the dormant season. Do not apply when the soil is frozen or snow-covered. Do not apply to red cedar over 6 feet tall.
hexazinone @ 0.66 lb/A	Red cedar, elms, honeysuckle, hickory, oaks.	**Velpar L** 2 to 4 milliliters per stem up to ⅓ gal/A.	Can be applied any time. Late winter and early spring applications perform the best. Needs rainfall for activation.	Soil-applied only. Do not use on soils with a high clay content. Persimmon and sassafras are not controlled. Do not apply where the roots of desirable vegetation extend. Will injure grass. Apply during the dormant season. Do not apply when the soil is frozen or snow-covered. Do not apply to red cedar over 6 feet tall. Apply to soil at base of stem with a spotgun. Do not exceed ⅓ gal per acre per season or treat more than 709 brush plants per acre per season.
2,4-D + dicamba @ 1.4 + 0.5 lb/A	Buckbrush, hawthorn, black locust, sumac, willows.	**KambaMaster, Brash, Weedmaster, Range Star** 2 qt/A.	At full leaf-out in spring.	Effective on a limited number of brush species. Contains amine 2,4-D. Follow-up treatments are usually needed. Use 2% solution for hand equipment applications. Add 0.5% nonionic surfactant.
2,4-D ester @ 2 to 4 lb/A	Buckbrush, black locust, hawthorn, sumac, willows.	**2,4-D** 2 to 4 qt/A.	At full leaf-out in spring.	Ester formulations more readily penetrate the leaves of brush species. Effective on a limited number of brush species. Follow-up treatments are usually needed. Use 2% solution for hand equipment applications. Add 0.5% nonionic surfactant. Some studies have shown the amine formulation to be more effective on buckbrush.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
ALFALFA				
Postemergence				
2,4-DB amine @ 1 lb/A	Broadleaf weeds.	**Butyrac 200/Butoxone** 2.3 qt of 1.75 lb/gal 2,4-DB or 2 qt of 2 lb/gal.	When alfalfa seedlings are 3 inches or following hay harvest before new growth starts.	AVOID DRIFT. Best applied to very small weeds, 2 to 6 leaves.
bromoxynil @ 0.25 to 0.375 lb/A	Seedling broadleaf weeds.	**Buctril 2E** 1 to 1.5 pt/A. Use higher rate for less susceptible weeds.	Apply when seedling alfalfa is in the 2- to 4-leaf stage. Weeds should be 4-leaf or less than 2 inches tall.	Crop leaf burn can occur following application. Do not add a surfactant or crop oil. Do not treat when temperatures exceed 70°F. Do not apply to alfalfa under stress. Do not feed or graze for 30 days following treatment. May be tank mixed with 2,4-DB.
imazethapyr 0.047 to 0.094 lb/A	Foxtails, chickweed, cocklebur, mustards, shepherdspurse.	**Pursuit 70 DG** 1.08 to 2.16 oz/A.	Postemergence to seedling alfalfa when the weeds are in the 1- to 3-inch size range.	Apply to alfalfa that has reached the second trifoliate or later. Pursuit may be tank mixed with other herbicides. Add crop oil concentrate and UAN at 1 qt/A.
imazamox @ 0.03 to 0.04 lb/A	Annual grasses and some broadleaf weeds.	**Raptor 1L** 4 to 6 oz/A.	Early postemergence while the weeds are actively growing and before they exceed 3 inches.	Alfalfa should have at least two trifoliates before applying Raptor. For weeds such as mustards with a prostrate growth habit, apply before the rosette exceeds 3 inches. Raptor may cause temporary stunting.
clethodim @ 0.094 to 0.125 lb/A	Crabgrass, fall panicum, foxtails, johnsongrass.	**Select 2E** 6 to 8 oz/A.	Postemergence.	See label for weed sizes and rates. Allow time for regrowth if applying after harvest. Add crop oil concentrate at 1 qt/A.
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses and johnsongrass.	**Poast 1.5 EC** 1 to 2.5 pt/A. Use low rate for small annual grasses, high rate for johnsongrass.	Small annual grasses. Johnsongrass 15" to 20". Do not apply to grass under stress.	See comments for Poast in soybean section. Do not apply more than 5 pt/A per year. Split application most effective for johnsongrass. 1.5 pt/A followed by 1 pt/A.
glyphosate @ 0.7 to 1.4 lb/A	Many broadleaf and grass weeds.	**glyphosate 4 lb/gal** 22 to 44 oz/A.	Postemergence.	For use with Roundup Ready Alfalfa. Do not exceed 44 fl oz/A in a single application. May be used from emergence to 5 days before cutting. Wait at least 7 days between applications. Do exceed 132 oz/A per growing season. Remove livestock before application and do not graze for 5 days. Make a 22 oz/A application during establishment before the 3 to 4 trifoliate stage to eliminate non Roundup Ready seedlings. In established stands, make weed control applications while the weeds are exposed and not hidden by alfalfa regrowth.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
ALFALFA				
Preemergence and Postemergence				
terbacil @ 0.5 lb/A	Postemergence control of winter weeds, also preemergence control of summer annual grass and broadleaf weeds.	**Sinbar 80W** 0.6 lb/A.	In late winter or early spring **before** alfalfa breaks dormancy.	Treat only stands established for one year or more. Do not use on alfalfa-grass mixture.
diuron @ 1.2 to 2.4 lb/A	Winter annuals.	**Karmex 80 DF** 1.5 to 3.0 lb/A.	While alfalfa is dormant.	Treat only stands established for one year or more. Do not treat alfalfa under stress.
metribuzin @ 0.38 to 0.75 lb/A	Winter annuals.	**Sencor 75 DF** 0.5 to 1.0 lb/A.	While alfalfa is dormant.	Treat only stands established for one year or more. Do not treat alfalfa under stress.
pronamide @ 0.5 to 0.75 lb/A	Winter grasses and some winter broadleaves.	**Kerb 50W** 1 to 1.5 lb/A.	Apply during the fall or winter months. Has preemergence and postemergence activity.	Do not use on legumes before the first trifoliate stage. See label for particulars.
hexazinone @ 0.5 to 1.5 lb/A	Most winter broadleaves and some winter grasses.	**Velpar L** 1 to 3 qt/A.	Treat while crop is dormant.	Treat only healthy stands established one year or more. Do not use on sandy loams or loamy sands with less than 1% organic matter. Do not exceed 1 qt/A on sandy loams or loamy sands with 1 to 2% organic matter.
CLOVER: RED, ALSIKE, LADINO				
Postemergence				
2,4-DB amine @ 1 lb/A	Annual grasses and broadleaf weeds.	**Butyrac, Butoxone** 2.3 qt/A of 1.75 lb/gal 2,4-DB or 2 qt/A of 2 lb/gal.	When legumes (seedlings or established stands) have two or more true leaves with weeds in seedling stage.	Best control is achieved with weeds in the 2- to 4-leaf stage. Will not control henbit or chickweed.
sethoxydim @ 0.31 lb/A	Most grasses.	**Poast 1.5 EC** 2.5 pt/A.	Postemergence.	For use on established stands of clover. See label for specific grass weed information. Do not spray drought-stressed weeds. Add surfactant or crop oil concentrate.
MISCANTHUS, OTHER BIO-FUEL CROPS				
Post Sprigging				
glyphosate @ 1 lb/A	Emerged weeds.	**Glyphosate (4 lb/gal formulations)** 32 oz/A.	Preplant for vegetation knockdown.	Apply immediately after sprigging – no green miscanthus leaves.
acetochlor @ 1.5 lb/A	Small-seeded grass and broadleaf weeds.	**Degree 3.8 EC** 3.2 pt/A.	Apply at planting up to early post. Residual control only.	Do not exceed 6.4 pints per year. Do not graze treated forage or use for hay.
acetochlor + atrazine @ 1.11 to 1.5 + 0.55 to 0.74 lb/A	Same as above plus post broadleaf activity and better residual control.	**Degree Xtra 4L** 3.3-4.4 pt/A.	Apply at planting or when miscanthus is 2 to 3 inches tall.	Do not exceed 8.8 pt/A per year. Do not graze or feed.

WEED RESPONSE RATINGS FOR VEGETABLE, SMALL FRUIT AND NUT CROP HERBICIDES

(See Explanation of Ratings Tables on Page 3.)

	Barnyardgrass	Bermudagrass	Crabgrass	Fall panicum	Foxtail	Goosegrass	Johnsongrass (S)	Johnsongrass (R)	Signalgrass	Texas panicum	Carpetweed	Chickweed	Cocklebur	Evening primrose	Jimsonweed	Lambsquarters	Morningglory	Nightshade	Pigweed	Prickly sida	Purslane	Ragweed	Sicklepod	Smartweed	Velvetleaf	Nutsedge, yellow	Nutsedge, purple
2,4-D	N	N	N	N	N	N	N	N	N	N	G	G	G	G	E	E	E	E	E	E	G	E	F	F	G	F	G
Atrazine	G	P	G	P	G	G	P	P	P	P	E	E	G	E	G	E	G	G	E	G	E	E	F	E	E	P	P
Basagran	P	P	P	P	P	P	P	P	P	P	G	G	E	G	G	G	G	G	P	F	G	G	F	G	E	P	P
Chateau	F	F	F	F	F	F	F	P	F	F	E	E	P	E	G	E	G	E	E	E	E	G	P	G	G	P	P
Command	E	N	E	E	E	E	E	N	E	E			P		F	G	P		F	E	G		F	F	E	N	N
Curbit	G	N	E	G	G	G	G	N	G	G	G		N		N		N		G				N	N	N	N	N
Dual	G	P	E	E	E	E	F	P	E	F	G	G	P	G	P	F	P	G	G	P	E	F	P	F	P	G	P
Eptam	G	P	E	G	E	G	G	P	F	G	G	F	P	F	P	G	P	P	G	P	G	P	P	P	E	G	G
Fusilade DX	E	E	E	E	E	E	E	E	E	E	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Glyphosate	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	G	E
Goal	E	P	E	F	F	E	F	P	F	F	E	E		G		E	P	E	E	E	E	E	E	E		P	P
Karmex	G	P	G	F	G	G	P	P	P	F		G	F	G	G	E	F	G	E	F	E	G	P	F	F	P	P
Metribuzin Pre	G	P	G	E	E	E	F	P	P	F	E	G	F	G	E	E	F	P	E	G	E	G	F	G	G	P	P
Metribuzin Post	G	P	G	E	E	E	F	P	P	F	E	G	E	G	E	E	E	P	E	G	E	G	E	G	G	P	P
Paraquat	E	P	E	E	E	E	E	P	E	E	E	G	G	G	G	E	G	G	E	G	G	E	G	G	G	P	P
Poast	E	E	E	E	E	E	E	E	E	E	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Princep	E	P	G	G	G	G	P	P	P	P	E	E	G	E	E	E	G	G	E	G	E	E	F	E		P	P
Pursuit	F	F	F			P	G	G	F				E				G	P	E	F		G	P	F		F	
Pyramin	N	N	N	N	N	N	N	N	N	N						E		P	E	G	E	E		E		P	P
Raptor	G		G	G	G	P	G	G																		P	
Select	E	E	E	G	G	G	E	E	E	G																	
Sandea													G						G			G		G	G	E	E
Sinbar	G	F	G	E	G	G	G	P	G	G	E					E		G	G	G	G	G		G		F	P
Spin-aid	N	N	N	N	N	N	N	N	N	N						E		G								P	P
Stinger	N	N	N	N	N	N	N	N	N	N	N	N	E		G				G			G	E			N	N
Treflan	G	N	E	G	E	E	G	F	G	G	G	E	P	P	P	G	P	P	G	P	G	F	P	P	E	P	P

At recommended rates for your soil type or weed species: E = 90% control or better
G = 75-90% control
F = 50-75% control
P = 5-50% control
N = less than 5% control

NOTE: Always check current recommendations to be sure the herbicide is registered for the crop in question.

VEGETABLE HERBICIDE REGISTRATION CHART FOR HOME GARDENS

	Asparagus	Beans, Pole & Snap	Beans, Lima	Brussel Sprouts	Broccoli	Cabbage	Carrots	Cantaloupes	Cauliflower	Collard Greens	Cucumbers	Eggplant	Garlic	Lettuce	Honeydew	Horseradish	Kale	Mustard Greens	Okra	Onions	Peas, English	Peas, Southern	Peppers	Potatoes	Pumpkins	Radishes	Sweet Potatoes	Squash	Tomatoes	Turnip Greens	Watermelon
Dacthal (G), Dacthal (WP)		R		R	R	R		RP	R	R	RP	RT	R		RP	R	R	R		R		R	RT	R		R	R	RP	RT	R	RP
Poast (L)**	R	R	R	R	R	R		R	R	R	R	R	R	R			R	R		R	R	R	R	R	R		R	RP	R		R
Preen (trifluralin)	R	R	R	R	R	R	R	R	R	R	R	R					R	R	R	R	R	R	RT	R		R			R	R	R

R = The herbicide is registered on this crop.
RP = Apply this herbicide only after the plants have 4 to 6 true leaves and are not under stress.
RT = Do not use this chemical on newly seeded crops or small seedlings. Use only on transplants (for Dacthal, use only 4 to 6 weeks after transplanting) or on direct seeded plants that are at least 6 inches tall.
* = This chemical must be incorporated into the top 2 to 3 inches of soil before seeding or transplanting.
** = Apply to annual grasses when they are less than 4 inches tall.
L = Liquid
WP = Wettable Powder
GR = Granular

Weed control in home vegetable gardens requires a coordinated effort using a combination of methods. These include cultural, mechanical and chemical techniques.

Aggressive, fast-growing crops make weed control easier because they are better able to compete with weeds. Squash, beans, southern peas, pumpkins, cucumbers, sweet corn, Irish potatoes and sweet potatoes emerge quickly and have the potential to suppress weeds. Small-seeded and slow-growing crops such as lettuce, carrots, peppers, greens, onions, English peas, tomatoes, broccoli, cabbage and radishes do a rather poor job of competing with weeds.

Cover or smother crops can be used to reduce weed seed germination in succeeding crops. Cover crops are usually planted in the fall and killed by tillage or chemicals the following spring before planting vegetables. The residue from cover crops (rye, ryegrass, etc.) can inhibit early season germination of weeds such as lambsquarters, purslane and pigweed. Avoid planting cover crops where small-seeded crops such as lettuce will be planted the following year or germination will be reduced. To prevent increases in weeds, rotate crops to different areas of the garden so that the same crop is never planted in the same area two years in a row.

Organic mulches include straw, grass clippings, leaves, newspapers, manures, bark chips and other products derived from plant materials. Do not mulch with straw containing weed seeds. Weedy straw may be cleaned by wetting to encourage weed seed germination and then air dried several times to kill seedlings. Organic mulches allow some flexibility in fertilizing and watering since they can be raked back from the plant. Use organic mulches after the soil has warmed in the spring. If applied to cold soils, the rate of soil warming will be slowed.

Black plastic is one of the most commonly used inorganic mulches. Clear plastic is not recommended. Before applying plastic films, make sure the soil is moist and most of the fertilizer has been applied. A more durable option is the use of woven landscape fabric for garden weed control. They may last for up to 20 years if kept covered with soil. Inorganic mulches will increase soil temperature by 6 to 8°F.

When using mechanical means of weed control such as pulling, hoeing or tillage, it is important to remove weeds before they are more than 3 inches tall. There are a variety of hoes available for removing weeds including the scuffle hoe (an open stirrup with a blade), Warren hoe (arrowhead shaped), and the onion hoe (narrow blade). The scuffle hoe is a push-pull weeder that requires no lifting. The garden Weasel has three sets of wheels with spikes that are push-pulled to cultivate weeds. It is recommended where numerous small weeds are present.

Adjust tillers or cultivators to cultivate no deeper than 2 inches and to throw dirt into the row to cover emerged weeds.

When considering the use of herbicides in the home garden, it is important to know that **no single herbicide will do the entire job** of controlling weeds in all vegetable crops. Another problem is accurately and uniformly applying relatively small amounts of herbicide to the garden surface. Under application will result in poor weed control, while over application will result in crop damage.

For all-purpose weed control or to prepare a future garden site, Roundup or Ortho Kleenup (glyphosate) may be used for nonselective weed control. This is typically done in fall, late winter or early spring. **Do not use this material when crops are present or serious damage will occur.**

The two major chemicals available to control germinating seedlings before the crop emerges are Dacthal (DCPA) and Treflan (trifluralin). Dacthal and Treflan are trade names, and the common names are listed in parenthesis. These herbicides are marketed under several trade names, so check the common name on the label before buying. Check the herbicide registration chart for home vegetable gardens for specifics on the use of these products.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES	Go this website for more information on weed control in vegetables: http://www.sripmc.org/docs/SoutheasternVegetableGuide.pdf			
Broccoli				
S-metolachlor @ 0.47 to 1.2 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dual Magnum 7.62 EC*** 0.5 to 1.3 pt/A.	Post-transplant.	Do not exceed 1.3 pt/A. Make only one application per year. Do not harvest within 60 days of application. Do not mechanically incorporate Dual Magnum before transplanting. The risk of crop injury is less with post-transplant applications than from pre-transplant applications, and the risk of crop injury is less with post-directed than from post over-the-top applications. Application before bed formation may result in crop injury. The addition of another registered herbicide, especially Goal, will increase the risk of crop injury from postemergence applications.
oxyfluorfen @ 0.25 to 0.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Goal 2XL** 1 to 2 pt/A.	Pre-transplant.	Do not apply if Dual Magnum herbicide has been applied to the field during the current growing season. Do not apply as a preemergence treatment to direct-seeded broccoli. Do not apply post-transplant or over-the-top of broccoli. Sprinkler irrigation is recommended during early establishment of transplants. Do not apply more than 2 pt/A per season.
Cabbage				
S-metolachlor @ 0.47 to 1.2 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dual Magnum 7.62 EC*** 0.5 to 1.3 pt/A.	Post-transplant.	Do not exceed 1.3 pt/A. Make only one application per year. Do not harvest within 60 days of application. Do not mechanically incorporate before transplanting. The risk of crop injury is less with post-transplant applications than from pre-transplant applications, and the risk of crop injury is less with post-directed than from post over-the-top applications. Application before bed formation may result in crop injury. The addition of another registered herbicide, especially Goal, will increase the risk of crop injury from postemergence applications. Chinese varieties are more sensitive to injury.
oxyfluorfen @ 0.25 to 0.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Goal 2XL** 1 to 2 pt/A.	Pre-transplant.	Do not apply if Dual Magnum herbicide has been applied to the field during the current growing season. Do not apply as a preemergence treatment to direct-seeded cabbage. Do not apply post-transplant or over-the-top of cabbage. Sprinkler irrigation is recommended during early establishment of transplants. Do not apply more than 2 pt/A per season.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Cucurbits - Cantaloupe, Cucumber, Pumpkin, Summer Squash, Watermelon				
Preplant - Burndown				
carfentrazone @ 0.03 lb/A	Annual broadleaves, excellent control of morningglories.	**Aim 2EC** 2 fl oz/A.	Apply to actively growing weeds less than 4 inches tall.	**Crops: All cucurbits** Apply to preformed beds. Transplants: Apply no later than one day before transplanting. Seeded: Apply no later than 7 days after seeding.
glyphosate @ 1 to 2 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations)** 2 to 4 pt/A.	Prior to planting for planting into a weed free bed.	**Crops: All cucurbits** Apply directly to emerged weeds. Provides only postemergence control.
paraquat @ 0.5 to 1 lb/A	Annual weeds and foliage of perennials.	**Gramoxone 3SL** 2 to 4 pt/A.	Apply to emerged and actively growing weeds.	**Crops: All cucurbits** Contact action. Apply to emerged weeds prior to planting. Add a non-ionic surfactant at 0.25% v/v. Herbicide has no residual activity.
Cucurbits				
Preplant				
ethalfluralin + clomazone @ 0.52 lb total ai	Small seeded broadleaves and annual grasses.	**Strategy 2.1L** 2 pt/A.	Incorporate to soil 14 days before seeding on bare ground.	**Crops: All cucurbits** Activate with at least ½ in of irrigation. Helps reduce weed population early in the season. Follow with appropriate residual herbicide PRE or POST-row middles.
halosulfuron @ 0.024 to 0.048 lb ai/A	Sedges, ragweed, pigweed, smartweed, morningglory.	**Sandea 75 DG** 0.5 – 1 oz.	Apply to soil surface 7 days pretransplant or 7 days before seeding, before plastic installation.	**Crops: All cucurbits**
bensulide @ 4 lb/A	Annual grasses and broadleaf weeds, not very effective on pigweeds and morningglories.	**Prefar 4EC** 4 qt/A.	Apply to soil surface of preformed beds 14 days before planting. Or, apply at planting and incorporate with irrigation water.	**Crops: All cucurbits** Incorporate prior to planting by shallow tillage or 0.5 in irrigation.
Cucurbits				
Preemergence				
clomazone @ 0.15 to 0.25 lb/A	Small-seeded broadleaves and annual grasses.	**Command 3ME** 0.4 to 0.67 pt/A.	Apply to soil surface of preformed beds.	Activate with at least ½ inch of irrigation. Apply after seeding or before transplanting. DO NOT APPLY UNDER PLASTIC.
ethalfluralin + clomazone @ 0.4 to 1.2 lb/A + 0.125 to 0.375	Small-seeded broadleaves and annual grasses	**Strategy 2.1L** 2 to 6 pt/A.	Apply to the soil surface of preformed beds.	**Crops: All cucurbits** Apply immediately after planting. Activate with at least ½ inch of irrigation. DO NOT APPLY UNDER PLASTIC.

*Use of the Dual Magnum 24(c) labels for spinach, collards, kale, mustard greens, turnip greens, cantaloupe, cucumber, watermelon, transplanted broccoli, cabbage and Chinese cabbage requires agreeing to **Syngenta's waiver of liability and indemnification agreement**. To accept, go to the website, **farmassist.com**, and register to set up an account. After registering go to the top left of the home page, click on **Products** and then **Indemnified Labels**. You will then be prompted to select the state, **Arkansas**, the product, **Dual Magnum** and the crop. Read the **waiver of liability and indemnification agreement** and either accept or decline. If the conditions are unacceptable, return the Dual Magnum herbicide at once unopened or use the Dual Magnum herbicide for a different approved use in accordance with the label on the product container.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES				
Cucurbits - Preemergence [cont.]				
ethalfluralin @1.1 to 1.7 lb/A	Small-seeded broadleaves and annual grasses.	**Curbit 3EC** 3 to 4.5 pt/A.	Apply to the soil surface of preformed beds.	**Crops: All cucurbits** DO NOT APPLY UNDER PLASTIC, row covers, or hot caps. Apply to the soil surface immediately after seeding. DO NOT SOIL INCORPORATE. May also be used as a BANDED spray BETWEEN rows of plastic mulch. Shallow cultivation, irrigation or rainfall within 5 days is needed for good weed control. Do not use under mulches, row covers or hot caps. Under conditions of unusually cold or wet soil and air temperatures, injury may occur.
fomesafen @ 0.156 to 0.188 lb/A	Residual control of grasses and small-seeded broadleaf weeds.	**Reflex** 10 to 12 fluid oz/A.	Apply within 24 hours of planting.	**Crops: Pumpkin and watermelon ONLY** Incorporation by rainfall or irrigation within 36 hours of watermelon cracking the ground may cause crop injury. Watermelon varieties may vary in their response and not all varieties have been evaluated for tolerance. Do not apply more than 1 pt/A per crop per season. 35 days PHI.
halosulfuron @ 0.024 to 0.044 lb ai/A	Yellow and purple nutsedge, ragweed, pigweed, smartweed, cocklebur and morningglory.	**Sandea 75 DG** 0.5 to 1.0 oz.	Apply after seeding on bareground, before cracking.	**Crops: All cucurbits** Preemergence: apply after planting but before cracking.
S-metolachlor @ 0.67 to 1.2 lb/A	Small-seeded broadleaves and annual grasses.	**Dual Magnum** 0.67 to 1.27 pt/A.	Apply to soil surface of preformed beds.	**Crops: DO NOT USE ON SQUASH** Apply to bare soil after seeding, before crop or weed emergence. Make only one application per crop per year. Do not harvest within 60 days of application. May be applied to row middles as a tank-mixture with Sandea. Dual will not control emerged weeds. If rainfall (0.5 inch) does not occur within 7 to 10 days following application, weed control may be reduced. Irrigation following application will improve weed control. The risk of injury to melons is greater with a broadcast pre-emergence application than with a row middle application. The risk of crop injury is less with transplants than with direct-seeded melons. Application to emerged melon foliage may result in crop injury. Soil incorporation will increase the risk of crop injury.
S-metolachlor + halosulfuron @ 0.64 to 0.95 lb ai + 0.024 to 0.044 lb ai/A	Sedges, annual grasses, small-seeded broadleaves.	**Dual Magnum + Sandea** 0.67 to 1 pt/A + 0.5 to 1 oz/A.	Apply after seeding on bareground, before cracking.	**Crops: DO NOT USE ON SQUASH**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Cucurbits				
Postemergence				
clethodim @ 0.09 to 0.125 lb/A	Annual and perennial grasses ONLY. Very effective on annual bluegrass.	**Select 2EC** 6 to 8 fl oz/A.	Postemergence to weeds	**Crops: All cucurbits** Apply to actively growing grasses not under drought stress. Add 1 gallon crop oil concentrate per 100 gallons spray mix. Adding crop oil may increase the likelihood of crop injury at high air temperatures. Do not apply more than 8 oz/A per application. Do not apply within 14 days of harvest. Multiple applications are required for perennial grass control. Repeat application on 14- to 21-day intervals.
halosulfuron @ 0.024 to 0.044 lb/A	Sedge and broadleaf control; should be mixed with other herbicides to enhance grass activity.	**Sandea 75 DG** 0.5 to 0.75 oz.	Apply to emerged and actively growing weeds when crop is at 3 to 5 leaves. Split application (PRE fb POST) for better sedge control.	**Crops: All cucurbits** Do not apply sooner than 14 days after transplanting. Can be applied over the top, if bareground, but reduce late-season applications when the temperature and humidity are high. If on plastic, apply in row middles; keep off the plastic. Do not apply more than 2 ounces per year. Do not apply to crops treated with soil-applied organophosphate insecticides.
sethoxydim @ 0.2 to 0.5 lb/A	Annual and perennial grasses ONLY.	**Poast 1.5EC** 1 to 2.5 pt/A.	Apply to emerged and actively growing weeds, before annual grasses exceed 14 days after emergence. Timing is very important. Johnsongrass: 15 to 20 inches Bermudagrass: 1-inch height or 6-inch maximum runner length	**Crops: All cucurbits** Apply to emerged grasses. Consult manufacturer's label for specific rates and best times to treat. Add 1 quart of crop oil concentrate per 100 gal spray. Do not apply on days which are unusually hot and humid. Do not apply within 7 days of harvest. Total cannot exceed 2.5 pt/A/year.
S-metolachlor @ 0.64 to 0.95 lb/A	Small seeded broadleaves and annual grasses.	**Dual Magnum** 0.67 to 1 pt/A.	Apply to the crop at 1- to 2-leaf stage.	**Crops: DO NOT USE ON SQUASH** Dual Magnum is a soil-active herbicide. It has no postemergence activity. Mix with a postemergence herbicide to kill emerged weeds. Or, soil should be weed-free at application. Row middle applications are recommended in mulched crops.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES [cont.]				
Greens [collards, kale, mustard, turnips]				
trifluralin @ 0.3 to 0.5 lb/A		**Treflan 4 EC** 0.6 to 1 pt/A.	Anytime from 6 weeks prior to planting up to planting.	Trifluralin requires thorough incorporation into soil top a depth of 1 to 1½ inches.
sethoxydim @ 0.2 to 0.3 lb/A	Annual and perennial grasses.	**Poast 1.5 EC** 1 to 1.5 pt/A.	Postemergence. Consult label for the correct timing for the target weed(s).	Do not apply within 30 days of harvest. Do not apply more than 1.5 pt/A per treatment. Do not exceed 3 pt/A per growing season.
clethodim @ 0.094 to 0.125 lb/A	Grasses.	**Select 2 EC** 6 to 8 oz/A.	Postemergence.	Apply postemergence for annual grasses at 6 to 8 oz/A or bermudagrass and johnsongrass at 8 oz/A. Add 1 gallon crop oil concentrate per 100 gallons spray mix. Adding crop oil may increase the likelihood of crop injury at high air temperatures. Very effective in controlling annual bluegrass. Apply to actively growing grasses not under drought stress. Do not apply more than 8 ounces per acre per application. Do not apply within 14 days of harvest of green crops. Do not apply within 30 days of harvest of turnips grown for roots.
S-metolachlor @ 0.64 to 0.95 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dual Magnum 7.62 EC*** 0.67 to 1 pt/A.	Preemergence.	Do not exceed 1 pt/A. Make only one application per year. Do not harvest within 30 days of application. Will not control emerged weeds. May be post-applied when the crop has 1 to 2 true leaves.
Okra				
trifluralin @ 0.5 to 0.75 lb/A	Grasses, pigweed, purslane.	**Treflan 4 EC** 1 to 1.5 pt/A.	Preplant incorporated.	Apply and incorporate before planting.
sethoxydim @ 0.3 lb/A	Grasses only.	**Poast 1.5 EC** 1 to 1.5 pt/A.	Postemergence.	Apply to grasses that are actively growing and not under stress. Do not apply within 14 days of harvest.
Peppers				
trifluralin @ 0.5 to 0.75 lb/A	Small-seeded annual grass and broadleaf weeds.	**Treflan 4 EC** 1 to 1.5 pt/A.	Any time from 6 weeks before planting up to planting. After bedding if beds are used.	Requires thorough incorporation to a depth of 1 to 1½ inches.
sethoxydim @ 0.19 to 0.38 lb/A	Grasses.	**Poast 1.5 EC** 1 to 2 pt/A.	Before annual grasses exceed 14 days after emergence. Timing is very important. Johnsongrass – 15 to 20 inches; bermudagrass – 1-inch height or 6-inch maximum runner length.	Apply only under conditions of active growth. Thorough coverage required. Do not tank mix with other pesticides. Do not cultivate 7 days before or after treatment. Cultivation soon after 7 days will be helpful. Do not apply within 20 days of harvest. Do not apply more than 3 pt/A per season.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
clethodim @ 0.094 to 0.125 lb/A	Grasses.	**Select 2 EC** 6 to 8 oz/A.	Postemergence.	Apply postemergence for annual grasses at 6 to 8 oz/A or bermudagrass and johnsongrass at 8 oz/A. Add 1 gallon crop oil concentrate per 100 gallons spray mix. Adding crop oil may increase the likelihood of crop injury at high air temperatures. Very effective in controlling annual bluegrass. Apply to actively growing grasses not under drought stress. Do not apply more than 8 oz/A per application. Do not apply within 20 days of harvest.
Snapbeans, Lima Beans				
halosulfuron @ 0.02 to 0.04 lb/A	Yellow and purple nutsedge, ragweed, pigweed, smartweed, cocklebur and morningglory.	**Sandea 75 DF** 0.5 to 1 oz/A.	Preemergence.	Preemergence: apply after planting but before cracking.
S-metolachlor @ 0.6 to 1.01 lb/A	Annual weeds.	**Dual Magnum 7.62 EC*** 10 oz to 16 oz/A.	Preemergence.	Apply during or after planting but before weeds emerge.
EPTC + trifluralin @ 3.5 + 0.5 lb/A	Annual weeds.	**Eptam + Treflan 4 EC** 3.5 pt/A + 1 pt/A.	Just prior to planting.	Requires thorough incorporation to a depth of 3 inches.
trifluralin @ 0.5 lb/A	Small-seeded broadleaf weeds and annual grasses.	**Treflan 4 EC** 1 pt/A.	Any time from 6 weeks before planting up to planting. After bedding if beds are used.	Requires thorough incorporation to a depth of 1 to 1½ inches.
bentazon @ 0.25 to 0.5 lb/A	Purslane, velvetleaf, ragweed, smartweed, cocklebur, jimsonweed.	**Basagran 4S** 0.5 to 1 pt/A.	Postemergence to small weeds.	See label for details and weed sizes.
sethoxydim @ 0.3 to 0.5 lb/A	Annual and perennial grasses.	**Poast 1.5 EC** 1.5 to 2.5 pt/A.	Treat annual grasses within 14 days of emergence. Johnsongrass at 12 to 18 inches.	Do not apply within 15 days of harvest. Do not exceed 4 pt/A per season. Add 1% crop oil concentrate.
fomesafen @ 0.1875 to 0.25 lb ai/A	Many broadleaf weeds.	**Reflex 2L** 0.75 to 1 pt/A.	Apply postemergence to dry beans having at least 4 expanded trifoliate leaves or snap beans having at least 1 expanded trifoliate leaf. Include a nonionic surfactant at 1 quart per 100 gallons spray mixture.	Dry or snap beans only. Total use per year cannot exceed 1.5 pt/A. Do not apply within 45 days of dry bean harvest or 30 days of snapbean harvest. See label for further information.
fomesafen @ 0.25 to 0.375 lb/A	Broadleaf weeds.	**Reflex 2L** 1 to 1.5 pt/A.	Preplant or early post.	Do not exceed 1.5 pt/A rate. Dry or snapbeans.

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Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES [cont.]				
Southern Peas - Preemergence				
imazethapyr @ 0.063 lb/A	Small-seeded broadleaves and annual grasses.	**Pursuit** 4 fl oz/A.	Preplant soil-incorporated, preemergence, or early postemergence.	Has activity on pigweeds, but will not control ALS-resistant pigweeds.
S-metolachlor @ 0.64 to 0.95 lb/A	Small-seeded broadleaves and annual grasses.	**Dual Magnum** 0.67 to 1 pt/A.	Preplant soil-incorporated or preemergence.	Excellent control for pigweeds, other small-seeded broadleaves and annual grasses. Needs 1 inch of rainfall for activation. Rainfall exceeding 2 inches will reduce residual activity.
sulfentrazone @ 0.1 to 0.25 lbs/A	Excellent broad spectrum control of broadleaf weeds including pigweeds. Good on grasses, but grasses will be the first to break through. Good yellow nutsedge control.	**Spartan 4F** 3 to 8 fl oz/A.	Apply to a weed-free, bareground soil.	Do not apply to coarse soil classified as sand which has less than 1% organic matter. Weak on hemp sesbania. Section 24c label for Arkansas. For dry cowpeas only.
sulfentrazone + carfentrazone @ 0.1 to 0.2 lb/A + 0.01 to 0.02 lb/A	Annual grasses and small-seeded broadleaves, good activity on pigweeds.	**Spartan Charge** 3.8 to 7.6 fl oz/A.	Apply to the soil surface immediately after planting.	Similar to Spartan. Will have postemergence activity on small emerged weeds at planting. Apply immediately following planting to prevent crop injury. Can be applied preplant to preemergence. Tank mixing with Dual Magnum may cause stunting, but increase weed-control spectrum.
sulfentrazone + *S*-metolachlor @ 0.1 lb/A to 0.14 + 0.95 to 1.27 lb/A	Annual grasses and small-seeded broadleaves, excellent on pigweeds and morningglories. Good control of yellow nutsedge.	**Broadaxe** 19 to 26 fl oz/A.	Apply to a weed-free bareground soil.	Preplant application is safer than application at planting. Follow the same precautions as with sulfentrazone alone.
trifluralin @ 0.5 to 0.75 lb/A	Annual grasses and small seeded broadleaves.	**Treflan 4L** 1 to 1.5 pt/A.	Apply to a weed-free bareground soil.	Requires thorough incorporation to a depth of 1 to 1.5 inches. Should be applied with another herbicide to improve spectrum of control.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Southern Peas - Postemergence				
bentazon @ 0.5 lb/A	Prickly sida, smartweeds, and common cocklebur.	**Basagran** 1 pt.	Apply over the top of the crop and weed, good coverage required.	Apply over the top. Weak on pigweeds. Excellent activity on prickly sida, smartweeds and common cocklebur.
clethodim @ 0.094 to 0.125 lb/A	Grasses.	**Select 2 EC** 6 to 8 oz/A.	Apply to small grass seedlings.	Apply to emerged grasses. Consult manufacturer's label for specific rates and best times to treat. For clethodim, add 1 gallon of crop oil concentrate per 100 gallons of spray solution. Adding crop oil to Select may increase the likelihood of crop injury at high air temperatures. Do not apply Select on days that are unusually hot and humid. Do not apply within 14 days of harvest.
fomesafen @ 0.2 lb/A	Annual grasses and small-seeded broadleaves, good activity on pigweeds 2 inches tall.	**Reflex 2 SL** 13 oz/A.	2 to 4 trifoliate crop.	Will burn leaves, especially if it is applied on a very hot and sunny day, but the crop will recover. Some varieties will be injured more than others. Dry or snap beans only. Total use per year cannot exceed 1.5 pints/A. Do not apply within 45 days of dry bean harvest. See label for further information.
imazamox @0.03 lb/A	Small-seeded broadleaves, annual grasses, and sedges.	**Raptor** 4 fl oz/A.	Apply over the top of the crop and weed, good coverage required.	Similar to Pursuit, but has shorter residual activity. Some varieties may be stunted by Raptor.
imazethapyr @ 0.063 lb/A	Small-seeded broadleaves, annual grasses and sedges.	**Pursuit** 4 fl oz/A.	Apply over the top of the crop and weed, good coverage required.	Annual grasses and broadleaves. Will not control ALS-resistant pigweeds. Good on sedges.
sethoxydim @ 0.2 to 0.5 lb/A	Annual and perennial grasses ONLY.	**Poast 1.5EC** 1 to 2.5 pt/A.	Apply to actively growing weeds.	Thorough coverage required. Do not tank mix with other pesticides. Do not cultivate 7 days before or after treatment. Cultivation soon after 7 days will be helpful. Use a crop oil concentrate at 1% v/v. Add 1 quart of crop oil concentrate per acre. This may cause crop injury on a hot, sunny day. Total cannot exceed 2.5 pt/A/year. Do not apply within 15 days of harvest.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES [cont.]				
Spinach				
sethoxydim @ 0.19 to 0.38 lb/A	Grasses.	**Poast 1.5 EC** 1 to 1.5 pt/A.	Before annual grasses exceed 14 days after emergence. Timing is very important. Johnsongrass: 15 to 20 inches Bermudagrass: 1-inch height or 6-inch maximum runner length	Apply only under conditions of active growth. Thorough coverage required. Do not tank mix with other pesticides. Do not cultivate 7 days before or after treatment. Cultivation soon after 7 days will be helpful. Do not apply within 15 days of harvest.
clethodim @ 0.094 to 0.125 lb/A	Grasses.	**Select 2 EC** 6 to 8 oz/A.	Postemergence.	Apply to emerged grasses. Consult manufacturer's label for specific rates and best times to treat. For sethoxydim, add 1 quart of crop oil concentrate per acre. For clethodim, add 1 gallon of crop oil concentrate per 100 gallons of spray solution. Adding crop oil to Poast or Select may increase the likelihood of crop injury at high air temperatures. Do not apply Poast or Select on days that are unusually hot and humid. Do not apply sethoxydim within 15 days of harvest or clethodim within 14 days of harvest.
S-metolachlor @ 0.32 to 0.64 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dual Magnum 7.62 EC**** 0.33 to 0.67 pt/A.	Preemergence.	Do not incorporate. Make only one application per year. Do not exceed 0.67 pt/A. Use low rate on coarse soil. Do not harvest within 50 days of application. Do not apply through an irrigation system. Irrigate within 2 days of application.
phenmedipham @ 0.5 to 1 lb/A	Annual broadleaf.	**Spin-Aid 1.3 EC** 3 to 6 pt/A.	Postemergence.	Do not use when expected high temperatures will be above 75°F. For best results, spray when weeds are in the 2-leaf stage. Use the 6 pint rate only on well-established crops which are not under stress. Do not apply within 40 days of harvest. Spinach plants must have 6 true leaves or more. For processing spinach only. Do not exceed 22 gallons per acre water. Avoid drift.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Sweet Corn				
S-metolachlor + atrazine 1.25 to 1.5 lb + 1 to 1.6 lb/A	Annual weeds.	**Dual Magnum 7.62 EC + AAtrex, atrazine** See label for specific formulations.	Preplant incorporated, preemergence or early postemergence.	Use high atrazine rate where cocklebur and morningglory are severe. Rainfall in 5-7 days is necessary for best results. With preplant, shallow incorporate 2-3 inches within 7 days of planting.
bentazon @ 0.75 to 1 lb/A	Cocklebur, common ragweed, jimsonweed, Pennsylvania smartweed, velvetleaf, yellow nutsedge, and morningglory.	**Basagran 4S** 0.75 to 1 qt/A.	Apply early postemergence over top when weeds are small and corn has 1 to 5 leaves.	See label for rates according to weed size and special directions for annual morningglory and yellow nutsedge control. Use a crop oil at a rate of 1 qt/A.
halosulfuron @ 0.032 lb/A	Cocklebur, passionflower, pigweed, pokeweed, ragweed, smartweed, velvetleaf.	**Permit 75 DF** 0.67 oz/A.	Postemergence.	Apply over the top with drop nozzles to sweet corn from spike to lay-by for control of emerged weeds. Add nonionic surfactant at 1 to 2 quarts per gallon of spray solution or 1 gallon per 100 gallons of spray solution. See label for all instructions and restrictions.
S-metolachlor + atrazine @ 1 to 2 + 0.78 to 1.56	Most annual grass and broadleaf weeds.	**Bicep II Magnum** 1.3 to 2.6 qt/A.	Preemergence.	Apply to soil surface immediately after planting. See label for further instructions.
atrazine @ 1 to 2 lb/A	Most annual broadleaf and grass weeds.	**Aatrex 4L** 1 to 2 qt/A.	Preemergence or postemergence.	Apply to soil surface immediately after planting. Shallow cultivation of preemergence applications improves control. Postemergence: Use the 2 quart rate and apply before weeds reach 1.5 inches. See label for amount of crop oil to add. For best results, tank mix with a grass herbicide such as Dual.
Sweet Potatoes				
sethoxydim @ 0.3 to 0.5 lb/A	Annual and perennial grasses.	**Poast 1.5 EC** 1.5 to 2.5 pt/A.	Apply to small annual grasses, preferably within 14 days after emergence. See label for timing perennial grasses.	Do not apply within 30 days of harvest. Do not apply more than 4 pt/A in one season. Add 1% crop oil concentrate.
clethodim @ 0.09 to 0.25 lb/A	Grasses.	**Select 2 EC** 6 to 16 oz/A.	Postemergence.	Apply postemergence for annual grasses at 6 to 8 oz/A or bermudagrass and johnsongrass at 8 oz/A. Add 1 gallon crop oil concentrate per 100 gallons of spray mix. Adding crop oil may increase the likelihood of crop injury at high air temperatures. Very effective in controlling annual bluegrass. Apply to actively growing grasses not under drought stress. Do not apply within 30 days of harvest.

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Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
VEGETABLES				
Sweet Potatoes [cont.]				
clomazone @ 0.48 to 1.5 lb/A	Annual grasses.	**Command 3 ME** 1.3 to 4 pt/A.	Pre-transplant.	Use the low rate on coarse soils and the high rate on fine soils. May also be applied as a single, post-transplant application to the crop before weeds emerge at a maximum of 1.5 pt/A.
fluazifop-P @ 0.19 lb/A	Grasses.	**Fusilade DX 2 EC** 6 to 18 oz/A.	Before annual grasses exceed 14 days after emergence. Timing is very important. Johnsongrass: 12 to 18 inches Bermudagrass: 3-inch height or 6- to 12-inch maximum runner length	Less effective than Poast on annual grasses. More effective on bermudagrass and johnsongrass. Thorough coverage required. Do not tank mix. Do not cultivate 7 days before or after application. Do not apply within 20 days of harvest.
flumioxazin @ 0.094 lb/A	Annual broadleaf weeds including pigweed.	**Valor 51 WDG** 3 oz/A.	Apply 2 to 5 days prior to transplanting crop.	Movement of soil during transplanting should not occur or reduced weed control may result. Do not use on greenhouse-grown transplants. Do not apply postemergence or serious crop injury will occur. Do not use on transplants harvested more than 2 days prior to transplanting. Do not use on transplant propagation beds. See label for instructions on use. Use only on the 'Beauregard' variety.
S-metolachlor @ 0.95 to 1.26 lb/A	Annual sedge and yellow nutsedge.	**Dual Magnum 7.62 EC** 1 to 1.33 pt/A.	After the sweet potatoes have been transplanted but before weeds emerge.	Do not incorporate following application. Use the lower rate on coarse-textured soils. The transplanter trench must be closed before applying. Do not apply more than 0.5 inches of irrigation for the first irrigation following application. Make only one application per season.
Tomatoes				
S-metolachlor @ 0.95 to 1.5 lb/A	Yellow nutsedge, annual grasses, broadleaf weeds.	**Dual Magnum 7.62 EC** 1 to 2 pt/A.	Preplant or postdirected to transplants.	Apply preplant or postdirected to transplants after the first settling rain or irrigation. In plasticulture, apply to preformed beds just prior to applying plastic mulch. Minimize contact with crop. Do not apply within 90 days of harvest. Also registered for use in row middles, and in seeded crop. See label for further instructions.
trifluralin @ 0.5 to 0.75 lb/A	Annual weeds.	**Treflan 4 EC** 1 to 1.5 pt/A.	Preplant any time from 6 weeks before transplanting up to transplanting. After bedding if beds are used.	Requires thorough incorporation to a depth of 1 to 1½ inches. Do not use on direct-seeded tomatoes.
metribuzin @ 0.25 to 0.5 lb/A	Annual broadleaf and grass weeds.	**Metribuzin 75 DF** 0.33 to 0.67 lb/A.	After transplants have 5-6 leaves or have fully recovered from shock of transplanting and weeds are small.	Over top. Do not apply within 3 days after period of cool, wet or cloudy weather or injury will occur. See label for other precautions.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
halosulfuron @ 0.02 to 0.04 lb/A	Yellow and purple nutsedge, ragweed, pigweed, smartweed, cocklebur and morningglory.	**Sandea 75 DF** 0.5 to 1.0 oz/A.	Preemergence and postemergence	Direct-seeded, postemergence: Sandea may be applied over the top from the 4-leaf stage to first bloom. After bloom, use shields or directed spray to avoid contact with the plant. Transplants: May be applied from 14 days after transplanting to first bloom. After first bloom, apply as a directed spray.
metribuzin @ 0.5 to 1 lb/A	Same as above but better control.	**Metribuzin 75 DF** 0.67 to 1.33 lb/A.	Before direct seeding or transplanting.	Directed spray. Avoid contact with foliage. See above precautions and refer to label for further details.
sethoxydim @ 0.19 to 0.38 lb/A	Grasses.	**Poast 1.5 EC** 1 pt/A.	Before annual grasses exceed 14 days after emergence. Timing is very important. Johnsongrass: 15 to 20 inches Bermudagrass: 1-inch height or 6-inch maximum runner length	Apply only under conditions of active growth. Thorough coverage required. Do not tank mix with other pesticides. Do not cultivate 7 days before or after treatment. Cultivation soon after 7 days will be helpful. Do not apply within 20 days of harvest. Do not apply more than 4.5 pt/A per season.
clethodim @ 0.09 to 0.25 lb/A	Annual and perennial grasses.	**Select 2E** 6 to 16 oz/A.	Postemergence.	Add 1.0% crop oil concentrate. Apply to actively growing grasses. Repeat applications may be needed for perennial grass control. Good on annual bluegrass and broadleaf signalgrass.
trifloxysulfuron-sodium @ 0.0047 to 0.0094 lb/A	Yellow nutsedge, morningglory, common cocklebur, common lambsquarters and other broadleaf weeds.	**Envoke 75 DG** 0.1 to 0.2 oz/A.	Post-directed.	**In row.** Apply post-directed to tomato grown on plastic for control of nutsedge and certain broadleaf weeds. Crop should be transplanted at least 14 days prior to application. The application should be made prior to fruit set and at least 45 days prior to harvest. Use nonionic surfactant at 1 quart per 100 gallons spray solution with all applications. **Row middles.** Apply for control of nutsedge and certain broadleaf weeds. Crop should be transplanted at least 14 days prior to application. Use nonionic surfactant at 1 quart per 100 gallons spray solution with all applications. See label for information on registered tank mixes. Tank mixtures with Select or Poast may reduce grass control. See label for more information.

WEED CONTROL IN HOME FRUIT PLANTINGS

Many home gardeners have fruit plantings that are too large to hand weed and too small to use heavy equipment in. Hand pulling and mulching can be used to control weeds in many cases. In addition, herbicides can be used to supplement the above cultural practices to make controlling weeds easier and faster. For small areas, several chemical manufacturers (e.g., Ortho, Scott, Southern States, Security, and others) sell a variety of herbicides in small quantities which are ideal for this job. These chemicals are formulated to make them more convenient and easier for the homeowner to use. For larger areas, several products can be purchased over the counter at farm chemical retail stores. For all-purpose weed knockdown, use glyphosate. These knockdown materials (postemergence) will kill many emerged weeds already growing. Remember to keep these materials off the crop plants to avoid damage.

To control germinating seedlings, several preemergence herbicides are available. General use recommendations are given below, but consult the label on each product for specific directions before application.

Strawberries

Weed control is difficult since newly set strawberries are sensitive to many of the herbicides. Dacthal is the only herbicide which can be applied to clean soil after planting strawberries. Use 4 ounces by weight of Dacthal 75% wettable powder in one gallon of water to spray 1,000 square feet. Up to three applications can be made per year with at least one month intervals. Dacthal will be effective for 4 to 8 weeks. Devrinol can also be used on established plants. See the label for directions. Apply one-half inch of irrigation immediately after application of Devrinol for best results. Poast can be used for control of emerged annual and perennial grasses at any time except during harvest and during the period up to 30 days before harvest begins.

Small Fruits

(raspberries, blackberries, blueberries, grapes) and Orchard Fruit (apples, pears, peaches, plums, nuts)

A weed-free strip around the base of each plant is desirable. Mowing a grass or natural weed strip between crop plants and applying a preemergence herbicide and/or a 3-inch mulch under the crop plants is the ideal method of managing weeds in your home fruit planting. Following are general suggestions for using weed control chemicals in fruit plantings. Read the information on the container for more detailed directions.

Preemergence Herbicides

These materials are used to prevent weed germination. They must be applied as a directed spray to the base of the crop plant. Contact of the spray with the lower stems or leaves of these plants, however, will not damage them. Mixing these herbicides into the soil surface is often suggested to increase effectiveness. Watering with an inch or more of water can often be used as a substitute for incorporation around established plants.

- Casoron (dichlobenil) is available as a 2 or 4% granule. It can be used on most woody plants 30 days after transplanting. This material is excellent for control of cool-season grasses and weeds. It is best applied during the winter months.
- Devrinol 50% dry flowable granules can be used on many newly planted and established fruit crops. Put 1 ounce by weight in one gallon of water (or more) and spray uniformly over 1,000 square feet. It is best applied either in early spring or after harvest to weed-free soil.
- Princep (simazine) is available as a wettable (90 WP) powder and a liquid (4L) and can be used on many established woody plants. Do not apply to plants less than 3 years old. It is best applied either in early spring or after harvest to weed-free soil.
- Surflan is available as a liquid (4AS). Apply 2 to 4 quarts of the 4AS evenly over one acre in at least 20 gallons water or put 1½ to 3 tablespoons of 4AS in one gallon water and spray evenly over 1,000 square feet. Surflan can be applied safely after transplanting on many woody stemmed crops. It is best applied either in early spring or after harvest to weed-free soil.

Postemergence Herbicides

These materials are used to eliminate existing weeds. Remember to keep these materials off crop plants or damage will result.

- Roundup or Ortho Kleenup – This material is most effective on small annuals and perennials in the middle of the summer. Roundup is a slow-acting material which will completely kill the plants, including the roots of perennials. It will take 10 to 14 days for the plants to die. Since the concentration of active ingredient in these products varies, follow the mixing directions on the container. Do not use these materials during bloom or harvest periods.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FRUIT AND NUT CROPS				
Tree Fruits				
Preemergence				
indaziflam @ 0.065 to 0.085 lb/A		**Alion 1.67 SC** 5 to 6.5 fl oz/A.		Use in orchards established three years or more. See label for details pertaining to replants in established orchards. Allow at least 30 days between applications. Use 5 fl oz/A on medium- and coarse-textured soils. Do not use on soils that have a 20% or greater gravel content. Do not use in orchards with open channels or cracks in soil. Do not apply more than 10.3 oz/A per year. Alion has a 14-day PHI. Tank mix glyphosate, glufosinate, or paraquat for nonselective POST weed control.
pendimethalin @ 1.9 to 3.8 lb/A	Annual grasses and some broadleaf weeds.	**Prowl H_2O 3.8 AS** 2 to 4 qt/A.	Preemergence.	Most effective when adequate rainfall or irrigation is received within 7 days of application. Do not apply to newly transplanted trees until ground has settled around roots. Apply with paraquat to control emerged weeds. Prowl has a 60-day preharvest interval (PHI). May be applied as sequential applications so long as total amount used does not exceed 4.2 qt/A. Allow at least 30 days between applications.
oryzalin @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Surflan 4 AS** 2 to 4 qt/A. Use low rate for short-term (4 months) weed control and high rate for 6- to 8-month weed control. May be tank mixed with Karmex or Princep. See comment at right.	Apply to weed-free soil. Mix any weed residue or trash thoroughly into soil before application.	Sprayer must have thorough agitation and avoid spray drift to foliage. For broader spectrum of control, Surflan may be tank mixed with Karmex or Princep as recommended individually. See label for details. May be used on apples, peaches, pears and most other tree fruits.
diuron @ 2 to 3.2 lb/A	Annual weeds and some perennials.	**Karmex 80 DF** 2.5 to 4 lb/A.	Apply February through May or in fall after harvest.	Time period that trees should be established in the orchard before using Karmex: apples 1 year, peaches 3 years, pears 1 year.
norflurazon @ 2 to 4 lb/A	Annual weeds and some perennials.	**Solicam 80 DF** 2.5 to 5 lb/A.	From fall to early spring before weeds emerge.	Orchard floor should be free of weeds. Use only on trees 18 months or older. May be applied to applies, cherries, pears, nectarines, peaches and plums.
terbacil @ 1.6 to 3.2 or 0.8 to 1.6 lb/A	Annual weeds and some perennials.	**Sinbar 80W** 1 to 2 lb/A.	From fall to early spring before weeds emerge.	Time period that trees should be established in the orchard before using Sinbar: apples 3 years, peaches 3 years.
simazine @ 2 to 4 lb/A	Annual weeds, primarily broadleaves.	**Princep** 2 to 4 qt/A of 4L.	From fall to early spring before weeds emerge.	Time period that trees should be established in the orchard before using Princep: apples, peaches, plums, nectarines, cherries, pears 1 year.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FRUIT AND NUT CROPS				
Tree Fruits				
Preemergence [cont.]				
flumioxazin @ 0.19 to 0.38 lb/A	Annual broadleaf and grass weeds.	**Chateau** 6 to 12 oz/A.	Preemergence, dormant applications preferred or use shielded sprayer.	For trees established less than three years growing in soil with a sand plus gravel content of over 80 percent, use a maximum rate of 6 ounces per acre. Do not harvest fruit from treated trees within one year of application.
Tree Fruits				
Postemergence				
paraquat @ 0.63 to 1 lb/A	Annual weeds and foliage of perennials.	**Paraquat (3 lb/gal formulations)** 1.7 to 2.7 pt/A.	Apply in spring with preemergence herbicide. If needed, repeat alone throughout the season as required to contain weeds.	For paraquat: apply directly to weed foliage. May be used with preemergence material to eliminate existing weeds or 6 to 8 weeks later to eliminate escape weed plants. May be used in apples, cherries, peaches, nectarines, pears, plums, prunes and apricots.
fluazifop-P @ 0.19 lb/A	Annual and perennial grasses, including johnsongrass and bermudagrass.	**Fusilade DX 2 EC** 1.5 pt/A.	When grasses are actively growing. See label for growth stages. Repeat applications needed for bermuda-grass and johnsongrass.	Do not use on bearing apples or pears. Do not harvest apricots, cherries, nectarines, peaches, plums or prunes within 14 days of application.
sethoxydim @ 0.3 to 0.5 lb/A	Annual and perennial grasses.	**Poast 1.5 EC** 1.5 to 2.5 pt/A.	Apply to small annual grasses preferably within 14 days after emergence. See label for timing for perennial grasses.	Labeled for apple, crabapple, pear and quince. Do not harvest within 14 days of treatment. Add 1% crop oil concentrate.
glyphosate @ 0.75 to 3.75 lb/A	Annual weeds, johnsongrass and bermudagrass.	**Glyphosate (4 lb/gal formulations)** 1 to 5 qt/A in 10 to 20 gal water.	To actively growing vegetation.	Apply to peach orchards that have been planted for 2 years or more. Application **must** be made with a shielded boom sprayer or wiper applicator which prevents any contact of Roundup with the peach foliage or bark. Remove suckers and hangers at least 10 days before application. Mis-application of Roundup around peach trees can result in severe tree injury or death. Use 20 gpa or less of clean water.
Blueberry and Blackberry				
Preplant - Burndown				
glyphosate @ 1 - 4 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations)** 1 to 4 qt/A	Prior to planting for planting into a weed free bed.	Apply directly to emerged weeds. Provides only postemergence control.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Preemergence - Blueberry ONLY				
flumioxazin @ 0.188 to 0.38 lb/A	Annual broadleaf and grass weeds.	**Chateau 51WDG** 6 to 12 oz.	Early winter and not later than mid-February.	Shallow incorporation or irrigation of ½ to 1 inch recommended. Apply to bearing and nonbearing plants. **Established plants (>1 year).**
Preemergence - Blueberry and Blackberry				
dichlobenil @ 4 to 6 lb/A or 2 to 4 lb /A	Annual broadleaf and grass weeds.	**Casoron 4G or Casoron CS** 100 lb/A or 1.4 to 2.8 gal/A.	Early winter and not later than mid-February.	Shallow incorporation or irrigation of ½ to 1 inch recommended. Apply to bearing and nonbearing plants. **Established plants (>1 year).**
diuron @ 1.2 to 1.6 lb/A	Annual broadleaf and grass weeds.	**Karmex 80DF** 1.5 to 2 lb/A.	Early spring and again in fall.	Apply as a band treatment to the base of the canes. Use low rate on sandy, gravelly soils with low organic matter. May cause injury. **Established plants (>1 year).**
isoxaben @ 0.5 t 1 lb/A	Annual broadleaf weeds.	**Gallery 75DF** 0.66 to 1.33 lb/A.	Sequential applications throughout the year.	Apply to crops that will not be harvested for one year. Apply sequential applications no sooner than 60 days apart and no more than 4 lb/A per year. **Nonbearing plants only.**
isoxaben + trifluralin @ 2.5 to 5 lb/A	Annual broadleaves and grasses.	**Snapshot 2.5TG** 100 to 200 lb/A.	Sequential applications throughout the year.	Apply to crops that will not be harvested for one year. Irrigation or rainfall of ½ to 1 inch needed within 3 days of application. Make applications no sooner than 60 days apart. No more than 600 lb/A per year. **Nonbearing plants only.**
mesotrione @ 0.1 to 0.2 lb/A	Broadleaves.	**Callisto** 3 to 6 fl oz/A.	Pre-bloom.	Callisto has some POST activity, add 1% v/v crop oil concentrate. No more than two applications at 2 fl oz, 14 days apart per season. May cause bleaching. **Established plants (>1 year).**
napropamide @ 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Devrinol 50 DF** 8 lb/A.	Early spring or after harvest.	Apply to a weed-free surface or tank mix with a POST herbicide. Must be incorporated with irrigation or rainfall within 24 hours. Do not exceed 8 lb/A per crop cycle.
norflurazon @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaves and some seedling perennials.	**Solicam 80DF** 2.5 to 5 lb/A.	Apply from fall to early spring while plants are dormant.	Apply while plants are dormant. Limit to one application per year. Do not apply within 60 days of harvest. Use higher rates on higher clay soil. May cause some bleaching or yellowing. **Established plants (>18 m).**
oryzalin @ 2 to 6 lb/A	Annual grasses and small-seeded broadleaf weeds	**Surflan 4AS** 2 to 6 qt/A.	Sequential applications throughout the year	Irrigation or rainfall of ½ to 1 inch needed for proper activation. Sequential applications on 2½-month intervals. No more than 12 qt/A per year.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FRUIT AND NUT CROPS				
Preemergence - Blueberry and Blackberry [cont.]				
simazine @ 1 to 2 lb/A @2 to 4 lb/A	Annual broadleaf and grass weeds.	**Princep 4L** 1 to 2 qt/A. 2 to 4 qt/A.	Before bud break and after harvest. New planting (<6 m) Established plants	Split applications with half the recommendation in the fall and half in the spring. Do not apply when fruit is present.
terbacil @ 0.4 to 1.6 lb/A	Annuals and some perennials.	**Sinbar 80W** 0.5 to 2 lb/A.	In spring before fruit set or after harvest in the fall	Use low rates on coarse/ sandy soils and/or soils with less than 3% organic matter. Avoid contact with foliage. **Established plants (>1 year).**
Postemergence - Blueberry and Blackberry				
carfentrazone @ 0.016 to 0.031 lb/ A for weed control @0.1 lb/A for primocane control	Annual broadleaves.	**Aim 2EC** 1 to 2 fl oz/A for weed control. 6.4 fl oz/A for primocane control.	Apply to emerged and actively growing weeds.	Apply to primocanes as post-directed spray when they are approximately 6 inches tall. Use a crop oil concentrate at 1% v/v or nonionic surfactant at 0.25%. Avoid contact with green tissues or foliage. Sequential application should not be made sooner than 14 days. Do not apply within 15 days of harvest.
clethodim @ 0.09 to 0.25 lb/A	Annual and perennial grasses ONLY.	**Select 2EC** 6 to 16 fl oz/A	Apply to emerged and actively growing weeds.	Use on nonbearing crop only. Do not apply within one year of harvest. Multiple applications are required for perennial grass control. Repeat application on 14- to 21-day intervals. Add a nonionic surfactant a 0.25% v/v.
sethoxydim @ 0.2 to 0.5 lb/A	Annual and perennial grasses ONLY.	**Poast 1.5EC** 1 to 2.5 pt/A.	Apply to emerged and actively growing weeds.	Do not apply within 45 days of harvest. Use a crop oil concentrate at 1% v/v. Apply no more than 5 pt/A per year.
fluazifop @ 0.19 to 0.38 lb/A	Annual and perennial grasses ONLY.	**Fusilade DX 2EC** 12 to 24 fl oz/A.	Apply to emerged and actively growing weeds.	Use on nonbearing crop only that will not be harvested for one year. Use a crop oil concentrate at 1% v/v or nonionic surfactant at 0.25%. Apply no more than 72 fl oz/A per year. Use 14-day intervals for sequential applications.
glyphosate @ 1 to 2 lb/A	Annual and perennial weed control.	**Glyphosate (4 lb/gal formulations)** 2 to 4 pt/A.	Apply to emerged and actively growing weeds.	Apply directly to emerged weeds; provides only postemergence control. Consult label for proper restrictions and rates.
halosulfuron @ 0.667 to 1.33 oz/A	Sedge and broadleaf control; should be mixed with other herbicides to enhance grass activity.	**Sandea 75 DG** 0.5 to 1 oz/A.	Apply to emerged and actively growing weeds.	Do not apply more than 2 oz/A per year and sequential applications should not be made more than 45 days apart. Does have some residual control. Can be tank mixed with paraquat or glyphosate. **Established plants (>1 year).**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
paraquat @ 0.5 to 1 lb/A	Annual weeds and foliage of perennials.	**Gramoxone SL** 2 to 4 pt/A.	Apply to emerged and actively growing weeds.	Direct spray to weed foliage and avoid any green or exposed tissues on the blackberry. Make no more than five applications per year. Use a crop oil concentrate at 1% v/v or nonionic surfactant at 0.25%. Can be tank mixed with PRE herbicides for residual activity. Contact with blackberry will cause necrotic lesions but the canes should grow through it.
pelargonic acid	Annual weeds and foliage of perennials.	**Scythe** 3% -10% v/v.	Apply to emerged and actively growing weeds.	The only herbicide recommended for weed control in organic production systems. Herbicide must have direct contact and adequate coverage with the foliage of young weeds for activity.
Grapes				
Preemergence				
diuron @ 2 lb or 1 lb/A	Annual weeds and some perennials.	**Karmex 80 DF** 2.5 lb/A (1.25 lb/A after second year).	Early spring before weeds emerge.	Apply in 4-ft band centered under the trellis to soil free of trash and weeds. Do not use on 1- and 2-year-old plantings. May be tank mixed with Sinbar or Surflan.
simazine @ 1 to 2 lb/A	Annual grasses and broadleaf weeds.	**Princep** 1 to 2 qt/A 4L. 1.1 to 2.2 lb 90WDG.	Early spring before weeds emerge.	Vineyard must be at least 3 years old. May be tank mixed with Surflan, paraquat or Roundup.
oryzalin @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds	**Surflan 4 AS** 2 to 4 qt/A. Use low rate for short-term (4 months) weed control and high rate for 6- to 8-month weed control.	Apply to weed-free soil. Mix any weed residues or trash thoroughly into soil before application.	Sprayer must have thorough agitation and avoid spray drift to foliage. See label for further details. Surflan may be tank mixed with Karmex or Princep as recommended individually to broaden spectrum of control. See label for details.
norflurazon @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Solicam 80 DF** 2.5 to 5 lb/A. Use low rate on light soils.	Fall to early spring. Do not apply to sandy loam soils after bud break.	Do not use on sandy or gravelly soils. Vines must be established for 2 years. Do not use on nursery stock.
flumioxazin @ 0.19 to 0.38 lb/A	Annual broadleaf and grass weeds.	**Chateau** 6 to 12 oz/A.	Preemergence, dormant applications preferred or use shielded sprayer.	Apply as a directed spray to dormant vines or use a shielded sprayer. Do not apply to vines established less than 2 years unless they are protected from spray contact by nonporous wraps, grow tubes or waxed containers. Combine with a labeled postemergence herbicide for control of emerged weeds.
isoxaben @ 0.5 to 1.0 lb/A	Annual broadleaf weeds.	**Gallery 75 DF** 0.66 to 1.33 lb/A.	Preemergence.	Use on nonbearing grapes only. Do not apply until soil has settled after transplanting. Tank mix with Surflan for grass control.
pendimethalin @ 2.0 to 4.0 lb/A	Annual broadleaf and grass weeds.	**Prowl H_2O** 2.0 to 4.0 qt/A.	Preemergence. Apply only to dormant plants. Do not apply after bud swell.	Use on nonbearing plantings only. Allow soil to settle around vines before applying. Do not apply overtop vines.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FRUIT AND NUT CROPS				
Grapes				
Preemergence [cont.]				
oxyfluorfen @ 1.25 to 2.0 lb/A	Annual broadleaf weeds.	**Goal 2 XL** 5 to 8 pt/A.	Use only on dormant grapes for preemergence or postemergence control of weeds.	Direct spray to base of plant. Do not apply after buds begin to swell or when foliage or fruit is present. Do not apply to grapes established less than 3 years unless vines are on a trellis wire at least 3 feet above the ground.
flumioxazin @ 0.19 to 0.375 lb/A	Annual grasses and small broadleaf weeds.	**Chateau 51 WDG** 6 to 12 oz/A.	Apply with hooded or shielded application equipment. Grapes established less than 2 years must be shielded from contact with spray solution using grow tubes.	Once vines break dormancy, do not apply in combination with glyphosate. Do not apply more than 6 ounces per acre per application to vines less than 3 years old on soils having a sand plus gravel content greater than 80%.
dichlobenil @ 4 to 6 lb/A	Annuals and many perennials.	**Casoron 4G** 100 to 150 lb/A.	In early winter and not later than mid-February.	Granular form preferred. Apply in early spring. Incorporate lightly for best results. May be used in vineyards in first year after transplanting after vines are established. Do not apply immediately after transplanting.
Grapes				
Postemergence				
glyphosate @ 0.75 to 1.5 lb/A	Annual weeds, bermudagrass and johnsongrass.	**Glyphosate (4 lb/gal formulations)** 1 to 2 qt/A.	Apply to actively growing weeds.	Direct to base and avoid contact with green bark or foliage. Do not apply to vines less than 3 years old or within 14 days of harvest. See label.
paraquat @ 0.47 to 0.94 lb/A	Annual weeds and foliage of perennials.	**Paraquat (3 lb/gal formulations)** 1.3 to 2.7 pt/A.	Apply in spring with preemergence herbicide. If needed, repeat alone throughout the growing season as required to contain weeds.	Direct spray to weed foliage, avoiding vines. Do not graze treated areas.
sethoxydim @ 0.3 to 0.5 lb/A	Annual and perennial grasses including johnsongrass and bermudagrass.	**Poast 1.5 EC** 1.5 to 2.5 pt/A.	Use low rate on annual grasses up to 6 inches tall; high rate on annual grasses up to 12 inches tall and perennial grasses. Broadleaf weeds and nutsedge(s) will not be controlled by Poast.	Do not apply within 50 days of harvest. Apply as a directed spray using 5 to 20 gal water/acre and 40 to 60 psi pressure. Use flat fan nozzle tips. Always use a nonphytotoxic oil concentrate (1 qt/acre).
fluazifop-P @ 0.19 lb/A	Annual and perennial grasses including johnsongrass and bermudagrass.	**Fusilade DX 2EC** 1.5 pt/A.	Make application to johnsongrass – 12 to 18 inches tall; bermudagrass – 3 inches tall or with 4- to 6-inch runners; annual grasses – 2 to 8 inches tall. Broadleaf and nutsedge(s) will not be controlled by Fusilade.	Apply to NONBEARING vines that will not be harvested within 1 year of application. Apply as a directed spray using 25 gal water/acre and 30 to 60 psi pressure. Use flat fan nozzle tips and DO NOT contact foliage. Always use a crop oil concentrate (1 qt/25 gal water/acre) or a nonionic surfactant (0.5 pt/25 gal water/acre).
clethodim @ 0.09 to 0.25 lb/A	Annual and perennial grasses.	**Select 2 EC** 6 to 16 oz/A.	Postemergence to grasses.	Use on nonbearing crop only. Do not apply within one year of harvest. Effective for annual bluegrass control.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Strawberries				
Preplant - Burndown				
glyphosate @ 1 to 2 lb/A	Annual grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations)** 2 to 4 pt/A.	Prior to planting for planting into a weed-free bed.	Apply directly to emerged weeds. Provides only postemergence control.
Strawberries				
Preplant - Before Plastic Laying				
acifluorfen @ 0.125 to 0.375 lb/A	Annual broadleaf weeds	**Ultra Blazer 2L** 0.5 to 1.5 pt/A.	Apply after bed formation and prior to plastic laying and transplanting.	Can be applied to row middles after transplanting as a directed/shielded spray. Avoid contact with foliage.
flumioxazin @ 0.1 lb/A	Annual broadleaf and grass weeds	**Chateau 51WDG** 3 oz/A.	Apply to preformed beds a minimum of 30 days prior to transplanting	Can be applied to crop rows and row middles. Avoid soil disturbance after application. Do not apply over the top of strawberries.
napropamide @ 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Devrinol 50 DF** 8 lb/A.	Apply after bed formation and prior to plastic laying and transplanting	Apply to a weed-free surface. Must be incorporated with irrigation or rainfall within 24 hours. Lay plastic the same day as application. Can be used in row middles, requires incorporation.
sulfentrazone @ 0.125 to 0.25	Annual grasses and small-seeded broadleaf weeds.	**Spartan 4F** 4 to 8 oz/A.	Apply prior to transplanting to reduce injury to the crop.	
terbacil @ 0.1 to 0.3 lb/A	Annual broadleaf and grass weeds.	**Sinbar** 2 to 6 oz/A.	FOR USE IN MATTED STRAWBERRIES ONLY. Preemergence.	For planting year: apply 2 to 3 oz of Sinbar per acre after transplanting but before new runner plants start to root. If strawberry transplants are allowed to develop new foliage before application, apply 0.5 to 1.0 inch of overhead irrigation immediately after application. For control of winter weeds, apply 2 to 6 oz per acre in late summer or early fall. If the crop is not dormant, apply 0.5 to 1.0 inch of overhead irrigation immediately after application. To extend control through harvest of the following year, apply 2 to 4 oz per acre just before mulching in the late fall. For harvest years: after postharvest renovation and before new growth begins in midsummer, apply 4 to 6 oz of Sinbar per acre in midsummer. To extend control through harvest of the following year, apply 4 to 6 oz of Sinbar per acre just before mulching in the late fall. Do not apply within 110 days of harvest. See label for more information.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
FRUIT AND NUT CROPS [cont.]				
Strawberries				
Postemergence - Over the Top				
2,4-D amine @ 1 to 1.5 lb/A	Broadleaf weeds only.	**2,4 D Amine 4SL** 2 to 3 pt/A.	FOR USE IN MATTED STRAWBERRIES ONLY. Apply to established plants that are dormant or after final harvest.	Do not apply on plasticulture annual strawberries. Will cause injury to actively growing strawberries.
clopyralid @ 0.125 to 0.25 lb/A	Broadleaf weeds, especially clovers, vetch, curly dock, horsenettle.	**Stinger 3 SL** 1/3 to 2/3 pt/A.	Apply in the spring up to 30 days before harvest and after harvest following the spring application.	Section 24C label. Up to 2 applications per year. Do not exceed 2/3 pt/A. Do not use any surfactant. May cause some injury in certain conditions.
clethodim @ 0.09 to 0.125 lb/A	Annual and perennial grasses ONLY	**Select 2EC** 6 to 8 fl oz/A.	Apply to emerged and actively growing weeds.	Multiple applications are required for perennial grass control. Repeat application on 14- to 21-day intervals. Add a crop oil concentrate at 1% to increase efficacy. Do not apply within 14 days of harvest.
sethoxydim @ 0.2 to 0.3 lb/A	Annual and perennial grasses ONLY.	**Poast 1.5EC** 1 to 1.5 pt/A.	Apply to emerged and actively growing weeds.	Do not apply within 3 days of harvest. Use a crop oil concentrate at 1% v/v. Total cannot exceed 2.5 pt/A/year.
Strawberries				
Preemergence and Postemergence - Row Middles				
carfentrazone @ 0.03 lb/A	Annual broadleaves, excellent control of morninglories	**Aim 2EC** **2 fl oz/A**	Apply to actively growing weeds less than 4 inches tall.	Apply post-directed/ shielded to the row middles. If contact with foliage occurs some burning will occur. Does not have activity on grasses.
paraquat @ 0.325 to 0.5 lb/A	Annual weeds and foliage of perennials.	**Gramoxone 2SL** **1.3 to 2 pt/A**	Apply to actively growing weeds.	Apply post-directed/shielded to the row middles. If contact with foliage occurs some burning will occur.
pendimethalin @ 0.9 lb/A	Annual grasses and small-seeded broadleaves.	**Prowl H2O 3.8 EC** **1.5 pt/A**	Apply to weed free row middles.	Apply to row middles only. Must be activated with at leat ½ inch of rainfall. PHI = 35 days.
Pecans				
Preemergence				
diuron @ 1.6 to 3.2 lb/A	Most annual broadleaf weeds and grasses.	**Karmex 80 DF** 2 to 4 lb/A.	Apply in spring or early summer.	Apply as directed spray. Avoid contact of foliage with spray. Do not use on soils with less than ½ percent organic matter. Do not graze livestock in treated groves.
simazine @ 1 to 2 lb/A	Most annual broadleaf weeds and grasses.	**Princep** 1 to 2 qt/A 4L. 1.1 to 2.2 lb 90WDG.	Apply in spring or early summer.	Direct to floor of orchard. Avoid contact with foliage. Do not use on sand or loamy sand soils. May be tank mixed with Roundup, paraquat or Surflan.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
oryzalin @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Solicam 80 DF** 2.5 to 5 lb/A.	Apply to weed-free soil. Mix any weed residues or trash thoroughly into soil before application.	Sprayer must have thorough agitation and avoid spray drift to foliage. May be tank mixed with Karmex or Princep as recommended individually to broaden spectrum of control. See label for details. May be tank mixed with Roundup, paraquat or Princep.
dichlobenil @ 4 to 6 lb/A	A wide range of annual weeds and some perennials.	**Casoron 50W** 8 to 12 lb/A.	Apply in January or February. Granular form may be applied in late fall.	Do not apply within 6 months after transplanting or within 1 month of harvest. Rainfall or sprinkler irrigation is needed after application to move the herbicide into the soil.
norflurazon @ 2 to 4 lb/A	Annual grasses and some broadleaf annual weeds.	**Solicam 80 DF** 2.5 to 5 lb/A.	Apply in early spring or after harvest in the fall.	Do not apply until transplanted trees have completed their first growing season (fall application). Make only one application per year. Do not graze treated areas. May be tank mixed with paraquat.
diuron + terbacil @ 1 to 1.5 + 0.8 to 1.6 lb/A	A wide range of annual weeds.	**Karmex 80 DF + Sinbar 80W** 1.2 to 1.8 lb/A + 1 to 2 lb/A.	Apply in early spring.	Use under trees established 2 years or more. See label for soil type and organic matter precautions. Do not graze treated areas.
Pecans				
Postemergence				
glyphosate @ 0.75 to 1.5 lb/A	Annual weeds, johnsongrass and bermudagrass.	**Glyphosate (4 lb/gal formulations)** 1 to 2 qt/A.	To actively growing vegetation.	Direct to base of tree and do not allow drift to contact foliage or green bark. See label for details. May be tank mixed with Surflan or Princep.
paraquat @ 0.47 to 0.94 lb/A	Annual weeds and foliage of perennials.	**Paraquat (3 lb/gal formulations)** 1.3 to 2.7 pt/A.	Apply in spring and repeat as needed.	Directed spray. Do not allow spray to contact green stems, fruit or foliage of pecan tree. Do not apply when nuts to be harvested are on ground. May be tank mixed with Princep or Surflan.
sethoxydim @ 0.3 to 0.5 lb/A	Annual and perennial grasses including johnsongrass and bermudagrass.	**Poast 1.5 EC** 1.5 to 2.5 pt/A.	Use low rate on annual grasses up to 6 inches tall; high rate on annual grasses up to 12 inches tall and perennial grasses. Broadleaf weeds and nutsedge(s) will not be controlled by Poast.	Apply to NONBEARING trees that will not be harvested within 1 year of application. Apply as a directed spray using 5 to 20 gal water/acre and 40 to 60 psi pressure. Use flat fan nozzle tips. Always use a nonphytotoxic oil concentrate (1 qt/acre).
fluazifop @ 0.19 lb/A	Annual and perennial grasses including johnsongrass and bermudagrass.	**Fusilade DX 2 EC** 1.5 pt/A.	Make application to johnsongrass – 12 to 18 inches tall; bermudagrass – 3 inches tall or with 4- to 8-inch runners; annual grasses – 2 to 8 inches tall. Broadleaf weeds and nutsedge(s) will not be controlled by Fusilade.	Do not apply to pecans within 30 days of harvest. Apply as a directed spray using 25 gal water/acre and 30 to 60 psi pressure. Use flat fan nozzle tips and DO NOT contact pecan tree foliage. Always use a crop oil concentrate (1 qt/25 gal water/acre) or a nonionic surfactant (0.5/25 gal water/acre).

Using registered herbicides for aquatic plant control is a widely employed technique for both private and public waters. Treatments can be applied with a 1-gallon pump sprayer for a spot treatment, a helicopter or airboat for a whole lake treatment or anything in-between. Treatment objectives could be the control of a single invasive plant species or a broad spectrum control of numerous species.

All herbicides listed have undergone EPA review and are approved for aquatic use in Arkansas, when used in accordance to the instructions included on the label. There are approximately 300 herbicides registered in the U.S., but only 15 of these are labeled for aquatic use.

Like all pesticides, herbicides have three names: a trade name, a common name and a chemical name. An example of this is the common herbicide Rodeo. Rodeo is the trade name, the common name is glyphosate and the chemical name is N-(phosphono-methyl) glycine, isopropylamine salt. In this publication, the common name will be used the majority of time.

All herbicides come with a label. Included on the label is the product form and instructions for safe handling and effective use. It cannot be stressed too strongly that the label is the law, and not using herbicides according to the labeled directions can have legal ramifications for the applicator.

Often included is a listing of species that are controlled by the chemical and sometimes the extent of the control. If the target species is not included on a particular label, the herbicide may still be used as long as the herbicide is labeled for use at the desired site of application, though effectiveness may be unknown.

Herbicide Types

Herbicides can be classified in several ways. One way is by their activity in the plant: systemic or contact. This classification refers to whether or not the herbicide is translocated, or moves within the plant. Whether the herbicide moves within a plant or not has implications on its effectiveness, application and how quickly it acts upon the plant.

Contact herbicides do not move and will cause death to only those parts of the plant they contact. Contact herbicides also tend to cause more rapid injury to treated plants but require more complete spray coverage of all plant tissue during application. If a contact herbicide is used on submersed plants, the chemical must remain in the treatment area long enough for the entire plant to be exposed to a lethal concentration. Since contact herbicides tend to cause rapid plant death, in areas with dense plant populations and warm water, the decomposing plant tissue can lead to a low dissolved oxygen fish kill. Care must be taken to treat only 33-50% of a pond or have supplemental aeration available.

Systemic herbicides are mobile in plant tissue and move through the plant's vascular tissue to their action site. This gives them the ability to affect all parts of the plant, not just those parts they contact. One implication is effects on the plant take longer to become apparent. Additionally, complete plant coverage may not be necessary to attain control. Finally, with correct timing, some herbicides will be stored within the plant's root tissues. The following season, as sugars move upward in the plant, the herbicide moves with it, leading to a second season of control.

Contact Herbicides	Systemic Herbicides
Copper and Copper products	2,4-D
Diquat	Glyphosate
Endothall	Fluridone
Carfentrazone	Triclopyr
Sodium Carbonate Peroxyhydrate	Imazapyr
Flumioxazin	Imazamox
	Penoxsulam
	Bispyribac Sodium
	Topramazone

Adjuvants

Herbicides that are applied as a foliar treatment will include a recommendation to include an adjuvant. The two most common are a crop oil and some kind of nonionic surfactant. While different in chemistry, they serve the same function. Both of these reduce the surface tension of the herbicide solution and increase the herbicide coverage and penetration into plant stems and leaves. A third type of adjuvant often used in aquatic plant control acts as a "sinker" when added to a spray solution. When the solution is sprayed onto the water surface, the "sinker" will help carry the herbicide down through the water column, into the weeds growing on the pond bottom.

Why Treatments Fail

Oftentimes a herbicide treatment for a submersed plant will not have the desired results. Sometimes this results from inaccurate plant identification, leading to incorrect herbicide selection. Another cause is using the herbicide under suboptimal conditions. For example, selecting diquat for a submersed plant in a muddy pond. Diquat binds with suspended particles, rendering it inactive. Water temperature can also affect effectiveness. As a general rule, most herbicides shouldn't be used when the water temperature is below 50-60°F. While still growing, reduced plant metabolism may prevent sufficient herbicide uptake.

However, the most common reason is some form of dilution. Every plant and herbicide has a unique concentration and exposure time relationship. If the exposure time is reduced or the concentration is lower than required, the treatment will fail. Exposure time can be shortened by increased degradation due to bacteria, sunlight, high pH or a water current carrying the herbicide away, to list some examples. Inaccurately estimating a pond's volume can also reduce the herbicides' target concentration. The end result of these things is that plants are not exposed to a concentration of herbicide sufficient to lead to plant control. Please take the time to carefully read the label and correctly estimate the water body's size and conditions prior to an herbicide application.

WEED RESPONSE RATINGS FOR AQUATIC HERBICIDES[1]

Aquatic Weed Group	Copper Sulfate and Copper Complexes	2,4-D	Diquat	Endothall	Fluridone	Glyphosate	Triclopyr	Imazapyr	Imazamox	Carfentrazone	Penoxsulam	Sodium Carbonate Peroxyhydrate	Flumioxazin	Bispyribac Sodium	Topramazone	Grass Carp
Algae																
Planktonic	E	P	P	G	P	P	P	P				G-E				
Filamentous	E[2]	P	G	P-G[3]	P	P	P	P				G-E	G-E			F-P
Chara	E	P	P-G	P-G[3]	P	P	P	P								E
Nitella	E	P	P-G	P-G[3]	P	P	P	P								G
Floating Weeds																
Bladderwort	P	P-G[4]	E	F				G-E							G	E-G
Duckweed	P	F	G	P	E			G		G-E	E		E	E		P-F
Watermeal	P	P	F		F-G	P	P	P		F-G	G		E	E		
Azolla	P	F	G		G-E	F				E	E			E		P-F
Water hyacinth	P	E	E		P	F	E	E	E	G-E	E			E	E	P
Emersed Weeds																
Alligator weed	P	F	P	P	G	E	E	E	G	F-G	G		E	E		P
American lotus	P	E	P	P	F	G	E	G	G						G	P
Arrowhead	P	E	G	G		P		E	E		G				E	F-P
Buttonbush	P	E	F	P	P	G	G	G								
Cattails	P	G	G	P	F	E	P	E	E							
Common reed	P	F	F	P	F	E	G	E								
Ducksalad	P	E	G	P		E		E	G-E							P
Frogbit	P	E	E					E	E	G	E		E			P
Water lily (fragrant and white)	P	E	P	P	E	E	E	E	G							P
Maidencane	P	P	F		F	E	P	E								F-P
Pickerelweed	P	G	G			P	E	E	E		G					P
Pond edge annuals	P		G		E	E		E								
Sedges and rushes	P	F	F	P		G	P	E								P
Slender spikerush	P		G		G	P	P	E			G					
Smartweed	P	G	F		F	E	E	E	E		G					P
Spatterdock	P	E	P	P	E	G		G								P
Water pennywort	P	G	G	P	P	G	E	E			E		E	E		F-P
Water primrose	P	E	F-G		F	E	E	E	E	F-G						P
Watershield	P	E	P		G	G		E	G	G						F-P
Willows	P	E	F	P	P	E	E	E								

[1] E = excellent control, G = good control, F = fair control, P = poor control.

(Continued on page 148)

[2] For Pithophora, only F-G control.

[3] Hydrothol formulation only.

[4] Granular 2,4-D formulation.

[5] Copper complexes only (ex. Komeen, Captain, K-Tea).

WEED RESPONSE RATINGS FOR AQUATIC HERBICIDES[1] [cont.]

Aquatic Weed Group	Copper Sulfate and Copper Complexes	2,4-D	Diquat	Endothall	Fluridone	Glyphosate	Triclopyr	Imazapyr	Imazamox	Carfentrazone	Penoxsulam	Sodium Carbonate Peroxyhydrate	Flumioxazin	Bispyribac Sodium	Topramazone	Grass Carp
Submersed Weeds																
Coontail	P	G	E	E	E	P							E			G-F
Egeria	P	P	G	F	E	P		P			E					E
Elodea	P		E	F	E	P		P			E					E
Fanwort	P	F	G	E	E	P		P					E			E
Hydrilla	P-F[5]	P	G	G	E	P		P	G		E		E	E	E	E
Naiads	P	F	E	E	E	P		P			G		E		G	E
Parrotfeather	P	E	E	E	E	F	F	G (when emerged)	G	E	G		E	E		F-P
Pondweeds	P	P		E	E	P		F	E		E		E	E	E	G-P
Water milfoil (broadleaf)	P		E	E	E	P	G	P	G	G	E					P
Water milfoil (Eurasian)	P	E	E	E	E	P	G	P	G	G-E	E		E	E	G	F-P

[1] E = excellent control, G = good control, F = fair control, P = poor control.
[2] For Pithophora, only F-G control.
[3] Hydrothol formulation only.
[4] Granular 2,4-D formulation.
[5] Copper complexes only (ex. Komeen, Captain, K-Tea).

GRASS CARP FOR AQUATIC WEED CONTROL

Grass carp (Ctenopharyngodon idella), or white amur, is a member of the minnow family native to Asia. They feed almost exclusively on aquatic plants. Their short digestive tract requires grass carp to feed almost continuously when water temperatures are above 68ºF, which means they can eat two to three times their body weight each day. This makes them an excellent biological control of certain nuisance aquatic plants.

Grass carp are capable of fast growth and may gain 5 to 10 pounds per year, reaching their final size of 20 to 30 pounds within a few years, and can live for 10 to 15 years. Unfortunately, when they reach maturity, their rate of weed consumption declines, and restocking of additional fish is required every 3 to 5 years.

Grass carp have definite preferences of the type of vegetation they consume. They prefer tender, succulent vegetation that is under water. This makes them best suited for submerged vegetation, and they will not generally control tough, fibrous plants that grow up out of the water. The extent to which they are able to control a particular weed depends upon many factors, including their feeding preferences, the aquatic plant density, water temperature and the number and size of grass carp stocked. As more preferred vegetation becomes scarce, grass carp will eat less preferred types of vegetation. Water chemistry can affect weed palatability. Grass carp will consume floating fish food as well as aquatic plants.

Grass carp are readily available in Arkansas, and the *Sport Fish Supplier List* provides a listing of the fish farms that sell grass carp. This publication is available at the county office or online at http://aqfi.uaex.edu/extension/farmponds/Pond_Management/pdf/Arkansas-Sport-Fish-Supplier-List-2012.pdf. Unlike many states, Arkansas permits the stocking of either diploid (normal) or triploid (sterile) grass carp in ponds and lakes. Because grass carp require flowing water to reproduce, stocking fertile grass carp in your pond will not result in more grass carp. New ponds can be stocked with 2- to 6-inch grass carp, but if largemouth bass are present, the grass carp stocked should be 8 to 10 inches in length. The stocking rates can vary depending on the amount of weeds. A standard recommendation is 5 to 10 per acre, but if the pond has plant coverage of greater than 50 percent, a stocking rate of 20 or more per acre may be required.

As a biological control agent, they will not provide immediate results. Assuming the target plant is readily consumed by grass carp, 1 to 2 years are required for control. If the pond/lake owner wants quicker results, applying an aquatic herbicide followed by stocking grass carp 2 to 3 weeks later may be the best solution. Stocking should take place after much of the dead plant material has had a chance to decompose.

Grass carp are natural inhabitants of rivers and readily escape ponds that overflow. Barriers on spillways are a good idea to prevent fish losses. Ponds with grass carp often develop a green or yellow color as grass carp promote greater phytoplankton growth in the water by the release of nutrients from the plants they eat.

After the grass carp reach maturity, the pond/lake owner may want to remove them. These large fish can be removed by snagging, bow fishing, spearing or angling. Their habit of hanging near the surface can make bow fishing especially simple. Because of their jumping ability, seining is often not effective. Their flesh is white, firm and not oily, but the muscle mass contains “Y” bones that can make cleaning more difficult. Their flesh is considered a delicacy by many seafood enthusiasts.

For more information, ask your county extension agent for Southern Regional Aquaculture Center (SRAC) Fact Sheet #3600, *Using Grass Carp in Aquaculture and Private Impoundments*, or it can be downloaded from https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/160/.

GOLDFISH (*CARASSIUS AURATUS*) FOR WATERMEAL AND DUCKWEED

Duckweed (*Lemna* spp.) and Watermeal (*Wolffia* spp.) are free-floating aquatic plants commonly found together. Watermeal is the smallest and simplest of flowering plants. It is rootless and tiny, usually less that 1 mm, and appears as little green pinheads floating on the surface. To the touch, it feels somewhat like dry grits. Duckweed is a little bigger but still very small, usually ⅛ to ¼ of an inch across. The fronds tend to be elliptical, and a small root is present on the lower surface of each frond.

The growth of these plants is linked to high nutrient levels, which is why they are common in cattle ponds. Both of these plants tend to grow in dense colonies in quiet waters. Individual plants stick readily to birds, animals and equipment that may be in ponds that have these plants. As a result, they spread easily from one pond to another. Once in a new pond, their growth can be quite explosive if the conditions are right. Both species can reproduce by budding and, in some cases, double their population every 24 hours.

Both watermeal and duckweed tend to disappear from the pond surface in the late fall. During the summer, the plants have buoyancy due to trapped oxygen from photosynthesis. In the fall, photosynthesis slows down, leading to less oxygen in the plant, and the accumulated starch from a season of growth makes the plant heavier, so it sinks to the sediments. In the spring, the plants start photosynthesizing, accumulate oxygen and float to the surface again.

Under certain conditions, goldfish can provide a biological control option for watermeal. It is recommended that they be stocked into small ponds at a rate of 35 to 65 pounds per acre. Like any biological control, results take time and are not universal. In ponds where goldfish failed to control watermeal, it may have been due to predation from largemouth bass or some other factor. Stocking them is fairly inexpensive and will cause no harm, but success is not guaranteed.

AQUATIC DYES

Aquatic dyes are made from EPA-registered nontoxic dyes (typically blue) that can be applied to natural and man-made lakes and ponds to help control filamentous algae and submersed plants. They do not kill plants; they prevent growth by limiting light penetration, which reduces photosynthesis. They are less effective when plant growth is near the surface (2 feet or less). Aquatic dyes should only be applied to water bodies entirely within the control of the applicator, and only those with little or no outflow. If water is continuously released from the pond/lake, product is wasted and effectiveness reduced. The effects of an aquatic dye typically last up to 6 weeks.

Dye should be applied in the late winter/early spring before weed growth begins or applied when weeds may be seen on the bottom of the pond. When applied to ice, it will melt a hole and disperse underneath. Additional applications will be necessary throughout the year to maintain an acceptable level of dye in the water. These dyes may be used at any time of the year.

Do not apply dyes to water that will be used for human consumption. Water may be used for swimming after complete dispersal of the dye in water. Dyes are nontoxic to livestock.

Formulations include AquaShade, Admiral Liquid, Admiral WSP, SePro Blue, Lake Colorant Liquid and Lake Colorant WSP, though this list is undoubtedly incomplete. For the liquid formulations, the rate is typically 1 ppm, or 1 gallon/acre*ft. To restrict hydrilla growth, the rate should be doubled, due to its ability to grow at very low light levels. See label for rates.

USE RESTRICTIONS FOR AQUATIC HERBICIDES
(Number of Days After Treatment and Before Use)

Chemical	Active Ingredient Formulation	Withdrawal PPM	Drinking	Swimming	Eating Fish	Dairy	Other Stock	Withdrawal Crop Irrigation
Copper	Copper Sulfate Crystals		0	0	0	0	0	0
Copper	Copper-Ethanolamine complexes		0	0	0	0	0	0
Copper	Copper Sulfate Solution		0	0	0	0	0	0
2,4-D	Ester formulation		(*a)	0	0	0	0	(*b)
2,4-D	Amine formulation		21 or (*c)	0	0	0	0	21 or (*d)
2,4-D	Acid formulation		21 or (*c)	0	0	0	0	21 or (*d)
2,4-D	Acid formulation		(*e)	0	0	0	0	(*e)
Diquat			1-3	0	0	1	1	5
Diquat			5	0	0	5	5	5
Endothall	Dipotassium Salt		(*f)	0	0	7-25 (*f)	7-25 (*f)	0
Endothall	Mono (N,N-dimethylalkylamine) Salt		(*f)	0	0	7-25 (*f)	7-25 (*f)	0
Fluridone		0.15	0 (*g)	0	0	0	0	7-30 (*h)
Glyphosate		0.7	2 (*i)	0	0	0	0	0
Imazapyr			(*j)	0	0	0	0	120 or (*r)
Triclopyr			(*l)	0	0	0	0	120 or (*k)
Imazamox			6	0	0	0	0	*i
Carfentrazone			1 (*m)	0	0	0-1(*n)	0-1(*n)	0-14 (*n)
Penoxsulam			0	0	0	0	0	(*o)
Sodium Carbonate Peroxyhydrate			0	0	0	0	0	0
Flumioxazin			0	0	0 (*p)	0	0	5
Bispyribac-sodium			0	0	0 (*p)	(*q)	(*q)	(*q)
Topramazone			(*s)	0 (*t)	0 (*t)	0	0	(*u)

(*a) Approved assay of less than 0.07 ppm.
(*b) Approved assay of less than 0.1 ppm.
(*c) Approved assay of less than 0.07 or 0.1 ppm, depending on brand used.
(*d) Approved assay of less than 0.1 ppm.
(*e) Withdrawal period varies based on type of weed treated, setback from intake pipes and application rate.
(*f) Maximum Concentration Level of less than 0.1 ppm. 600 foot setback from potable water intake.
(*g) Do not apply within ¼ mile of water intake at rates above 20 ppb.
(*h) Withdrawal period may depend upon crop to be irrigated and soil type. FasTEST assay may be required prior to use as irrigation.
(*i) Can't be applied within ½ mile upstream of active potable water intake. Water intakes must remain off for 48 hours if application made within ½ mile of intake, unless assay determines glyphosate level below 0.7 ppm.
(*j) Do not apply within ½ mile of active potable water intake.
(*k) Until residue is 1.0 ppb or less by assay.
(*l) Potable water intakes must be turned off till triclopyr levels are determined to be 0.4 ppm or less.
(*m) Do not apply within ¼ mile of potable water intake. Water intake may be turned back on less than 24 hours if assay shows carfentrazone-ethyl and degradate levels are below 0.2 ppm.
(*n) Withdrawal restriction depends on percentage of surface area treated, whether it is less than 20%, or between 20-50%. Check label.
(*o) Treated water cannot be used for crop irrigation until below assay shows levels below 1 ppb, or 30 ppb if used to irrigate rice.
(*p) Do not use for water applied to crayfish ponds.
(*q) ELISA or other approved assay indicating concentration of less than or equal to 1 ppb.
(*r) If use results in residue > 1 ppb, withdrawal is 120 days or until residue is 1.0 ppb or less by assay.
(*s) Application concentrations must be below 45 ppb.
(*t) 0 days if application rate is below 50 ppb.
(*u) Residue concentration must be below 1 ppb by FasTEST assay.

USE OF COPPER SULFATE IN PONDS WITH FISH

Copper sulfate is a contact herbicide recommended for algae control. If improperly used, copper can be toxic to fish by interfering with gill function. Trout and koi are particularly sensitive to copper. However, most fish kills associated with copper sulfate treatments are related to oxygen depletions due to the decomposition of dead plant material or a massive phytoplankton kill.

The effectiveness and safety of copper sulfate treatments are mostly determined by water alkalinity. In water with an alkalinity below 40 ppm (mg/l), the amount of copper sulfate needed to control algae can be toxic to fish. Copper sulfate treatments at water alkalinities below 20 ppm are extremely risky and should be avoided. Low alkalinity water is considered "soft" water and can be very common in Arkansas fish ponds, especially watershed ponds. In high alkalinity water (>250-300 ppm), copper sulfate quickly binds with carbonate and forms a precipitate that is not effective for algae control.

The toxicity of copper sulfate to fish also increases as water temperatures increase. It is best to try and avoid copper sulfate treatments during the summer months. In most cases, treat only one-third to one-half of the pond at a time.

To calculate a copper sulfate treatment, you will need to know your pond's alkalinity, surface area and depth. A good starting "Recommended Dose Rate" for copper sulfate is typically 0.5 to 1.0 ppm. To calculate a pond's volume, multiply the acreage by the average depth.

In suitable water, the effective copper sulfate dosage can be calculated using the following formula:

Maximum Safe Dose in ppm = Total Alkalinity (ppm)/100

Amount copper sulfate needed (lb) =
Max Safe Dose x Recommended Dose Rate (ppm)
x Volume (in acre*ft) x 2.72

To make a copper sulfate solution, mix 1½ lb of copper sulfate crystals with 1 gal of water.

For water testing and further recommendations, contact your county extension office or one of the UAPB Aquaculture/Fisheries extension specialists.

HERBICIDES APPROVED FOR AQUATIC USE

Below is a listing of herbicides currently approved for aquatic use by the Arkansas State Plant Board. This list may not be complete.
Copies of all current labels can be downloaded from the Arkansas State Plant Board website at http://170.94.200.136/prodreg/.

Chemical	Active Ingredient Formulation	Trade Name(s) (list may be incomplete)
Copper	Copper Sulfate crystals	various
Copper	Copper Sulfate solution	Copper Cat Liquid Copper, AgriTec Algicide, Clearwater Blue, EarthTec, Radiance, Aqua Hawk Cu, Crystal Plex Algae Control, SeClear Algaecide, Current, AgriTec 2, AquaVet Algae Control, Pond Boss Pro, Liquid Copper Sulfate, SePro Total Pond Clear, PondMaster Aquatic Algaecide, Clearigate, Pondmaster SeClear Algaecide
Copper	Copper-Ethanolamin complexes	Harpoon Granular, Komeen Crystals, Alligare Argos, Cutrine Ultra, CutrinePlus, CutrinePlus Granular, Algi-Cure Algaecide, Harpoon, Gordon's Pondmaster Aquatic Algaecide, Gordon's Pondmaster Aquatic Herbicide, Captain Liquid Copper Algaecide, K-Tea Algaecide, Komeen, Nautique, Captain XTR, Pond Oasis Algaecide, Algimycin-PWF Alligare 8% Copper, SePro Total Pond Rescue
2,4-D		Agristar 2,4-D Amine 4, Alligare 2,4-D Amine, Navigate, DMA 4 IVM, , Helena 2,4-D Amine 4, Opti-Amine, Unison, Weed Rhap A-4D, HardBall, Loveland Amine 4 2,4-D, Savage, Clean Amine, WEEDestroy AM-40, Platoon, Riverdale Solution Water Soluble, Nufarm Weedar 64, Sculpin G, Tenkoz Amine 4 2,4-D, Hi-Yield 2,4-D Amine No. 4, Hi-Yield 2,4-D, Winfield 2,4-D Amine 4, Tacoma 2,4-D Amine 4, Sentry Amine 4, Defy Amine 4, Rugged, Shredder Amine 4, Drexel De-Amine 4, Havoc Amine, United Suppliers 2,4-D Amine 4, Aquasweep (mix of Triclopyr and 2,4-D), Renovate Max G (Triclopyr and 2,4-D)
Diquat dibromide		Reward Landscape and Aquatic, Aceto Diquat 2L Landscape and Aquatic, Harvester, Weedtrine-D, Alligare Diquat, Nufarm Diquat SPC 2L, Diquash Landscape and Aquatic, Quick Kill, Solera Diquat Landscape and Aquatic, Eliminator, Tsunami DQ, Littora, Tribune, RowRunner ATO, Liberator 711, Misty Weedtrol VF, AquaVet Submerged Weed Control, Ultra PondWeed Defense, Pond Oasis Aquatic Plant Control, Edger, SePro Total Pond React, Aquastrike (plus endothall)
Endothall	Dipotassium Salt	Aquathol K, Aquathol Super K, Cascade, Aquastrike (plus diquat)
Endothall	Mono (N,N-dimethylalkylamine) Salt	Hydrothol 191, Hydrothol 191 Granular, Teton
Fluridone		Release, Sonar Q, Avast! SC, Restore S.M.A.R.T., Alligare Fluridone, Alligare Fluridone RTU, Alligare Fluridone Granular, WhiteCap SC, Sonar H4C
Glyphosate		Rodeo, AquaPro, Shore-Klear, Shore-Klear Plus, Alligare Glyphosate 5.4, Cinco, AquaMaster, AquaNeat, Gordon's PondMaster, Gordon's GlyphoMate 41, Catt Plex Cattail Control, Eraser AQ, Roundup Custom, Drexel Imitator Aquatic, AquaVet Shoreline Weeds, Shoreline Defense, Aqua star, Misty Glypho Kill 18, Glyphos Aquatic, Accord Concentrate, Refuge, Hi-Yield Killzall, Shoreline Plant Control
Imazapyr		Habitat, Alligare Imazapyr 4SL, Alligare Ecomazapyr 2SL, Arsenal, Polaris, Polaris AC, AmTide Imazapyr 2SL, Helena Imazapyr 2SL, Helena Imazapyr 4SL
Triclopyr		Renovate 3, Renovate OTF, Renovate Max G (triclopyr and 2,4-D), Triclopyr 3, Element 3A, Garlon 3A, Trycera, Navitrol, Aquasweep (triclopyr and 2,4-D), Platform, Tahoe 3A, Alligare Triclopyr 3
Imazamox		Clearcast, Clearcast 2.7G
Carfentrazone		Stingray

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HERBICIDES APPROVED FOR AQUATIC USE [cont.]

Chemical	Active Ingredient Formulation	Trade Name(s) (list may be incomplete)
Penoxsulam		Galleon SC
Sodium Carbonate Peroxyhydrate		Phycomycin-SCP, GreenClean, GreenClean Pro, TerraCyte Pro, Algae Remover, Pak 27, Algae Off, Ecoblast
Flumioxazin		Clipper
Bispyribac-sodium		Tradewind
Topramazone		Oasis
Aquatic Dyes		Admiral Liquid, Admiral WSP, SePro Blue, Gordon's Pondmaster Blue, Aquashade, Aquashadow, others

APPLICATION NOTES

Active Ingredient	Rate	Application and Notes
Copper Sulfate Crystals	Algae Blue-Green, Filamentous and Planktonic 0.25-2ppm Chara, Nitella 1.5-2.0 ppm Submersed Weeds 0.25-0.5ppm	• Copper is toxic to fish. Please refer to "Use of Copper Sulfate in Ponds with Fish" in this section for more details and correct dose calculation. • If water alkalinity is above 250 ppm, use results will be unsatisfactory. The free copper ions precipitate before they can be effective. • Use can lead to dissolved oxygen problems when applied to ponds with water temperatures above 85ºF. • To make a copper sulfate solution, mix 1½ lb of copper sulfate crystals with 1 gal of water. • For filamentous algae, copper can be tank mixed with diquat. • For submersed weeds, it can be tank mixed with endothall, diquat or fluridone.
Copper Sulfate Solution	See label.	• Copper solutions can be tank mixed with diquat, endothall and chelated coppers. • See previous warning about copper toxicity to fish.
Copper-Ethanolamine complexes	See label.	• If treated water is potable, rate cannot exceed 1 ppm. • Can be tank mixed with diquat and endothall. • Dilute with water in ratio of at least 9:1 and apply uniformly. • Labeled for hydrilla. Can be tank mixed with Diquat.
2,4-D	Various and numerous. Formulations can be liquid or granular; ester, amine or acid. This impacts the amount of active ingredient that is applied and application method used.	• Growth essential for uptake. • Please consult label thoroughly due to numerous formulations. • Due to local restrictions, use of 2,4-D may be prohibited at certain times of the year. • Plant roots absorb salt forms more readily than esters. • Esters more readily penetrate foliage. Foliar • Rate depends on species and water depth of emergent plant. • Apply early in season when weeds are small and growing actively before the bud stage. • Apply when biennial and perennial species are in the seedling stage and before flower stalks appear. • For liquid formulations, thorough wetting of foliage is essential for maximum control. • A pH above 8 reduces effectiveness. • Do not treat more than one-half pond at a time. • Do not apply within 600 to 2,400 feet of a potable water intake, depending on treatment rate. • 2,4-D may be more effective if applied after dark. Submersed • pH higher than 8 reduces effectiveness. • Do not treat more than one-half pond at a time. • Do not apply within 600 to 2,400 feet of a potable water intake, depending on treatment rate. • 4-hour contact time. • Low light intensity reduces ability of submersed plants to recover. • Apply when water temperature is above 50°F.

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Active Ingredient	Rate	Application and Notes
Diquat dibromide	2-4 lb ai/acre (foliar) (ai = active ingredient) 0.09-0.37 ppm 0.25-1 lb ai/acre*ft (submersed)	• Rapid wilting, often within several hours. • Plant must be actively growing for uptake. – Use whenever plant is growing, even in winter. <u>Foliar</u> • For spot treatment, apply a 0.5% solution with approved adjuvant at 0.25-1%. • For broadcast treatment, apply at labeled rate with sufficient carrier (water), and approved adjuvant, to ensure sufficient plant coverage. • For best results, apply before flowering (cattail). • Repeat treatments may be necessary. • Diquat becomes rainfast (won't wash off) in 1 to 2 hours. • For floating and emergent plants, diquat requires a 30-minute contact time with foliage to be effective. • Do not tank mix with penoxsulam. <u>Submersed</u> • Treat only one-third to one-half of pond at one time to avoid oxygen depletion due to decomposing vegetation. • Wait 14 days between treatments. • Application to muddy/turbid water may reduce effectiveness. • For submersed plants, faster acting when combined with copper or endothall. • Water half-life < 48 hours. • Diquat is rapidly absorbed by submersed leaves but still requires a 24-hour contact time to be effective. Do not apply to flowing water. • Low light intensity reduces ability of submersed plants to recover. • Labels have rates as gallons per surface acre, assuming a 4-foot average pond depth.
Endothall (Dipotassium Salt)	0.5-5 ppm (concentration) 1.3-13.5 lb ai/acre*ft	• If plant infestation is heavy, treat sections 5 to 7 days apart. • Not for use in brackish or salt water. • Up to 24-hour exposure needed. • Active growth needed for plant uptake. – Late winter/early spring. • Rapid breakdown of product occurs at temperatures > 80°F, reducing effectiveness.
Endothall (Mono (N,N-dimethylalkylamine) Salt)	0.05-1.5 ppm (algae) 0.5-3 ppm 1.4-8 lb ai/acre*ft (submersed)	• May be mixed with copper sulfate, 1 gallon plus 5 pounds per surface acre. • Toxic to fish at rates higher than 0.3 ppm. Generally rates of 0.05-0.3 ppm are effective. • If rates higher than 0.3 ppm, should be applied by commercial applicator only. • Do not treat more than one-tenth of pond or lake with doses in excess of 1 ppm. • Up to 24-hour exposure needed. • Active growth needed for plant uptake. – Late winter/early spring.° • Rapid breakdown of product occurs at temperatures > 80F.
Fluridone	10-90 ppb (see label)	• Good to excellent control of duckweed, salvinia and bladderwort. • Poor control of water hyacinth and water lettuce. • Use "Lake" rate for water bodies over 5 surface acres. • Do not apply as a spot treatment. • Needs minimum of 45 days of contact. • May require 30 to 90 days to achieve weed control. • May be mixed with other herbicides and algaecides. • Greater potential for crop injury if treated water is applied to crops grown on low organic and sandy soil. • Thirty days may be insufficient restriction if pond water will be used to irrigate sensitive crops, such as tomatoes or peppers. • Absorbed from water by shoots and from hydrosoil by roots. • Can be applied to water surface or subsurface. • Broken down by sunlight. • No issues related to pH, alkalinity.

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Active Ingredient	Rate	Application and Notes
Glyphosate	Up to 3 lb ai/acre	• Nonselective. • For foliar application only. • Use of nonionic surfactant is recommended or required, depending on formulation, read label. (2 or more quarts/100 gallons water) • If applying by boat, take care to not create waves that may wash the herbicide off floating leaves. • Rainfall within 6 hours may reduce effectiveness. • Will not work in water. • No root absorption. • Vegetation must be on or above the surface for treatment to be effective.
Imazapyr	0.25-0.75 lb ai/acre (foliar)	• Mix with 100 gallons water to insure complete coverage. • Will not control plants completely or mostly submerged. • Treat one-half of pond surface area or less in a single operation. Do not exceed 6 pints/acre (1.5 ppb ai/acre). • Do not use on food crops. • Do not apply within one-half mile upstream of active potable water intake. • Rapid foliage absorption (< 24 hours), root absorption too. • Adjuvant can be nonionic surfactant, methylated seed oil or silicone based surfactant based on weed to be controlled. • Plant needs to be actively growing. • Will not work on submersed vegetation. • Can be mixed with glyphosate. • Do not mix with diquat or 2,4-D. • Not temperature or light sensitive. • Can be selectively used when nontarget plants are dormant.
Triclopyr	1.5-6 lb ai/acre (foliar) 2-6.8 lb ai/acre*ft (submersed)	• Can be tank mixed with 2,4-D amine. • Readily absorbed by roots. • No pH, alkalinity, temperature issues. <u>Foliar</u> • Apply when plants are actively growing. • Use higher rate when the weed mass is dense. • Thoroughly wet all foliage. • Use of nonionic surfactant is recommended. • Do not exceed 2.5 ppm ai triclopyr/year. Can repeat treatments as long as 2.5 ppm annual limit not exceeded. • Readily penetrates foliage (< 4 to 12 hours) – Rainfast in 2 hours <u>Submersed</u> • Setbacks from potable water intake based on amount of area treated and rate used. • Do not exceed 2.5 ppm ai triclopyr/year. Can repeat treatments as long as 2.5 ppm annual limit not exceeded. • Results can be unsatisfactory if pond has high water exchange.
Imazamox	0.125-0.5 lb ai/acre (foliar) 50-500 ppb (submersed)	• An approved adjuvant should be used for foliar applications. Consult label for appropriate type and rate. • A glyphosate herbicide can be added for quicker brownout. • Imazamox can be applied to the water targeting emergent vegetation. Rate is 17-173 ounces product/acre*ft. (50-500 ppb). • Do not exceed 500 ppb (173 oz/acre*ft) for water application or 2 quarts/acre for foliar application. • Spot application can use 5% rate. • Absorbed mostly by foliage. • Root absorption is slower. • Broken down by photolysis (14-day half life in water) • Low light intensity may reduce ability of submersed plants to recover.

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Active Ingredient	Rate	Application and Notes
Carfentrazone	0.05-0.2 lb ai/acre (foliar) 200 ppb (concentration) 0.5434 lb ai/acre*ft (submersed)	• Light dependent. • Best if applied to young actively growing plants. • Mixing with systemic herbicides can enhance effectiveness. • May be tank mixed with other herbicides (2,4-D, diquat, glyphosate, triclopyr, or imazapyr). • Single application will not control plants with high biomass. Foliar • For best results, use a methylated seed oil or non-ionic surfactant. • Dirty or muddy water for spray mixtures will reduce effectiveness. • Thorough wetting of foliage essential for maximum effectiveness. • Rapidly absorbed by foliage, rainfast in 15 minutes. – 1-2 hrs of contact for good activity. Submersed • Inject below the surface or use suitable polymer to rapidly sink spray mixture. • Do not apply within ¼ mile of potable water intake. • Treatment of dense weed mats may result in oxygen loss from dead weed decomposition. • Highly effective on broadleaved weeds. • Visible results in 24 to 48 hours. • pH 7 – half life 8.6 days, pH 9 – half life 3.6 hours.
Penoxsulam	0.03125-0.0875 lb ai/acre (foliar) 5-150 ppb (submersed)	• Absorbed by roots and foliage. Foliar • Use of surfactant required for best results. Surfactant should not be organosilicone surfactant. • Apply only to actively growing weeds (temperature > 50°F). .• Can be applied as a pre-emergent at rates of 5.6-11.2 oz/acre. • Do not tank mix with Diquat. • Works faster for submersed weeds when mixed with endothall Submersed • Single application rate 25-75 ppb. Sum of all applications must not exceed 150 ppb/year.
Sodium Carbonate Peroxyhydrate	0.3-10.2 ppm hydrogen peroxide	• SCP converts to hydrogen peroxide when applied to water which is the compound that causes plant death. • Active ingredient concentration based on hydrogen peroxide concentration that evolves from product application.
Flumioxazin	3.06-6.12 oz ai/surface acre (foliar)	• Target plant will determine whether to make a surface or subsurface application (check label). • Taken up by roots and foliage. • Need actively growing plants for uptake. • Mature plants might have carbohydrate reserves to recover. • Very sensitive to pH (pH 9 – half-life is minutes). Foliar • Tank mix with water having a pH of 5-7. Buffer spray solution to pH less than 7. Use nonionic surfactant with at least an 80% ai (perform jar test to determine compatibility). Apply in 5-10 gallons of water per acre to ensure coverage. Treat less than one-half of the pond at a time and wait 10 to 14 days before treating remaining area. Do not retreat same section within 28 days. • May be tank mixed with 2,4-D, diquat or other approved aquatic herbicide. • Evidence that duckweed and watermeal are susceptible regardless of pH. • Foliar contact causes rapid desiccation and necrosis of exposed plant tissue. • 1 to 2 hours contact time needed. • Floating plants – Better efficacy during cooler weather (late September/October and March/April). Submersed • Application in early morning might enhance effectiveness, due to rapid break down of product in water with pH 8.5 or greater. Pond pH tends to be lower in the morning but should be tested prior to application. • Tank mix with water having a pH of 5-7. • May be tank mixed with other approved herbicides. • 4-6 hour contact time needed.

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Active Ingredient	Rate	Application and Notes
Bispyribac-sodium	0.8-1.6 oz ai/acre (foliar) 20 to 45 ppb initial concentration (submersed)	• Absorbed by roots and foliage. • No pH or temperature issues. • Need active growth. • Late winter/early spring application best. Foliar • Higher rate for more mature/denser vegetation. • Min of 30 gallons water per acre to ensure coverage. No more than 8 oz per year. • May be tank mixed with 2,4-D, diquat or other approved herbicide. • Tank mix with a nonionic surfactant at the labeled rate. Submersed • For optimum control, repeat applications 60 to 90 days to maintain desired concentration (not to exceed 45 ppb). • Do not reapply within 14 days. No more than 4 applications per year. • Tradewind can be tank mixed with other approved herbicides for enhanced Hydrilla control. • Clear water and higher light intensity may increase control.
Topramazone	0.03125-0.0875 lb ai/acre (foliar) 5-150 ppb (submersed)	• Can be applied directly to water or sprayed onto foliage of plants or exposed sediment after drawdown. • Symptoms appear 7 to 10 days after treatment. • Plant death occurs over 60 to 120 days period. • Maximum initial application can't exceed 50 ppb. • Do not exceed 150 ppb cumulative total. • Do not irrigate crops if concentrations above 1 ppb. • Use surfactant for foliar applications.

Useful Tank Mixes

- Imazapyr – glyphosate, triclopyr, carfentrazone
- Imazamox – penoxsulam, carfentrazone, endothall, fluridone
- Penoxsulam – imazamox, endothall (possible synergy), fluridone, flumioxazin, carfentrazone
- Bispyribac-sodium – endothall, flumioxazin
- Diquat – 2,4-D (emersed), endothall (submersed), copper (submersed),
- Carfentrazone – penoxsulam, glyphosate, 2,4-D, triclopyr, imazapyr, imazamox
- Flumioxazin – diquat, glyphosate, endothall, imazamox, copper, bispyribac-sodium (can use lower rates), penoxsulam
- Glyphosate – imazapyr, tryclopyr, carfentrazone
- 2,4-D – diquat, triclopyr, carfentrazone
- Triclopyr – 2,4-D, glyphosate, imazapyr, carfentrazone
- Copper sulfate – diquat, endothall, flumioxazin (for algae),
- Endothall – penoxsulam, imazamox, bispyribac –sodium
- Fluridone – penoxulam, imazamox

Aquatic Herbicide Toxicity to Some Fish

The 96-hour LC_{50} is given in ppm columns. The lb column gives the pounds of active ingredient needed per acre*ft to reach the 96-hour LC_{50}

	Bluegill		Channel Catfish		Rainbow Trout	
Herbicide	**ppm[2]**	**lb**	**ppm**	**lb**	**ppm**	**lb**
Endothall (Aquathol)	343	933	150	408	230	625.6
Endothall (Hydrothol)	1.0	2.72	0.5	1.4	1.7	4.6
Copper	Toxicity dependent upon alkalinity of water. The lower the alkalinity, the greater the toxicity.					
Diquat	14	38			15	41
Rotenone (a fish toxicant)	0.02	0.05	0.002	0.005	0.03	0.08
Glyphosate	25	68	13	35	28	76
2,4-D (Amine) Weedar 64, Weed Rhap A-4D, DMA 4 IVM	263	715	166	452	222	604
2,4-D (Ester) Navigate, Aqua-Kleen	2	5.4	1	2.7	1	2.7
Imazapyr	336	914	>100	>272	>100	>272
Triclopyr	681	1,852	446	1,213	400	1,088
Imazamox	119	324			122	332
Carfentrazone	2.0	5.4			16	44
Penoxsulam	103	280			102	277
Sodium Carbonate Peroxyhydrate	26(*a)	71(*b)	24(*a)	65(*b)	22(*a)	60(*b)
Flumioxazin	21	111.3			2.3	12.2
Bispyribac-sodium	>100	272			>100	>272
Topramazone					>100	>272

-The 96-hour LC50 is the amount of material needed to kill 50% of a population within 96 hours.
-ppm values are for the amount of active ingredient.
(*a) - Toxicity as ppm Hydrogen Peroxide
(*b) - Expressed as pounds Hydrogen Peroxide. User will need to calculate the amount of product this equals from label information.

Control of Common Lawn Weeds

American Burnweed (*Erechtites hieraciifolius*)

Simazine, Specticle and FreeHand provide preemergence control of fireweed. Celsius, Confront, Tribute Total and Blindside (metsulfuron + sulfentrazone) provide excellent postemergence control.

Annual Bluegrass (*Poa annua*)

It is difficult to achieve complete control of annual bluegrass with a single pre or post herbicide application. Preemergence and postemergence treatment may be needed. To achieve preemergence control with herbicides such as indaziflam (Specticle), prodiamine (Barricade), pendimethalin (Pendulum) and dithiopyr (Dimension), apply on August 15 and water in immediately. Specticle can be applied later because it has postemergence activity on small annual bluegrass. In bermudagrass, one of the cheapest and easiest ways to control *Poa annua* is to use glyphosate while bermudagrass is completely dormant. Revolver (foramsulfuron), TranXit (rimsulfuron) and Monument (trifloxysulfuron) will provide postemergence *Poa annua* control without damaging partially green bermudagrass or zoysiagrass. Simazine and atrazine are effective preemergence and postemergence on annual bluegrass that has not tillered.

Annual Sedge (*Cyperus compressus***)**

Monument (trifloxysulfuron), Certainty (sulfosulfuron) and Dismiss South (sulfentrazone + imazethapyr) provide excellent annual sedge control. **See Sedge Control for Homeowners in this section.**

Bahiagrass (*Paspalum notatum***)**

Metsulfuron (Manor, Blade, Mansion) is a good choice for bahiagrass control in bermudagrass. Make two applications of metsulfuron 60 DF at one ounce of product per acre three to four weeks apart. Do not use over the root zone of desirable trees and ornamentals. Add 0.25% nonionic surfactant. In centipedegrass, sethoxydim (Segment) may be used to control bahiagrass.

Bermudagrass (*Cynodon dactylon*) **–**
Selective Suppression

In zoysiagrass or tall fescue, use Fusilade II (fluazifop) at 6 fluid ounces per acre plus Turflon Ester at 32 fluid ounces per acre to suppress bermudagrass. Begin around June 1 and repeat every four weeks unless the zoysiagrass has not recovered from the first application. **In centipedegrass**, Segment (sethoxydim) may be used at 24 fluid ounces per acre to suppress bermudagrass, bahiagrass and other weedy grasses. Do not apply Segment sooner than three weeks after green-up and more than twice per season. Do not tank mix sethoxydim with other pesticides or fertilizers.

Bermudagrass – Preplant Control. Make three or four applications of 41% ai glyphosate or higher at 2 to 3 quarts per acre over the growing season (May, July and September). Wait for regrowth before making the next application. Using this method does not guarantee complete control. Tank mixing with 24 fluid ounces per acre of Fusilade II may improve control. Do not seed for 30 days after applying Fusilade II.

Cat's Ear Dandelion (*Hypochaeris radicata*)

Cat's ear dandelion may be effectively controlled in the fall or spring with two-, three- and four-way broadleaf herbicides, as well as with metsulfuron.

Carolina Geranium (*Geranium carolinianum*)

Effective control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Chickweed, Common (*Stellaria media*)

Effective chickweed control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Chickweed, Sticky (*Cerastium glomeratum*)

Effective chickweed control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor, Mansion or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Corn Speedwell (*Veronica arvensis*)

Three-ways alone do not control corn speedwell. Effective control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor, Mansion or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Crabgrass (*Digitaria* spp)

For preemergence control, apply indaziflam (Specticle), prodiamine (Barricade) pendimethalin (Pendulum) and dithiopyr (Dimension) around March 1 or before crabgrass begins to germinate. **Scotts Halts (pendimethalin) is a good preemergence choice for homeowners.** For postemergence control, apply quinclorac (Quinclorac 75 DF, Drive, Drive XLR8) to tolerant turfgrasses when crabgrass is less than 2-tillers or mature. Repeat application in 7 days. Use methylated seed oil for a surfactant. Other postemergence possibilities include mesotrione (Tenacity) or sethoxydim (Segment) in centipedegrass. MSMA can be used for crabgrass control but is not labeled for use on residential turf. **Postemergence homeowner products that contain quinclorac include Ortho® Weed-B-Gon Weed Killer for Lawns Plus Crabgrass Control Concentrate, Bayer Advanced All-In-One Lawn Weed & Crabgrass Killer and Fertilome Weed Out with Q.**

Cudweed (*Gnaphalium* spp)

Cudweed species are biennial plants but are relatively easy to control. Two-, three- and four-way broadleaf herbicides control postemergence as do repeat applications of metsulfuron (Manor, Mansion, Blade, etc.). Apply in the spring while in rosette stage and before seed stalk formation.

Dallisgrass (*Paspalum dilatatum*)

One option is to dig out the clumps with a shovel. Spot treatment with MSMA is legal on sod farms and golf courses. Repeat applications of Tribute Total (foramsulfuron + halosulfuron + thiencarbazone) in late summer and early fall will suppress dallisgrass in residential lawns. **Use Tribute Total only in bermudagrass.** Another approach is spot treatment with glyphosate. Obviously, this is going to kill some of the desirable grass and leave brown spots in the turf. Two applications of glyphosate are needed. Apply the first after active growth begins in May, and spray again when regrowth appears. This will take most of the summer. Keep the glyphosate spray off nontarget plants.

Dandelion (*Taraxacum officinale)*

The common three-way herbicides (2,4-D + dicamba + MCPP) control dandelion. Metsulfuron and quinclorac also control dandelion. *(continued on page 159)*

Control of Common Lawn Weeds [cont.]

Dichondra (*Dichondra* spp)

The common three-way herbicides (2,4-D + dicamba + MCPP) control dichondra. Two applications about 30 days apart will be needed. Tank mixing metsulfuron with a three-way herbicide often improves control.

Doveweed (*Murdannia nudiflora*)

Products containing atrazine or simazine, Revolver or metsulfuron applied twice 30 days apart provide partial control. Tank mixes of MSMA with metribuzin or multiple applications of two- or three-way broadleaf herbicide mixtures also provide good control but also can cause injury to some turfgrass species. Tank mixing Quicksilver or Dismiss with these products increases and hastens their activity. Repeat applications of all herbicides or combinations will be needed for complete control.

Facelis (*Facelis retusa*)

Effective control requires a tank mix of a postemergence broadleaf herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor, Mansion or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Field Madder (*Sherardia arvensis*)

Glyphosate alone does not control field madder. Effective field madder control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Goosegrass (*Eleusine indica*)

Use either Specticle or Ronstar for preemergence control of goosegrass. Barricade and Pendulum will provide slightly less effective preemergence control. Postemergence herbicides for goosegrass include Revolver, Illoxan, Dismiss and metribuzin. Repeat applications are needed when controlling goosegrass postemergence. Pylex (topramezone) is effective on goosegrass in centipedegrass and certain cool-season grasses.

Ground Ivy (*Glechoma hederacea*)

In cool-season grasses, use a product containing triclopyr or fluroxypyr. Momentum FX2 (2,4-D + triclopyr + fluroxypyr) or T-Zone (triclopyr + 2,4-D + dicamba + sulfentrazone) are good options for ground ivy. In warm season grasses, metsulfuron (Mansion, Manor, Blade) or Celsius WG are good choices. **Ortho Chickweed and Oxalis Killer (8% triclopyr) is a good choice for homeowners. Do not use on centipedegrass, St. Augustinegrass or bermudagrass.**

Hairy Bittercress (*(Cardamine hirsuta*)

The dinitroaniline (prodiamine, pendimethalin, others) herbicides do not provide effective preemergence control of hairy bittercress. Effective hairy bittercress control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Henbit (*Lamium amplexicaule*)

Three-ways (2,4-D + MCPP + dicamba) alone do not control henbit. Effective control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or metsulfuron plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Kyllinga (*Kyllinga* spp)

Monument (trifloxysulfuron), Certainty (sulfosulfuron) and Dismiss South (sulfentrazone + imazethapyr) provide excellent kyllinga control. SedgeHammer+ (halosulfuron), while slightly less effective on kyllinga, is safe to use on all turfgrasses. **See Sedge Control for Homeowners in this section.**

Large Hop Clover (*Trifolium campestre*)

Effective large hop clover control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or metsulfuron plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Lawn Burweed or Spurweed (*Soliva pterosperma*)

Simazine or atrazine will provide pre and postemergence control of spurweed if applied early. For best results apply between Thanksgiving and Christmas. If that timing is missed, make the application before March 1. Metsulfuron (Manor, Mansion or Blade) or three-ways (MCPP + dicamba + 2,4-D) provide postemergence control of spurweed. Metsulfuron or a three-way may be tank mixed with either simazine or atrazine.

Lespedeza, Common (*Lespedeza striata* or *Kummerowia striata*)

Lespedeza is often an indicator of insufficient nitrogen fertilization. 2,4-D alone will not control lespedeza or white clover. Products containing metsulfuron, fluroxypyr or triclopyr are very effective on most legumes. Escalade II, Confront and metsulfuron (Manor, Mansion or Blade) are good lespedeza control products. When using three-ways (2,4-D + MCPP + dicamba), repeat applications are usually needed. Celsius (thiencarbazone + iodosulfuron + dicamba) should be effective on lespedeza. **Ortho Chickweed and Oxalis Killer (8% triclopyr) is a good choice for homeowners. Do not use this product on centipedegrass, St. Augustinegrass or bermudagrass.**

Moss (*Bryum argentum*)

Quicksilver T&O (carfentrazone) at 6.7 ounces per acre in 100 GPA when temperatures are less than 85°F provides excellent moss control. Bentgrass has excellent tolerance for Quicksilver. Do not apply to desirable hybrid bermudagrass. Quicksilver does not control algae.

Nutsedge, Purple (*Cyperus rotundus*)

This is the most difficult sedge to control. Repeat applications will be needed. Monument (trifloxysulfuron), Certainty (sulfosulfuron) and Dismiss South (sulfentrazone + imazethapyr) provide temporary suppression of purple nutsedge. SedgeHammer+ (halosulfuron), while slightly less effective, is safe to use on all turfgrasses. Image 70 DG (imazaquin) is an effective herbicide for suppressing sedges in warm-season turfgrasses. Image may cause stunting of turfgrasses. **See Sedge Control for Homeowners in this section.**

Nutsedge, Yellow (*Cyperus esculentus*)

Not usually a problem in lawns. It is more common in ornamental beds and vegetable gardens. SedgeHammer+, Image, Certainty, Monument, Dismiss and Dismiss South are all effective for yellow nutsedge. **See Sedge Control for Homeowners in this section.**

Plantain, Broadleaf (*Plantago major*)

The common three-way herbicides (2,4-D + dicamba + MCPP) control buckhorn plantain. Tank mixing metsulfuron with a three-way herbicide often improves control.

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Plantain, Buckhorn (*Plantago lancelota*)

The common three-way herbicides (2,4-D + dicamba + MCPP) control buckhorn plantain. Tank mixing metsulfuron with a three-way herbicide often improves control.

Prostrate Knotweed (*Polygonum aviculare*)

Metsulfuron at 0.5 ounce per acre or dicamba (Banvel, Vanquish) at 0.5 pound per acre will control prostrate knotweed. Celsius WG (thiencarbazone + iodosulfuron + dicamba) should be effective on lespedeza. There are many combination products that contain 2,4-D and dicamba including Trimec 992 and Speedzone.

Purple Deadnettle (*Lamium purpureum*)

Three-ways (2,4-D + MCPP + dicamba) alone will not control purple deadnettle.

Effective deadnettle control requires a tank mix of a post-emergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or metsulfuron plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Sedge Control for Homeowners

SedgeHammer+ (halosulfuron + surfactant) is a good sedge control choice for homeowners because it is effective on the common sedges, comes in a small package with surfactant added and is safe on all turfgrasses. Hi-Yield Nutsedge Control also contains halosulfuron. Ortho Nutsedge Killer for Lawns (0.05% sulfentrazone) is a quick-acting herbicide that is fairly effective on most sedges and safe on most lawn grasses. Sulfentrazone is fast-acting and will cause leaf burn on sedges within two to three days. It is weaker on purple nutsedge compared to halosulfuron.

Shepherd's Purse (*Capsella bursa-pastoris*)

Effective control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor, Mansion or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Spotted Burclover (*Medicago arabica*)

Effective control requires a tank mix of a postemergence herbicide with simazine or atrazine. Typical mixes are a three-way plus simazine or atrazine or Manor, Mansion or Blade plus simazine or atrazine. Apply early (between December and March 1) before the weeds get big.

Spring Beauty (*Claytonia virginica*)

Mano, Mansion or Blade (metsulfuron) will provide acceptable control of spring beauty. Apply in February or March. Add 0.5% nonionic surfactant.

Spurges (*Chamaescye* spp.)

Manor, Mansion or Blade (metsulfuron) is the best spurge control treatment. Use only in bermudagrass, centipedegrass, St. Augustinegrass and zoysiagrass.

Violets (*Viola* spp.)

Manor, Mansion or Blade (metsulfuron) is an effective violet control herbicide in bermudagrass, centipedegrass, St. Augustinegrass and zoysiagrass. Products containing triclopyr and clopyralid (Confront, Turflon), 2,4-D + fluroxypyr + dicamba (Escalade 2) or triclopyr + phenoxy herbicides (Cool Power, HorsePower or Chaser) are fairly effective for violet control, and these products can be used on cool-season grasses such as tall fescue. Repeat applications are usually required. Mid to late fall applications are best followed by mid-spring to early summer applications. **Ortho Chickweed and Oxalis Killer (8% triclopyr) is a good choice for homeowners. Do not use this product on centipedegrass, St. Augustinegrass or bermudagrass.**

Virginia Buttonweed (*Diodia virginiana*)

Herbicides provide only temporary suppression of Virginia buttonweed. Products containing fluroxypyr or triclopyr such as Escalade II or Momentum FX2 seem to be more consistent than the standard three-ways. However, multiple applications of three-way (2, 4-D + MCPP + dicamba) herbicides at intervals of three to six weeks do a fair job of suppressing Virginia buttonweed. **Consult label to determine the maximum number of applications allowed per year.**

White Clover (*Trifolium repens*)

Three-way growth regulator herbicides, quinclorac and metsulfuron will provide postemergence control of white clover.

Wild Garlic, Wild Onion (*Allium vineale*)

Metsulfuron (Manor, Mansion or Blade) is very effective for wild garlic control and many other winter broadleaf weeds. Apply in late February or early March on a warm (at least 50°F), sunny day when there is good soil moisture. Add 0.25% non-ionic surfactant. Another option is the use of either 2,4-D LV ester or one of the three-ways (Trimec, Triplet). These products are the least effective and require three applications to eliminate garlic. Make the first treatment in November, repeat in March and then again the following November. Do not treat 2,4-D-sensitive grasses such as centipedegrass and St. Augustinegrass unless they are dormant. The ester formulations of 2,4-D are more effective against garlic.

TURFGRASS WEED RESPONSE TO PREEMERGENCE HERBICIDES

HERBICIDES	ANNUAL GRASSES	Annual bluegrass	Crabgrass	Goosegrass	Sandbur	ANNUAL BROADLEAVES	Bittercress	Common Chickweed	Corn Speedwell	Henbit	Hop Clover'	Knotweed	Lespedeza	Parsley Piert	Spurges	Spurweed	PERENNIAL GRASSES	Bahiagrass	Bermudagrass	Dallisgrass	Tall Fescue	PERENNIAL BROADLEAVES	Clovers	Dandelion	Dichondra	Docks	Ground Ivy	Mallow	Mock Strawberry	Mousear Chickweed	Pennywort	Plantains	Woodsorrel	Violets	Virginia Buttonweed	OTHER WEEDS	Nutsedge, Yellow	Wild Garlic/onion
atrazine (AAtrex)		E	F				E	E	E	E	E	E	E	E	E	E		F			F		E	F	G	G					E	G	E		F			
benefin (Balan)		E	E	F	F			G	E	G				E																E								
benefin + oryzalin (XL)		E	E	F	G			G		G		L		E	G																							
benefin + trifluralin (Team)		E	E	F	F									E																								
bensulide (Betasan)		F	E	F	G							G	G	E																								
bensulide + oxadiazon (Goose/Crab)		F	E	E	G																																	
dithiopyr (Dimension)		E	E	G			E	E	G	E				E	G																							
ethofumesate (Prograss)		G						L											F																			
fenamirol (Rubigan)		G																																			
indaziflam (Specticle)		E	E	E																																	
isoxaben (Gallery)		P	P	P	P		E	E	E	E	E			E	E	E																						
metolachlor (Pennant)		F	F	F	F																															F		
oryzalin (Surflan)		G	E	G	G			G		G		L		G	E																							
oxadiazon (Ronstar)		G	E	E	F			P	G	P	G	G	G	E	F	P																						
pendimethalin (Lesco Pre-M, etc.)		G	E	G	G			L		L					G																							
prodiamine (Barricade)		E	E	G				G		G		G			G																							
siduron (Tupersan)			G	P								P			P				F																			
simazine (Princep)		E	F				E	E	G	E	E	G	E	G	G	E					F		G							E								

E = Excellent, ≥90% control. Good = 80% to 89% control. F = Fair, 70% to 79% control. P = Poor, <70% control.
L = Weed species is listed on the herbicide label, but has not been evaluated by the University of Arkansas. _ = Weed response is not known.

TURFGRASS WEED RESPONSE TO POSTEMERGENCE HERBICIDES

HERBICIDES	ANNUAL GRASSES	Annual bluegrass	Crabgrass	Goosegrass	Sandbur	ANNUAL BROADLEAVES	Bittercress	Common Chickweed	Corn Speedwell	Henbit	Hop Clover	Knotweed	Lespedeza	Parsley Piert	Spurges	Spurweed	PERENNIAL GRASSES	Bahiagrass	Bermudagrass	Dallisgrass	Tall Fescue	PERENNIAL BROADLEAVES	Clovers	Dandelion	Dichondra	Docks	Ground Ivy	Mock Strawberry	Mousear Chickweed	Pennywort	Plantains	Woodsorrel	Violets	Virginia Buttonweed	OTHER WEEDS	Nutsedge, purple	Nutsedge, yellow	Wild Garlic/onion	Green Kyllinga
2,4-D (many)							G	F	F	F	F		F	F	F	G							F	E		G	F	F	F	F	P	P	F	P				G	
2,4-D + dichlorprop (DPC)							E	E	E	E	E	G	E	E	G	E							E	E		E	G	G	E	E	F	G	G	G				G	
2,4-D + dichlorprop + dicamba							E	E	E	E	E	G	E	E	G	E							E	E		E	G	G	E	E	F	G	G	G				G	
carfentrazone (Quicksilver)															G																								
chlorsulfuron (Corsair)								G		G					G																								
clopyralid (Lontrel)											E		P										E																
dicamba (Banvel)							E	E	E	E	E	E	G	E	G	E							E	E	G	E	G	G	E	E	F	G	G	F					
dicamba + iodosulfuron + thiencarbazone (Celsius)								G	G	G			G		G								G	G	G		G		G		G								
diclofop (Illoxan)				E																																			
diquat (Reward)		E	E	E	E			E	E	G	E		G	E	E	E					G																		
ethofumesate (Prograss)		E																																				
fenoxaprop (Acclaim)			G	L															F																			
foramsulfuron (Revolver)		E	P	E																	G																	
glyphosate		E	E	E	E		E	E	E	E	E	E	E	E	E	E		G	E	E	E		F	E	E	E	G	G	E	E	E	E		F		G		E	
halosulfuron (Sedgehammer)																																				E	G		F
imazaquin (Image)					L			L		L				L															L							G	F	E	E
mecoprop (Mecomec)								L															L				L		L		L								
metribuzin		E	G	E	G		G	G	E	G	G	G	E	E	E	G					G		G				E		E										
metsulfuron (Manor)										E	E	G	E		E	E		E					E	E	G	E	G		E	G	E	G	E	G				E	
MSMA/DSMA (many)		F	E		E								G		F			F		E																F	F		E
pronamide (Kerb)		E						E	E	P				P		P																							
sethoxydim (Segment)			E	G																																			
simazine (Princep)							E	E	E	E	G			E		G													E										
triclopyr + clopyralid (Confront)							E	E	E	E	E	G	E	E	G	E							E	E		E	G	G	E	E	F	G	G	G				G	
trifloxysulfuron (Monument)		E	P	P							G							F			G		G		G					P				G	E	E		E
sulfentrazone (Dismiss)																																				F	G		G
sulfosulfuron (Certainty)		G																																		E	E		E

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L = Weed species is listed on the herbicide label, but has not been evaluated by the University of Arkansas. _ = Weed response is not known.

Turfgrass Tolerance of Postemergence Herbicides

Herbicide	Bermudagrass	Centipedegrass	St. Augustinegrass	Tall Fescue	Zoysiagrass
2,4-D	S	I	I	S	S
2,4-D + dicamba	S	I	I	S	S
2,4-D + dichlorprop (2,4-DP)	S	I	I	S	S
2,4-D + mecoprop	S	I	I	S	S
2,4-D + mecoprop + dicamba	S	I	I	S	S
2,4-D + mecoprop + dichlorprop	S	I	I	S	S
atrazine (AAtrex)	S-I	S-I	S-I	NR	S-I
bentazon (Basagran)	S	S	S	S	S
bromoxynil (Buctril)	S	S	S	S	S
carfentrazone (Quicksilver)	S	S	S	S	S
chlorsulfuron (Corsair)	S	NR	NR	NR	NR
clopyralid (Lontrel)	S	S	S	S	S
dicamba (Banvel)	S	I	I	S	S
dicamba + iodosulfuron + thiencarbazone (Celsius)	S	S	S	NR	S
diclofop (Illoxan)	S	NR	NR	NR	NR
fenoxaprop (Acclaim)	NR	NR	NR	S	S
fluazifop-p (Fusilade II)	NR	NR	NR	S-I	S-I
foramsulfuron (Revolver)	S	NR	NR	NR	S
halosulfuron (Sedge Hammer)	S	S	S	S	S
imazaquin (Image)	I	NR	S	NR	S
MCPA + MCPP + dichlorprop	S	I	I	S	S
mecoprop (MCPP)	S	I	I	S	S
mesotrione (Tenacity)	NR	R	I	R	NR
metribuzin	S-I	NR	NR	NR	NR
metsulfuron (Manor)	S	S	S	NR	S
MSMA, DSMA	S	NR	NR	I	I
pronamide (Kerb)	S	NR	NR	NR	NR
sethoxydim (Segment)	NR	S	NR	NR	NR
sulfentrazone (Dismiss)	S	S	NR	S	S
sulfosulfuron (Certainty)	S	S	S	NR	S
topramezone (Pylex)	I	NR	NR	S	S
triclopyr (Turflon)	N	S	NR	S	NR
triclopyr + clopyralid (Confront)	I	NR	NR	S	I
trifloxysulfuron (Monument)	S	NR	NR	NR	S

S = safe at labeled rates, I = Intermediate safety, use at reduced rates, NR = Not registered for use on this turfgrass, do not use.

Turfgrass Tolerance of Preemergence Herbicides

Herbicide	Bermudagrass	Centipedegrass	St. Augustinegrass	Tall Fescue	Zoysiagrass
atrazine (AAtrex)	S	S	S	NR	I-S
benefin (Balan)	S	S	S	S	S
benefin + oryzalin (XL)	S	S	S	S	S
benefin + trifluralin (Team)	S	S	S	S	S
bensulide (PreSan)	S	S	S	S	S
bensulide + oxadiazon (Goosegrass/Crabgrass)	S	NR	NR	NR	S
dithiopyr (Dimension)	S	S	S	S	S
fenarimol (Rubigan)	S	NR	NR	NR	NR
indaziflam (Specticle)	S	S	S	NR	S
isoxaben (Gallery)	S	S	S	S	S
metolachlor (Pennant)	S	S	S	S	S
napropamide (Devrinol)	S	S	S	S	NR
oryzalin (Surflan)	S	S	S	S	S
oxadiazon (Ronstar)	S	NR	S	S	S
pendimethalin (Pre-M)	S	S	S	S	S
prodiamine (Barricade)	S	S	S	S	S
pronamide (Kerb)	S	R	R	NR	R
simazine (Princep)	I	S	S	NR	S

S = safe at labeled rates on healthy mature turf. I = Intermediate safety, may cause minor damage to mature, healthy turf. Consider using the lower end of the rate range. Do not apply to turf under stress. NR = Not registered for use on this species.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES	**Using Preemergence Herbicides** – While degree of persistence varies, most preemergence herbicides provide about 100 days of control and thus require repeat applications for season-long control in the mid-south. Applications must be made before weeds emerge or poor control will result. Recommended dates of application for crabgrass and other annual grasses are February 15 - March 5 for southern Arkansas and March 1-20 in northern Arkansas. Fall preemergence applications for winter annual control: Apply simazine after September 1 for winter weed control unless annual bluegrass is the target, then apply after October 1. Apply atrazine after October 1. If you are not using atrazine or simazine for fall preemergence control of annual bluegrass, apply pre-emergence treatments on or near September 1 in all parts of the state. Where possible, water-in preemergence herbicides immediately after application. Dinitroaniline herbicides such as benefin, oryzalin, prodiamine and pendimethalin are not recommended for high traffic areas such as cart path margins, par-3 tees and bare or poorly established areas. For these high traffic areas, especially those with goosegrass, consider using a preemergence product containing oxadiazon. Herbicide-only formulations have been the standard for many years, but the practice of impregnating herbicides on dry fertilizer granules is becoming increasingly popular. Common sense suggests that choosing a fertilizer carrier with relatively uniform particle size will improve the uniformity of herbicide distribution.			
Preemergence - Established Grasses				
prodiamine @ 0.75 lb/A	Annual grasses and some broadleaf weeds.	**Barricade 65 WDG** 1.15 lb/A.	Before crabgrass germinates. Applying around March 15 is usually effective.	Apply only to well established turf. See label for limitations. Do not apply to tees or greens. Do not exceed 0.65 lb of active ingredient per year for centipedegrass and St. Augustinegrass. Do not make more than two applications per calendar year, and allow at least 60 days between treatments. Use a split application for goosegrass control. Wait 4 to 6 months per 0.75 lb of Barricade applied before reseeding.
pendimethalin @ 1.5 to 3 lb/A	Same as above.	**Pendulum AquaCap 3.8 AS** 3.15 to 6.31 pt/A.	Spring. Preemergence to target weeds.	DO NOT use on newly sprigged turfgrasses; NOT recommended for turfgrass that has been severely thinned due to winter stress. DO NOT reseed within 4 months of application. Use the low rate for tall fescue and Kentucky bluegrass. The high rate may be used on warm-season grasses.
siduron @ 3 lb/A	Crabgrass.	**Tupersan 50W** 6.0 lb/A.	Spring seeding – as final operation following seeding. Fall seeding – apply following spring.	Use only on newly seeded Kentucky bluegrass or tall or red fescue. Irrigate after application. Do not use on warm-season grasses. Granular formulation available.
oryzalin @ 1.5 to 3 lb/A	Same as above.	**Surflan 4 AS** 1.5 to 3 qt/A.	Spring seeding – as final operation following seeding. Fall seeding – apply following spring.	Apply 2 to 3 qt/A for summer annual grass control, or apply 1.5 qt/A and apply an additional 1.5 qt/A 8 to 10 weeks after the initial application. Split applications are recommended for improved goosegrass control and for tall fescue. DO NOT apply to newly sprigged grasses until well established. DO NOT apply to golf course greens. DO NOT make a spring application to fall-planted turfgrasses. Surflan is recommended for use on healthy, established turf. Delay reseeding for 3 to 4 months after applications.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
dimethenamid-P @ 1.0 to 1.5 lb/A	Small-seeded broadleaf weeds, doveweed, purslane, spurge, yellow nutsedge and some annual grasses.	**Tower 6L** 21 to 32 oz/A.	Postemergence.	Safe on most cool- and warm-season turfgrasses. Not for residential use.
dithiopyr @ 0.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dimension Ultra 40 WP** 1.25 lb/A.	Mid-March to early April.	May be used on bentgrass and bermudagrass, zoysia, St. Augustine, centipede, tall fescue, Kentucky bluegrass and most other species of turfgrass. Has postemergence activity on very small crabgrass. Do not reseed, overseed or sprig within 8 weeks of application.
bensulide @ 7.5 to 12.5 lb/A	Summer annual grasses and selected broadleaf weeds.	**Betasan, Presan, Betamec 4 EC** 1.9 to 3.2 gal/A.	March 15 to April 1.	Apply high rate in fall for annual bluegrass control. Apply a light irrigation immediately after treatment. DO NOT apply to newly sprigged grasses. Delay reseeding for 4 months after treatment. May be used on bermudagrass and bentgrass greens.
isoxaben @ 0.5 to 1 lb/A	Broadleaf weeds including spurge.	**Gallery 75 DF** 0.66 to 1.33 lb/A.	MId-March to early April for summer weeds, October for winter annuals.	Tank mix with a grass herbicide such as Surflan, etc., if using for fall preemergence treatment to improve annual bluegrass control. May be used on most common turfgrasses. Do not use on putting greens.
oxadiazon @ 2 to 4 lb/A	Same as above.	**Ronstar 2G** 100 to 200 lb/A of 2% G or 4 to 8 lb/A of 50WP or 2.5 to 3.8 qt/A of **Ronstar Flo**	MId-March to early April for summer weeds, October for winter annuals.	DO NOT apply more than 3 lb ai/acre on St. Augustine. May cause temporary discoloration of bermudagrass and St. Augustine which is normally outgrown in 2 to 3 weeks. DO NOT apply to wet turf. Delay reseeding for 4 months after treatment. DO NOT apply to red fescue, centipede or golf course greens.
indaziflam @ 0.014 to 0.04 lb/A	Annual grasses including crabgrass and goosegrass and some broadleaf weeds.	**Specticle Flo** 3 to 10 fl oz/A.	Preemergence.	Do not use on cool-season grasses. Use only on well-established grasses. Leave a 15-foot buffer between treated areas and cool-season grasses.
oxadiazon + bensulide @ 1.5 + 6 lb/A	Annual grasses including crabgrass and goosegrass and some broadleaf weeds.	**Goosegrass/Crabgrass Control** 115 lb/A.	Preemergence.	Apply a light irrigation after treatment. DO NOT use on newly sprigged grasses until well established. Delay reseeding for 5 months after treatment. May be used on bermudagrass and bentgrass greens under conditions of heavy goosegrass infestations. See label for precautions concerning use on putting greens.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES				
Preemergence - Established Grasses [cont.]				
metolachlor @ 1.8 to 3.9 lb/A	Annual grasses and some small-seeded broadleaf weeds, yellow nutsedge suppression.	**Pennant Magnum 7.62** 1.9 to 4.1 pt/A.	Mid-March to early April.	May be used on bermuda, zoysia, St. Augustine or centipede. See label for overseeding restrictions. May cause delayed greenup when applied to dormant bermuda. Needs 0.5 inch rainfall or irrigation within 7 days of application. Do not apply more than once per year.
simazine @ 1 to 2 lb/A	Annual bluegrass, spurweed and many other winter annual weeds.	**Princep 4L** 1 to 2 qt/A.	Between October and April 15 for control of winter annual weeds.	Apply simazine in October or November for preemergence control of winter annual weeds. Apply December through February for late postemergence control of winter annuals. Apply low rate for annual bluegrass control or high rate for winter annual broadleaf control. DO NOT overseed with desirable turfgrass within 4 months before or 6 months after treatment. DO NOT apply more than 1 lb ai/acre on newly sprigged turfgrasses or on hybrid bermudagrass such as Tiflawn, Tifway and Ormond.
atrazine @ 1 to 2 lb/A	Annual bluegrass, spurweed, chickweed and many other weeds.	**AAtrex 4L** 1 to 2 qt/A.	October to November for spurweed. October 1 to April 1 for most winter annuals.	Atrazine provides both preemergence and postemergence control of annual broadleaf weeds. Restricted-use herbicide. See label for special instructions. Do not apply to fairways, etc., that drain onto golf greens. Avoid applications during greenup. For bermudagrass and zoysiagrass, atrazine should be applied only to dormant turf. DO NOT overseed 4 months before or 6 months after treatment. DO NOT apply within the active root zone of azaleas, camellias, boxwoods, etc.
flazasulfuron @ 0.012 to 0.047 lb/A	Cool season grasses, fescue, annual bluegrass, ryegrass.	**Katana 25 DF** 0.75 to 3.0 oz/A.	Postemergence.	Use only on bermudagrass or possibly zoysiagrass. Do not apply on or upslope to desirable bentgrass or overseeded turf. Movement is encouraged when saturated soils are treated and/or heavy (>0.25 inch) rainfall occurs within 48 hours of application. Time required for control increases as weeds mature; therefore, apply in late fall for optimum results. Treated plants do not show herbicide symptoms until air temperatures are consistently above 60ºF.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES				
Using Postemergence Herbicides – Postemergence herbicides are active only on emerged weeds. In general, these herbicides are most effective on young weeds. Applying postemergence herbicides when temperatures are above 85-90°F may result in increased turfgrass yellowing. In many cases, repeat applications may be needed for satisfactory control. Repeat applications should be timed 10-14 days apart or until regrowth appears. Repeat applications at moderate rates will usually be preferable for turfgrass safety and weed control compared to single treatments at excessive rates. A rain-free period of 6 to 24 hours is needed for effective control.				
Postemergence - Established Grasses				
metsulfuron @ 0.0038 to 0.038 lb/A	Many broadleaf weeds and bahiagrass.	**Patriot, Manor, Blade 60 DF** 0.25 to 1.0 oz/A.	Postemergence.	Safe for use on bermudagrass, centipedegrass, St. Augustinegrass and zoysiagrass. Add 0.25% nonionic surfactant. Do not exceed the 0.25 oz rate on centipedegrass. Do not use beneath desirable trees or ornamentals or on desirable bahiagrass. Treating zoysiagrass during transition may result in injury.
rimsulfuron @ 0.031 to 0.062 lb/A	Annual bluegrass.	**TranXit GTA 25 DF** 0.5 to 2.0 oz/A.	See label for details.	Labeled for *Poa annua* control in nonoverseeded bermudagrass, for transition of perennial ryegrass and *Poa annua* control before overseeding.
metsulfuron + rimsulfuron @ 0.015 + 0.018 lb/A	Most winter turfgrass weeds including broadleaf weeds and grasses.	**Negate 37WG** 1.5 oz/A.	December-March.	For use on bermudagrass and zoysiagrass only. Do not use beneath desirable trees or ornamentals or on desirable bahiagrass. May injure zoysiagrass during transition. Do not use on residential turf. Leave a buffer around cool-season grasses. Add 0.5% nonionic surfactant.
chlorsulfuron @ 0.046 to 0.25 lb/A	Tall fescue, wild garlic, chickweed.	**Corsair 75 DF** 1.0 to 5.3 oz/A.	Postemergence.	Safe for use on bermudagrass. Add 0.25% nonionic surfactant. Very slow acting.
foramsulfuron @ 0.02 to 0.03 lb/A	Cool season grasses, goosegrass, centipedegrass.	**Revolver 0.19 SC** 8.8 to 27 oz/A.	Postemergence.	For use on bermudagrass and zoysiagrass. Do not apply to areas where runoff water may come into contact with cool-season grasses.
trifloxysulfuron @ 0.015 to 0.026 lb/A	Cool-season grasses, Virginia buttonweed, sedges, white clover, dichondra, carpetweed.	**Monument 75 WG** 0.33 to 0.56 oz/A.	Postemergence.	For use on bermudagrass and zoysiagrass. For spot treatment, add 0.0176 ounce per gallon plus two teaspoons of surfactant. Use repeat applications for sedges. Do not apply to areas where runoff water may come into contact with cool-season grasses.
sulfosulfuron @ 0.06 to 0.12 lb/A	Johnsongrass, sedges including yellow, purple and kyllinga.	**Certainty 75 DF** 0.75 to 1.25 oz/A.	Postemergence.	Apply to 3- to 6-leaf sedges. Do not exceed 2.66 ounces per acre per year. Apply in boot stage to johnsongrass. Add 0.25% nonionic surfactant.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES				
Postemergence - Established Grasses [cont.]				
dicamba + iodosulfuron + thiencarbazone @ 0.11 to 0.21 lb/A	Broadleaf weeds including medic, clover, geranium, speedwell, dandelion, dollarweed, doveweed, burweed, spurge and others and carpetgrass.	**Celsius 68 WDG** 2.5 to 4.9 oz/A.	Postemergence.	Do not exceed 7.4 oz/A per year. Not for greens, collars or turf that is not established. Do not use on bahiagrass or cool-season grasses. Do not use within 14 days of seeding ryegrass or sprigging bermudagrass, or 30 days before seeding bermudagrass or zoysiagrass.
thiencarbazone + foramsulfuron + halosulfuron 0.038 to 0.12 lb/A	Nutsedge, goosegrass, see label for other weeds.	**Tribute Total** 1.0 to 3.2 oz/A.	Postemergence.	For use on **bermudagrass** only. Do not exceed 6.4 oz per year.
2,4-D amine @ 1 to 2 lb/A	Annual and perennial broadleaf weeds.	**Weedar 64, Dacamine 4D** 1 to 2 qt/A.	Apply in spring or fall when weeds are actively growing.	Amine formulations of 2,4-D are nonvolatile and are safer than ester formulations to use near ornamental trees and shrubs. Apply to small and actively growing broadleaf weeds as a summer or winter treatment. To control wild garlic/onion, use 2 lb ai/acre plus a commercial surfactant. Make first application in late November or early December and follow with a second application in February or March. Repeat this schedule for three consecutive years to control this weed. DO NOT apply 2,4-D to St. Augustinegrass or to centipede. DO NOT allow spray to drift to contact the foliage of ornamentals.
dicamba @ 0.25 to 0.5 lb/A	Annual and perennial broadleaf weeds. Provides better control of henbit, knotweed, clovers, docks, woodsorrel, spurge and lespedeza than 2,4-D alone.	**Banvel 4S** 0.5 to 1.0 pt/A.	Apply in spring or fall when weeds are actively growing.	Do not apply over the root zone of ornamental trees and shrubs. Repeat applications may be needed. Do not exceed 1 lb/acre during the growing season. Do not apply to St. Augustinegrass.
sulfentrazone @ 0.125 to 0.375 lb/A	Kyllinga, yellow nutsedge and many broadleaf weeds.	**Dismiss 4F** 4 to 12 fl oz/A.	Postemergence.	Safe on most warm- and cool-season turfgrasses. Maximum use rate on tall fescue is 4 fl oz/acre. Weed control spectrum increases when tank-mixed with 2,4-D and dicamba. Do not apply to golf course tees or greens. Do not apply directly to landscape ornamentals or ornamental beds.
sulfentrazone + imazethapyr @ 0.29 to 0.45 lb/A	Annual sedge, kyllinga, yellow and purple nutsedge.	**Dismiss South 4L** 9.5 to 14.5 oz/A.	Postemergence.	Use only on well-established labeled turfgrass species. Do not use within 4 weeks of reseeding, overseeding or sprigging. Do not use on golf course greens or tees or directly to landscape ornamentals or ornamental beds. Suggested split application rate options are 9.5 oz followed by 4.9 oz/acre or 7.2 oz followed by 7.2 oz/acre 35 days after the initial for both. Aryltriazinone + imidazolinone herbicide.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
2,4-D + mecoprop + dicamba	Annual and perennial broadleaf weeds. Controls a broader spectrum of weeds than 2,4-D alone.	**Trimec Classic, Super Trimec (ester), Trimec 992, Others** (See label for rates.)	Apply in spring or fall when weeds are actively growing.	Several commercial formulations are available. See label for the recommended amount of the formulated product. Do not spray when the turfgrass is emerging from winter dormancy. **Do not spray St. Augustine or centipede.** Delay reseeding for 4 weeks after application.
2,4-D + mecoprop + dicamba	Annual and perennial broadleaf weeds. Controls a broader spectrum of weeds than 2,4-D alone.	**Trimec Southern, Triplet** (See label for rates.)	Apply in spring or fall when weeds are actively growing.	Refer to label for centipede and St. Augustine rates. Do not spray when the turfgrass is emerging from winter dormancy.
MCPA + mecoprop + dicamba	Annual and perennial broadleaf weeds. Controls a broader spectrum of weeds than 2,4-D alone.	**Tri-Power, Trimec Encore** (See label for rates.)	Apply in spring or fall when weeds are actively growing.	Delay reseeding for 4 weeks after treatment. Do not spray when the turfgrass is emerging from winter dormancy.
MCPA + mecoprop + dichlorprop	Annual and perennial broadleaf weeds. Controls a broader spectrum of weeds than 2,4-D alone.	**Triamine II, Tri-Ester II** (See label for rates.)	Apply in spring or fall when weeds are actively growing.	Delay reseeding for 4 weeks after treatment. Weedestroy Triamine II is labeled at low rates in centipede and St. Augustine. Do not spray when the turfgrass is emerging from winter dormancy.
carfentrazone + mecoprop + 2,4-D + dicamba	Most broadleaf weeds.	**Speed Zone** 2 to 5 pt/A.	Postemergence.	Carfentrazone is a contact herbicide, which will cause rapid appearance of symptoms on target species. See label for details.
carfentrazone + mecoprop + 2,4-D + dicamba	Most broadleaf weeds.	**Speed Zone St. Augustine Formula** 2 to 5 pt/A.	Postemergence.	Carfentrazone is a contact herbicide, which will cause rapid appearance of symptoms on target species. See label for details.
carfentrazone + MCPA + mecoprop + dicamba	Most broadleaf weeds.	**Power Zone** 2 to 6 pt/A.	Postemergence.	Carfentrazone is a contact herbicide, which will cause rapid appearance of symptoms on target species. Power Zone does not contain 2,4-D. See label for details.
clopyralid @ 0.19 to 0.5 lb/A	Legume species including kudzu, white clover, hop clover, bur clover, black medic. Also controls some composites.	**Lontrel 3S** 0.25 to 1.33 pt/A.	Postemergence during periods of active growth.	Avoid contact with any leguminous landscape plants such as mimosa, honey locust, redbud or littleleaf linden (*Tilia cordata*). St. Augustinegrass and centipedegrass have good tolerance for Lontrel.
triclopyr @ 0.25 to 0.5 lb/A	White clover, dandelion, henbit, chickweed, lespedeza, buckhorn plantain, ground ivy, wild violet, prostrate spurge.	**Turflon Ester 4 EC** 1 to 2 pt/A.	Postemergence to actively growing weeds.	For use on tall fescue, perennial ryegrass and perennial bluegrass. Do not use on other turf species unless injury can be tolerated. Wild violet and prostrate spurge control requires repeat applications.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES				
Postemergence - Established Grasses [cont.]				
2,4-D + triclopyr @ 0.5 + 0.25 to 1.0 to 0.5 lb/A	White clover, dandelion, henbit, chickweed, lespedeza, buckhorn plantain, ground ivy, wild violet, prostrate spurge.	**Chaser** 2 to 4 pt/A.	Postemergence to actively growing weeds.	For use on tall fescue, perennial ryegrass and perennial bluegrass. Do not use on other turf species unless injury can be tolerated. Wild violet and prostrate spurge control requires repeat applications.
triclopyr + clopyralid @ 0.28 + 0.094 to 0.56 + 0.188 lb/A	White clover, dandelion, henbit, chickweed, lespedeza, buckhorn plantain, ground ivy, wild violet, prostrate spurge.	**Confront** 1 to 2 pt/A.	Postemergence to actively growing weeds.	For use on tall fescue, perennial ryegrass and perennial bluegrass. Do not use on other turf species unless injury can be tolerated. Do not treat warm-season grasses being mowed at less than 0.5 inch. Wild violet and prostrate spurge control requires repeat applications.
bentazon @ 1 to 2 lb/A	Yellow nutsedge, spurweed, and annual sedges.	**Basagran T/O 4S** 2 to 4 pt/A.	Postemergence. Allow nutsedge to develop as much leaf area as possible.	Apply bentazon to emerged yellow nutsedge that is actively growing and under good soil moisture conditions. Apply 2 to 3 pt/acre and follow 10 to 14 days later with an additional application if necessary. Thorough spray coverage is essential for acceptable control. Spot spraying may result in possible turf injury. DO NOT mow 3 to 5 days prior to or after application. DO NOT apply more than 6 pt/acre in one season or apply to golf course greens or collars.
bromoxynil @ 0.5 to 4 lb/A	Seedling broadleaf weeds with 4 true leaves or more.	**Buctril 2 EC** 1 to 2 pt/A.	When weeds are in the 2- to 4-leaf stage. Will not control larger weeds.	On newly sprigged or seeded grasses, DO NOT exceed 0.5 lb ai/acre of bromoxynil. Apply as a summer or winter treatment to control seedling annual broadleaf weeds. Repeated applications spaced 2 weeks apart may be necessary for acceptable control of prostrate spurge. Bromoxynil is a contact herbicide and uniform spray coverage is essential. Buctril is not labeled for centipede.
sulfentrazone + quinclorac @ 0.75 lb/A	Numerous broadleaf weeds, yellow nutsedge, crabgrass, and foxtail. Refer to label for complete listing.	**Solitare** 1 lb/A.	Postemergence.	Refer to comments for sulfentrazone and quinclorac. Not for use on golf greens, collars or tees. A one-month seeding restriction follows use. Bermudagrass, bluegrass, buffalograss, centipedegrass, perennial ryegrass, seashore paspalum, tall fescue, zoysiagrass.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
sulfentrazone + metsulfuron @0.26 to 0.41 lb/A	Numerous broadleaf weeds, especially dollarweed, ground ivy, doveweed, wilt violet and some sedges (not purple). Refer to label for complete listing.	**Blindside 66 WG** 6.5 to 10 oz/A.	Postemergence.	Refer to comments for sulfentrazone and metsulfuron. Not for use on golf greens, collars or tees. A one-month seeding restriction follows use. Bermuda, centipedegrass, Kentucky bluegrass, St. Augustinegrass, tall fescue, zoysiagrass.
carfentrazone + quinclorac @ 0.5 to 0.8 lb/A	Numerous broadleaf weeds, yellow nutsedge, crabgrass and foxtail. Refer to label for complete listing.	**Square One 70 WG** 12 to 18 oz/A.	Postemergence.	Refer to comments for carfentrazone and quinclorac. Do not use on golf greens. Can be used 1 day before seeding or 7 days after seeding.
flumioxazin @ 0.375 lb/A	Winter annual broadleaf weeds, crabgrass preemergence.	**SureGuard 51 WDG** 12 oz/A.	Dormant bermudagrass	A contact product for **dormant** bermudagrass for rapid nonselective winter annual broadleaf control with subsequent preemergence crabgrass control. Best winter annual broadleaf control is with early winter (November and December) applications. Best preemergence crabgrass control is with late winter applications. Allow 8 weeks after application before seeding or sodding. BroadStar 0.25G is a granular formulation. Dicarboximide herbicide.
imazaquin @ 0.5 lb/A	Nutsedge, wild garlic, selected broadleaf weeds.	**Image 70 DG** 11.4 oz/A.	Apply to actively growing weeds.	Add a nonionic surfactant (1.0 qt/100 gal). The addition of MSMA @ 2 lb ai/A (bermudagrass only) will aid in control of nutsedge(s) and escaped weedy grasses. DO NOT apply when turfgrass is emerging from winter dormancy. Image will severely injure fescue(s) and ryegrass(es). DO NOT apply to newly planted or sprigged lawns or golf greens.
halosulfuron @ 0.062 lb/A	Yellow and purple nutsedge green kyllinga (suppression).	**Sedgehammer 75 DF** 1.33 oz/A.	Postemergence to actively growing nutsedge, early to mid-June.	Apply to 3- to 8-leaf nutsedge. Use 0.5% nonionic surfactant. Two applications may be made. Do not exceed 0.125 lb/ai per acre in a single season. Do not apply to putting greens. For spot treatment, mix 0.9 grams of Manage in one gallon of water with ⅓ ounce surfactant. Do not mow for 2 days before and 2 days after application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
TURF GRASSES				
Postemergence - Established Grasses [cont.]				
metribuzin @ 0.25 to 0.5 lb	Goosegrass, chickweed, henbit, parsley-piert, spurweed.	**Metribuzin 75 DF** 0.33 to 0.66 lb/A.	Apply to dormant turf for control of the winter annual complex. Apply to actively growing turf for control of goosegrass.	*Dormant bermudagrass:* Apply to emerged winter annual weeds before greenup of turf. Make only 1 application per season. *Actively growing bermudagrass:* Apply to bermudagrass that is actively growing and not under stressed conditions. Controls goosegrass and selected annual weeds. Repeat if necessary but do not apply closer than 1-week intervals. DO NOT make more than two applications per season. Metribuzin may cause temporary discoloration. Avoid spray overlaps that will increase rate above recommended rate. Delay mowing treated areas for at least 3 days.
Postemergence Grass				
MSMA @ 2 to 3 lb/A	Crabgrass and dallisgrass, sandbur and nutsedge suppression.	**MSMA** See label.	Multiple applications spaced 7 to 10 days apart are needed for acceptable control. Three to five applications may be needed for dallisgrass control. Do not apply this many treatments to grasses other than bermuda.	Temporary discoloration of turf will occur. May be applied to newly sprigged bermudagrass at the above rates. On new stands of fescue, apply one-half rate after three mowings. Add a surfactant according to label directions. Zoysiagrass cultivars vary in tolerance to MSMA. 'Meyer' is more tolerant to MSMA than 'Emerald' or 'Matrella'. DO NOT apply to centipede or St. Augustinegrass.
MSMA + metribuzin @ 2 + 0.25 to 0.33 lb/A	Goosegrass.	**MSMA + metribuzin 75 DF** See label.	Postemergence salvage application, usually done in July or August.	This tank mix provides better control of goosegrass than the use of MSMA alone. Apply ONLY to established bermudagrass that is actively growing and not under stressed conditions. Two applications, spaced 7 to 10 days apart, may be necessary for acceptable control.
diclofop @ 0.75 to 1.5 lb/A	Goosegrass, ryegrass.	**Illoxan 3 EC** 32 to 43 oz/A.	Early postemergence to actively growing goosegrass.	For use only on bermudagrass on golf courses. Do not use on other turfgrass areas. Use the high rate on goosegrass with one to two tillers, Use the low rate on smaller goosegrass. Do not mow for 24 to 36 hours after application. Do not tank mix with other pesticides. Control requires 2 to 3 weeks. Do not overseed treated areas for at least 3 months after the last application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
glyphosate @ 0.28 lb/A	Annual bluegrass.	**Glyphosate (4 lb/gal formulations)** 1 pt/A.	APPLY ONLY TO DORMANT BERMUDAGRASS.	Apply in 10 to 20 gal water/acre. Add surfactant according to label directions. DO NOT apply during greenup or to actively growing bermudagrass.
fenoxaprop @ 0.11 to 0.35 lb/A	Crabgrass, goosegrass.	**Acclaim Extra 0.57 EC** 13 to 39 oz/A.	Apply to actively growing crabgrass between the 3-leaf and 4-tiller stage.	Use only on established Kentucky bluegrass, tall fescue, per. ryegrass, red fescue and zoysiagrass.
sethoxydim @ 0.19 to 0.28 lb/A	Large crabgrass, goosegrass.	**Segment 1 EC** 1.5 to 2.25 pt/A.	Apply to actively growing large crabgrass before it is well tillered.	Add 2 pt oil concentrate per acre or ¾ fl oz/1,000 sq ft. **Centipedegrass only.**
amicarbazone @ 0.0044 to 0.0175	Annual bluegrass, some broadleaf weeds (see label).	**Xonerate 70WDG** 1 to 4 oz.	Postemergence.	For selective *Poa annua* control in creeping bentgrass, up to 4 applications spaced 7 days apart at 1 oz/acre each are used starting in late winter, 2 to 4 following active *Poa* growth. On overseeded ryegrass, apply once regrowth resumes in late winter at 2 to 4 oz/acre. Repeat in 2 to 3 weeks. Repeat applications should be perpendicular to the initial, minimizing overlaps in at least 20 GPA. Adding a NIS is optional. Bentgrass areas can be reseeded 7 days following the last application. Treat only when temperatures are between 50 and 80°F. Three to 5 oz/acre may be used in St. Augustinegrass for blanket crabgrass control. Maximum use rate per season is 10 total oz/acre.
asulam @ 2 lb/A	Crabgrass, goosegrass, sandbur.	**Asulox 3.34 L** 5 pt/A.	Postemergence.	Bermudagrass and St. Augustinegrass sod production. Do not apply to freshly mowed turf or turf under stress. On Bermudagrass, use on 'Tifway' only. Do not use a surfactant. Asulox is for professional applicators only and only for sod production when used on St. Augustinegrass.
mesotrione @ 0.125 to 0.25 lb/A	Tufted lovegrass, preplant crabgrass, chickweed, speedwells and others.	**Tenacity 4L** 4 to 8 fl oz/A.	Pre and postemergence.	Use on tall fescue, centipedegrass, St. Augustinegrass (grown for sod). A postemergence (primary) herbicide with some preemergence activity. Apply at grass seeding in at least 30 GPA (280 L/ha). Activate with 0.15-inch (3.8 mm) irrigation. Do not use on bentgrass, *Poa annua*, zoysiagrass, seashore paspalum and bermudagrass.
topramezone @ 0.021 to 0.031 lb/A	Crabgrass, goosegrass and other annual grasses.	**Pylex** 1.0 to 1.5 fl oz/A.	Postemergence to weeds.	See label for detailed instructions. May be used on centipedegrass and Kentucky bluegrass and tall fescue. Do not apply to bermudagrass, St. Augustinegrass or zoysiagrass.

Quick Reference for Common Ornamental Weed Control Options

Weed	Herbaceous Ornamentals		Woody Ornamentals	
	Selective Preemergence Control	**Selective Postemergence Control**	**Selective Preemergence Control**	**Selective Postemergence Control**
Annual bluegrass	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension (apply in August).	Envoy	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension (apply in August).	Envoy
Bermudagrass	No	Fusilade/Ornamec, Segment, Envoy (repeat applications needed). In our trials, Fusilade has been the most effective for bermudagrass.	No	Fusilade/Ornamec, Segment, Envoy (repeat applications needed). In our trials, Fusilade has been the most effective for bermudagrass.
Common chickweed	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension (apply in September). Ronstar does not control this weed.	No	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension, Gallery (apply in September). Ronstar does not control this weed.	Limited Options (carefully directed applications of Roundup or Finale).
Creeping woodsorrel	Yes (from seed) Factor, RegalKade G, Pendulum 2G.	No	Yes (from seed) Gallery, Snapshot, Ronstar, Rout, OH2, Surflan.	No (carefully directed applications of Roundup or Finale).
Large crabgrass	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension. Apply split applications for full-season control.	Envoy, Fusilade, Ornamec or Segment. Treat before crabgrass tillers. In our trials, Segment has been more effective on large crabgrass.	Pendulum, Surflan, Barricade, Treflan, Preen, Devrinol, Dimension Apply split applications for full-season control.	Envoy, Fusilade, Ornamec, or Segment. Treat before crabgrass tillers. In our trials, Segment has been more effective on large crabgrass.
Prostrate spurge	Pendulum and Surflan (fair control). Apply split applications for full-season control.	No	Rout, OH2, Snapshot. Apply split applications for full-season control.	No (carefully directed applications of Roundup or Finale).
Wild garlic	No	No	No	No (carefully directed applications of Roundup or Finale).
Yellow nutsedge	Pennant. Not effective on purple nutsedge.	No	Pennant. Not effective on purple nutsedge.	Directed applications of Basagran or Manage. Basagran is not effective on purple nutsedge.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
ORNAMENTALS				
Postplant but Preemergence to Weeds				
prodiamine @ 0.75 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Barricade WDG** 1.15 lb/A.	Postplant but preemergence to weeds.	Apply to established trees, shrubs and flowers listed on the label. Allow the soil to settle around the roots before application. Do not apply more than 1.15 lb in any 60-day period and do not exceed 2.3 lb per year.
dithiopyr @ 0.5 lb/A	Annual grasses and some broadleaf weeds.	**Dimension Ultra 40 WP** 1.2 lb/A.	Preemergence to weed-free soil.	Apply to established ornamentals. Do not incorporate. Activate by applying 0.5 inch of sprinkler irrigation. Check label for tolerant species.
isoxaben @ 0.5 to 1 lb/A	Many annual broadleaf weeds.	**Gallery 75 DF** 0.66 to 1.33 lb/A.	Postplant but preemergence to weeds.	Do not apply until the soil has settled around the roots and no cracks are present. Will not control emerged weeds. Combine with Surflan for improved annual grass control. **See label for plant back restrictions.** Do not treat seed, liner or cutting beds. Do not treat ground covers until they are established and well-rooted.
pendimethalin @ 2 to 3 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Pendulum 2G** 100 to 150 lb/A.	Postplant but preemergence to weeds.	May be applied to container- and field-grown ornamentals. Do not apply to moist foliage. Apply only to established plants. Do not apply to soil with cracks that would allow direct contact of Pendulum with roots. Do not apply to seedbeds, liner or transplant beds. Weed control spectrum similar to Treflan (trifluralin).
metolachlor @ 1.2 to 2.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Pennant Magnum 7.62** 1.3 to 2.6 pt/A.	Postplant but preemergence to weeds.	Apply to weed-free soil. Direct toward the base of ornamentals established at least 2 weeks. For additional broadleaf control, tank mix with Princep. Derby is a premix which contains Princep and Pennant.
simazine @ 1 to 2 lb/A	Annual grasses and broadleaf weeds.	**Princep 4L** 1 to 2 qt/A.	Postplant but preemergence to weeds.	Apply in fall or spring before new weed growth appears. Do not apply on Japanese holly, azaleas or rhododendrons. Apply only once per year. Apply at least one year after transplanting.
oxadiazon @ 2 to 4 lb/A	Annual grasses and some broadleaf weeds. **Does not control chickweed.**	**Ronstar 2G** 100 to 200 lb/A.	Postplant but preemergence to weeds.	Apply to weed-free soil. Safe on a wide variety of plant material. Disturbing soil after application may result in reduced weed control. Use on container- and field-grown nursery stock. Do not apply when the foliage is wet. Higher rates may be needed on bark/peat media. For continued weed control, a second application may be made 60 to 120 days later on some species. Ronstar 50WP may cause foliar injury to species that are not affected by Ronstar G. Consult WP label. Toxic to fish. Do not contaminate water.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
ORNAMENTALS				
Postplant but Preemergence to Weeds [cont.]				
oxyfluorfen + oryzalin @ 2 + 1 lb/A	Annual grasses and some broadleaf weeds.	**Rout** 100 lb/A.	Postplant but preemergence to weeds.	Use on container- and field-grown nursery stock. Apply to weed-free soil when plant foliage is dry and plants are not in a growth flush. Apply overhead irrigation to wash granules off foliage. Do not apply when foliage is wet.
isoxaben + trifluralin @ 0.5 to 1.0 + 2.0 to 4.0 lb/A	Annual grasses and broadleaf weeds.	**Snapshot 2.5 TG** 100 to 200 lb/A.	Postplant but preemergence to weeds.	Prepackaged mix of Gallery and Treflan. Apply before weed germination.
trifluralin + isoxaben + oxyfluorfen @ 2 + 0.25 + 0.25 to 4.0 + 0.5 + 0.5 lb/A	Wide range of grass and broadleaf weeds.	**Showcase 2.5 G** 100 to 200 lb/A.	Preemergence.	Useful on a wide range of container- and field-grown ornamentals. See label for sensitive species.
flumioxazin @ 0.25 to 0.38 lb/A	Many annual grasses and broadleaf weeds.	**SureGuard** 8 to 12 oz/A.	Preemergence or postemergence to weeds.	This is a new product. It is a very active herbicide. Read the label carefully before using. Do not apply to wet foliage. Do not apply in an enclosed structure. Before moving plants into an enclosed structure, apply 1 inch of irrigation water and wait 14 days. Can severely injure bedding plants and herbaceous perennials, and immature foliage on woody plants.
flumioxazin @ 0.38 lb/A	Many annual grasses and broadleaf weeds.	**BroadStar** 150 lb/A.	Preemergence to weeds.	This is a new product. It is a very active herbicide. Read the label carefully before using. Do not apply to wet foliage. Do not apply in an enclosed structure. Before moving plants into an enclosed structure, apply 1 inch of irrigation water and wait 7 days. Can severely injure bedding plants and herbaceous perennials, and immature foliage on woody plants.
oryzalin @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Surflan AS** 2 to 4 lb/A.	Postplant but preemergence to weeds.	May be applied over-top or as a directed spray on field- and container-grown ornamentals. Will not control established weeds. Irrigate to improve weed control. XL is granular formulation that contains Surflan and Balan.
trifluralin @ 2 to 4 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Treflan 5G, Preen** 40 to 80 lb/A.	Preemergence or preplant incorporated.	Use lower rate if incorporated, higher rate if irrigation is used for activation.
prodiamine @ 0.5 to 1.5 lb/A	Annual grasses and some small-seeded broadleaves.	**RegalKade G** 132 to 300 lb/A.	Preemergence to weeds.	Apply before weeds germinate. Do not apply more than 300 lb per year.
oxadiazon + prodiamine @ 2.0 + 0.4 lb/A	Annual grasses and some small-seeded broadleaves.	**RegalStar G** 200 lb/A.	Preemergence to weeds.	Apply before weeds germinate. Do not apply when foliage is wet.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
bentazon @ 0.75 to 1.0 lb/A	Broadleaf weeds, annual sedges and yellow nutsedge.	**Basagran T/O, Lescogran** 1.5 to 2.0 pt/A.	Early postemergence for broadleaf annuals, during active growth for yellow nutsedge.	Apply as a directed spray to small, actively growing weeds and away from the foliage of desirable plants. Add a crop oil or nonionic surfactant. A second application 7-10 days later may be needed for acceptable yellow nutsedge control.
glufosinate @ 0.75 to 1.5 lb/A	Most annual weeds, top burn on perennials.	**Finale 2S** 3 to 6 pt/A.	During active growth.	Finale is a nonselective herbicide. Post-directed spray only. Use as an edging treatment. Avoid contact with desirable plants including foliage and green bark. Use shield to prevent spray from contacting desirable plants.
fluazifop-P @ 0.09 to 0.38 lb/A	Grasses.	**Fusilade II** 6 to 24 oz/A.	Early postemergence for annual grasses, johnsongrass 8-18", bermudagrass 4-8" runners.	May be applied over-top to selected ornamentals and as a directed spray to others. Do not apply to grass weeds under environmental stress. Use nonionic surfactant for ornamentals (0.5 fl oz/gal water), not crop oil concentrate.
imazaquin @ 0.38 to 0.5 lb/A	Broadleaf annuals, yellow and purple nutsedge.	**Image 1.5 LC** 2 to 3 pt/A.	Postemergence also has soil activity.	Add nonionic surfactant. Do not apply over the roots of species that are not approved on the label.
glyphosate @ 0.75 to 4.0 lb/A	Grasses and broadleaf weeds.	**Glyphosate (4 lb/gal formulations)** 3 to 8 pt/A.	Postemergence.	Apply as a directed spray in established plantings. Avoid contact with bark or foliage of desirable plants. Cleared for site preparation before planting nursery stock.
sethoxydim @ 0.19 to 0.47 lb/A	Grasses.	**Segment 1 EC** 2.25 to 3.75 pt/A.	Early postemergence for annual grasses, johnsongrass 8-18", bermudagrass 4-8" runners.	Apply over-top of ornamentals to actively growing grasses. Retreatment may be needed for perennial grasses. Do not apply to grass weeds under environmental stress. Add a crop oil concentrate.
clethodim @ 0.125 to 0.25 lb/A	Annual and perennial grasses.	**Envoy 0.94 EC** 17 to 34 oz/A.	Postemergence to actively growing grasses.	Add 0.25% nonionic surfactant (1 pt in 50 gal). Crop oil concentrate is not recommended.
halosulfuron @ 0.063 lb/A	Purple nutsedge, yellow nutsedge, green kyllinga.	**Sedgehammer 75 DF** 1.33 oz/A.	Postemergence to weeds, start applications in late May to early June, repeat 6 to 8 weeks later.	Add as a post-directed spray around any established woody ornamental plants. Wait 3 months after transplanting before using this product. Begin nutsedge treatment program in May to early June to reduce tuber formation. Manage injured foliage of azalea, crape myrtle, cotoneaster and Japanese holly.

Ornamental Weed Control Tips:

1. None of the preemergence herbicides will give complete control of all weed species. Tank mixing herbicides will usually broaden the spectrum of control. Typical combinations are a grass herbicide such as Surflan or Pendulum plus a broadleaf herbicide such as Princep or Gallery. If a chemical application kills all but one species, that species will multiply, resulting in a shift in the weed population. The resulting shift will eventually render that product ineffective. Rotate chemical usage to reduce the buildup of tolerant weeds. Directed sprays of nonselective herbicides such as Roundup or Gramoxone and cultivation will help provide control of escapes.
2. A single application of a preemergence herbicide will not provide season-long control. Late fall or winter applications of Gallery, Princep or Casoron will provide weed control well into the growing season. When control begins to break, the area may be clean cultivated or treated with a nonselective postemergence herbicide, and an application of one of the other preemergence herbicides can be made.
3. Always use a new herbicide on a trial basis until sufficient experience is gained to feel comfortable with its use. Leave an untreated area for comparison when using new product so that weed control and crop injury comparisons are possible.
4. Small, shallow-rooted plants are more susceptible to herbicide injury than mature, deep-rooted plants. Other factors that increase the chances of injury are (1) sandy soils and excessive watering and (2) failure to use irrigation to remove granular herbicides from the foliage.
5. Use a separate sprayer for herbicides only. It is very difficult to completely remove all traces of some chemicals from sprayers.
6. Consult the label precautions before using any ornamental herbicide since specific cultivars within a genus and species may have varying degrees of sensitivity to a herbicide. In addition, be certain the herbicide is approved for the use that you have chosen, i.e., propagation beds, container, transplanted liners or rooted cuttings, or large, well-established plants.

LIST OF FORESTRY HERBICIDES WITH AN ESTIMATE OF POTENTIAL WEED CONTROL

Herbicide	Application	Rate Per Acre	Ash	Bay (Magnolia)	Birch	Black Cherry	Blackberry	Blackgum	Cedar, Red	Dogwood	Elm	Hackberry	Hawthorn	Hickory	Honeysuckle	Hornbeam	Kudzu	Locust	Maple, Red	Oak	Peppervine	Persimmon	Pine	Privet	Sassafrass	Sumac	Sweetgum	Trumpetcreeper	Waxmyrtle	Willow
Arsenal A.C.	Foliar Spray	24 fl oz	E	P	G	P	P	E	P	G	P	P	E	E	F	G	F	P	G	E	G	G	P	G	G	E	E	G	P	E
Arsenal A.C. + Accord	Foliar Spray	6 oz + 5 qt	E	P	G	G	E	E	P	G	G	E	E	E	G	G	F	G	G	E	G	G	G	G	G	E	E	E	F	E
Arsenal A.C. + Escort	Foliar Spray	1 pt + 1 oz	E	P	G	G	E	E	F	G	G	-	E	G	G	G	G	E	E	E	G	G	P	G	G	E	E	G	F	E
Arsenal A.C. + Forestry Garlon 4	Foliar Spray	24 oz + 2 qt	E	F	G	F	E	E	P	G	G	-	E	E	G	G	G	-	G	E	G	G	G	G	G	E	E	G	G	E
Arsenal A.C. + Tordon K	Foliar Spray	1 pt + 2 qt	E	P	-	G	E	E	G	G	F	-	E	E	G	-	G	E	G	E	G	G	G	G	G	E	E	G	-	E
Tordon K + Forestry Garlon 4	Foliar Spray	2 qt + 2 qt	E	F	G	G	E	E	G	G	G	-	E	G	G	G	G	E	G	E	G	G	G	G	G	E	E	G	G	E
Tordon 101M + Forestry Garlon 4	Foliar Spray	6 qt + 3 qt	E	F	G	G	E	E	G	G	G	-	E	G	G	G	G	E	G	E	G	G	G	G	G	E	E	G	G	E
Velpar, Pronone	Soil Treatment	3 lb ai	P	P	G	E	E	G	F	F	E	P	G	G	G	G	P	P	F	E	P	P	P	F	P	E	G	P	F	E
Pathway	Cut Surface	undiluted	E	E	E	E	-	E	E	F	E	-	E	F	-	E	-	-	F	E	-	E	E	-	-	E	-	-	-	E
Arsenal A.C.	Cut Surface	6 oz/gal water	E	E	E	G	-	E	F	E	P	P	E	E	-	E	-	P	G	E	-	E	F	G	G	E	E	E	-	E

Weed Control Estimates: E = Excellent, G = Good, F = Fair, P = Poor, - = No data

FORESTRY HERBICIDES USED FOR HERBACEOUS WEED CONTROL: ESTIMATE OF POTENTIAL CONTROL

Herbicide	Bahiagrass	Bermudagrass	Bitterweed	Broomsedge	Buttercup	Cocklebur	Crabgrass	Dogfennel	Fescue	Fleabane	Goldenrod	Johnsongrass	Horseweed	Ragweed	Tickseed Sunflower
Arsenal A.C. (6 to 8 oz/A)	F	G	E	P	E	F	F	F	G	G	F	G	G	G	G
Arsenal A.C. + Oust (4 to 6 oz + 2 oz)	F	G	E	P	E	F	G	G	G	G	F	G	G	G	G
Arsenal A.C. + Escort (4-6 oz + 1-2 oz/A)	E	G	E	P	E	F	F	F	F	G	F	F	G	G	G
Oust (3 oz/A)	F	P	E	P	E	P	G	G	E	G	F	G	G	G	G
Oust + Atrazine (2 oz + 2 lb/A)	F	P	E	P	E	G	G	G	E	E	F	G	E	E	G
Oust + Velpar DF (2 oz + 1.33 lb/A)	F	P	E	P	E	P	G	G	G	G	F	F	G	G	G
Pronone 10 MG (7 lb/A)	F	P	E	P	E	P	F	G	E	G	F	P	G	G	G

Weed Control Estimates: E = Excellent, G = Good, F = Fair, P = Poor, - = No data

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Forestry Herbicide Use in Hardwoods **Herbaceous Weed Control** **Postplant but Preemergence to Weeds**				
sulfometuron @ 0.047 to 0.19 lb/A	Many herbaceous species.	**Oust XP** 1 to 4 oz/A.	Up to 4 oz may be used before transplanting, 1 to 2 oz after transplanting. Early spring after the soil has settled around the base of the transplants (March).	Apply while hardwood seedlings, transplants or cuttings are dormant. Application after bud break or leaf-out may cause injury to the hardwoods. Do not add surfactant. Broadcast or band with a ground sprayer. Approved for use on the following species: northern red oak, white oak, chestnut oak, green ash, yellow poplar, red maple, bald cypress, American sycamore. Use 3 oz per acre for tall fescue control. Do not use on marshy sites unless hardwoods are planted on raised beds.
Forestry Herbicide Use in Pines **Site Preparation - Foliar Spray**				
imazapyr @ 0.5 to 1.0 lb/A	Most brush species except blackberry, elm, cherry, locust and pine. Control many herbaceous plants.	**Arsenal A.C.** 16 to 32 oz/A.	Late summer to fall before leaves begin to change color.	May be applied by helicopter, ground equipment and backpack sprayers. Apply as a foliar spray. Add nonionic surfactant at 0.5%. Brownout is very slow with this treatment. Used on sites with dense brush where no burn is planned and mechanical site prep is likely. Do not spray when wind exceeds 5 mph.
imazapyr + metsulfuron @ 0.5 to 0.38 lb/A	Most brush species including vines, elm, cherry, blackberry and legumes and many grasses and broadleaf weeds.	**Arsenal Applicator's Concentrate + Escort** 1 pt/A + 1 oz/A.	Late summer to fall, but before leaves begin to change color.	For loblolly pines only. May be applied by helicopter, ground equipment and backpack sprayers. Do not spray when wind exceeds 5 mph. Apply as a foliar spray. Add nonionic surfactant at 0.5% or 1 qt/A. Brownout is slow with this treatment. Good choice for sites with heavy vine pressure and species such as elm, cherry, blackberry and legumes.
imazapyr @ 0.75 to 1.25 lb/A	See above.	**Chopper** 48 to 80 oz/A.	Late summer to fall before leaves begin to change color.	Chopper may be mixed with water, diesel oil or recommended seed oils and penetrating oils. Chopper may be mixed as an emulsion carrier. Mix with water first and then make up the rest of the carrier volume with 12 to 50% seed oil on a volumetric basis. Use a seed oil with at least 50% esterified seed oil by volume.
imazapyr + glyphosate @ 0.5 to 1.0 + 2.0 lb/A	Most woody species and many herbaceous plants.	**Arsenal A.C. + Accord** 16 to 32 oz/A + 64 oz/A.	Late summer to fall before leaves begin to change color.	May be applied by helicopter, ground equipment and backpack sprayers. Apply as a foliar spray. Add nonionic surfactant at 0.5% or 1 qt/A. Do not spray when wind exceeds 5 mph. Considered to be one of the most consistent treatments available over a wide range of conditions.
imazapyr + glyphosate @ 0.64 + 1.5 lb to 1.2 + 3.0 lb/A	Most broadleaf and grass weeds including woody plants.	**OneStep** 8 to 16 pt/A.	Postemergence. Apply to actively growing weeds.	Contains surfactant. May be applied as a foliar directed spot spray.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
imazapyr + triclopyr @ 0.5 to 1.0 + 0.5 to 1.5 lb/A	Most woody species and many herbaceous plants.	**Arsenal A.C. + Garlon 4** 16 to 32 oz/A + 16 to 48 oz/A.	Late summer to fall before leaves begin to change color.	Provides rapid brownout, especially on sites with a high percentage of waxy leaf species.
picloram or (picloram + 2,4-D) + triclopyr @ 1 or (0.8 + 3) + 2 to 3 lb/A	Most brush species and many broadleaf weeds but no grass control.	**Tordon K or Tordon 101M + Forestry Garlon 4** 2 qt/A or 6 qt/A + 2 to 3 qt/A.	Apply after full leaf development in the spring.	Do not burn or cut treated plants for 6 to 8 weeks after application. Apply by ground or air. Add 0.5% nonionic surfactant. Use on bottomland hardwood sites where there is little grass competition.
picloram + imazapyr @ 1 + 0.5 lb/A	Most brush species including residual pines and many grasses and broadleaf weeds.	**Tordon K+ Arsenal Applicator's Concentrate** 2 qt/A + 1 pt/A.	June to July.	Ground or aerial application. Used on sites where there is a high percentage of undesirable pines.
Forestry Herbicide Use in Pines Site Preparation				
hexazinone @ 3 to 4 lb/A	Most woody plants.	**Velpar ULW** 4.0 to 5.33 lb/A.	In the spring after danger of frost has passed. Apply from bud swell to early leaf-out.	Velpar ULW is generally applied by helicopter. Rates depend on soil type and species present. Uniform, accurate application is essential.
Forestry Herbicide Use in Pines Pine Release - Foliar Spray				
imazapyr @ 0.38 to 0.5 lb/A	Most brush species except blackberry, elm, cherry, locust and pine.	**Arsenal Applicator's Concentrate** 12 to 20 fl oz/A.	Late summer to fall, but before leaves begin to change color. Change in leaf color of blackgum is a reliable indicator of when to spray.	May be applied by helicopter, ground equipment, backpack sprayers and injection equipment. Apply as a foliar spray. Add nonionic surfactant at 0.25%. Brownout is very slow with this treatment. Do not spray when wind exceeds 5 mph.
imazapyr + glyphosate @ 0.25 to 0.38 + 1.0 to 1.5 lb/A	Most brush species.	**Arsenal Applicator's Concentrate + Accord** 12 to 16 fl oz/A + 0.5 to 1.0 qt/A.	Apply after pines have hardened off.	Accord improves blackberry control. May be applied by helicopter, ground equipment and backpack sprayers. Apply as a foliar spray. Add nonionic surfactant at 0.25% or 1 qt/A. Do not spray when wind exceeds 5 mph. Brownout is very slow with this treatment.
imazapyr + metsulfuron @ 0.5 to 0.38 + .038 lb/A	Most brush species including blackberry.	**Arsenal Applicator's Concentrate + Escort** 12 to16 fl oz/A + 0.75 to 1.0 oz/A.	Same as above. Escort is safe to use on non-hardened off pines.	Commonly used on sites with blackberry infestation. May be applied by helicopter, ground equipment and backpack sprayers. Do not spray when wind exceeds 5 mph. Apply as a foliar spray. Add nonionic surfactant at 0.25% or 1 qt/A. Brownout is slow with this treatment.
imazapyr	Most brush species.	**Arsenal Applicator's Concentrate** 1 to 3 fl oz/A per gallon of water.	Same as above.	Apply as a directed foliar spray in a low volume backpack application. Add 0.25% nonionic surfactant. See label for instructions for making more concentrated mixtures for hard to kill species.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Forestry Herbicide Use in Pines Pine Release - Soil Treatment				
hexazinone @ 1.5 to 2.25 lb/A	Many brush species.	**Velpar ULW** 2 to 3 lb/A.	Mid-March to early May.	Do not use on a ripped site. For use in natural stands employing all-age management. Excessive injury may occur when applications are made to loblolly pines less than 4 years of age when planted in coarse-textured soils and less than 3 years of age when planted in fine-textured soils.
hexazinone @ 2 to 3 lb/A	Many brush species.	**Pronone 25G** 8 to 12 lb/A.	Same as above.	Do not use on a ripped site. May be used in plantations. Low analysis formulation (10%) is more forgiving in the absence of uniform application. Some mortality (10%) may be expected in conifers less than 5 years old.
Forestry Herbicide Use in Pines Herbaceous Weed Control				
sulfometuron + hexazinone @ 0.047 to 0.094 + 1.0	Many herbaceous species.	**Oust + Velpar DF** 1 to 2 oz/A + 1.33 lb/A.	February to April.	Soil and foliar activity. Broadcast, ground or aerial.
hexazinone + sulfometuron @ 0.4 to 0.63 + 0.07 to 0.11 lb/A	Annual grasses and broadleaf weeds.	**Oustar** 10 to 16 oz/A.	Preemergence to weeds.	Loblolly pines only. Use lower rate on coarse-textured soils. Rainfall is needed for activation.
imazapyr @ 0.19 to 0.31 lb/A	Most woody plants.	**Arsenal A.C.** 6 to 10 fl oz/A.	Early spring to newly emerged weeds.	Broadcast, ground or aerial. Do not use more than 0.25% nonionic surfactant. Some temporary growth inhibition may result.
sulfometuron + atrazine @ 0.047 to 0.094 + 2 lb/A	Sicklepod, morningglory, cocklebur and other species likely to be found on former agricultural land.	**Oust + AAtrex 4L** 1 to 2 oz/A + 2 qt/A.	Early spring after the soil has settled around the base of the transplants (February - April).	Soil and foliar activity. Broadcast aerial or ground application.
imazapyr + sulfometuron @ 0.13 to 0.19 + 0.094	Many herbaceous species including bermudagrass suppression.	**Arsenal A.C. + Oust** 4 to 6 fl oz/A + 2 oz/A.	Early spring to newly emerged weeds.	Soil and foliar activity. Broadcast aerial or ground application.
imazapyr + metsulfuron @ 0.13 to 0.19 + 0.038 to 0.075 lb/A	Bahiagrass control and many other herbaceous species.	**Arsenal A.C. + Escort** 4 to 6 fl oz/A + 1 to 2 oz/A.	Late spring (May) when bahiagrass is actively growing.	Add 0.25% nonionic surfactant. Arsenal may cause some temporary growth inhibition of young pines.
sulfometuron @ 0,14 lb/A	Fescue and other herbaceous species.	**Oust** 3 oz/A.	Early spring after the soil has settled around the base of the transplants (March - April).	Foliar and soil activity. For fescue pastures planted in pines. Band or broadcast application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
hexazinone @ 0.6 to 0.7 lb/A	Many herbaceous species.	**Pronone 10 MG** 6 to 7 lb/A.	March - April.	Soil active. Aerial broadcast. Used mainly in pulpwood applications. Do not use on sites where 10% conifer mortality cannot be tolerated. Apply only to transplant stock that is 2 years old (loblolly, 1 year old), then apply only if rainfall has settled the soil around the base of the transplant. Do not use on containerized stock or sites that have been ripped. Higher rates will be required for fine-textured soils and soils high in organic matter.
Pine Release - Cut Surface, Frill and Injection (dilute solutions)				
picloram 5.4% + 2,4-D amine 20.9%	Most woody plants.	**Pathway** 1 ml undiluted per 1 inch of stem diameter, or to wet frill completely.	Apply during period of active growth.	Hatchet and squirt bottle. Make cuts at a convenient height around stem and evenly distributed around the tree. Completely circle the stem of difficult to kill species such as dogwood, hickory and red maple with overlapping cuts. Avoid treating during periods of heavy sap flow. Do not leave more than 1 inch between cuts.
imazapyr 4 lb/gal	Most woody plants.	**Arsenal A.C.** Add 6 fl oz to 1 gal of water and use 1 ml per 1 inch of stem diameter.	Apply during period of active growth.	Hatchet and squirt bottle. Make cuts at a convenient height around stem. Completely circle the stem of difficult to kill species such as dogwood, hickory and red maple. Avoid treating during periods of heavy sap flow. Do not leave more than 1 inch between cuts.
Pine Release and Hardwood TSI – Frill and Injection (concentrated solutions)				
imazapyr 4 lb/gal	Most woody plants.	**Arsenal A.C.** 25% concentrate + 75% water and use 1 ml per 3 inches of stem diameter.	Add anytime excluding spring green-up. Best results apply in fall.	Hatchet and squirt bottle. Make cuts at a convenient height around stem. Completely circle the stem of difficult to kill species such as dogwood, hickory and red maple. Avoid treating during periods of heavy sap flow. Do not leave more than 1 inch between cuts.

Non-Cropland
Guide to Woody Plant Response to Herbicides*

HERBICIDES	Ash	Birch	Blackberry	Buckbrush	Cedar	Dogwood	Elm	Greenbrier	Hawthorn	Hickory	Honey Locust	Honeysuckle	Kudzu	Maple	Mulberry	Multiflora Rose	Oaks	Osage Orange	Persimmon	Pines	Poison Ivy	Poplar	Sassafras	Sumac	Sweetgum	Sycamore	Trumpet Creeper	Willow		Grazing land	Forestry	Noncropland	Ditch Banks
2,4-D amine (FS)	P	F	P	G	P	P	F	P	F	F	P	P	P	P	P	P	F	P	P	P	P	F	P	F	P	F	P	P		L	L	L	L
2,4-D amine (CS)	P	F	P	P	P	F	G	P	F	F	F	P	P	P	F	P	F	F	F	F	F	G	G	F	F	F	F	G		L	L	L	L
2,4-D ester (FS)	P	-	P	G	P	P	P	P	-	P	P	P	P	P	P	P	P	P	P	P	P	-	P	F	P	-	P	P		L	L	L	L
Arsenal (FS)	G	P	P	P	P	G	P	G	G	G	G	G	G	G	G	G	G	P	F	P	G	F	G	G	G	F	G	G		N	N	L	L
Banvel (FS)	P	-	F	F	F	F	F	P	F	P	P	F	G	P	N	F	F	P	G	G	F	-	F	F	F	-	F	F		L	N	L	L
Crossbow (FS)	F	F	G	F	P	P	F	P	F	F	F	P	P	F	P	F	F	F	F	F	F	F	F	G	F	F	P	F		L	N	L	L
Escort (FS)	F	P	F	G	P	F	F	P	P	P	G	G	E	F	P	F	F	P	P	P	P	P	P	P	P	P	P	P		N	N	L	N
Garlon 3A (FS)	F	F	G	P	P	F	F	P	F	F	F	P	P	F	F	F	G	P	F	G	F	F	F	G	G	F	P	F		N	L	L	L
Garlon 3A (CS)	F	F	P	P	F	F	F	P	F	F	F	P	P	G	F	F	G	F	F	F	G	F	F	G	G	F	P	F		N	L	L	L
Garlon 4 (FS)	F	F	G	P	P	F	F	P	F	F	F	P	P	F	F	F	G	P	F	G	F	F	F	G	G	F	P	F		N	L	L	N
Garlon 4 (BS)	F	F	G	P	F	G	F	P	F	G	F	P	P	G	F	F	G	P	F	G	P	F	F	G	G	F	P	F		N	L	L	L
Glyphosate (FS)	F	F	F	F	P	P	F	P	F	P	P	F	F	P	P	F	G	P	F	P	F	F	P	F	F	P	F	F		L	L	L	L
Glyphosate (CS)	F	F	F	P	F	F	F	P	F	F	F	F	P	F	F	P	G	F	F	G	G	F	F	F	G	G	P	F		L	L	L	L
Hyvar X-L (FS)	F	F	F	F	F	F	F	P	F	F	F	F	P	F	F	F	F	F	P	F	F	F	P	F	F	F	P	F		N	N	L	L
Hyvar X-L (ST)	F	F	F	F	F	F	F	P	F	F	F	P	P	F	F	F	F	F	P	F	F	F	P	F	F	F	P	F		N	N	L	L
Krenite (FS)	F	F	F	F	P	F	F	P	P	P	F	F	G	F	F	F	F	F	F	G	P	F	P	F	F	F	F	F		N	L	L	L
Pathway	F	F	P	P	F	F	F	P	F	F	F	F	P	F	P	P	F	P	F	G	P	P	P	P	F	P	P	P		N	L	L	N
Spike (ST)	F	F	F	F	P	G	G	F	P	F	G	G	P	F	F	G	G	P	P	F	P	F	P	G	F	F	F	F		L	N	L	L
Transline (FS)											G		G																	N	N	L	N
Velpar (ST)	F	F	F	F	F	F	F	P	P	P	G	P	P	F	F	G	G	F	P	P	F	F	P	F	F	F	P	F		L**	L	L	L

Weed Control: G = Good F = Fair *** P = Poor - = No data available
FS = Foliar Spray BS = Basal Spray CS = Cut Surface ST = Soil Treatment L = Labeled N = Not labeled

* Repeated herbicide applications over several years may be necessary for complete control of woody plants.

** Basal soil or cut-surface applications only.

*** Fair = Partial control or defoliation.

Use this table as a guide for comparing the relative effectiveness of herbicides on individual weeds. Herbicides may perform better or worse than indicated due to extreme weather conditions and other variables. If you are obtaining satisfactory results under your growing conditions, changing products as a result of information in this table is not necessarily recommended.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Woody Plant Control in Non-Cropland (Right-of-ways, fencerows, industrial sites, etc.)				
Foliar Spray				
imazapyr @ 0.5 to 1.5 lb/A	Hickory, honeylocust, honeysuckle, kudzu, maple, mulberry, multiflora, rose, oaks, poison ivy, sassafras, sumac, sweetgum, willow, other broadleaf plants.	**Arsenal 2S** 2 to 6 pt of 2 lb/gal.	Apply to actively growing vegetation not under stress.	Apply during warm weather after full leaf-out and before leaf drop. Apply to foliage in 10 to 60 gal/A if using ground equipment. Use 0.5 to 1% for low volume hand application. Spray to wet but do not allow runoff. Keep away from foliage or roots of desirable plants.
metsulfuron @ 0.038 to 0.15 lb/A	Kudzu, honeysuckle, black locust, sericea lespedeza, privet, bodark.	**Escort 60 DF** 1 to 4 oz/A.	During periods of active growth.	Use the 4 oz rate for kudzu and add 0.25% nonionic surfactant. Wet the kudzu canopy thoroughly, using at least 60 gpa. Make a follow-up treatment one year later to control escapes and misses. Failure to do so will result in reinfestation.
triclopyr @ 2.25 to 4 lb/A	Blackberry, oaks, pines, sumac, sweetgum and other broadleaf plants.	**Garlon 3A or 4** 0.75 to 1 gal/A.	Apply uniformly as a foliar spray after leaves are fully developed until 3 weeks before a frost.	Wet foliage to point of runoff with a backpack sprayer. Apply in 100 to 400 gallons per acre with a hydraulic sprayer. See label for application directions for specific brush species.
bromacil @ 4.4 to 24 lb/A	Controls many brush and tree species.	**Hyvar X-L** 2.25 to 12 gal/A.	Apply to actively growing brush.	Do not apply to brush standing in water; do not use in irrigation ditches nor on right of ways or other sites where marketable timber or other desirable trees or shrubs are immediately adjacent to the treated areas.
fosamine @ 6 to 12 lb/A	Kudzu, pines and other woody plants.	**Krenite S + Surfactant (nonionic)** 1.5 to 3 gal/A + 1 qt/100 gal of water.	Apply as a foliar spray from July until the first frost in the fall.	Complete coverage is required for control. See label for application directions for specific brush species.
glyphosate @ 1.5 to 3.75 lb/A	Most annual weeds and many perennials such as johnsongrass, bermudagrass, curly dock, milkweed, horsenettle, honeysuckle, lespedeza, brambles, multiflora rose and trumpetcreeper.	**Roundup Pro 4L + Surfactant (nonionic)** 2 to 5 qt/A + 2 qt/100 gal of water.	When plants are actively growing. Perennial plants are best controlled when sprayed at growth stages nearing maturity. Brush control is best when applications are made in fall to nonstressed trees.	Follow instructions and precautions listed on the label. Adding 0.5% nonionic surfactant has improved control of some perennials. Surfactant must be added to Accord. Tank mix with Arsenal improves perennial grass control.
picloram + 2,4-D amine @ 0.54 + 2 lb to 2.2 + 8 lb/A	Dogwood, honeylocust, honeysuckle, persimmon, pines and other woody plants.	**Tordon 101 Mixture** 1 to 4 gal/A.	Apply to actively growing plants.	Use 15 to 25 gpa spray mix. See label for use rates for specific woody plant species. **Restricted use pesticide.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Woody Plant Control in Non-Cropland (Right-of-ways, fencerows, industrial sites, etc.)				
Soil Treatments				
bromacil @ 4.5 to 24 lb/A	Many woody plant species.	**Hyvar X-L** 2.25 to 12 gal/A.	Apply before or during the period of active growth when rainfall can be expected for activation.	Use higher rates (greater than 5 gpa) on high organic soils. Use as a soil treatment or basal treatment. For use on drainage ditches, use only as basal treatment. Apply broadcast treatment. Apply broadcast treatments using at least 200 gal per acre of water. Basal treatment may be applied undiluted using a hand-gun applicator, or mixed with water in a ratio of 1 gal Hyvar in 5 gal of water. Do not apply near desirable vegetation. See label for use roles for specific woody plant species.
tebuthiuron @ 2 to 6 lb/A	Dogwood, elm, honeylocust, honeysuckle, multiflora rose, oaks, sumac and other woody plants.	**Spike 20P or 80W** 10 to 30 or 2.5 to 7.5 lb/A.	Before or during the period of active growth. Best applied in mid-March.	Apply in 15 to 150 gal of water per acre before or during the period of active growth of target plants. See label for use rates for specific plant species to be controlled. Do not broadcast where maintenance of a grass cover is desired. Has some postemergence activity on some herbaceous weeds. May be used as an individual plant treatment on forage or pasture area when used at less than 5 lb/A. Do not cut for hay for 1 year after application.
hexazinone @ 2 to 12 lb	Honeylocust, multiflora rose, oaks and other woody plants.	**Velpar L** 1 to 6 gal/A.	Apply in late winter or early spring before rainfall that is needed for activation.	Direct spray to the soil beneath woody plants to be controlled.
indaziflam @ 0.045 to 0.091 lb/A	Annual grasses including crabgrass and goosegrass and some broadleaf weeds.	**Esplanade 200 SC** 3.5 to 7.0 fl oz/A.	Preemergence.	Do not exceed 7 fl oz/A in a single application or 10 fl oz per year. Tank mix with postemergence herbicides to control existing weeds.
indaziflam @ 0.089% + diquat 0.89% + glyphosate 20.46%	Most broadleaf weeds and grasses.	**Esplanade EZ** 8.0 to 16.0 oz per gallon of water.	Postemergence.	Not for use on turfgrass. Avoid tracking the spray on desirable vegetation. Do not apply more than 5.4 gallons per acre per year.
Cut Surface (frill, injection, hypo-hatchet, stump)				
2,4-D amine (4 lb/gal formulation)	Elm, poplar, sassafras, willow and many woody species.	**2,4-D amine (4 lb/gal formulation)** Undiluted. 1 to 2 ml of concentrate per injection.	May to October.	Make injections as near the root collar as possible. See label for instructions for specific woody plant species.
imazapyr	Many woody plant species.	**Arsenal 2S** 2 qt per 1 qt of water (concentrated), or 8 to 12 fl oz per gal of water (dilute).	During active growth.	May be used as a cut stump, injection, frill or girdle treatment. See label for instructions for specific uses and rates.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
imazapyr	Many woody plant species.	**Chopper RTU** Undiluted.	During active growth.	Spray or brush the undiluted solution onto the cambium area of freshly cut stump surface and the bark of the cut stump. Insure that the cambium area (wood just inside the bark) is thoroughly wetted, but not to the point of puddling.
triclopyr	Maple, oaks, poison ivy, sumac, sweetgum and other woody plant species.	**Garlon 3A, Tahoe 3A** Undiluted.	Apply in spring or summer.	Apply in 1 ml of concentrate to cuts spaced 3 inches apart around the tree trunk. May also be applied with frill or girdle method.
glyphosate	Oaks, pines, poison ivy, sweetgum, sycamore and other woody plant species.	**Glyphosate (4 lb/gal formulations)** Undiluted.	Apply during active growth.	Apply 1 ml in cuts spaced 2 to 3 inches apart around the tree trunk.
picloram + 2,4-D amine	Pines and other woody plant species.	**Pathway** Undiluted.	Any time except during heavy sap flow.	Apply 0.5 ml of undiluted solution to cuts spaced 3 inches apart around the trunk. Or use 1 ml of 50% solution of Tordon 101 in a continuous cut girdling the trunk. Use undiluted Tordon RTU for frill method. **Restricted use pesticide.**
Basal Spray				
imazapyr (see label)	Many brush species.	**Stalker 2L** (See label.)	Spring or Fall.	For thinline and low-volume basal bark treatments. See label for specifics. Imazapyr is soil active and may be taken up by the roots of desirable vegetation.
2,4-D ester + triclopyr	Many woody plant species.	**Crossbow** 4 gal in enough diesel oil, No. 1 or No. 2 fuel oil, or kerosene to make 100 gal of spray mixture.	Apply any time except when snow or water prevent spraying the groundline.	Spray basal parts of brush or trees to a height of 15 to 20 inches from the ground. Thoroughly wet all the basal bark area including crown buds and ground sprouts. Best results have been obtained with winter to early spring applications.
triclopyr	Blackberry, dogwood, hickory, maple, oaks, pines, sumac, sweetgum and other woody plant species.	**Garlon 4, Tahoe 4E** 4 gal in enough Arborchem Basal Oil, diesel fuel, No. 1 or No. 2 fuel oil, or kerosene to make 100 gal of spray mixture.	Apply any time except when snow or water prevent spraying the groundline.	For control of weedy plants with stems less than 6 inches in diameter. Spray the basal parts of trunks to a height of 12 to 15 inches from the ground. May be mixed in oil-water mixtures as well. Refer to label for rates and directions.
triclopyr @ 1.0 lb/gal	Many woody plants.	**Pathfinder II** Ready to use.	Apply any time except when snow or water prevent spraying the groundline.	Use on plant with basal stem diameter less than 6 inches. Thoroughly wet the lower 12 to 15 inches of stems including the root collar, but not to runoff. See label for streamline basal bark instructions.
aminopyralid + triclopyr @ 0.83 to 1.23 lb/A	Many herbaceous and woody broadleaf weeds.	**Capstone** 6 to 9 pt/A.	Postemergence to actively growing weeds.	No grazing or haying restrictions. Do not use treated hay for mulch. Do not use manure from animals grazing treated pastures around sensitive plants.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Woody Plant Control in Non-Cropland (Right-of-ways, fencerows, industrial sites, etc.)				
Basal Spray [cont.]				
clopyralid @ 0.5 lb	Kudzu, honeylocust, black locust, sericea lespedeza.	**Transline 3 lb/gal** 1.33 pt/A.	Late June to early October.	Clopyralid is a chemical which can travel (seep or leach) through soil and, under certain conditions, has the potential to contaminate groundwater which may be used for irrigation and drinking purposes. Users are advised not to apply picloram where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow or to soils containing sinkholes over limestone bedrock, severely fractured surfaces and substrates which would allow direct introduction into an aquifer. Your local county Extension office can provide further information of the type of soil in your area and the location of groundwater.
aminocyclopyrachlor + metsulfuron + imazapyr @ 0.5 to 0.77 lb/gal	Many broadleaf herbaceous and woody plants and some grasses.	**Viewpoint 61.7 DF** 13 to 20 oz/A.	Postemergence.	Read the label carefully before using Viewpoint. Very low rates of this herbicide can injure crops. Do not use on lawns, walks, driveways, tennis courts or similar areas. Do not apply more than 20 oz/A per year.
General Herbaceous Weed Control in Non-Cropland (Right-of-ways, fencerows, industrial sites, etc.)				
imazapyr @ 0.5 to 3 lb/A	Ash, dogwood, greenbrier, hawthorne and many other grass, broadleaf and brush weeds.	**Arsenal 2S** 2 to 6 pt/A.	May be applied preemergence or as postemergence spray.	Post sprays are usually more effective. Apply to wet foliage. Apply to actively growing vegetation.
2,4-D amine 1 to 4 lb/A	Many annual and perennial broadleaf weeds.	**2,4-D amine** 1 to 4 qt/A.	Postemergence.	Apply as a foliar spray in 15 to 30 gpa of water to young, vigorously growing weeds. Avoid drift to susceptible crops or other desirable vegetation.
dicamba @ 0.5 to 8 lb/A	Many annual and perennial broadleaf weeds.	**Vanquish 4S** 1 pt to 2 gal/A.	Postemergence.	Apply to actively growing weeds and brush. May be tank mixed with 2,4-D, Karmex, Dalapon, Princep, Tordon, Amitrole, Hyvar, Velpar, Spike, Garlon and other herbicides to broaden spectrum of weed and brush control. See label for more information.
prodiamine @ 0.65 to 1.5 lb/A	Annual grasses.	**Endurance 65 DF** 1 to 2.3 lb/A.	Preemergence.	Tank mix with Roundup Pro or Arsenal for control of emerged weeds.
DSMA or MSMA @ 2.7 to 5.4 lb/A	Johnsongrass control in other perennial grasses.	**DSMA or MSMA** Many formulations.	Postemergence.	Apply when johnsongrass is 6 inches tall until early head stage. Repeat applications may be needed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
sulfosulfuron @ 0.062 to 0.13 lb/A	Johnsongrass, nutsedge, buttercup, others.	**Outrider 75 DF** 1.33 to 2.66 oz/A.	Postemergence to actively growing weeds. Treat johnsongrass at 12 to 18 inches.	Excellent for johnsongrass control in bermudagrass. Does not injure actively growing bermudagrass. Add 0.5% nonionic surfactant or methylated seed oil. May be tank mixed with Roundup Pro, Escort, Oust or other herbicides to broaden the spectrum of control.
triclopyr @ 1.0 to 4.5 lb/A	Many annual and perennial broadleaf weeds.	**Tahoe 3A, Garlon 3A or 4 + Nonionic Surfactant** 0.33 to 1.5 gal/A of Garlon 3A, or 1 to 4 qt/A of Garlon 4 + 0.25 to 1 pt per 20 to 100 gal of water.	Postemergence.	Apply any time during growing season. May be tank mixed with 2,4-D or Tordon 22K to broaden spectrum of weed and brush control. See labels for more information.
fosamine @ 6 to 12 lb/A	Blackberry, multiflora rose, sumac and other brush and woody plant species.	**Krenite S + Nonionic Surfactant** 1.5 to 3 gal/A.	Postemergence.	Apply as a foliar spray from July through first frost. Complete coverage is essential for good control.
sulfometuron-methyl @ 0.5 to 0.56 lb/A	Johnsongrass, fescue, most annual grass and broadleaf weeds.	**Oust 75 DF** 1 to 12 oz/A.	Preemergence or postemergence.	Apply preemergence or early postemergence in late spring to early summer. Use nonionic surfactant for postemergence applications. Do not apply where runoff water may flow onto agricultural land or where other desirable vegetation is growing. May be tank-mixed with Karmex, Velpar and other herbicides for broader spectrum weed control. See label for more information.
sulfometuron + chlorsulfuron @ 0.14 to 0.048 to 0.35 + 0.12 lb/a	Many broadleaf weeds and grasses.	**Landmark XP** 4 to 9 oz/A.	Preemergence and postemergence.	Premix of Oust + Telar.
glyphosate @ 0.75 to 3.75 lb/A	Johnsongrass, bermudagrass, fescue, dandelion, multiflora rose, thistles, most annual weeds and many perennial plants.	**Glyphosate (4 lb/gal formulations)** 2 to 5 qt/A.	Postemergence.	Apply as foliar spray to actively growing plants. See label for use rates for specific plant species.
imazapic @ 0.032 to 0.188 lb/A	Johnsongrass, ragweed, tall fescue, prickly sida, trumpetcreeper.	**Plateau 2S** 2 oz to 12 oz/A.	Postemergence.	Provides weed control and growth suppression.
imazapic + glyphosate @ 0.023 + 0.063 to 0.188 + 0.5 lb/A	Johnsongrass, crabgrass, sandbur, sedges, tall fescue control or seedhead suppression.	**Journey** 4 to 32 oz/A.	Postemergence.	Do not use unless bermudagrass injury can be tolerated.
pendimethalin @ 2 to 4 lb/A	Annual grasses.	**Pendulum 60 DF** 3.3 to 6.6 lb/A.	Preemergence.	Tank mix with Roundup Pro or Arsenal for control of emerged weeds.
aminocyclopyrachlor + chlorsulfuron @ 0.06 to 0.38 lb/A	Many broadleaf herbaceous and woody plants.	**Perspective 55.3 DF** 1.75 to 11 oz/A.	Postemergence.	Read the label carefully before using Perspective. Very low rates of this herbicide can injure crops. Do not use on lawns, walks, driveways, tennis courts or similar areas. Do not apply more than 11.5 oz/A per year.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Soil Sterilants (Right-of-ways, fencerows, industrial sites, etc.)				
triclopyr @ 1.0 to 4.5 lb/A	Many annual and perennial broadleaf weeds.	**Tahoe 3A, Garlon 3A or 4 + Nonionic Surfactant** 0.33 to 1.5 gal/A of Garlon 3A, or 1 to 4 qt/A of Garlon 4 + 0.25 to 1 pt per 20 to 100 gal of water.	Postemergence.	Apply any time during growing season. May be tank mixed with 2,4-D or Tordon 22K to broaden spectrum of weed and brush control. See labels for more information.
bromacil + diuron @ 1.6 + 1.6 to 18.4 + 18.4 lb/A	Many annual and perennial broadleaf and grass weeds.	**Krovar II DF** 2 to 23 lb/A.	Preemergence or early postemergence.	Apply just before weed emergence or in early stages of weed growth. See label for use rates for specific weeds.
prometon @ 8 to 20 lb/A	Many annual and perennial broadleaf and grass weeds.	**Pramitol 25E** 4 to 10 gal/A.	Preemergence or postemergence.	Apply prior to emergence until 3 months after weed emergence. Will give residual control for over 1 year. See label for use rates for specific weeds and uses.
prometon + simazine + sodium chlorate + sodium metaborate	Many annual and perennial broadleaf and grass weeds.	**Pramitol 5 PS** 0.35 to 0.92 lb/100 sq ft.	Preemergence or postemergence.	Apply prior to emergence until 3 months after weed emergence. Will give residual control for over 1 year. See label for use rates for specific weeds and uses.
tebuthiuron @ 1 to 4 lb/A	Many annual and perennial broadleaf and grass weeds.	**Spike 20P** 10 to 20 lb/A of 20P.	March.	May be applied any time except when ground is frozen or the soil is saturated with moisture. Do not apply near desirable vegetation where roots may come in contact with the herbicide. Avoid contamination of irrigation water. See label for use rates for specific weeds.
dichlobenil @ 4 to 8 lb/A	Many annual and perennial weeds and woody plant species.	**Casoron 4G** 100 to 200 lb/A.	Preemergence.	See label for application instructions, use rates and specific weeds.
bromacil @ 3 to 24 lb/A	Many annual and perennial broadleaf and grass weeds.	**Hyvar X-L** 1.5 to 12 gal/A.	Preemergence or postemergence.	Apply as spray in 100 to 200 gal of water per acre. See label for use rates for specific weeds.
diuron @ 4 to 12 lb/A	Many annual and perennial broadleaf and grass weeds.	**Karmex 80DF** 5 to 15 lb/A.	Preemergence or early postemergence.	Apply to soil shortly before weed growth begins. See label for use rates for specific weeds.
bromacil + diuron @ 1.6 + 1.6 to 12 + 12 lb/A	Many annual and perennial broadleaf and grass weeds.	**Krovar IDF** 4 to 30 lb/A.	Preemergence or early postemergence.	Apply just before weed emergence or in early stages of weed growth. See label for use rates for specific weeds.
hexazinone @ 6 to 12 lb/A	Many annual and perennial broadleaf and grass weeds.	**Velpar L** 3 to 6 gal/A.	Preemergence or early postemergence.	Apply to soil from late winter to early summer, or in fall. Needs rainfall for activation. See label for use rates for specific weeds.
imazapyr + diuron @ 1.0 + 8.0 to 1.5 + 12.0 lb/A	Most herbaceous weeds.	**Sahara DG** 13 to 19 lb/A.	Pre or postemergence.	Tank mix with Roundup Pro for faster burndown of emerged vegetation. Do not apply over or near the roots of desirable trees.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
WILDLIFE FOOD PLOTS				
Burndown, Preplant				
glyphosate @ 1.0 to 2.0 lb/A	Emerged weeds.weeds including woody plants.	**Glyphosate (4 lb/gal formulations)** 1 to 2 qt/A.	Apply at least 14 days before seedbed preparation.	Contains surfactant. May be applied as a foliar directed spot spray. Field must be free of standing water. Avoid drift to sensitive crops.
Austrian Winter Pea [dry pea]				
pendimethalin @ 0.5 to 1.49 lb/A	Annual grasses and small-seeded broadleaves.	**Prowl 3.3 EC** 1.2 to 3.6 pt/A. Apply lower rate to coarse soils and higher rate to fine (clay) soils	Preplant incorporated.	May be applied immediately before planting or up to 60 days prior to planting. Must be incorporated. DO NOT APPLY preemergence.
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses and johnsongrass.	**Poast 1.5 EC** 6 to 8 oz/A + crop oil concentrate @ 1% v/v.	Small annual grasses. Johnsongrass 15 to 20 inches. Do not apply to grass under stress.	See comments for Poast in soybean section. Do not apply more than 5 pt/A per year. Split application most effective for johnsongrass. 1.5 pt/A followed by 1 pt/A.
imazethapyr @ 0.047 lb/A	Annual grasses and broadleaves.	**Pursuit 70 DG** 1.08 oz/A.	Can be applied preplant incorporated, preemergence or early postemergence (fall).	Add nonionic surfactant at 0.25% v/v with postemergence applications. Apply after plants reach 3 inches in height, but prior to five nodes. Needs rainfall for optimum activity.
imazamox @ 0.031 lb/A	Annual grasses and broadleaves.	**Raptor** 4 oz/A + nonionic surfactant @ 0.25% v/v.	Postemergence (fall).	Apply when peas have at least three pairs of leaves, but prior to bloom stage. Apply when crop and weeds are actively growing.
Clover				
benefin @ 1.12 to 1.5 lb/A	Summer annual grasses and some broadleaves.	**Balan 60 DF** 2 lb/A.	From 10 weeks prior to planting up to planting.	Thoroughly incorporate into upper 3 inches of soil immediately after application.
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses and johnsongrass.	**Poast 1.5 EC** 6 to 8 oz/A + crop oil concentrate @ 1% v/v.	Small annual grasses. Johnsongrass 15 to 20 inches. Do not apply to grass under stress.	See comments for Poast in soybean section. Do not apply more than 5 pt/A per year. Split application most effective for johnsongrass. 1.5 pt/A followed by 1 pt/A.
2,4-DB amine @ 0.5 lb/A	Annual and perennial broadleaf weeds.	**Butyrac, Butoxone** 1.15 qt/A of 0.875 lb/gal 2,4-DB or 1 qt/A of 2 lb/gal.	When legumes (seedlings or established stands) have two or more true leaves with weeds in seedling stage.	Best control is achieved with weeds in the 2- to 4-leaf stage. Will not control henbit or chickweed. Safe on clovers and grasses.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
WILDLIFE FOOD PLOTS [cont.]				
Greens [collards, kale, mustard, turnips]				
sethoxydim @ 0.2 to 0.3 lb/A	Annual grasses and johnsongrass.	**Poast 1.5 EC** 6 to 8 oz/A + crop oil concentrate @ 1% v/v.	Small annual grasses. Johnsongrass 15 to 20 inches. Do not apply to grass under stress.	See comments for Poast in soybean section. Do not apply more than 5 pt/A per year. Split application most effective for johnsongrass. 1.5 pt/A followed by 1 pt/A.
Oats				
carfentrazone-ethyl @ 0.008 to 0.031 lb/A	Annual broadleaf weeds.	**Aim 2 EC** 1.0 to 1.9 oz/A.	Postemergence to weeds up to 4 inches tall.	Use a nonionic surfactant at 0.25% v/v. Coverage is essential for good control. Do not apply more than 1.9 oz/A per year.
dicamba @ 0.063 to 0.125 lb/A	Annual broadleaf weeds.	**Clarity** 2.0 to 4.0 oz/A.	At planting or postemergence prior to 5-leaf stage on spring-seeded oats or prior to jointing on fall-seeded oats.	
thifensulfuron-methyl + tribenuron-methyl @ 0.014 to 0.01875 lb/A	Annual broadleaf weeds.	**Harmony Extra 75 XP** 0.3 to 0.4 oz/A.	Make application after the 2-leaf stage, but before flag leaf in fall-seeded oat and after 3-leaf stage but before jointing in spring-seeded oat.	Add a nonionic surfactant at 0.25% v/v. Check rotation intervals.
2,4-D amine @ 0.25 to 1.0 lb/A	Annual and perennial broadleaf weeds.	**2,4-D amine** 0.5 to 2 pt/A of 4 lb/gal 2,4-D. Use the higher rate for late applications and high infestations.	Apply after oat is fully tillered but not forming joints in the stem.	Apply 0.25 to 0.5 pt/A if underseeded with legume. Use higher rate only if weed infestation is severe and legume injury can be tolerated.
Millet (Japanese, Proso, Others)				
glyphosate @ 1 lb/A	Annual grass and broadleaf weeds. Weak on morningglories.	**Glyphosate (4 lb/gal formulations)** 2 pt/A.	Use prior to planting for vegetation knockdown.	Apply to actively growing weeds.
2,4-D amine @ 0.5 lb/A	Morningglory, cocklebur, and most other broadleaf weeds.	**2,4-D 4L** 1 pt/A. Add 0.25% v/v nonionic surfactant.	4- to 6-inch millet.	Do not apply when heading.
dicamba @ 0.25 lb/A	Morningglory, cocklebur, and most other broadleaf weeds, horseweed and ragweeds.	**Banvel or Clarity 4SL** 0.5 pt/A.	2- to 5-leaf stage.	Do not apply when heading.
prosulfuron @ 0.027 lb/A	Most broadleaf weeds.	**Peak** 0.75 oz/A. Add 0.25% v/v nonionic surfactant.	Apply to actively growing millet 8 to 10 inches tall.	Will not control ALS-resistant weeds. Do not apply to millet under stress.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
SUNFLOWERS (Grown for Doves)				
Note: Sunflower recommendations are based on drilled or planted sunflowers with adequate seed coverage. Broadcast seeding may result in an increased risk of herbicide injury.				
Preplant Incorporated				
metolachlor @ 1.27 lb/A	Annual grasses, nutsedge, and small-seeded broadleaf weeds.	**Dual Magnum** 1.33 pt/A.	Prior to planting.	Avoid high rates.
pendimethalin @ 0.5 to 1.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Prowl 3.3 EC or Pendimax 3.3 EC** 1.2 to 3.6 pt/A.	Up to 14 days prior to planting.	Incorporate within 7 days. Use low rate on sandy soils.
ethalfluralin @ 0.56 to 1.125 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Sonalan HFP** 1.5 to 3 pt/A.	Prior to planting.	Incorporate with two passes in opposite directions no more than 48 hours after application. See label for improved groundcherry control program.
trifluralin @ 0.5 to 1.0 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Treflan, Trilin, Trifluralin 4 EC** 1.0 to 2.0 pt/A.	Up to 14 days prior to planting.	Incorporate immediately. Use 1 pt/A on sandy soils.
Preemergence				
metolachlor @ 1.27 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Dual Magnum** 1.33 pt/A.	Immediately after planting.	Do not apply POST. Avoid high rates.
pendimethalin @ 0.5 to 1.5 lb/A	Annual grasses and small-seeded broadleaf weeds.	**Prowl or Pendimax 3.3** 1.2 to 3.6 pt/A.	Immediately after planting.	Must receive activating rainfall within 7 days. Do not apply POST.
sulfentrazone + carfentrazone @ 0.12 + 0.014 to 0.15 to 0.016 lb/A	Annual broadleaf weeds.	**Spartan Charge** 5 to 6 oz/A.	Up to 3 days after planting.	Do not use POST. Tank mixtures of Prowl or Dual with Spartan have performed well in University trials.
sulfentrazone + *S*-metolachlor @ 0.13 + 1.2 lb/A	Grass and broadleaf weeds.	**BroadAxe 7 EC** 24 oz/A.	Immediately after planting.	Do not apply POST.
Postemergence				
clethodim @ 0.125 lb/A	Annual grasses, johnsongrass, and red rice.	**Select Max 0.97 EC** 16 oz/A. Use 1 qt/A or 1.0% v/v crop oil concentrate.	2 to 6 inch tall grass weeds.	Must add crop oil concentrate. Avoid applications during periods of drought.
Clearfield Sunflowers				
imazamox @0.039 lb/A	Annual grasses, suppression of johnsongrass and certain broadleaf weeds. Good on broadleaf signalgrass and foxtail.	**Beyond 1 AS** 5 oz/A. Surfactant and liquid nitrogen are required as adjuvants.	3 to 4 inch weeds and grass.	Avoid applications during dry periods. Preliminary research has shown that a soil-applied program is needed prior to making POST Beyond applications in Arkansas. **Use on Clearfield hybrids only!**

SUPPLEMENTAL PUBLICATIONS

* MP169, *Weeds of Arkansas Lawns, Turf, Roadsides and Recreation Areas*
MP192, *Arkansas Rice Production Handbook*
* MP193, *Identifying Seedling and Immature Weeds of Arkansas Field Crops*
MP197, *Arkansas Soybean Handbook*
MP370, *Turfgrass Weed Control for Professionals*
MP519, *Row Crop Plant-Back Intervals for Common Herbicides*
FSA2080, *Pasture Weed and Brush Control*
FSA2109, *Home Lawn Weed Control*
FSA3054, *Musk Thistle*
FSA6123, *Weed Control in Container Nurseries*
FSA6124, *Woody Plant Control in Home Landscapes*
FSA6127, *Weed Control in Field Nurseries*
FSA6137, *Weed Control in Landscape Plantings*

(Check for current revisions of the above publications.)

FOR FURTHER INFORMATION ON HERBICIDES,
SEE YOUR COUNTY EXTENSION AGENT.

A suggested equipment cleanup procedure to follow immediately after applying phenoxy formulations is:

(1) Flush system completely with detergent water; drain.

(2) Flush system with ammonia solution (1 quart ammonia per 25 gallons water); drain.

(3) Fill system completely with above concentration ammonia solution; let stand overnight.

(4) Drain system next day; flush with excess water.

(5) Flush system the day before next use.

(6) Clean outside of equipment and nozzle assemblies in above manner.

This method is not foolproof but should reduce the hazards involved in applying phenoxy amine herbicides.

Some chemicals used for weed control can be injurious to man if handled carelessly. They can also be injurious to desirable plants, livestock, wildlife and fish if improperly applied. Care should be exercised in the use of herbicides and the disposal of unused herbicides to avoid polluting streams and water supplies. Precautions for handling and applying that are printed on the container label should be followed.

*For sale only.

NOTES

NOTES

See MP44 on the web at www.uaex.edu.

Cooperative Extension Service, University of Arkansas, U.S. Department of Agriculture, and County Governments Cooperating

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