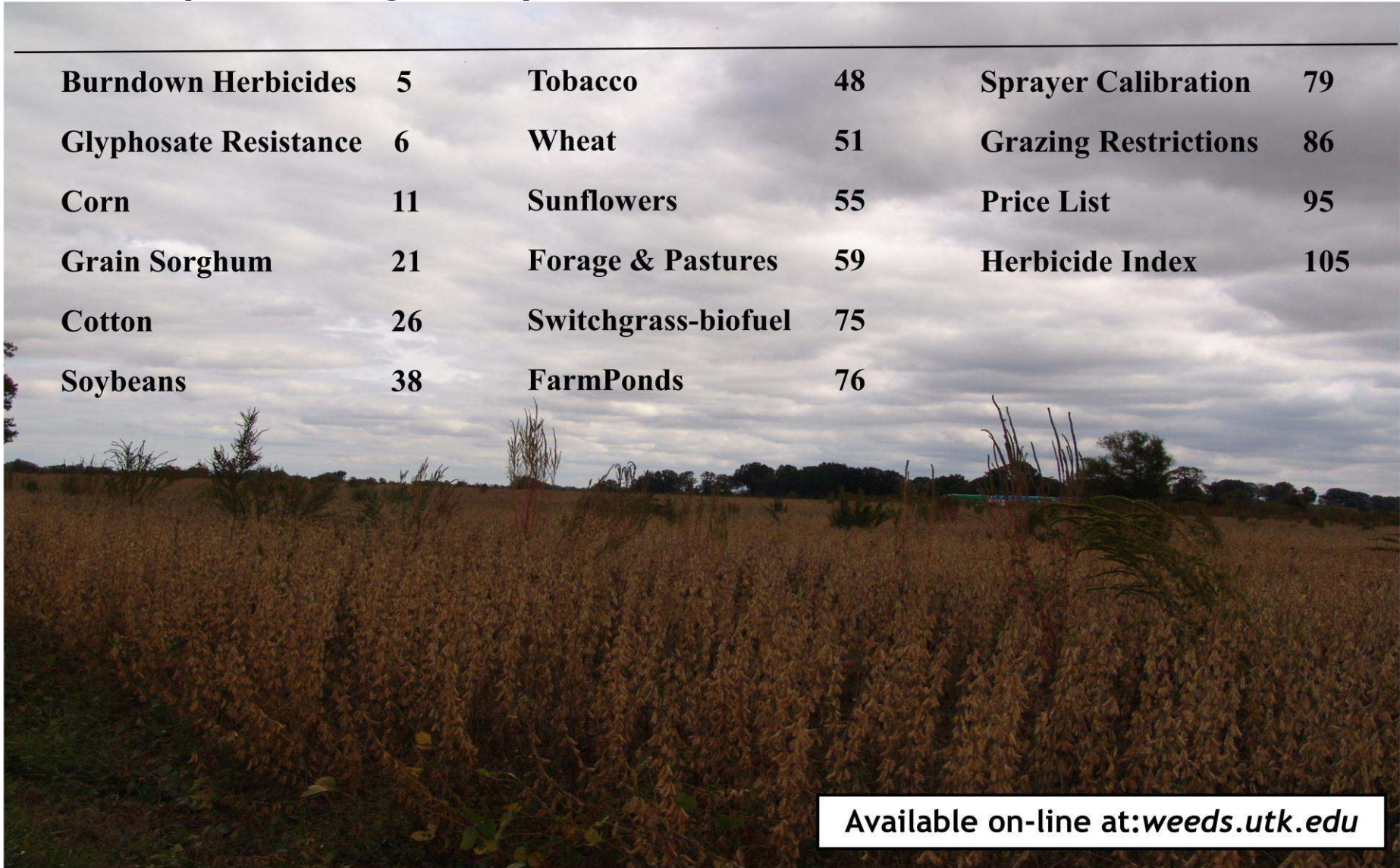


2013 Weed Control Manual for Tennessee

Field Crops • Forage Crops • Pastures • Farm Ponds • Harvest Aids



Burndown Herbicides	5	Tobacco	48	Sprayer Calibration	79
Glyphosate Resistance	6	Wheat	51	Grazing Restrictions	86
Corn	11	Sunflowers	55	Price List	95
Grain Sorghum	21	Forage & Pastures	59	Herbicide Index	105
Cotton	26	Switchgrass-biofuel	75		
Soybeans	38	FarmPonds	76		

Available on-line at: weeds.utk.edu

Weed Control Manual (PB1580)

2013 Weed Control Manual for Tennessee

Larry Steckel, Associate Professor, Plant Sciences Department
The University of Tennessee Agricultural Extension Service

Contributing Authors:

G. Neil Rhodes, JR.	Professor	Plant Sciences Department
Chris Main	Associate Professor	Plant Sciences Department
Barry D. Sims	Center Director	Highland Rim AgResearch and Education Center
Robert M. Hayes	Center Director	West Tennessee AgResearch and Education Center
Angela McClure	Associate Professor	Plant Sciences Department
Thomas C. Mueller	Professor	Plant Sciences Department
Blake Brown	Center Director	AgResearch and Education Center at Milan

Advisors to Contributing Authors:

Greg Armel	Assistant Professor	Plant Sciences Department
Jim Brosnan	Assistant Professor	Plant Sciences Department
Paul Denton	Professor	Plant Sciences Department

INTRODUCTION

This manual contains the 2013 University of Tennessee weed control recommendations for corn, grain sorghum, cotton, soybeans, burley and dark tobacco, wheat, forage crops, and farm ponds. These recommendations are based on results of research and demonstrations conducted by the Agricultural Experiment Station and the Agricultural Extension Service. Decisions regarding recommendations are made by the University of Tennessee Weed Control Committee and are based on three years of data at various locations in the state.

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

TABLE OF CONTENTS

Introduction	2
Expected Weed and Cover Crop Response to Burndown Herbicides.....	5
Glyphosate-Resistant Horseweed Management Systems	6
Glyphosate-Resistant Palmer Amaranth Management Systems	9
Corn Weed Control.....	11
Burndown Herbicides Recommended for No-till Corn	11
Preplant or Preemergence Package Mix Herbicides for No-till or Conventional Corn	12
Preemergence Herbicide Tank Mixtures for No-till or Conventional Corn.....	13
Postemergence Herbicides Recommended for Corn.....	15
Corn Harvest Aids	18
Expected Weed Response to Soil Applied Corn Herbicides.....	19
Expected Weed Response to Postemergence Corn Herbicides.....	20
Grain Sorghum Weed Control	21
Burndown Herbicides Recommended for No-till Grain Sorghum.....	22
Preemergence Herbicides for Grain Sorghum	23
Postemergence Herbicides for Grain Sorghum.....	24
Grain Sorghum Harvest Aids	25
Expected Herbicide Response of Common Weeds in Grain Sorghum	26
Cotton Weed Control	27
No-till Cotton Weed Control Considerations.....	27
Preplant Herbicides for Burndown and Residual Weed Control Cotton.....	28
Preplant Incorporated Herbicides for Conventional Tillage Cotton	29
Burndown Herbicides for No-Till Cotton.....	29
Preemergence Herbicides for Conventional or No-Till Cotton.....	30
Overtop Herbicides for Cotton.....	31
Post-Directed Herbicides Recommended for Cotton	33
Herbicides Recommended for use in Hooded Sprayers	35
Layby Herbicides Recommended for Cotton.....	36
Expected Weed Response to Cotton Herbicides	37
Soybean Weed Control	38
Burndown Herbicides for No-till Soybeans.....	38
Preplant Incorporated Herbicides for Soybeans.....	39
Preplant/Preemergence Herbicides for Soybeans	39
Postemergence Herbicides for Weed Control in Soybeans.....	42
Soybean Harvest Aids.....	45
Expected Soil Applied Herbicide Response of Common Weeds in Soybeans	46
Expected Weed Response from Postemergence Soybean Herbicides	47
Burley and Dark Tobacco Weed Control.....	48
Herbicides for Tobacco Fields	48
Expected Herbicide Response of Common Weeds in Tobacco	50

Wheat Weed Control	51
Herbicides for Use in Wheat	52
Expected Weed Response to Wheat Herbicides	54
Sunflower Weed Control	55
Preplant Incorporated Herbicides for Sunflowers	55
Preemergence Herbicides for Sunflowers	56
Postemergence Herbicides for Sunflowers	57
Expected Weed Response to Sunflower Herbicides	58
Forage Crop and Pasture Weed Control	59
Herbicides for Alfalfa and other Legume Hay Crops	59
Grazing and Cutting Restrictions for Alfalfa Herbicides	60
Expected Weed Response to At-Planting and Postemergence Alfalfa Herbicides	61
Herbicides for Pastures	62
Expected Weed Response to Pasture Herbicide Applications	65
Expected Weed Response to Pasture Herbicides Late-Spring to Summer Applications	66
Spot Treatments for Specific Weeds in Pastures	67
Grazon P+D and Surmount Guidelines for Tennessee.....	69
Grazing, Hay Cutting and Slaughter Restrictions for Pasture Herbicides.....	71
2013 Pasture Herbicide Price List.....	72
Weed Control in Switchgrass Grown for Biofuel Feedstock	73
Herbicides for Use in Switchgrass Grown for Biofuels	75
Weed Management in Farm Ponds	76
Restrictions and Waiting Periods	77
Aquatic Herbicides for Weed Control in Farm Ponds	78
Sprayer Calibration	79
Summary of Herbicide Mechanism of Action According to the Weed Science Society of America (WSSA)	82
Rainfree Requirement for Postemergence Herbicides	83
Forage, Feed and Grazing Restrictions for Herbicides	86
Postemergence Herbicide Preharvest Intervals (PHI).....	91
Herbicide Price List	95
Crop Rotational Guidelines for Herbicides.....	99
Herbicide Name and Ingredient Index	105

EXPECTED WEED AND COVER CROP RESPONSE TO BURNDOWN HERBICIDES*

These are ratings for burndown materials alone, and also for some of the more widely used combinations in corn, cotton or soybeans. See appropriate crop section in this manual for the specific labeled and recommended burndown and residual herbicides.

	Glyphosate	Liberty 280 SL	Gramoxone SL	2,4-D	Dicamba	Glyphosate + 2,4-D	Glyphosate + Dicamba	Liberty 280 SL + 2,4-D	Liberty 280 SL + Dicamba	Gramoxone SL + 2,4-D	Gramoxone SL + Dicamba	Liberty 280 SL + diuron	Liberty 280 SL + Caparol	Gramoxone SL + diuron	Gramoxone SL + Caparol	Gramoxone SL + Coloran	Gramoxone SL + Sencor	Gramoxone SL + atrazine	Glyphosate + atrazine
Hericide Site of Action*	9	10	22	4	4	9+4	9+4	10+4	10+4	22+4	22+4	10+7	10+5	22+7	22+5	22+7	22+5	22+5	9+5
Annual bluegrass	5	3	8	0	0	5	5	3	3	7	7	5	5	9	9	9	9	9	9
Carolina Geranium	1	8	8	7	8	9	9	9	9	9	8	9	9	9	9	9	9	9	9
Chickweed	5	9	9	7	9	7	8	9	9	9	8	9	9	9	9	9	9	9	9
Common lambsquarters	8	6	6	6	8	9	9	7	9	8	8	8	8	9	8	9	9	9	9
Curly dock	4	7	5	2	7	7	8	8	9	6	8	8	8	5	5	5	8	9	9
Cutleaf Eveningprimrose	4	7	5	7	8	8	8	8	9	7	8	8	8	8	8	8	8	9	9
Dandelion	3	6	2	8	8	9	9	8	9	9	8	8	8	8	8	8	8	8	8
Deadnettle/Henbit	5	7	7	4	5	7	8	8	8	8	9	8	8	8	8	8	8	9	9
Horseweed (mare's-tail)	2	8 ^a	5	6	8	7	9	8	9	8	8	8	8	8	8	7	8	9	9
Ryegrass*	7	3	6	0	0	5	5	3	3	6	6	5	5	7	7	7	7	7	8
Smartweed	7	7	2	6	8	9	9	7	8	8	8	8	8	8	8	8	8	9	9
Vetch	5	8	7	8	9	9	9	9	9	8	8	9	9	7	7	7	8	9	9
Wheat	9	5	5	0	1	9	9	5	5	5	5	5	5	7	5	7	5	8	9
Plant back restrictions (days)																			
Corn	0	0	0	7	0	7	0	7	0	7	0	NR	NR	NR	NR	NR	NR	NR	NR
Cotton	0	0	0	30	21	30	21	30	21	30	21	0	0	0	0	0	NR	NR	NR
Soybean	0	0	0	30	21	30	21	30	21	30	21	NR	NR	NR	NR	NR	0	NR	NR

* Herbicide mode of action see page 82 for details.

^a Poor performance is possible with this product if day time temperatures are less than 60F.

GLYPHOSATE-RESISTANT HORSEWEED MANAGEMENT SYSTEMS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
CORN			
Burndown			
Liberty 280 SL (Glufosinate)	1.67-2.09 lbs.	22 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions. May be tank-mixed with atrazine and 2,4-D. Poor performance is possible with this product if day time temperatures are less than 75F.
Roundup PowerMax (glyphosate) + Banvel or Clarity (dicamba) or 2,4-D	0.75 - 1.5 lbs.(a.e.) + 0.25 lb. or 0.5 - 1.0 lb.	22 - 43 ozs.+ 0.5 pt. or 1.0-2.0 pt. of a 4 lb. /gal. formulation	Apply these products before, during or after corn planting (prior to corn emergence) for control of existing horseweed. Note: Make sure seed furrow is closed to avoid injury to corn seedlings. With 2,4-D apply 7-14 days prior to, or 3-5 days after corn planting, but prior to crop emergence. Do not use 2,4-D on light, sandy soils.
Sharpen SG (saflufenacil)	0.0445 lbs.	2 ozs.	MSO 1.0% Use on smaller weeds. Do not tank-mix with Valor. Thorough coverage is needed for efficient control.
Preemergence			
Gramoxone SL +Atrazine (u)	0.47-0.75 lbs + 1.6 - 2.0 lbs.	30 - 48 ozs + 1.6 - 2.0 qts. 4L	Atrazine provides extended preemergence control of late emerging horseweed. Atrazine is a restricted use herbicide.
Postemergence			
Dicamba or Distinct (dicamba + diflufenzopyr)	0.25 lb. or 0.175 - 0.26 lb.	0.5 pt. or 4 -6 ozs.	The 0.5 pt. rate may be applied overtop corn up to 36" tall. For Distinct apply overtop to corn between 4" and 24" tall. For corn 4 to 10" tall, use 6 oz./A. For corn 10 to 24" tall, use 4 oz./A. Always add nonionic surfactant at 1 qt./100 gal. of spray mix. Do not use crop oil. Temporary corn injury (twisting, leaning) may be noted when applications are made during periods of rapid growth, or crop stress. Do not apply under conditions which favor drift onto nearby, sensitive crops. Do not tank-mix with Lorsban, Ambush or Warrior insecticides. Check labels of tank-mix partners for restrictions on corn size at application.
SOYBEAN			
Preplant Burndown			
Liberty 280 SL (Glufosinate)	1.67-2.09 lbs.	22 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tank-mix partners. Poor performance is possible with this product if day time temperatures are less than 75F.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Roundup PowerMax (glyphosate) + Dicamba	0.75 - 1.5 lbs. (a.e.) + 0.25 lb.	22 - 43 ozs. + 8 ozs.	Apply as a tank-mix for control of winter weeds. A minimum of 1 inch of rainfall/irrigation and a 14 day waiting period after rainfall/irrigation is required before planting soybeans to avoid crop injury.
Roundup PowerMax (glyphosate) + 2,4-D	0.75 - 1.5 lbs.(a.e.) + 0.5 - 1.0 lb.	22 - 43 ozs.+ 1.0-2.0 pt. of a 4 lb. /gal. formulation	Apply 2,4-D before soybean planting for control of existing horseweed. With 2,4-D apply 30 days prior to soybean planting. Do not use 2,4-D on light, sandy soils. Higher 2,4-D rates (1.5 to 2 pts/A) have provided consistently better glyphosate-resistant horseweed control.
Sharpen SG (saflufenacil)	0.02 lbs.	1 ozs.	30 days plant back restriction to soybean on coarse soils with O.M. less than 2. Tank-mix with glyphosate or Gramoxone SL for best burndown results. 1.0% MSO. Do not tank-mix with Valor.
Valor 51% WDG (flumioxazin)	0.5 - 1 ozs.	1 - 2 ozs.	Apply as a fall treatment after November 15 in combination with labeled burndown herbicides to provide residual horseweed control the following year. 2 ozs. is recommended for fall application. Valor alone will not control emerged horseweed. Caution should be used with fall applied treatments on highly erodible land.
IN WHEAT PRIOR TO DOUBLECROP Harmony GT (Thifensulfuron) + Clarity (dicamba)	0.023-0.028 lbs. + 0.09 lbs.	0.5-0.6 ozs. + 3 ozs.	Apply in February. This herbicide treatment plus competition from a healthy wheat crop has reduced horseweed populations in subsequent double-crop soybeans. When wheat is combined, the tops of the horseweed plants are cut off, leaving a small amount of leaf surface for foliar herbicides to kill prior to double-crop planting.
Preemergence			
Authority First	0.282 – 0.35 lbs	6.45 – 8 oz/A	
Authority XL	0.219 – 0.263 lb 0.284 – 0.328 lb 0.306 – 0.35 lb	5-6 ozs coarse 6.5.-7.5 ozs Medium 7-8 ozs fine	
Boundary (Dual Mag + Metribuzin)	1.31 lbs + 0.31 lbs/ ai/A	2 pts.	Requires rainfall to be activated and provide good small seeded broadleaf weed control.
Gramoxone SL (u) (paraquat) + Sencor DF (metribuzin)	0.75 lb. + 0.19 lb.	48 ozs. + 4 ozs.	Apply to 6 inch or smaller horseweed and other weeds in a minimum of 20 gallons of water per acre as a preemergence burndown. Include a non-ionic surfactant at 2 pts. per 100 gals. of mix, or crop oil concentrate at 1 gal. per 100 gals. of spray mix. Weeds larger than 6 inches may not be controlled.
Prefix (Fomesafen + S-metolachlor)	sandy loam: 1.33 lb. silt loam: 1.33-1.66 lb. silty clay loam: 1.82-1.99 lb.	2 pts. 2-2.5 pts. 2.75-3 pts.	Requires rainfall to be activated and provide good small seeded broadleaf weed control.
Valor 51% WDG (flumioxazin)	0.5 - 1 ozs.	1 - 2 ozs.	Do not apply more than 3 ozs/acre per growing season. Apply as a preplant or preemergence treatment to control spring germinating horseweed. Valor will not control existing horseweed.
Postemergence			
FirstRate 84 DG (cloransulam-methyl)	0.016 – 0.032 lb.	0.3 – 0.6 ozs.	Postemergence in Roundup Ready soybeans: For tank-mix with Roundup WeatherMax, PowerMax, UltraMax or Glyphomax Plus, DO NOT add additional surfactant or crop oil. For tank-mix with other glyphosate products, add non-ionic surfactant at 2 pts. per 100 gals. of mix. Label recommends including ammonium sulfate at 8.5 to 17 lb/100 gals.

(u)- Restricted Use Herbicide

COTTON			
Preplant Burndown			
Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Dicamba + Roundup PowerMax (glyphosate)	0.25 lb. + 0.75-1.5 lbs.(a.e.)	0.5 pt. + 22 - 32 ozs.	Preplant for control of emerged annual weeds prior to planting cotton. Best results are obtained when weeds are small and actively growing and during warm weather. A minimum of 1 inch of rainfall/irrigation and a 21 day waiting period after rainfall/irrigation is required per 8 ounces, before planting cotton. May be tanked-mixed with Caparol, Cotoran, Gramoxone SL, and Roundup PowerMax for control of additional grasses and broadleaf weeds.
Postemergence			
Envoke (Trifloxysulfuron)	0.0038 – 0.0069 lbs.	0.10 – 0.15 oz	Must be planted back to cotton. Safe on wheat cover crop. Some plant residue should be on the field to reduce soil erosion on highly erodible soils.
Valor 51% WDG (flumioxazin) + broad spectrum herbicide	0.5 - 1 ozs.	1 - 2 ozs.	Use after November 15 in combination with labeled burndown herbicides to control emerged weeds and provide residual control the following year. A minimum of 30 days must pass, and 1 inch of rainfall/irrigation must occur, between Valor application and planting of cotton. Valor will not control existing horseweed.
Preemergence			
Liberty 280 SL (Glufosinate)	1.67-2.09 lbs.	22 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. See label for further application instructions and tank-mix partners. Performance is enhanced by adding Caparol/Direx/Cotoran or delaying application until temperatures are greater than 75F.
Gramoxone SL (u) (paraquat) + Cotoran (fluometuron) or Direx (diuron) or Caparol (prometryn)	0.50 – 0.75 lb.	32 – 48 ozs.	Effective in suppressing glyphosate-resistant horseweed during the interval within 21 days before planting of cotton. Terminal regrowth can occur. Avoid drift to sensitive plants. See Preemergence Herbicides for Conventional or No-Till Cotton section of this manual for rates of Cotoran, Direx, or Caparol based on soil texture.
Postemergence			
Liberty 280 SL (Glufosinate) Liberty Tolerant Cotton Only	0.4 – 0.53 lbs.	22 – 29 ozs.	Apply over the top to Liberty tolerant cotton varieties. No more than 40 ozs./A may be applied per application and no more than 80 ozs./A may be applied per cotton growing season. Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed and crop canopies require 20 to 40 gallons per acre. See label for further application instructions.
Envoke (trifloxysulfuron)	0.0046 – 0.0069 lbs.	0.12 – 0.15 ozs.	Apply over the top of 5 leaf or greater cotton for suppression.
Post-directed			
Cotoran (fluometuron) + MSMA	1.0 lb.+ 2.0 lbs.	32 + 42 ozs.	May be applied to cotton at least 6 inches tall until bloom. Precise application is necessary to avoid cotton injury.
Direx (diuron)+ MSMA	0.8 -1.2 lbs.+ 2.0 lbs.	1.6 - 2.4 pts. + 42 ozs.	May be applied after cotton reaches 12 inches tall until bloom. May injure fall-seeded cover crops.
Suprend (prometryn + trifloxysulfuron)	0.8 – 1.2 lbs	1.0 – 1.5 lbs	May be applied to cotton at least 6 inches tall until bloom. Precise application is necessary to avoid cotton injury.

(u)- Restricted Use Herbicide

GLYPHOSATE-RESISTANT PALMER AMARANTH MANAGEMENT SYSTEMS

Control of Palmer amaranth will center around PRE applied herbicides. PRE applied herbicides require pre-precipitation in order to provide effective residual control of Palmer. As a result weed management plan for this weed most also include an effective POST option in case the PRE is not activated.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
SOYBEAN			
Preplant Incorporated			
Treflan 4 EC and other trade names (trifluralin)	0.5 lbs. 0.75 lbs. 1.0 lbs.	1 pt. 1.5 pt 2 pt.	Must be incorporated.
Preemergence			
Authority First	0.282 – 0.35 lbs	6.45 – 8 oz/A	
Authority MTZ (Sulfentrazone + Metribuzin)	0.096 + 0.16 lbs ai/A	12 – 18 ozs	Applied PRE provides good horseweed and pigweed control. Plant back restriction to cotton is 18 months.
Authority XL	0.219 – 0.263 lb 0.284 – 0.328 lb 0.306 – 0.35 lb	5-6 ozs coarse 6.5-.7.5 ozs Medium 7-8 ozs fine	Do not follow Authority XL with a post-emergence application of another chlorimuron containing herbicide the same cropping season.
Boundary (S-metolachlor + Metribuzin)	1.31 lbs + 0.31 lbs ai/A	2 pts.	
Prefix (Fomesafen + S-metolachlor)	sandy loam: 1.33 lb.	2 pts.	Requires rainfall to be activated provides good small seeded broadleaf weed control.
Valor 51% WDG (flumioxazin)	1 to 1.5 ozs.	2 to 3 ozs.	Rainfall splashing Valor treated soil on newly emerged soybeans can cause injury.
Postemergence			
Cobra 2E (Lactofen)	0.2 lb.	12.5 ozs.	Add 2 pts. nonionic surfactant, or 2 to 4 pts. crop oil concentrate, per 100 gals. spray. Will control Palmer up to 3” tall. Palmer larger than 3” will not be controlled with this herbicide! Causes soybean foliar burn which is usually of short duration.
Liberty 280 SL (Glufosinate) For glufosinate-tolerant varieties	0.4 – 0.53 lbs.	22 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Will control Palmer up to 4 to 6” tall. A follow up application of Liberty 7 to 10 days after the first application may be needed to control Palmer that is over 5” tall. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tank-mix partners.
Flexstar 1.88SC (Fomesafen plus adjuvants)	0.24-0.35 lb.	1.0-1.5 pts.	Contains same active ingredient as Reflex, but is formulated with an adjuvant system. Palmer larger than 3” will not be controlled with this herbicide! Causes soybean foliar burn which is usually of short duration. Always add 1 gal. MSO per 100 gals. of spray mix.
Ultra Blazer 2L (Acifluorfen)	0.13-0.38 lb.	0.5-1.5 pts.	See label regarding the use of surfactant. Palmer larger than 3” will not be controlled with this herbicide!

Herbicide	Rate/Acre Broadcast		Remarks												
	Active Ingredient	Formulation													
Cotton															
Preplant Incorporated															
Treflan 4 EC and other trade names (trifluralin)	0.5 lbs. 0.75 lbs. 1.0 lbs.	1 pt. 1.5 pt 2 pt.	Must be incorporated.												
Preemergence															
Caparol 4L (Prometryn)	0.75-1.0 lbs. ^a 2.4 lbs. ^{bc}	1.5-2.0 pts. ^a 4.8 pts. ^{bc}													
Cotoran 4L or 85DF (Fluometuron)	1.0 lb. ^a	2 pts. 4L, or 1.2 lbs. 85DF, or 1.25 lbs. 80DF ^a	For improved pigweed control, particularly in no-till, reduced rates of Caparol may be applied in combination with Cotoran preemergence. See label for precautions. Rates in pints/A are based on soil texture: <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th><u>coarse</u></th> <th><u>medium</u></th> <th><u>fine</u></th> </tr> </thead> <tbody> <tr> <td>Caparol 4L</td> <td>1.5-2</td> <td>2</td> <td>-----</td> </tr> <tr> <td>Cotoran 4L</td> <td>2</td> <td>2.5-3</td> <td>3-3.5</td> </tr> </tbody> </table>		<u>coarse</u>	<u>medium</u>	<u>fine</u>	Caparol 4L	1.5-2	2	-----	Cotoran 4L	2	2.5-3	3-3.5
		<u>coarse</u>		<u>medium</u>	<u>fine</u>										
	Caparol 4L	1.5-2		2	-----										
Cotoran 4L	2	2.5-3	3-3.5												
1.5 lbs. ^b	3 pts. 4L, or 1.8 lbs. 85DF, or 1.88 lbs. 80DF ^b														
2.0 lbs. ^c	4 pts. 4L, or 2.4 lbs. 85DF, or 2.5 lbs. 80DF ^c														
Reflex 2LC (Fomesafen)	0.25 lbs	1 pts.	May be applied preemergence on coarse textured soils. On all other soils cotton may be planted after Reflex application has had 0.5" of rainfall or irrigation.												
Valor 51% WDG (flumioxazin) +	1 ozs.	2 ozs.	Can be applied up to 21 days before planting in conservation tillage and 30 days before planting in conventional tillage.												
Postemergence															
Liberty 280 SL (Glufosinate)	0.53 lbs.	29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tank-mix partners.												
Hooded Sprayer Applications															
Gramoxone SL (u) (Paraquat)	0.31-0.62 lb.	20-40 ozs.	State label for Tennessee. Apply in cotton at least 6" tall using hooded sprayers only. Avoid crop contact. Always add nonionic surfactant (1 qt./100gals.of spray mix). Operate hoods as close to soil surface as possible. Gramoxone SL is labeled for tank-mix applications with residual herbicides (Cotoran, Caparol, Direx). See labels for rates and precautions.												
Liberty 280 SL (Glufosinate)	0.4-0.53 lbs.	22 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Avoid contact of plant foliage.												
Valor 51% SX (flumioxazin)	0.5 - 1 ozs.	1 - 2 ozs.	Operate hoods as close to soil surface as possible. Provides good control of morningglories and pigweeds. Glyphosate may be added to control existing vegetation.												

CORN 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.

Postemergence Applications

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

BURNDOWN HERBICIDES RECOMMENDED FOR NO-TILL CORN*

Burndown Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Gramoxone SL (Paraquat) (u)	0.5-0.75 lbs.	32 – 48 ozs.	Use the higher rate to kill sod or where hard-to-kill plants are present. Weeds more than 6" tall may not be adequately controlled. Always add surfactant (0.5 gal./100 gals. of spray mix) and apply in 20-30 gals. of water per acre.
Liberty 280 SL (Glufosinate)	0.4 – 0.53 lbs. 0.66 lbs	22 – 29 ozs. Up to 36 oz	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tank-mix partners.
Touchdown/others* (Glyphosate 3ae)	0.75-1.5 lbs. (a.e.)	32-64 ozs.	Better control of smartweed than Gramoxone. Fields infested with glyphosate-resistant horseweed require the addition of dicamba or 2,4-D to glyphosate at burndown. See page (7) for information on glyphosate-resistant horseweed management. Use the low rate on small, easy-to-kill annual weeds. Increase the rate on larger weeds and most perennials. See labels for additional information.
Roundup PowerMax* (Glyphosate 4.5ae)		22-43 ozs.	
Dicamba, 2,4-D	0.25-0.75 lbs. 0.5-1.0 lbs.	8-12 ozs. 1-2 pts.	Add if glyphosate- resistant horseweed is present. Can be applied prior to, at planting, or immediately after planting.
Verdict 5.57EC(Saflufenacil + dimethenamid-P)	0.435 – 0.78 lbs	10-18 oz	If crop lost, replant to soybeans 1-4 months, see label for specifics.

(u)- *Restricted Use Herbicide*

* NOTE: *Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.*

PREPLANT OR PREEMERGENCE PACKAGE MIX HERBICIDES FOR NO-TILL OR CONVENTIONAL CORN*

Herbicide	Formulation Rate/Acre Broadcast (Qts.)	Grass Herbicide Equivalent Rate	Atrazine 4L (Qts.) Equivalent Rate	Amount of Atrazine 4L (Qts.) (To add to give 2 qt./A equivalent)**	Remarks
Bicep II Magnum (u) (Dual II Magnum plus Atrazine)	1.3-1.6 ^a 1.6-2.1 ^b 2.1-2.6 ^c	0.8-0.9 pts. 0.9-1.3 pts. 1.3-1.6 pts.	1-1.24 1.24-1.63 1.63-2	1-0.76 0.76-0.37 0.37-none	Use the higher rate for each soil texture in minimum tillage or in no-tillage corn. See label. Also available as a premix with glyphosate (Expert).
Cinch ATZ (u) (Cinch plus Atrazine)	1.3-1.6 ^a 1.6-2.1 ^b 2.1-2.6 ^c	0.8-0.9 pts. 0.9-1.3 pts. 1.3-1.6 pts.	1-1.24 1.24-1.63 1.63-2	1-0.76 0.76-0.37 0.37-none	Use the higher rate for each soil texture in minimum tillage or in no-tillage corn. See label.
Degree Xtra (u) (Degree plus Atrazine)	2.9 ^a 2.9-3.7 ^b 3.2-3.7 ^c	4.1 pts. 4.1-5.3 pts. 4.6-5.3 pts.	0.9 0.9-1.24 1.1-1.24	1.1 1.1-0.76 0.9-0.76	Apply after planting before crop and weed emergence. In areas of heavy weed infestation use up to 4.3 qt./A on medium and fine textured soils. Degree is a micro-encapsulated version of acetochlor.
Expert (u) (Dual II Magnum + Glyphosate + Atrazine)	2.5 ^a 3.0 ^b 3.75 ^c	1.14 pts. 1.37 pts. 1.71 pts.	1.34 1.61 2.01	0.66 0.39 none	Can be used PRE on all corn hybrids. Can be used POST only on glyphosate-tolerant corn hybrids. Good resistance management tool.
Guardman Max (u) (Outlook plus Atrazine)	1.3-1.5 ^a 1.5-2.0 ^b 1.5-2.0 ^c	12-13 ozs. 13-14 ozs. 13-14 ozs.	1.1-1.2 1.2-1.7 1.2-1.7	0.9-0.8 0.8-0.7 0.8-0.7	Use the higher rate for each soil texture in minimum tillage or no tillage corn.
Harness Xtra 5.6 (u) (Harness plus Atrazine)	1.4-1.7 ^a 1.7-2.6 ^b 2.3-3.0 ^c	1.25-1.5 pts. 1.5-2.3 pts. 2-2.6 pts.	0.9-1.1 1.1-1.6 1.4-1.9	1.1-0.9 0.9-0.4 0.6-0.1	Use the higher rate for each soil texture in conservation or minimum tillage systems. In areas of heavy weed infestations, use up to 2.3 qts./A on coarse textured soils, and 2.3-3.0 qts./A on medium and fine textured soils. See label.

^a Sandy Soils

^b Medium Textured Soils

^c Fine Textured Soils

*Recommended rates are based on soils with less than 3% organic matter. See labels for soils higher in organic matter content.

**Remember that for highly erodible soils with less than 30% residue cover at planting, the maximum pre-atrazine rate is 1.6 lb. a.i./A (1.6 qts./A of 4L formulation).

(u)- Restricted Use Herbicide...

.NOTE: For cases where weather or other factors prevent application of preemergence package mix herbicides until after corn emerges, most of the above products may be applied overtop small corn. Rates, corn size restrictions, and directions for addition of adjuvants vary by product. Consult the label for postemergence use directions.

PREEMERGENCE HERBICIDE TANK MIXTURES FOR NO-TILL OR CONVENTIONAL CORN

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient (lbs.)	Formulation	
Atrazine (u)	1.6-2.0	1.6-2.0 qts. 4L or 1.8-2.2 lbs. 90DF	Use to control most broadleaf weeds and a few grasses. Tank mix with a grass herbicide for broader spectrum control. Atrazine is a restricted use herbicide.
Authority MTZ ((Sulfentrazone + Metribuzin)	0.096 + 0.16 lbs/ ai/A	12 – 18 ozs	Applied PRE provides good horseweed and pigweed control. Plant back restriction to cotton is 12 months.
Axiom 68DF (Flufenacet + Metribuzin)+ Atrazine (u)	0.55-0.94 + 1.0-2.0	13-22 ozs. 68DF + 1-2 qts. 4L	Apply preemergence to control annual grasses and several broadleaf weeds. Use the higher rates required on fine-textured soils. Note: On overflow ground, if Axiom is applied without atrazine and corn stand is lost to flooding, soybeans can be replanted.
Balance Flexx (Isoxaflutole)	0.047- 0.0625 0.078 – 0.094 0.086 – 0.094	3-4 oz coarse 5-6 oz medium 5.5-6 oz fine	
Corvus (thiencarbazone-methyl + Isoxaflutole)	0.84-1.4 ozs.	3.3-5.6 ozs.	Use the higher rate on fine-textured soils. Available as package mixes. Some products offer further reduced rates when the product is used as part of a planned preemergence followed by postemergence program.
Cinch (S-metolachlor)+ Atrazine(u)	0.78-1.56 + 1.0-2.0	0.8-1.67 pts. 7.64E + 1.0-2.0 qts. 4L	Apply one of these combinations for broader spectrum weed control than atrazine alone. Use the higher rates on fine-textured soils. All are available as package mixes. Some products offer further reduced rates when the product is used as part of a planned preemergence followed by postemergence program.
Degree (u) (Acetochlor)+ Atrazine (u)	0.83-2.0 + 1.25-2.0	1.75-4.25 pts. 3.8ME + 1.25-2.0 qts. 4L	
Dual II Magnum (S-metolachlor)+ Atrazine(u)	0.78-1.56 + 1.0-2.0	0.8-1.67 pts. 7.64E + 1.0-2.0 qts. 4L	
Fierce (Flumioxazin + Pyroxasulfone)	0.143 – 0.214 lbs.	3 – 4.5 ozs.	
Harness (u) (Acetochlor)+ Atrazine (u)	1.5-2.2 + 1.25-2.0	1-2.5 pts. 7E + 1.25-2.0 qts. 4L	
Instigate (Rimsulfuron + mesotrione)	0.172	6 oz	Apply up to 14 days before planting. Add surfactant when mixing with paraquat, Liberty or glyphosate which does not contain an adjuvant.
Leadoff(Rimsulfuron + Thifensulfuron-methyl)	0.0313 – 0.0564 lbs	1.5 – 2.7 oz	Apply preplant with burndown program or PRE. Add a surfactant to enhance burndown activity when mixing with paraquat, Liberty or glyphosate with no surfactants.
Lexar (S-metolachlor+ mesotrione + Atrazine(u)	2.78 – 3.34 lbs	3.0 – 3.5 qts.	
Outlook (Dimethenamid-P)+ Atrazine (u)	0.56-0.99 + 1.0-2.0	12-21 ozs. 6E + 1.0-2.0 qts. 4L	

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient (lbs.)	Formulation	
Surpass (u) (Acetochlor)+ Atrazine (u)	1.2-2.4 + 1.25-2.0	1.5-3.0 pts. 6.4E + 1.25-2.0 qts. 4L	
TopNotch (u) (Acetochlor)+ Atrazine (u)	1.6-2.4 + 1.5-2.0	2.0-3.0 qts. 3.2ME + 1.5-2.0 qts. 4L	
Prequel (Rimsulfuron + Isoxaflutole	0.04-0.07	1.66-2.5 ozs.	
Prowl or Pendimax 3.3 (Pendimethalin)+ Atrazine (u)	0.74-1.49 + 1.0-2.0 ozs.	1.8-3.6 pts. 3.3E + 1.0-2.0 qts. 4L	Do not apply preplant incorporated or serious corn injury can result. Plant corn at least 1.5 in. deep. Corn seed must be completely covered with soil. The use of no-till planters under conditions which do not allow good soil coverage of the corn seed can result in reduced crop stand or injury if the herbicide contacts the germinating corn seed. Apply after planting before emergence of weeds. Use the higher rates on fine-textured soils. In case of stand failure, corn seed should be replanted below the herbicide treated zone.
Python 80WDG (Flumetsulam)+ grass herbicide	0.05	1.0 oz.	For use primarily in areas where atrazine cannot be used (set-back zones, refuge fields, etc.) or in fields subject to flooding where soybeans may need to be planted. Plant corn at least 1.5" deep. Mix with a preemergence grass herbicide and apply on the surface. Good control of common lambsquarters, pigweed, spurge and velvetleaf. Do not apply where Counter or Thimet insecticides are to be used. Other corn insecticides should be applied in a T-band to avoid injury. Do not plant cotton within 18 months of application.
Sequence (Glyphosate Acid + S- metolachlor)	1.64-2.29	2.5-3.5 pts.	Can be used PRE on any corn hybrid. Can be applied POST on glyphosate-tolerant hybrids up to 50 days before harvest.
Valor 51% SX (flumioxazin)	1-1.25	2 -2.5 ozs.	Apply preplant with burndown program or pre for residual control of horseweed, pigweeds, morningglories. If corn stand is lost, soybean may be planted in treated field.
Verdict 5.57 EC (Saflufenacil + dimethenamid-P)	0.435- 0.52 0.566 – 0.65 0.696 – 0.78	10-12 fl oz ^a 13-15 fl oz ^b 16-18 fl oz ^c	Use MSO 1% v/v. See Label for Tank mixing.
Zidua (Pyroxasulfone)	0.106 - 0.16	2-3 ozs	Do not apply more than one application to corn in the spring.

(u)- Restricted Use Herbicide

POSTEMERGENCE HERBICIDES RECOMMENDED FOR CORN

Herbicide	Rate/Acre Broadcast		Remarks Note: To determine corn height, measure to highest leaf surface on free standing plants.
	Active Ingredient	Formulation	
Accent Q (Nicosulfuron)	0.48oz.	0.9 oz.	Apply overtop or with drop nozzles to control rhizome johnsongrass 8 to 18" tall. Accent may be applied overtop corn up to 20" tall, or up to the 6 leaf collar stage , whichever is most restrictive. Add nonionic surfactant at 1 qt./100 gal., or crop oil concentrate at 1 gal./100 gal. of spray mix. Consult the Accent label for directions on split applications, and tank-mixes or sequential applications with foliar herbicides and insecticides. Note: Now labeled on specified varieties of sweet corn refer to label for approved varieties.
Aim (Carfentrazone-ethyl)	0.008 lb.	0.5 oz.	Apply overtop corn up to the 8 leaf collar stage to control velvetleaf, eastern black nightshade, common lambsquarters and small, ivyleaf and pitted morningglory. Excellent on large velvetleaf. Temporary leaf burn may occur. Always add nonionic surfactant at 1 qt/100 gal. of spray mix.
Atrazine (u) + Crop Oil Concentrate	2.0 lb + 1 gal./100 gal	2 qts.	If no atrazine was applied prior to corn emergence, apply a maximum of 2 lbs. a.i./acre. If a postemergence treatment is required following an earlier herbicide application, the total atrazine applied may not exceed 2.5 lbs. a.i./acre/calendar year. Postemergence applications to corn must be made before corn exceeds 12 inches in height. Use to control most broadleaf weeds and a few grasses. Always add crop oil concentrate at 1 gal. per 100 gal. of spray mix. Atrazine is a restricted use herbicide.
Basagran (Bentazon)	0.75-1.0 lb.	1.5-2.0 pts.	Use to control yellow nutsedge and small broadleaf weeds. See label for specific rates for specific weed sizes. Add 1 qt. of crop oil concentrate per acre. May be tank-mixed with atrazine. See labels.
Buctril 4E (Bromoxynil)	0.25-0.38 lb.	0.5-0.75 pts.	Apply overtop corn from 3- to 8-leaf stage to control many broadleaf weeds. Apply when weeds are in the 2- to 4-leaf stage or less than 6" tall. Less danger of volatility drift than 2,4-D or Banvel.
Callisto 4L (Mesotrione) + Atrazine	0.094 + 0.25 lb.	3.0 ozs. 4L + 8.0 ozs. 4L	Apply overtop corn up to 12 inches tall. (Note: Without atrazine, Callisto may be applied to corn up to 30 inches tall). Good control of cocklebur, pigweed, and several other weeds. Always add crop oil concentrate at 1 gal./100 gal. of spray mix and UAN at a rate of 2.5% v/v or AMS at a rate of 8.5 lbs/100 gal. Do not use methylated seed oil (MSO) or MSO blend adjuvants. Do not apply postemergence if corn has been previously treated with Counter or Lorsban insecticides. See label for other insecticide precautions. Do not apply to popcorn, sweet corn, or ornamental corn. Callisto may be tank-mixed with Accent or Steadfast for grass control.
Capreno (Tembotrione + Thiencarbazone) + Atrazine.	1.0 ozs.	3.0 ozs.	Apply overtop corn up to 12 inches tall. (Note: Without atrazine, Capreno may be applied to corn up to V7 corn stage). Good control of broadspectrum of weeds including pigweeds. Always add crop oil concentrate at 1.25 pts/100 gal. of spray mix and UAN at a rate of 1.5 qt/A or AMS at a rate of 8.5 lbs/100 gal.
Dicamba	0.25-0.5 lb.	0.5-1.0 pt.	Apply Banvel or Clarity at the 1 pt. rate overtop corn up to 8" tall to give early control of vines and broadleaf weeds. The 0.5 pt. rate may be applied overtop corn up to 36" tall. Do not apply under conditions which favor drift onto nearby, sensitive crops.
Distinct 70G (dicamba +diflufenzopyr)	0.175-0.25 lb.	4-6 ozs	Apply overtop of corn between 4" and 24" tall. For corn 4 to 10" tall, use 6 oz/A. For corn 10 to 24" tall, use 4 oz/A. Always add COC at 1 gal/100 gal. of spray mix and UAN at a rate of 2.5% v/v or AMS at a rate of 8.5 lbs/100 gal.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Halex GT (u) (S-metolachlor + glyphosate + mesotrione)	2.0-2.2 lb	3.6-4 pts/A	Can be used POST only on glyphosate-tolerant corn hybrids. Can be used where atrazine is prohibited. DO NOT add nitrogen to this treatment as plant phyto has been observed.
Hornet (Flumetsulam + Clopyralid)	1.9-4.7 ozs.	1.6-4 ozs.	Apply as a postemergence spray from corn emergence (spike stage) up to 24 in. tall. For optimum control, apply when broadleaf weeds are less than 8 in. tall. Use higher end of range for heavy weed infestations. Good control of cocklebur and sicklepod. Always add a nonionic surfactant (1 qt. per 100 gal. of spray mix) or crop oil concentrate (1 gal. per 100 gal. of spray mix).
Laudis (Tembotrione)	0.082 lbs.	3 ozs.	Apply up to the V8 stage for field corn and V7 for sweet corn.
Lexar (atrazine + mesotrione +S-metolachlor)	2.78 – 3.24 lbs.	3 – 3.5 qts.	Atrazine is a restricted use product (see label). Use lower rates on coarse textured soils, higher rate on medium and fine-textured soils.
Liberty 280 SL (Glufosinate) For glufosinate-tolerant hybrids	0.4 lbs.	22 ozs.	Can be applied to Herculex hybrids. Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. See label for further application instructions and tank-mix partners. Apply up to 44 ozs on corn with sequential applications made 10-14 days apart.
Lightning 70DG (Imazethapyr + Imazapyr) Clearfield Hybrids Only	0.056 lb.	1.28 ozs.	Apply overtop in Clearfield corn from the spiking stage up to 20" tall corn. Good control of annual grasses, seedling johnsongrass, cocklebur, morningglory, pigweed and sicklepod. Does not provide residual control of cocklebur and other large seeded broadleaf weeds. Always add crop oil concentrate (1 gal./100 gal.) or nonionic surfactant (1 qt./100gal.) of spray mix.
Permit (Halosulfuron)	0.5-1 oz.	0.67-1.33 ozs.	Apply overtop to control cocklebur, common ragweed, velvetleaf and yellow nutsedge. Weak on sicklepod and morningglory. Add surfactant or crop oil (See label). May be tank-mixed with Accent or Beacon for johnsongrass control. See label. Also available as a premix with dicamba (Yukon).
Realm Q	0.097	4 oz	Include an adjuvant as recommended on label.
Resource (Flumiclorac)	0.03 lb.	4 ozs.	Apply overtop corn from the 2-leaf through 10-leaf stages for control of velvetleaf. Add crop oil concentrate at the rate of 1 pt./A. May be tank-mixed with Accent, Atrazine, Clarity or 2,4-D.
Resolve Q (rimsulfuron + thifensulfuron)	0.14 + 0.003 lbs.	1.25 ozs	Apply overtop corn until it reaches a height of 20" or V7. Add 0.25% NIS and 2 qt/A of UAN or 2 lbs/A AMS.
Sequence 5.25L (glyphosate + S-metolachlor) Roundup Ready Corn Only	0.75 ae + 0.94 ai lbs.	2.5 pints	
Status (dicamba + diflufenopyr + isoxadifen)	0.18 to 0.35 lb.	5 to 10 ozs	Add 0.25% NIS plus 1.25% UAN or 5 to 17 lbs AMS. Apply to corn from 4" tall or V2 to 36" tall or V10.
Touchdown/others (Glyphosate 3ae) Roundup Ready Hybrids Only	0.56-0.75 lb.(a.e.)	24-32 ozs. 3ae	Apply overtop in Roundup Ready corn up to the V8 stage (8 leaves with collars) or until corn height reaches 30", whichever comes first. Sequential applications may be made. Allow a minimum of 10 days between applications. May be tank mixed with Atrazine (up to 12" tall corn) for residual control, can be purchased as premix (Expert). See label for other tank-mixes. Tank-mix with Clarity or 2,4-D for control of glyphosate-resistant horseweed.
Roundup PowerMax (Glyphosate 4.5ae) Roundup Ready Hybrids Only	0.56-0.75 lb.(a.e.)	16-22 ozs. 4.5ae	

Steadfast Q (Nicosulfuron + Rimsulfuron)	0.035 lbs..	1.5 oz.	Do not apply to corn taller than 20 inches or exhibiting 7 or more collars, whichever is the more restrictive. Always add crop oil concentrate at 1 gal. per 100 gallons of spray mix or a nonionic surfactant at 1-2 qt. per 100 gallons of spray mix. The label recommends the addition of liquid nitrogen (28% N at 2 qt./A; 10-34-0 at 1 qt./A).
2,4-D amine or low volatile ester	0.25-0.5 lb.	0.5-1.0 pt. of 4 lb/gal. formulation	Overtop application is satisfactory for corn under 8". On taller corn, use directed application to prevent crop injury and provide better spray coverage of weeds. Do not apply under conditions which favor drift onto nearby, sensitive crops.
Gramoxone SL (Paraquat) (u)+ surfactant	0.25-0.5 lb.	16-32 ozs.	Directed, shielded or hooded application only. Use low pressure to reduce drift. For directed applications without shields, corn must be at least 10" tall. Direct spray to contact no more than 3" of the corn stalks. Add surfactant at 1 qt. per 100 gals. of spray mix.

CORN HARVEST AIDS

Harvest aid chemicals are sometimes needed to desiccate weeds in order to improve timeliness of harvest. This is most frequently encountered with early maturing hybrids which may be ready for harvest prior to a killing frost. Harvest aid chemicals do not speed-up maturity of the corn plant; they merely reduce moisture in weeds and may improve harvest efficiency, in addition to timeliness. Producers are encouraged to make harvest aid decisions by comparing cost with anticipated benefits. Also, care must be taken to minimize chances of drift to adjacent crops. Be sure to read labels thoroughly and follow required preharvest intervals (PHI).

Harvest Aid	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Aim EW or EC	0.15-0.30 lbs.	1-2 ozs.	Apply to mature corn to help desiccate morningglory vines at harvest. Add NIS at 2 pt/100 gal or MSO or COC at 1 to 2 gal/100 gal.
Gramoxone SL (u)	0.52 lbs.	33 ozs.	Make one application at least 7 days prior to harvest. Ensure that maximum kernel fill is complete and the corn is physiologically mature (black layer formed). Always add nonionic surfactant at 1 qt./100 gal. of spray mix. Provides good desiccation of cocklebur, burcucumber, and morningglories.
Roundup PowerMax* (Glyphosate 4.5ae)	0.75-1.5 lbs. (a.e.)	22-44 ozs. 4.5ae 32-64 ozs. 3ae	Make applications at 35 percent grain moisture or less. Ensure that maximum kernel fill is complete and the corn is physiologically mature (black layer formed). Allow a minimum of 7 days between application and harvest of corn. Use a spray volume of 10 to 20 gallons of water per acre for ground applications, or 3 -10 gallons of water for aerial applications. Do not apply more than 1 qt./A with aerial applications. Do not apply to corn grown for seed as a reduction in germination or vigor may occur. Avoid spraying during conditions which favor drift. See labels for other glyphosate formulations.
Touchdown/others* (Glyphosate 3ae)		32-64 ozs. 3ae	
Sodium Chlorate, Defol 5, other tradenames (Sodium Chlorate)	5 7.5.lbs.	4.8 qts for 5 lb./gal. formulation or 3.2 qts for a 7.5lb./gal. formulation	For desiccation of weeds in early maturing corn, make application in 5-7 gallons of water per acre by air at least 14 days before anticipated harvest date. Desiccation of morningglory and other vines may be erratic. Do not graze treated fields or feed fodder, forage or residual grain within 14 days of application. Do no apply under conditions which favor drift.

(u)- Restricted Use Herbicide

* NOTE: Several brands of glyphosate are available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

EXPECTED WEED RESPONSE TO SOIL APPLIED CORN HERBICIDES

	Atrazine (u)	Axiom+ Atrazine (u)	Bicep II Magnum (u) or Cinch ATZ (u) + Atrazine (u)	Acetochlor (u)+ Atrazine (u)	Guardzman (u)+ Atrazine (u)	Valor	Princep+ Atrazine (u)
Hericide Site of Action	5	15+5	15+5	15+5	15+5	14	5+5
Barnyardgrass	6	9	9	9	9	2	7
Broadleaf Signalgrass	4	8	8	8	8	2	5
Burcucumber	4	4	4	4	4	5	5
Cocklebur	7	7	7	7	7	6	7
Common Ragweed	9	9	9	9	9	---	9
Fall Panicum	3	9	9	9	9	4	4
Foxtail	6	9	9	9	9	4	7
Giant Ragweed	6	6	6	6	6	7	8
Goosegrass	6	9	9	9	9	4	7
Horsenettle	3	3	3	3	3	---	3
Jimsonweed	8	8	8	8	8	---	8
Lambsquarters	9	9	9	9	9	8	9
Large Crabgrass	7	9	9	9	9	4	8
Morningglory	8	8	8	8	8	7	8
Nutsedge	4	7	7	7	7	---	4
Pigweed, Palmer	9	9	9	9	9	9	9
Pigweed, Smooth	9	9	9	9	9	9	9
Rhizome Johnsongrass	0	2	2	2	2	0	0
Seedling Johnsongrass	1	8	8	8	8	2	1
Sicklepod	6	7	7	7	7	4	6
Smartweed	9	9	9	9	9	5	9
Smooth Crabgrass	3	9	9	9	9	2	5
Velvetleaf	6	6	6	6	6	6	8

KEY TO RESPONSE RATINGS: 0=No control; 10=100% control; -----=Data not available; (U) Restricted Use Pesticide

EXPECTED WEED RESPONSE TO POSTEMERGENCE CORN HERBICIDES

	Atrazine (n)+Oil	Aim	Capreno + Atrazine (n)	Banvel	Basagran	Steadfast Q	Buctril	Callisto + Atrazine (n)	Status	Halex GT	2,4-D	Accent Q	Liberty 280 SL	Laudis + Atrazine (n)	Impact + Atrazine (n)	Glyphosate
Hericide Site of Action	5	14	27+2+5	4	6	2	6	27+5	19	9+27+5	4	2	10	27+5	27+5	9
Barnyardgrass	4	0	8	0	0	----	0	8	1	9	0	----	5	9	9	9
Broadleaf Signalgrass	6	0	9	0	0	9	0	7	1	9	0	8	5	8	8	9
Burcucumber	4	----	7	8	3	7	7	7	8	7	3	7	9	----	----	----
Cocklebur	7	6	9	9	9	6	9	9	9	9	9	6	8	9	9	10
Common Ragweed	8	----	9	9	5	----	7	9	9	8	8	----	9	9	9	8
Fall Panicum	6	0	8	0	0	8	0	9	1	9	0	----	5	7	8	9
Foxtail	7	0	9	0	0	9	0	9	1	9	0	9	7	7	9	9
Giant Ragweed	6	2	9	9	5	3	7	8	9	7	9	2	9	8	8	6
Goosegrass	7	0	9	0	0	8	0	8	1	9	0	----	5	7	8	9
Horsenettle	4	4	6	6	0	2	4	6	6	----	4	2	4	----	4	----
Horseweed (glyphosate-tolerant)	5	0	9	8	0	2	2	8	8	7	8	2	8	9	8	2
Lambsquarters	8	8	9	9	6	----	8	7	9	8	8	2	8	8	8	8
Large Crabgrass	6	0	8	0	0	6	0	7	1	9	0	5	6	7	8	9
Morningglory	7	8	9	9	4	7	9	7	9	8	9	7	9	8	9	7
Nutsedge	6	0	6	0	8	2	0	----	0	----	0	4	0	3	1	7
Pigweed, Palmer	9	7	9	9	7	4	4	9	8	9	8	3	8	9	9	3
Pigweed, Smooth	9	8	9	9	9	9	4	9	9	9	9	9	8	9	9	9
Rhizome Johnsongrass	0	0	8	0	0	9	0	1	0	9	0	9	2	5	4	9
Ryegrass	5	0	8	0	0	8	0	6	1	7	0	8	2	----	----	7
Seedling Johnsongrass	0	0	9	0	0	9	0	5	1	9	0	9	5	8	6	10
Sicklepod	6	1	9	8	0	6	2	7	8	9	8	6	8	----	----	9
Smartweed	8	7	9	8	7	----	8	8	8	8	6	----	7	8	8	8
Smooth Crabgrass	4	0	9	0	0	2	0	6	1	9	0	5	6	6	8	9
Velvetleaf	7	10	9	8	8	7	8	9	8	9	8	7	7	9	9	7

KEY TO RESPONSE RATINGS: 0=No control; 10=100% control; ----=Data not available Ratings are based on application of labeled rates of each herbicide, applied at the optimum timing for each weed.
(U)Restricted Use Pesticide

GRAIN SORGHUM WEED CONTROL

Introduction

Weeds can exert serious pressure on young grain sorghum through competition for water, nutrients and light. If allowed to compete through mid- to late-season, many weeds can grow taller than grain sorghum and reduce yields, delay maturity and hinder harvesting. In most fields, a season-long weed control program is needed for successful grain sorghum production.

Grain Sorghum and Johnsongrass

Do not plant grain sorghum in fields which are heavily infested with johnsongrass. Johnsongrass is a very vigorous competitor for water, nutrients and light. The weed is closely related to grain sorghum, and it harbors several diseases and insects which attack grain sorghum. No herbicides are available to adequately control johnsongrass in grain sorghum. **Do not apply and avoid drift of Accent, Accent Gold, Beacon, or Steadfast to grain sorghum, as these herbicides will severely injure or kill grain sorghum.**

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 grain sorghum 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 of setback from runoff entry points must be planted to grain sorghum, 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 residue coverage at planting), apply a maximum of 2 lbs. a.i./acre. If residue coverage is less than 30 percent, apply a maximum of 1.6 lbs. a.i./acre.

* **Soils Not Highly Erodible** - Apply a maximum of 2 lbs. a.i./acre.

WARNING: These are the rates as listed on the AAtrex label, and they exceed the amount of atrazine recommended preemergence (in Bicep II Magnum, Bullet or Lariat) **on grain sorghum by The University of Tennessee. Grain sorghum, and particularly no-till grain sorghum, may be injured by preemergence applications of atrazine.** To reduce chances of injury, atrazine applications should be delayed until the crop has emerged.

Postemergence applications

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

BURNDOWN HERBICIDES RECOMMENDED FOR NO-TILL GRAIN SORGHUM*

Burndown Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Dicamba	0.25 lbs	8 ozs	May be applied at least 15 days before sorghum planting. See label.
Gramoxone SL (Paraquat) (u)	0.5-0.75 lbs.	32 – 48 ozs.	Use the higher rate to kill sod or where hard-to-kill plants are present. Weeds more than 6" tall may not be adequately controlled. Always add surfactant (0.5 gal./100 gals. of spray mix) and apply in 20-30 gals. of water per acre.
Sharpen SG (saflufenacil)	0.02 lbs.	1 2 ozs.	Tank-mix with glyphosate or Gramoxone SL for best burndown results. 1.0% MSO. Apply preplant or pre anytime before sorghum emerges.
Touchdown/others* (Glyphosate 3ae)	0.75-1.5 lbs. (a.e.)	32-64 ozs. 3ae	Better control of smartweed than Gramoxone SL. Use the low rate on small, easy-to-kill annual weeds. Increase the rate on larger weeds and most perennials. See labels for additional information.
Roundup PowerMax* (Glyphosate 4.5ae)		22-43 ozs. 4.5ae	
Verdict5.57 EC (Saflufenacil + dimethenamid-P)	0.218 – 0.436 lbs.	5-10 ozs	Apply preplant or pre to grain sorghum that has been treated with an approved chloroacetamide seed safener such as Concep III. Tank mix with glyphosate or paraquat for best burndown results.

(u)- Restricted Use Herbicide

* NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

PREEMERGENCE HERBICIDES FOR GRAIN SORGHUM*

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Bicep II Magnum (u) (contains 2.4 lbs. Dual II Magnum + 3.1 lbs. Atrazine per gallon)	sandy loam: do not use silt loam: 0.95- 1.5 lbs. silty clay loam: 0.95-1.5 lbs.	sandy loam: do not use silt loam:1.3-2.1 qts. silty clay loam: 1..3-2.1 qts.	Use 1.3-2 qts./A on soil with OM less than 1%. Controls most annual grasses and many broadleaf weeds. Do not use unless your seed has been treated with Concep seed safener.
Cinch (S-metolachlor)	sandy loam: 0.96-1.27 lbs. silt loam: 1.27-1.43 lbs. silty clay loam: 1.27-1.6 lbs.	sandy loam: 1.0-1.33 pts. silt loam: 1.33-1.5 pts. silty clay loam: 1.33-1.67 pts.	Recommended on overflow areas or fields where variable soil textures prevent preemergence application of atrazine. Use only with Concep safened seed. Use postemergence herbicides for broadleaf weed control.
Cinch ATZ (u) (Cinch plus Atrazine)	sandy loam: do not use silt loam: 2.2- 2.9 lbs. silty clay loam: 2.2-2.9 lbs.	sandy loam: do not use silt loam: 1.6-2.1 qts. silty clay loam: 1.6-2.1 qts.	Do not use unless your seed has been treated with Concep seed safener.
Lexar (S-metolachlor+ mesotrione + Atrazine(u))	2.78 lbs	3.0 qts.	Cannot be used on coarse textured soils. Applying Lexar less than 7 days before sorghum planting will increase the risk of crop injury, especially if irrigation or rainfall is received following the application. Applying Lexar more than 7 days (but not more than 21) prior to sorghum planting will reduce the risk of crop injury. Use only with Concep safened seed.
Lariat (u) (contains 2.5 lbs. Lasso + 1.5 lbs. Atrazine per gallon)	sandy loam: 2.5-2.75 lbs. silt loam: 2.75-3.75 lbs. silty clay loam: 3-4 lbs.	sandy loam: 2.5-2.75 qts. silt loam: 2.75-3.75 qts. silty clay loam: 3-4 qts.	Controls most annual grasses and many broadleaf weeds. Do not use unless your seed has been treated with a seed protectant containing the active ingredient flurazole. Use the higher rate for each soil texture in conservation or minimum tillage systems. See label.
Dual II Magnum (S-metolachlor)	sandy loam: 0.96-1.27 lbs. silt loam: 1.27-1.43 lbs. silty clay loam: 1.27-1.6 lbs.	sandy loam: 1.0-1.33 pts. silt loam: 1.33-1.5 pts. silty clay loam: 1.33-1.67 pts.	Recommended on overflow areas or fields where variable soil textures prevent preemergence application of atrazine. Will control most annual grasses and some broadleaf weeds. Use only with Concep or Screen safened seed. Use postemergence herbicides for broadleaf weed control.
Guardsman Max (u) (Outlook plus Atrazine)	sandy loam: do not use silt loam: 1.9-2.5 lbs. silty clay loam: 1.9-2.5 lbs.	sandy loam: do not use silt loam:1.5-2 qts. silty clay loam: 1.5-2 qts.	Do not use on soils containing less than 1% organic matter. Controls most annual grasses and many broadleaf weeds. Do not use unless your seed has been treated with Concep or Screen seed safener.
Lasso EC (u) or Micro-Tech (u) (Alachlor)	sandy loam: 1.5-2.5 lbs. silt loam: 2-2.75 lbs. silty clay loam: 2-3 lbs.	sandy loam: 1.5-2.5 qts. silt loam: 2-2.75 qts. silty clay loam: 2-3 qts.	Recommended on overflow areas or fields where variable soil textures prevent preemergence application of atrazine. Use only with seed properly treated with Screen seed protectant or a safener containing the active ingredient flurazole. Use postemergence herbicides for broadleaf control.
Sharpen SG (saflufenacil)	0.067 lbs.	3 ozs.	Before applying Sharpen to sorghum, verify with your local seed company the selectivity of Sharpen on your hybrid to help avoid potential injury.

*NOTE: Postemergence treatments may be required to control cocklebur, sicklepod or other hard-to-control broadleaf weeds.

(u) **Restricted Use Pesticide**--Refer to label for precautions to be taken during handling and application.

POSTEMERGENCE HERBICIDES FOR GRAIN SORGHUM

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Aim (carfentrazone-ethyl)	0.008 lbs.	0.5 ozs.	Apply overtop grain sorghum up to the 6- leaf growth stage to control velvetleaf, black nightshade, common lambsquarters and small ivyleaf and pitted morningglory. Excellent on large velvetleaf. Always add nonionic surfactant at 1 qt/100 gal. of spray mix. May be tank mixed with atrazine, Banvel, Clarity or other herbicides to expand weed spectrum. See label.
Atrazine (u)*	2.0 lbs.	2.0 qts. 4L 2.2 lbs. Nine-0	Apply overtop before weeds exceed 1.5 inches in height. Grain sorghum should be fully emerged. Refer to the label for directions on applying in combination with emulsifiable oil. Do not apply during cloudy weather. Postemergence applications must be made before crop exceeds 12 in tall.
Basagran (Bentazon)	0.75-1.0 lb.	1.5-2 pts.	Apply overtop grain sorghum to control most broadleaf weeds less than 4 inches tall. Refer to label for specific weed sizes.
Dicamba	0.125-0.25 lb.	0.25-0.5 pt.	Apply overtop grain sorghum from emergence to 8" tall. Use drop nozzles to apply to row middles and prevent spraying into the crop whorl when sorghum is 8" to 15" tall. Do not apply by air. Use caution to prevent drift and injury to sensitive crops.
Buctril 4E (Bromoxynil)	0.25-0.38 lb.	0.5-0.75 pt.	Apply overtop grain sorghum from the 3-leaf state to 12" height to control most broadleaf weeds in the 2-4 leaf stage of growth. Less drift potential than Banvel or 2,4-D. Use 10 or more gallons of water per acre.
Peak 75WG (Prosulfuron)	0.023-0.035 lb.	0.5-0.75 ozs.	Soybeans can be planted 10 months after a Peak application. Refer to label for other zone designations.
Permit 75WSG (Halosulfuron)	0.32-0.047 lb.	0.67-1.0 oz.	Good option for broadleaf weed control where adjacent sensitive crops such as cotton or soybeans prevent application of 2,4-D or Banvel. Apply overtop from the 2-leaf through layby stage of growth. Use 0.67 oz. to control cocklebur, small pigweed, common ragweed and velvetleaf. Use 1 oz. to control yellow nutsedge. Add nonionic surfactant at 1-2 qt./100 gal. of spray mix.
2,4-D	0.25-0.5 lb.	0.5-1 pt.	Apply overtop grain sorghum that is 6" to 10" tall to control most broadleaf weeds. Use drop nozzles if sorghum is more than 10" in height.
Prowl or Pendimax 3.3 (Pendimethalin) (culti-spray)	0.5-0.74 lb. ^a 0.74-1.0 lb. ^b 0.74-1.5 lb. ^c	1.2-1.8 pts. ^a 1.8-2.4 pts. ^b 1.8-3.6 pts. ^c	For extended control of seedling johnsongrass, signalgrass or late-season grasses cultivate to throw soil around stems and protect brace roots when sorghum is a minimum of 4" in height and immediately spray with Prowl. Use drop nozzles to apply if grain sorghum foliage will prevent uniform coverage of the soil surface.

^a sandy loam

^b silt loam

^c silty clay loam

(u) **Restricted Use Pesticide**--Refer to label for precautions to be taken during handling and application.

GRAIN SORGHUM HARVEST AIDS

Harvest aid chemicals are sometimes needed to desiccate weeds in order to improve timeliness of harvest. This is most frequently encountered with early maturing varieties which may be ready for harvest prior to a killing frost. Harvest aid chemicals do not speed-up maturity of the grain sorghum plant; they merely reduce moisture in weeds and may improve harvest efficiency, in addition to timeliness. Be sure to read labels thoroughly and follow required preharvest intervals (PHI).

Harvest Aid	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Aim 2EC	0.016 lb	1.0 ozs.	3 days PHI. Excellent on morningglory spp.
Touchdown/others (Glyphosate 3ae)	0.75-1.5 lbs. (a.e.)	32-64 ozs.	Apply at 30% grain moisture or less. Allow a minimum of 7 days between application and harvest. Use a spray volume of 10 to 20 gallons of water per acre for ground applications, or 3 -10 gallons of water for aerial applications. Do not apply to grain sorghum grown for seed as a reduction in germination or vigor may occur. See labels for additional directions.
Roundup PowerMax (Glyphosate 4.5ae)		22-43 ozs.	
Sodium Chlorate, Defol 5, other trade names (Sodium Chlorate)	5 -7.5 lbs.	4.8 qts. of a 5 lb./gal. formulation or 3.2 qts of a 7.5 lb./gal. formulation	Make application 7 to 10 days before anticipated harvesting date. Use the lower rates when grain moisture is low and the weather is clear and dry. Use the higher rates when conditions for desiccation are poor. Apply in a spray volume of 10- 20 gallons per acre by ground or 5-10 gallons per acre by air. Sodium Chlorate has not proven beneficial in Tennessee research for reducing the moisture content of the grain itself.

* NOTE: *Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.*

EXPECTED HERBICIDE RESPONSE OF COMMON WEEDS IN GRAIN SORGHUM

	PREEMERGENCE		POST OVERTOP					
	Bicep II Magnum(u) or Cinch ATZ (u)	Lariat (u)	Aim	Atrazine (u)	2,4-D	Banvel	Basagran	Buctril
Hericide Site of Action	15	15+5	14	5	4	4	6	6
Bermudagrass	0	0	0	1	0	0	0	0
Black Nightshade	8	8	-	7	8	9	3	8
Broadleaf Signalgrass	8	8	0	6	0	0	0	0
Cocklebur	7	6	6	7	9	9	9	9
Common Ragweed	9	9	-	8	8	9	5	7
Fall Panicum	9	8	0	6	0	0	0	0
Foxtail	9	9	0	7	0	0	0	0
Giant Ragweed	6	5	2	6	9	9	5	7
Goosegrass	9	9	0	7	0	0	0	0
Groundcherries	8	8	-	7	8	9	3	8
Lambsquarters	9	9	8	9	8	9	6	8
Large Crabgrass	9	9	0	6	0	0	0	0
Morningglories	8	8	8	7	9	9	4	7
Pigweed	9	9	8	9	8	9	0	6
Prickly Sida	7	7	4	8	7	8	8	6
Rhizome Johnsongrass	0	0	0	0	0	0	0	0
Seedling Johnsongrass	8	8	0	0	0	0	0	0
Sicklepod	7	7	1	6	8	8	0	5
Smartweed	9	9	7	8	6	8	7	7
Smooth Crabgrass	9	9	0	4	0	0	0	0
Velvetleaf	6	5	9	7	8	8	8	7
Yellow Nutsedge	7	6	0	5	0	0	8	0
Sorghum Tolerance	2*	2*	3	3	3	2	0	1

*Rating refers to herbicide safened seed.

(u) **Restricted Use Pesticide**--Refer to label for precautions to be taken during handling and application.

COTTON WEED CONTROL

NO-TILL COTTON WEED CONTROL CONSIDERATIONS

Weed management systems for cotton should prevent weed interference, be economical and sustainable, reduce weed seed bank in soil, prevent weed resistance and neither injure cotton nor reduce quality, lint or seed yield. To be successful, weed management systems require advance planning and timely execution. A few days delay in an application may mean reduced control, higher herbicide rates, and greater herbicide costs.

The components of a weed management system for no-tillage cotton may include the following:

1. Early preplant burndown with or without residual herbicide(s)
2. At-planting burndown with or without residual herbicide(s)
3. Postemergence with or without residual herbicide(s)
4. Post-directed herbicide(s) with or without residual herbicide(s)
5. Layby herbicide(s)
6. Pre-harvest herbicide(s)

Our most consistent and effective early preplant burndown program has included glyphosate plus Clarity, especially where glyphosate-resistant (GR) horseweed is present. Valor can be added to extend the preemergence control, but cost is increased. Where this program has been followed by an at-planting burndown of Gramoxone SL or Liberty 280 SL with a residual herbicide (Cotoran, Direx, Caparol, etc), excellent control has been achieved. Prowl can also be included with the at-planting application for additional control at little extra cost.

Timely postemergence application of glyphosate alone or tank-mixed with Dual Magnum (available as package mixture trade named Sequence) to improve grass and nutsedge control or Staple to improve morningglory control are critical to prevent early weed competition and establish a height differential for subsequent post-directed or hooded sprayer application. Envoke can be applied postemergence overtop after cotton reaches 5-true leaves for improved morningglory control. Envoke does not control Palmer amaranth (pigweed).

Post-directed application of herbicides can be made to cotton once a height differential between cotton and weeds is achieved. Cotoran plus MSMA may be post-directed in cotton at least 3 inches tall and will provide contact and residual control of many weed species. After cotton reaches 6 inches, Caparol, Direx, Layby Pro, Goal, Suprend and Cobra may be used. Any of these products can be applied with glyphosate in RR cotton but spray must be directed to the base of the cotton plant. Expect some glyphosate antagonism, especially on grasses, with some tank mixtures. Aim, Gramoxone SL, Liberty 280 SL, and Glyphosate may be used under hooded sprayers in any cotton varieties.

Layby herbicides for cotton include Caparol, Cotoran, Direx, Layby Pro, Suprend and Valor. Layby applications differ from normal post-directed application in that cotton should be >12 inches tall and generally higher application rates are used.

PREPLANT HERBICIDES FOR BURNDOWN AND RESIDUAL WEED CONTROL - COTTON

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Dicamba	0.25 lb.	8-12 ozs.	Apply in a tank-mix with glyphosate for hard- to-control weeds such as cutleaf eveningprimrose, vetch, vetchling, caley pea and others. Good control of horseweed. Following application of Clarity, a minimum accumulation of 1 inch of rainfall or overhead irrigation and a waiting period of 21-30 days is required per 8-12 ounces, before planting cotton.
Envoke (trifloxysulfuron)	0.005 lb	0.10 ozs.	Use after November 15 and treated fields MUST be planted back to cotton. Safe on wheat cover crop. Some plant residue should remain on the field to reduce soil erosion on highly erodible soils. Tank mix with 2,4-D or dicamba to increase weed spectrum on winter annuals
Dicamba + Roundup PowerMax (glyphosate)	0.25 lb. + 0.75 - 1.5 lbs. (a.e)	8 ozs. + 22 - 43 ozs.	Preplant for control of emerged annual weeds prior to planting cotton. Best results are obtained when weeds are small and actively growing and during warm weather. A minimum of 1 inch of rainfall/irrigation and a 15 day waiting period after rainfall/irrigation is required per 8 ounces applied, before planting cotton. May be tank-mixed with Caparol, Cotoran, Gramoxone SL, and Roundup PowerMax for control of additional grasses and broadleaf weeds.
Reflex 2LC (Fomesafen) + Roundup PowerMax (glyphosate)	0.25-0.38 lb. + 0.75 - 1.5 lbs.(a.e.)	1-1.5 pts. + 22 - 43 ozs.	A minimum of 14 days must pass and 1 inch of rainfall/irrigation must occur between Reflex application and planting of cotton on silt loam soils. Do not plant sorghum within 10 months of application.
2,4-D + Roundup PowerMax (glyphosate)	0.5 - 1.0 lb. + 0.75 - 1.5 lbs.(a.e.)	1.0-2.0 pt. of a 4 lb. /gal. formulation + 22 - 43 ozs.	Apply 2,4-D before cotton planting for control of existing horseweed. With 2,4-D apply 30 days prior to cotton planting. Do not use 2,4-D on light, sandy soils. Higher 2,4-D rates (1.5 to 2 pts/A) have provided consistently better control of glyphosate-resistant horseweed.
Valor 51% WDG (flumioxazin) + burndown herbicide	0.5 - 1 ozs.	1 - 2 ozs.	Use after November 15 in combination with labeled burndown herbicides to control emerged weeds and provide residual control of horseweed up to cotton planting. DO NOT apply to soils prone to erosion unless adequate crop residue is present to reduce erosion. A minimum of 30 days must pass, and 1 inch of rainfall/irrigation must occur, between Valor application and planting of cotton. Valor will not control existing horseweed.

^a Sandy loam (coarse-textured soils)

^b Silt loam (medium-textured soils)

^c Silty clay loam (fine-textured soils)

PREPLANT INCORPORATED HERBICIDES FOR CONVENTIONAL TILLAGE - COTTON

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Prowl or Pendimax 3.3 (Pendimethalin)	0.5-0.75 lb. ^a 0.75-1.0 lb. ^b 1.0-1.5 lbs. ^c	1.2-1.8 pts. ^a 1.8-2.4 pts. ^b 2.4-3.6 pts. ^c	Use to control annual grasses, seedling johnsongrass and some broadleaf weeds. For best results, apply and incorporate immediately with a field cultivator or Do-all. See label for specific incorporation instructions with other equipment. A second mixing with a shallow disking, field cultivator, or do-all generally improves weed control.
Treflan 4 EC and other trade names (Trifluralin)	0.5 lb. ^a 0.75 lb. ^b 1.0 lb. ^c	1.0 pt. ^a 1.5 pts. ^b 2.0 pts. ^c	

^a Sandy loam (coarse-textured soils)

^b Silt loam (medium-textured soils)

^c Silty clay loam (fine-textured soils)

BURNDOWN HERBICIDES FOR NO-TILL COTTON

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Gramoxone SL (u) (Paraquat 3SL)	0.5-0.75 lb.	32-48 ozs.	Apply at planting as a follow-up to an earlier application of glyphosate. Better control of chickweed, henbit, deadnettle and cutleaf eveningprimrose than glyphosate. Always add nonionic surfactant at 1 qt/100 gal. of spray mix.
Liberty 280 SL (Glufosinate)	1.67-2.09 lbs.	23-29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tank-mix partners.
Roundup PowerMax* (Glyphosate 4.5ae)	0.75-1.1 lb. (a.e.)	22-32 ozs.	Apply 2 to 4 weeks prior to your anticipated planting date to control non-resistant horseweed (marestalk) and several other weeds. In most fields, a follow-up application of Gramoxone SL will be needed at planting.
Touchdown Total (Glyphosate 4.17ae)		24-35 ozs.	
Generic glyphosate (Glyphosate 4.0ae)		32-47 ozs.	

(u)- Restricted Use Herbicide

* NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

PREEMERGENCE HERBICIDES FOR CONVENTIONAL OR NO-TILL COTTON

Herbicide	Rate/Acre Broadcast		Remarks												
	Active Ingredient	Formulation													
Caparol 4L (Prometryn)	0.75-1.25 lbs. ^a	1.5-2.5 pts. ^a	Good to excellent control of most annual grasses and broadleaf weeds, particularly residual pigweed control.												
Command 3ME (Clomazone)	0.5 lb.	1.3 pts.	For use where velvetleaf or spurred anoda are troublesome, and where application buffer zones can be observed (See label). Many trees, bushes, ornamentals and vegetables are sensitive to drift of this herbicide. See label for drift reduction directions and restrictions. Note: Di-Syston insecticide must be used in-furrow or severe crop injury may occur.												
Cotoran 4L or 85DF (Fluometuron)	1.0 lb. ^a	2 pts. 4L, or 1.2 lbs. 85DF, or 1.25 lbs. 80DF ^a	Good to excellent control of most annual grasses and broadleaf weeds. For improved pigweed control, particularly in no-till, reduced rates of Caparol may be applied in combination with Cotoran preemergence. See label for precautions. Rates in pints/A are based on soil texture: <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>coarse</u></th> <th style="text-align: center;"><u>medium</u></th> <th style="text-align: center;"><u>fine</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Caparol 4L</td> <td style="text-align: center;">1.5-2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">-----</td> </tr> <tr> <td style="text-align: right;">Cotoran 4L</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2.5-3</td> <td style="text-align: center;">3-3.5</td> </tr> </tbody> </table>		<u>coarse</u>	<u>medium</u>	<u>fine</u>	Caparol 4L	1.5-2	2	-----	Cotoran 4L	2	2.5-3	3-3.5
		<u>coarse</u>		<u>medium</u>	<u>fine</u>										
	Caparol 4L	1.5-2		2	-----										
Cotoran 4L	2	2.5-3	3-3.5												
1.5 lbs. ^b	3 pts. 4L, or 1.8 lbs. 85DF, or 1.88 lbs. 80DF ^b														
2.0 lbs. ^c	4 pts. 4L, or 2.4 lbs. 85DF, or 2.5 lbs. 80DF ^c	Staple may be added to Cotoran or Meturon preemergence for improved control of pigweed, prickly sida, spotted spurge, spurred anoda and velvetleaf. Add 0.6 oz./A to your normal rate of Cotoran. A follow-up postemergence application of 1.2 oz. can be made for control of cocklebur, morningglory and other escapes. See label.													
Cotoran 4L + Caparol 4L	1.0 lb. + 1.0 lb.	32 ozs. + 32 ozs.	Adjust rates to labeled soil texture requirements.												
Cotoran 4L + Prowl H ₂ O	1.0 lb. + 0.75 lb.	32 ozs. + 26 ozs.	Provides two modes of action to control Palmer amaranth.												
Prowl H ₂ O (Pendimethalin)	0.5-0.75 lb. ^a 0.75-1.0 lb. ^b 1.0-1.5 lbs. ^c	1.2-1.8 pts. ^a 1.8-2.4 pts. ^b 2.4-3.6 pts. ^c	Excellent control of most annual grasses. Tank-mix with Cotoran for improved broadleaf control. A compatibility agent may be required in tank mixes.												
Reflex (fomesafen)	0.25 lb	16 ozs. ^a	May be applied preemergence on coarse textured soils. On all other soils cotton may be planted after Reflex application has had 0.5" of rainfall or irrigation. Reflex does not mix well with some other herbicides.												
Reflex + Caparol	0.25 lb + 0.25 lb	16 ozs. + 32 ozs.	May be applied preemergence on coarse textured soils. On all other soils cotton may be planted after Reflex application has had 0.5" of rainfall or irrigation. Reflex will not mix well with IPA salt formulations of glyphosate.												
Staple LX 3.2 SL (Pyriithiobac)	1.3-2.1 ozs.	0.0325-0.0525	Do not apply to soils with <0.5% organic matter or coarse soils (sands or loamy sands).												

^a Sandy loam (coarse-textured soils)

^b Silt loam (medium-textured soils)

^c Silty clay loam (fine-textured soils)

OVERTOP HERBICIDES FOR COTTON

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Assure II 0.88E (Quizalofop)	0.034-0.069 lb.	5-10 ozs.	Apply overtop to control rhizome johnsongrass . Apply 5 ozs. of Assure II when johnsongrass is 10-24" tall and retreat with 5 ozs. when grass regrowth reaches 6-10" tall. Add oil concentrate at 1 gal. (for ground application) or 1 qt. nonionic surfactant per 100 gals. of spray mixture. The higher rates may be needed to control annual grasses or bermudagrass . See label. Controls volunteer Roundup Ready and glufosinate-tolerant corn in cotton.
Dual Magnum	0.96-1.27 lbs.	1.0-1.33 pts.	100 day PHI when applied. Applied in environmentally stressful conditions can increase crop injury.
Envoke 75DF (trifloxysulfuron)	0.0046-0.0069 lbs.	0.1-0.15 ozs.	Apply overtop of 5 leaf until 60 day PHI cotton for control of smooth pigweed, morningglories, and yellow nutsedge. Poor performance on Palmer pigweed. Apply with non-ionic surfactant (80-20 blend, NOT with 90-10 blend) at the rate of 1 quart per 100 gallons of water. DO NOT use with crop oil concentrate or tank-mix with Pix growth regulator or other pesticides. NEVER apply preemergence, substantial cotton injury will result.
Fusilade DX 2E (Fluazifop)	0.094-0.188 lb.	6-12 ozs.	Apply lower rate for control of most annual grasses before they exceed 4" tall. For johnsongrass control, apply the higher rate when it is 8-18" tall. Make a second application (8 ozs.) when regrowth is 6-12" tall. For bermudagrass , apply the higher rate when runners are 4-8" long, and repeat when regrowth reaches 4". Add oil concentrate (1 gal.) or nonionic surfactant (2 pts.) per 100 gal. of spray mixture. Controls volunteer Roundup Ready and glufosinate-tolerant corn in cotton.
Liberty 280 SL (Glufosinate) <u>Glufosinate-tolerant</u> <u>Cotton Only</u>	1.67-2.09 lbs.	23-29 ozs.	Apply over the top to glufosinate-tolerant cotton varieties. No more than 29 ozs./A may be applied per application and no more than 87 ozs./A may be applied per cotton growing season. Applied in environmentally stressful conditions can increase crop injury. Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre . Dense weed and crop canopies require 20 gallons per acre. Use only flat-fan or hollow-cone nozzles. Read label for further application instructions.
Poast 1.5E or Poast Plus 1E (Sethoxydim)	0.19 lb.	16 ozs. 1.5E or 24 ozs. 1.0E	Apply for control of most annual grasses . For best results, make applications before most grasses exceed 4" tall. Always include oil concentrate at 2 pts./A. Do not tank mix with other pesticides. Controls volunteer Roundup Ready and glufosinate-tolerant corn in cotton.

Herbicide	Rate/Acre Broadcast		Remarks	
	Active Ingredient	Formulation		
Roundup PowerMax (Glyphosate 4.5 ae) Glyphosate-tolerant Varieties Only	0.75-1.1 lb. (a.e.)	22-32 ozs.	<p>Roundup Ready Apply over-the-top up to 4th true leaf. Post-directed there after.</p> <p>22oz/A (4.5 lb material) any single application.</p> <p>Make only two overtop applications, 10 days apart and with at least two additional nodes developed following the first application.</p>	<p>Roundup Ready Flex Over-the-top or post-directed as needed for weed coverage.</p> <p>22-32oz/A (4.5 lb material) by ground: 22 oz/A aerial for any single application.</p> <p>No restrictions on timing of sequential applications.</p>
Touchdown Total (Glyphosate 4.17 ae) Roundup Ready Flex Varieties Only		24-35 ozs.		
Generic Glyphosate (Glyphosate 4.0 ae)		32-47 ozs.		
Select Max 1EC (Clethodim)	0.094-0.25 lb.	12-16 ozs.	<p>Apply 12 ozs./A for control of most annual grasses up to 6" tall. For johnsongrass, 12-24" tall, apply 8 ozs. A second application of 6 ozs./A can be made to regrowth, 6-10" tall. For bermudagrass, apply the higher rate on runners up to 6" long, and repeat on regrowth up to 6" long. Always use crop oil concentrate at 1 pt./A. If necessary, Select can be tank mixed with Orthene. Controls volunteer Roundup Ready and glufosinate-tolerant corn in cotton.</p>	
Generic Clethodim (Clethodim 2 EC)		6-8 ozs.		
Sequence 5.25L (glyphosate + S-metolachor)	0.75 ae + 0.94 ai lbs.	2.5 pints	Apply to cotton at least 3 inches tall but before cotton reaches fifth leaf stage. Do not add adjuvants and do not add other pesticides. Applied in environmentally stressful conditions can increase crop injury.	
Staple LX (Pyrithiobac)	0.043-0.095 lbs.	1.7-3.8 ozs.	Apply overtop or post-directed beginning at the first true leaf stage of cotton. Poor performance on Palmer pigweed. Add nonionic surfactant (1 qt./100 gal. of spray mix). A total of 5.1 oz./A may be applied per season. Do not tank-mix with malathion-containing insecticides (Cythion, etc.). To avoid injury, malathion should be applied at least 24 hrs. before or after Staple application. May be tank-mixed with glyphosate. See label.	

* NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

POST-DIRECTED HERBICIDES RECOMMENDED FOR COTTON

Recommended post-directed herbicides are listed in the following table. Each is usually applied in combination with MSMA for improved grass and nutsedge control. Various formulations of MSMA are available - some with a built-in surfactant and some without it. The 6 lb/gal formulation used as an example below usually contains surfactant. Rates are expressed on a broadcast basis. Use the conversion table, later in this section, to determine band rates.

Herbicide	Rate/Acre Broadcast*		Remarks
	Active Ingredient	Formulation	
For Cotton at Least 3" Tall			
MSMA 6	2.0	2.67 pts. 6L	Apply MSMA as a directed spray when cotton is at least 3" tall. Follow label directions regarding addition of surfactant. MSMA may be tank-mixed with most herbicides labeled for post-directed use in cotton. Do not apply after first bloom.
Cotoran 4L or Cotoran 85 DF (Fluometuron) + MSMA 6	1.0 lb. + 2.0 lb.	1 qt. 4L or 1.2 lbs. 85 DF + 2.67 pts. 6L	Apply as a directed spray when cotton is at least 3" tall. If omitting MSMA, be sure to add surfactant (1 qt./100 gals. of spray mix).
Dual Magnum (S-metolachlor)	1.27 lbs	1.33pt	Good to excellent control of annual grasses, nutsedge and seedling johnsongrass. Apply alone or in combination with other layby materials. May be purchased as a packaged mix with glyphosate as Sequence.
For Cotton at Least 6" Tall			
Caparol (Prometryn) + MSMA	0.5-0.65 lb. + 2.0 lbs.	1-1.3 pts. + 2.67 pts. 6L	Apply as a directed spray when cotton is at least 6" tall. If omitting MSMA, be sure to add surfactant (1 qts./100 gals. of spray mix). Caparol can be applied, at a reduced rate, to 3 to 6" cotton. See label.
Cobra (Lactofen) + MSMA 6	0.2 lb. + 2.0 lbs.	12.5 oz. + 2.67 pts. 6L	Apply as a directed spray when cotton is at least 6" tall. Do not allow spray to contact any green non-barked parts of the cotton plant or foliage.
Direx 4L or Direx 80 DF (Diuron) + MSMA 6	0.2-0.4 lb. + 2.0 lbs.	0.4-0.8 pt. 4L or 0.25-0.5 80 DF + 2.67 pts. 6L	Apply as a directed spray when cotton is at least 6" tall. Lower rate is for pigweed under 2" tall only. If omitting MSMA, be sure to add surfactant (1 qt./100 gals. of spray mix).
Envoke 25DF	0.025 – 0.063	0.10 - 0.25 ozs.	For contact and residual control of morningglories and nutsedge.
Goal 2XL (Oxyfluorfen) + MSMA 6	0.25-0.5 lbs. + 2.0 lbs.	1-2 pts. + 2.67 pts. 6L	Apply as a directed spray when cotton is at least 6" tall. Do not allow spray to contact cotton leaves or crop injury will result. If target weeds have more than 3 true leaves, use the higher rate of Goal. If omitting MSMA, be sure to add surfactant (1-2 qts./100 gals. of spray mix).
Reflex	0.25-0.375 lbs.	1-1.5 pts.	Reflex may be applied to cotton at least 6 inches in height through lay-by as post-directed application. All post-directed applications should avoid spray contact with any green non-barked parts of the cotton plant or foliage. Apply Reflex at 1-1.5 pts./A in a minimum of 10 gallons spray solution per acre.
Suprend (prometryn + trifloxysulfuron)	1.25 lbs.	1.56 lbs	May be applied to cotton from 6 inches tall until bloom. Precise application is necessary to avoid cotton injury.

Herbicide	Rate/Acre Broadcast*		Remarks
	Active Ingredient	Formulation	
For Cotton at Least 8" Tall			
Linex 4L (Linuron) + MSMA 6	0.5-0.75 lb. + 2.0 lbs.	1-1.5 pts. 4L +2.67 pts. 6L	State label for Tennessee. Apply as a directed spray when cotton is at least 8" tall and when weeds are not over 2" tall. If applying Linex 4L alone, add a nonionic surfactant at the rate of 2 qt. per 100 gal. of spray mix.
For Cotton at Least 12" Tall			
Aim 2EC (Carfentrazone-ethyl)	0.013-0.025 lb.	0.75-1.6 ozs.	Aim is a contact herbicide for postemergence directed spray control of broadleaf weeds. Apply Aim alone or tank mixed with other herbicides to emerged and actively growing weeds. Applications to cotton with less than 5 to 6 nodes must be made with hooded sprayers to completely avoid contact with the cotton plant. Layby applications of Aim or Aim tank mixtures at later growth stages may be made when cotton plants have achieved a height of 12 inches or more with sufficient bark development and height differential between crop and bottom leaves. Directed sprays should position nozzles a minimum of 3-4 inches above the soil with nozzles directed underneath the cotton canopy. Spray solution should be directed at the base of cotton plants for minimum contact with green stems and foliage while maintaining maximum contact with weeds. Use a crop oil concentrate at 1% v/v (1 gallon per 100 gallons of spray solution).
Caparol (Prometryn) + MSMA	0.75 – 1.25 lb.	1.5 – 2.5 pts.	Apply as a directed spray when cotton is at least 6" tall. If omitting MSMA, be sure to add surfactant (1 qts./100 gals. of spray mix). Caparol can be applied, at a reduced rate, to 3 to 6" cotton. See label.
For Cotton at Least 15" Tall			
Layby Pro (Linuron + Diuron)	0.4-0.6 + 0.4-0.6	1.6-2.4 pts./A	Apply after cotton is 15" tall. If weeds are present, add a nonionic surfactant at the rate of 2 qt. per 100 gal. of spray mix. Use rate based on soil type: 1.6 pt/A on coarse soils, 2 pt/A on medium soils, and 2.4 pt/A on fine soils.
Reflex	0.25-0.375 lbs.	1-1.5 pts.	Reflex may be applied to cotton at least 6 inches in height through lay-by as post-directed application. All post-directed applications should avoid spray contact with any green non-barked parts of the cotton plant or foliage as unacceptable injury will occur. Apply Reflex at 1-1.5 pts./A in a minimum of 10 gallons spray solution per acre. Crop rotation is restricted 4 months for wheat and 10 months for corn.
Valor SX 51 DF (flumioxazin)	0.5-1.0 ozs.	1.0-2.0 ozs.	Apply after cotton is 15 inches tall with a woody stem. Do not allow herbicide spray to contact green foliage. Apply no more than 4.0 ozs. of Valor per acre per year.

Factors to convert Broadcast Rate/A to a Band Rate at Various Row and Band Widths.

Band Width (in.)	Row Width (in.)			
	30	36	38	40
12	0.40	0.33	0.31	0.30
15	0.50	0.42	0.39	0.375
18	0.60	0.50	0.47	0.45
19	0.635	0.53	0.50	0.475
20	0.67	0.56	0.53	0.50

To Convert: Find the factor for your combination of row width and band width and multiply the broadcast rate by this number.

Example: A producer plans to apply 0.5 lb. (broadcast rate) per acre of Direx 80 DF on a 12 in. band on 38 in. rows. Multiply 0.31 by 0.5 lb. to get 0.16 lb./A on a 12 in. band.

Hooded Sprayers

HERBICIDES RECOMMENDED FOR USE IN HOODED SPRAYERS

Herbicide	Rate/Acre Broadcast*		Remarks
	Active Ingredient	Formulation	
Gramoxone SL (u) (Paraquat)	0.31-0.62 lb.	20-40 ozs.	State label for Tennessee. Apply in cotton at least 6" tall using hooded sprayers only. Avoid crop contact. Always add nonionic surfactant (1 qt./100gals.of spray mix). Operate hoods as close to soil surface as possible. Gramoxone SL is labeled for tank-mix applications with residual herbicides (Cotoran, Caparol, Direx). See labels for rates and precautions.
Liberty 280 SL (Glufosinate)	1.67-2.09 lbs.	23 - 29 ozs.	Thorough spray coverage is essential for optimal performance. Ground application requires a minimum of 15 gallons of water/acre. Avoid contact of plant foliage.
Roundup PowerMax (Glyphosate 4.5ae)	0.75-1.1 lbs. (a.e.)	22-32 ozs.	Apply in cotton at least 6" tall using hooded sprayers only. Avoid crop contact. Operate hoods as close to soil surface as possible.
Touchdown Total (Glyphosate 4.17ae)		24-35 ozs.	
Generic Glyphosate (Glyphosate 4.0 ae)		32-47 ozs.	
Reflex (fomesafen)	0.25-0.375 lbs.	1-1.5 pts.	Use only hooded or shielded spray equipment to apply Reflex in cotton that is 6 inches to 12 inches in height. Adjust nozzles to provide full coverage of emerged target weeds. Crop rotation is restricted 4 months for wheat and 10 months for corn.
Valor 51% SX (flumioxazin)	0.5 - 1 ozs.	1 - 2 ozs.	Operate hoods as close to soil surface as possible. Provides good control of morningglories and pigweeds. Glyphosate may be added to control existing vegetation.

(u)- Restricted Use Herbicide

LAYBY HERBICIDES RECOMMENDED FOR COTTON

Producers should consider the use of layby herbicides to improve both yield and quality of cotton lint. Good layby programs can reduce lint stain and trash, improve grades, and increase picking speed and efficiency. Each of the following herbicides can be tank mixed with MSMA to improve postemergence grass and nutsedge control. **Do not apply MSMA, alone or in combination with other herbicides, after first bloom.**

Herbicide	Rate/Acre Broadcast*		Remarks
	Active Ingredient	Formulation	
Caparol 4L (Prometryn)	1.2-1.6 lb.	2.4-3.2 pts.	Apply when cotton is at least 12 in. tall and before it laps the row middles. Rate depends on soil texture. (Apply 2.8 pts. on a silt loam soil). Add nonionic surfactant (2 qts./100 gals. of spray mix) if weeds are present.
Cotoran/Meturon 4L or Cotoran 85 DF or Meturon 80 DF (Fluometuron)	1-2 lb.	2-4 pts. 4L or 1.2-2.4 lbs. 85 DF or 1.25-2.5 lbs. 80 DF	Apply before cotton laps the row middles. Add nonionic surfactant (1-2 qts./100 gals. of spray mix) if weeds are present. Do not make more than 3 applications of fluometuron to the same field per year. Do not apply within 60 days of harvest.
Direx 4L or Direx 80 DF (Diuron)	0.8-1.2 lb.	1.6-2.4 pts. 4L or 1-1.5 lbs. 80 DF	Apply when cotton is at least 12 in. tall and before it laps the row middles. Add nonionic surfactant (1 qt./100 gals. of spray mix) if weeds are present. Reduced rates (1-1.5 pt. 4L or 0.63-0.94 lb. 80DF) may be tank mixed with Roundup PowerMax at 22 oz./A.
Linex 4L (Linuron)	1-1.5 lb.	2-3 pts.	Apply after cotton is 20" tall. If weeds are present, add a nonionic surfactant at the rate of 2 qt. per 100 gal. of spray mix.
Layby Pro (Linuron + Diuron)	0.4-0.6 + 0.4-0.6	1.6-2.4 pts./A	Apply after cotton is 15" tall. If weeds are present, add a nonionic surfactant at the rate of 2 qt. per 100 gal. of spray mix. Use rate based on soil type: 1.6 pt/A on coarse soils, 2 pt/A on medium soils, and 2.4 pt/A on fine soils.
Reflex	0.25-0.375 lbs.	1-1.5 pts.	Make a post-directed Reflex application to the base of the cotton plant avoiding contact with any non-barked portion of the cotton plant or foliage. Use precision post-directed equipment or hooded or shielded sprayers on cotton that has developed a minimum of 4 inches of brown bark through lay-by. Application equipment should be configured to provide full coverage of emerged target weeds. Crop rotation is restricted 4 months for wheat and 10 months for corn.
Valor SX 51 DF (Flumioxazin)	0.5-1.0 oz	1-2 oz./A	Apply after cotton is 15" tall. If weeds are present, add a nonionic surfactant at the rate of 2 qt. per 100 gal. of spray mix. Take care not to direct Valor on to cotton foliage.

EXPECTED WEED RESPONSE TO COTTON HERBICIDES

	Valor	Reflex	Treflan	Prowl	Cotoran	Command+ Cotoran	Dual II Magnum	MSMA	Cotoran +MSMA	Direx + MSMA	Caparol + MSMA	Suprend + MSMA	Cobra + MSMA	Valor + Roundup	Layby Pro+ MSMA	Roundup PowerMax/ Touchdown/others**	Envoke	Liberty 280 SL***	Staple LX	Select Max
	PPS	PPS	PPI	PPI/PRE	PRE	PRE	PRE	EPD	EPD	LPD	LPD	LPD	LPD	LPD	LPD	OT/LPD	OT	OT	OT	OT
Hericide Site of Action	14	14	3	3	7	13+7	15	17	7+17	7+17	5+17	5+17	14+17	14+9	5+7+1 7	9	2	10	2	1
Broadleaf Signalgrass	0	0	8	8	7	8	8	7	7	8	7	7	8	9	8	9	---	6	0	9
Cocklebur	5	6	1	1	8	8	1	8	8	9	9	9	8	9	8	10	9	8	8	0
Common Ragweed	8	8	0	0	9	9	0	8	8	8	8	8	8	8	---	8	---	-----	-----	0
Crabgrass	4	3	9	9	8	8	8	8	8	9	8	8	8	9	8	9	2	6	0	9
Fall Panicum	0	0	9	9	8	8	8	8	8	9	8	8	8	9	9	9	0	6	0	9
Foxtail	0	0	9	9	8	8	8	8	8	9	8	8	8	9	9	9	0	7	0	9
Goosegrass	2	2	9	9	8	8	8	7	8	9	8	8	8	9	9	9	0	5	0	9
Jimsonweed	---	---	0	0	8	8	1	8	8	9	9	9	8	9	8	8	0	8	8	0
Johnsongrass (rhizome)	0	0	2	2	0	1	0	5	3	4	3	3	3	8	4	9	0	2	0	9
Johnsongrass (seedling)	2	2	9	8	6	6	8	8	8	8	8	8	8	9	9	10	5	7	0	9
Lambsquarters	9	9	7	7	9	9	7	7	8	9	9	9	7	----	7	8	---	-----	-----	0
Morningglory, Entireleaf/Ivy	8	8	5	5	7	7	0	6	8	8	6	9	9	9	8	8	9	9	8	0
Morningglory, Pitted	8	8	7	7	8	8	0	6	9	9	9	9	9	9	8	7	9	9	7	0
Morningglory, Tall	8	8	4	4	6	6	0	5	8	8	7	9	9	9	----	8	9	9	3	0
Pigweed, Palmer	8	9	9	6	6	6	6	4	5	4	8	8	8	8	8	2	2	8	2	0
Pigweed, smooth	9	9	9	8	9	9	8	6	8	8	8	8	8	9	9	9	8	8	9	0
Prickly Sida	---	---	0	0	6	8	0	4	7	6	4	4	6	7	7	6	0	3	2	0
Sicklepod	4	3	0	0	8	8	2	6	8	7	7	9	6	8	8	8	9	8	3	0
Smartweed	5	5	0	0	8	8	1	6	7	8	8	8	8	8	8	8	---	8	7	0
Spotted Spurge	---	---	0	0	7	7	6	5	7	7	7	7	8	9	7	9	---	-----	3	0
Spurred Anoda	---	---	0	0	4	8	0	2	3	5	4	5	5	7	7	7	5	-----	8	0
Velvetleaf	---	---	0	3	5	9	0	4	5	5	6	6	5	7	6	7	---	6	9	0
Volunteer RR Soybeans	0	0	0	0	9	9	0	4	6	8	7	8	3	3	7	0	8	9	6	0
Yellow Nutsedge	0	2	0	0	0	1	8	7	7	7	7	9	7	5	7	7	9	2	1	0
Cotton Tolerance	3	3	1	1	1	1*	1	1	1	2	2	2	3	3	2	0**	2	0***	1	0

PPI=Preplant Incorporated

PRE=Preemergence

EPD=Early Post-Directed

LPD=Late Post-Directed

OT=Overtop

Cotton variety must be Roundup Ready and applications properly timed. *Cotton variety must be glufosinate-tolerant. †- 8 for PPI; 6 for PRE

SOYBEAN WEED CONTROL

BURNDOWN HERBICIDES FOR NO-TILL SOYBEANS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Gramoxone SL(u) (Paraquat)	0.5 -0.75 lbs.	32 - 48 ozs.	Apply in a minimum of 10 gallons of water per acre. Weeds taller than 6" may not be controlled adequately. As density of stubble, crop residue or weeds increases, water volume should be increased to ensure good coverage. Add a nonionic surfactant (at least 75% active) at 1 pt. per 100 gallons of mix. For aerial applications, apply at 5-10 gallons of water per acre.
Leadoff (Rimsulfuron + Thifensulfuron-methyl)	0.0313 – 0.0564 lbs.	1.5 - 2.7 ozs.	Applied 30 days or more preplant to cotton or soybeans for winter vegetation management. Apply with 1% COC or 0.5% MSO. NIS applied at 0.25%.
Liberty 280 SL (Glufosinate)	0.4 – 0.53 lbs. 0.66 lbs	22 – 29 ozs. Up to 36 ozs	Thorough spray coverage is essential for optimal performance. Will control Palmer up to 4 to 6" tall. A follow up application of Ignite 7 to 10 days after the first application may be needed to control regrowth of Palmer that is over 5" tall. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. See label for further application instructions and tankmix partners. If 36 oz is used at burndown, only 29 oz can be used POST.
Sharpen SG (saflufenacil)	0.02 lbs.	1 ozs.	30 day plant back restriction to soybean on coarse soils with O.M. less than 2. Tank-mix with glyphosate or Gramoxone SL for best burndown results. 1.0% MSO. Do not tank-mix with Valor.
Roundup PowerMax (Glyphosate 4.5ae)	0.75-1.1 lbs. (a.e.)	22-32 ozs.	Apply in 10-20 gallons of water per acre. More effective than Gramoxone SL on weeds such as smartweed and fall panicum. Apply lower rates to control many annual weeds less than 6" tall. Increase the rate on larger annual weeds and perennials. (See label).
Touchdown Total (Glyphosate 4.17ae)		24-35 ozs.	
Generic Glyphosate (Glyphosate 4.0 ae)		32-47 ozs.	
Verdict (saflufenacil + dimethenmid)	0.22 – 0.435	5 – 10 oz	Minimum preplant interval of 30 days is required for coarse (sand, loamy sand, and sandy loam) soils with ≤ 2.0% organic matter. Tank-mix with glyphosate or Gramoxone SL for best burndown results. 1.0% MSO. Do not tank-mix with Valor. Verdict contains product that will give some residual control of grasses.

(u)--Restricted Use Herbicide.

* NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

PREPLANT INCORPORATED HERBICIDES FOR SOYBEANS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Treflan, Tri-4, Trilin and other trade names. (Trifluralin)	sandy loam: 0.5 lb. silt loam: 0.75 lb. silty clay loam: 1.0 lb.	1 pt. 1.5 pts. 2.0 pts.	For best results, incorporate immediately after application. Trifluralin is labeled for incorporation* into the top 2-3" of soil. The 2X or double the normal rate of trifluralin can be applied for increased suppression of rhizome johnsongrass. However, this must be followed by 2 or more timely cultivations. Use a recommended preemergence herbicide for broadleaf control.

**For proper incorporation, a disk should be set to cut about twice as deep as placement is desired. A second mixing with shallow disking or field cultivator usually improves weed control. See label for incorporation instructions with other implements.*

PREPLANT/PREEMERGENCE HERBICIDES FOR SOYBEANS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Authority First (Sulfentrazone + cloransulam-methyl)	0.282 – 0.35 lbs	6.45 – 8 oz/A	
Authority MTZ (Sulfentrazone + Metribuzin)	0.188 + 0.28 lbs.	8– 12 ozs	Applied PRE provides good horseweed and pigweed control.
Authority XL (Sulfentrazone + chlorimuron)	0.219 – 0.263 lb 0.284 – 0.328 lb 0.306 – 0.35 lb	5-6 ozs coarse 6.5-.7.5 ozs Medium 7-8 ozs fine	Do not follow Authority XL with a post-emergence application of another chlorimuron containing herbicide the same cropping season.
Boundary (S-metolachlor + Metribuzin)	1.31 lbs + 0.31 lbs	2 pts.	
Broadaxe (Sulfentrazone + s- metolachlor)	1.04 - 1.37 lbs. 1.37 - 1.75 lbs. 1.37 - 1.75 lbs.	19-25 oz/A coarse 25-32 oz/A medium 25-32 oz/A fine	Broadaxe can be applied preemergence up to 3 days after planting as a soil surface application if seedlings have not broken the soil surface and if the seed furrow is completely closed and completely covered with soil.
Canopy 75DG (Chlorimuron + Metribuzin)	0.188 - 0.28 lbs.	4 – 6 ozs.	May be applied at planting or up to 45 days prior to planting.
Canopy EX (Chlorimuron + Tribenuron)	0.028-0.037 lbs.	1.5-2.0 ozs.	May be applied up to 7 days before planting.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Command 3ME (Clomazone)	0.5-1.25 lbs.	1.3-3.3 pts.	Apply as a surface application. Use where velvetleaf, spurred anoda, prickly sida or annual grasses (signalgrass, etc.) are serious problems and where application buffer zones can be observed. See label. Note: Many trees, shrubs and vegetables are sensitive to drift of this herbicide. See label for drift reduction instructions. Do not plant wheat within 12 months of application.
Dual Magnum or Cinch (S-metolachlor)	sandy loam: 0.96-1.27 lbs. silt loam: 1.27-1.59 lbs. silty clay loam: 1.27-1.59 lbs.	1-1.33 pts. 1.33-1.67 pts. 1.33-1.67 pts.	Good grass control. Use higher rate to control seedling johnsongrass. Use in tank-mix with a broadleaf herbicide for broadspectrum weed control. Available package mixtured with glyphosate as Sequence.
Envive (flumioxazin + chlorimuron + thifensulfuron)	0.077 lbs	3 ozs.	Apply PRE or with burndown program for residual control of glyphosate-resistant Palmer pigweed, horseweed, morningglories and other broadleaf weeds. Crop oil is preferred adjuvant with burndown program at 1 gallon/100 gallons for better performance.
Gangster (Valor + FirstRate)	0.080-0.096 lbs. Valor 0.026-0.032 lbs. FirstRate	3.0-3.6 ozs. (2.5-3.0 ozs. of Valor + 0.5-0.6 ozs. of FirstRate)	Controls small glyphosate-resistant horseweed less than 3 inches tall. Provides good residual pigweed and horseweed control.
Intrro (alachlor)	2.5 lbs.	2.5 qts.	Good control of grasses and small-seeded broadleaves.
Outlook 6EC (Dimethenamid-P)	sandy loam: 0.47-0.66 lb. silt loam: 0.66-0.75 lb. silty clay loam: 0.75-0.84 lb.	10-14 oz. 14-16 oz. 16-18 oz.	Good grass control. Use in combination with a broadleaf herbicide for broadspectrum weed control.
Prefix (Fomesafen + S- metolachlor)	sandy loam: 1.33 lb. silt loam: 1.33-1.66 lb. silty clay loam: 1.82-1.99 lb.	2 pts. 2-2.5 pts. 2.75-3 pts.	Requires rainfall to be activated provides good small-seeded broadleaf weed control.
Prowl H ₂ O (Pendimethalin)	sandy loam: 0.5-0.75 lb. silt loam: 0.75-1.0 lb. silty clay loam: 0.75-1.5 lbs.	1.2-1.8 pts. 1.8-2.4 pts. 1.8-3.6 pts.	Good grass control. Can be applied as a surface application after planting or preplant incorporated 1-2" deep. The 2X or double the normal rate can be applied preplant incorporated for increased suppression of rhizome johnsongrass. Use a recommended broadleaf herbicide for broad-spectrum weed control. Surface applications may cause crop lodging later in season (soybeans 8-12" tall) if cool, rainy weather occurs during crop emergence.
Pursuit 2AS or 70DG (Imazethapyr)	all soils 0.063 lb.	4 fl. ozs. or 1.44 ozs. 70 DG	Apply preemergence to control morningglories, nightshade, pigweed, spurge and many other broadleaf weeds. Mix with a grass herbicide for more complete control. Wheat can be planted after 3 months while corn requires 8.5 months. Edible beans and tobacco require a 9.5-month waiting period. Do not plant cotton for 18 months.
Sequence (S-metolachlor + Glyphosate)	1.64 lb.	2.5 pts.	Apply up to 3 trifoliate.
Sharpen SG (saflufenacil)	0.22 lbs.	1 ozs.	30 day plant back restriction to soybean on coarse soils with O.M. less than 2. Tank-mix with glyphosate or Gramoxone SL for best burndown results. 1.0% MSO.
Python 80WDG (Flumetsulam)	sandy loam: 0.04-0.045 lb. silt loam: 0.045-0.05 lb. silty clay loam: 0.045-0.05 lb.	0.8-0.89 oz. 0.89-1.25 oz. 0.89-1.25 oz.	Use Python with a recommended grass herbicide for broadspectrum control. Good control of pigweed, nightshade, spurge and velvetleaf. For hard-to-control weeds, such as sicklepod, apply 1.14-1.25 oz. on medium and fine textured soils. Do not apply to emerged soybeans (cracking stage or later) as severe crop injury will result. Do not plant cotton within 18 months or grain sorghum within 12 months. See label for other rotational crops.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Sencor 75DF (Metribuzin)	sandy loam: do not use silt loam: 0.38-0.5 lb. silty clay loam: 0.5-0.6 lb.	----- 0.5-0.67 lb. 0.67-0.83 lb.	Apply either preplant incorporated 1-2" deep or as a surface application after planting. Tank mix with a grass herbicide for broadspectrum control. Has controlled volunteer Roundup Ready cotton in research and demonstration trials in soybeans. For control of emerged cotton, Lexone/Sencor can be tank mixed with Gramoxone.
Scepter 1.5 AS or 70DG (Imazaquin)	sandy loam: 0.09 lb. silt loam: 0.125 lb. silty clay loam: 0.125 lb.	0.5 pt. or 2.1 oz. 0.67 pt. or 2.8 oz. 0.67 pt. or 2.8 oz.	Apply preplant incorporated or preemergence to control broadleaf weeds. Reduced rates (.33 to .5 pt./A) may be used for the control of a limited number of weeds such as cocklebur and pigweed-- see label.
Squadron 2.33EC (Pendimethalin + Imazaquin)	0.87 lb.	3 pts.	Apply preplant incorporated or preemergence to control grass and broadleaf weeds. Refer to remarks under Scepter regarding crop rotation and see remarks under Prowl section for possible crop effects.
Valor 51WDG (Flumioxazin)	0.063-0.078 lb.	2-2.5 oz.	Apply preemergence to control pigweed, lambsquarters, hophornbeam copperleaf, morningglories and several other weeds. Weak on cocklebur and sicklepod. Apply in 10-30 gal. of water per acre. Mix with a grass herbicide for broadspectrum weed control.
Valor XLT (flumioxazin + chlorimuron)	0.9+0.3 lbs-1.2+0.4lbs.	3-4 ozs.	Apply PRE to control pigweeds, horseweed, hophornbeam copperleaf and morningglory spp. Mix with grass herbicide for better broad spectrum grass control.

Postemergence Weed Control in Soybeans: Postemergence herbicides work best under the following conditions: weeds are young and rapidly growing, high humidity and good soil moisture, and good spray coverage. Performance is reduced when weeds are stressed due to drought, disease or cultivation, or when weeds are too large. Select the most effective weed management program for the money you can afford to spend. The following tables should assist with selection of a program for controlling your weeds.

POSTEMERGENCE HERBICIDES FOR WEED CONTROL IN SOYBEANS

Herbicide	Rate/Acre Broadcast*		Remarks**
	Active Ingredient	Formulation	
Aim EW (carfentrazone-ethyl)	0.008-0.025 lb.	0.25-0.5 ozs.	Apply overtop of soybeans from V3 to V10 to control velvetleaf and morningglories. Causes soybean foliar burn which is usually of short duration. Always add 1 qt. nonionic surfactant per 100 gals. of spray mix. May be tank-mixed with glyphosate to control larger morningglories.
Assure II 0.88E (Quizalofop)	0.034-0.069 lb.	5-10 ozs.	Apply overtop to control rhizome johnsongrass . Apply 5 ozs. of Assure II when johnsongrass is 10-24" tall and re-treat with 5 ozs. when grass regrowth reaches 6-10" tall. Add oil concentrate at 1 gal. (for ground application) or 1 qt. nonionic surfactant per 100 gals. of spray mixture. The higher rates may be needed to control annual grasses or bermudagrass . See label. Controls volunteer Roundup Ready corn in soybeans.
Basagran 4SC (Bentazon)	0.75-1.0 lb.	1.5-2 pts.	Apply to control cocklebur, prickly sida and other broadleaf weeds. Addition of 1 qt./A of crop oil concentrate may improve control of ragweed and lambsquarters. Add 2 ozs. of 2,4-DB (Butyrac) to the regular rate of Basagran for improved control of morningglory. Do not add oil or surfactant when mixing with 2,4-DB.
Classic 25DF (Chlorimuron)	0.008-0.012 lb.	0.5-0.75 oz.	Apply to control cocklebur, pigweed, burcucumber and other broadleaf weeds. Can be applied after the first trifoliolate until 60 days before harvest. Weak on prickly sida and lambsquarters . Add 1 qt. of nonionic surfactant (80 percent active) per 100 gal. water. See label for information concerning the use of crop oil concentrate and liquid fertilizer. Classic may be tank-mixed with Roundup Ultra (Roundup Ready soybeans only) for improved control of morningglory and hemp sesbania (see label). Do not plant corn, cotton, or sorghum within 9 months after application. See label for other crops. For salvage control of cocklebur or smooth pigweed, apply .75 oz. and 1 qt. of crop oil concentrate.
Cobra 2E (Lactofen)	0.2 lb.	12.5 ozs.	Apply to control morningglory, balloonvine and several broadleaf weeds. Add 2 pts. nonionic surfactant, or 2 to 4 pts. crop oil concentrate, per 100 gals. spray. Causes soybean foliar burn which is usually of short duration.
FirstRate 84DG (Cloransulam-methyl)	0.016-0.032 lb.	0.3-0.6 ozs.	Apply overtop prior to 50% flowering stage of soybeans. Application prior to full emergence of the first soybean trifoliolate leaf may cause temporary yellowing. Good control of cocklebur, common ragweed, giant ragweed and sicklepod. Always add crop oil concentrate at 1.2 gal. per 100 gal. of spray mix. FirstRate can be tank-mixed with Roundup PowerMax or Touchdown (Roundup Ready soybeans only), and several other herbicides (see label). For FirstRate tank mixes with Roundup WeatherMax or PowerMax, DO NOT add additional surfactant or crop oil. Other glyphosate product tank-mixes add non-ionic surfactant at 2 pt. per 100 gals. If needed, a sequential application can be made. See label.
Flexstar, Rythm (Fomesafen plus adjuvants)	0.24-0.35 lb.	1.0-1.5 pts.	Contains same active ingredient as Reflex, but is formulated with an adjuvant system. Will control larger cocklebur, morningglories, and pigweed. Causes soybean foliar burn which is usually of short duration. Always add 1-2 qts. nonionic surfactant, or 0.5-1 gal. crop oil concentrate per 100 gals. of spray mix. Less incompatibility problems with glyphosate. Also sold premix as Flexstar GT. Other generic formulations available.

Herbicide	Rate/Acre Broadcast*		Remarks**
	Active Ingredient	Formulation	
Fusilade DX 2E (Fluazifop)	0.094-0.188 lb.	6-12 ozs.	Apply lower rate for most annual grasses before they exceed 4" tall. For johnsongrass control, apply the higher rate when it is 8-18" tall. Make a second application (8 ozs.) when regrowth is 6-12" tall. For bermudagrass , apply the higher rate when runners are 4-8" long, and repeat when regrowth reaches 4". Add oil concentrate (1 gal.) or nonionic surfactant (2 pts.) per 100 gal of spray mixture. Controls volunteer Roundup Ready corn in soybeans.
Liberty 280 SL (glufosinate) FOR USE ON GLUFOSINATE- TOLERANT SOYBEAN VARIETES ONLY	0.4 – 0.66lbs.	22-36 ozs. 36 fb 29 29 fb 29	For control of glyphosate-resistant Palmer pigweed, horseweed and other weeds, apply early to small sized weeds for best control. Will control Palmer up to 4 to 6" tall. A follow up application of Ignite 7 to 10 days after the first application may be needed to control Palmer that is over 5" tall. Use at least 15 gallons/acre of water for more effective coverage. Apply up to a maximum of 65 oz/A prior to first bloom (R1) if no Liberty was used as a burndown treatment. R1 occurs approx. 40 days after planting for MG4 soybeans.
Poast 1.5E or Poast Plus 1.0E (Sethoxydim)	0.19 lb.	16 ozs. 1.5E or 24 ozs. 1.0E	Apply for control of most annual grasses . For best results, make applications before most grasses exceed 4" tall. Always include oil concentrate at 2 pts/A. Controls volunteer Roundup Ready corn in soybeans.
Prefix (fomesafen + s- metolachlor)	1.32 lb. (0.24 +1.09 lb.)	32 ozs	May be applied from cracking through the third trifoliate.
Pursuit 2AS or 70DG (Imazethapyr)	0.063 lb.	4 fl. ozs. or 1.44 ozs. 70DG	Apply to control morningglory, spurge, pigweed, cocklebur and other broadleaf weeds. For most effective control, apply before weeds exceed 3" in height. Use nonionic surfactant at the rate of 1 qt. per 100 gallons of spray mix. Use 10 or more gallons of spray solution per acre to ensure good weed coverage. See label regarding rotational crop restrictions. Also available as a premix with glyphosate (Extreme) for use in Roundup Ready soybeans. See label.
Raptor 1AS (Imazamox)	0.03-0.04 lb.	4-5 ozs.	Apply overtop prior to soybean bloom and before most weeds exceed 5 inches tall (see label). Good control of cocklebur, morningglory, pigweed, velvetleaf and seedling johnsongrass. Weak on sicklepod and hophornbeam copperleaf. Always add either crop oil concentrate at 1 gal. per 100 gals. or nonionic surfactant at 1 qt. per 100 gals. of spray mix. Do not make more than one application per season.
Reflex , Dawn (Fomesafen)	0.25-0.38 lb.	1-1.5 pts.	Apply to control morningglory (high rate only) and several broadleaf weeds. Add 1-2 qts. nonionic surfactant or 1 gal. crop oil concentrate per 100 gals. of spray. Reflex may be tank-mixed with Roundup Ultra (Roundup Ready soybeans only) for improved control of morningglory and hemp sesbania (see label). It is usually very safe on soybeans. Do not plant sorghum within 10 months of application. Has controlled volunteer Roundup Ready cotton that is 6 inches or smaller in research and demonstration trials in soybeans. May be less compatible when tank-mixed with glyphosate. Other generic formulations available.
Resource 0.86E (Flumiclorac)	0.03 lb.	4 ozs.	Apply to control velvetleaf with up to 6 leaves. Larger plants will require higher rates (see label). Add oil concentrate at 1 qt./A.

Herbicide	Rate/Acre Broadcast*		Remarks**
	Active Ingredient	Formulation	
Roundup PowerMax (Glyphosate 4.5ae)	0.75-1.1 lbs. (a.e.)	22-32 ozs.	The Roundup Ready system has been most successful where soybeans are drilled, where fields are scouted early, and when applications are timely. Apply overtop to control many annual broadleaf and grass weeds, and johnsongrass. Excellent control of crabgrass, fall panicum, goosegrass, signalgrass, johnsongrass, cocklebur, copperleaf, and spurge. Some of the more difficult to control weeds include morningglory, black nightshade, groundcherry, hemp sesbania, prickly sida, spurred anoda, and giant ragweed. Consider tank-mixing with reduced rates of Classic, Ultra Blazer, Cobra or Reflex for improved control of morningglories and hemp sesbania. Tank mixing with FirstRate will improve control of giant ragweed. See product labels for specific tank-mix directions. Avoid drift to adjacent crops. Be sure that your spray system has been thoroughly cleaned and flushed prior to and after application. Applications can be made from the cracking stage up to R3 (1/4" pod visible on at least one of top 4 nodes on main stem). Repeat applications may be required to maintain control. Dry conditions will reduce weed control.
Touchdown Total (Glyphosate 4.17ae)		24-35 ozs.	
Generic Glyphosate (Glyphosate 4.0 ae)		32-47 ozs.	
Scepter 1.5AS or 70DG (Imazaquin)	0.063-0.125 lb.	0.33-0.67 pt. or 1.4-2.8 ozs.	Use .33 pt. to control cocklebur and pigweed. Use higher rate to control other broadleaf weeds. Weak on jimsonweed and nightshade. Add 1 qt. nonionic surfactant (80 percent active) per 100 gals. of spray volume. See label for information concerning the use of crop oil concentrate and rates to use on specific weeds. Do not plant sorghum within 11 months or cotton within 18 months of application. Corn may be planted the following spring if 10 inches of water is received within 6 months following application. See label for other crops. For salvage control of cocklebur or smooth pigweed, apply 0.5-.67 pt./A (2.1-2.8 ozs. 70DG) per acre plus nonionic surfactant (1 qt./100 gal.). Also available as a premix with glyphosate for use in Roundup Ready soybeans. See label.
Select Max 1EC (Clethodim)	0.094-0.125 lb.	12-16 ozs.	Apply 12 ozs./A for control of most annual grasses up to 6" tall. For johnsongrass , 12-24" tall, apply 16 ozs. A second application of 12 ozs./A can be made to regrowth, 6-10" tall. For bermudagrass , apply the higher rate on runners up to 6" long, and repeat on regrowth up to 6" long. Always use crop oil concentrate at 1 qt./A. Controls volunteer Roundup Ready or glufosinate-tolerant corn in soybeans.
Sequence (S-metolachlor + Glyphosate)	1.64 lb.	2.5 pts.	Apply up to 3 trifoliate.
Storm (Basagran + Blazer premix)	0.75 lb.	1.5 pts.	Broadspectrum control of cocklebur, morningglory, and several other broadleaf weeds. Always add crop oil concentrate (1-2 pts./A) or nonionic surfactant (0.125-0.25% by volume) with Storm. Causes soybean foliar burn which is usually of short duration. Note: 1.5 pt/A of Storm is equivalent to 1 pt. of Basagran and 1 pt. of Blazer per acre.
Synchrony XP (chlorimuron + thifensulfuron)	0.0067 lbs.	0.375ozs.	May be tank-mixed at a reduced rate with glyphosate to provide residual control.
Ultra Blazer 2L (Acifluorfen)	0.13-0.38 lb.	0.5-1.5 pts.	Apply to control morningglory, pigweed and several other broadleaf weeds. See label regarding the use of surfactant. Ultra Blazer may be tank-mixed with Roundup Ultra (Roundup Ready soybeans only) for improved control of morningglory and hemp sesbania (see label). Add 2 ozs. of 2,4-DB (Butyrac) to improve control of cocklebur and large morningglory.

*If a band treatment is used, the rate should be reduced proportionately according to band width and row spacing.

**For rhizome johnsongrass control, do not tank mix postemergence grass herbicides with broadleaf herbicides.

SOYBEAN HARVEST AIDS

Harvest aid chemicals are sometimes needed to desiccate weeds in order to improve timeliness of harvest. This is most frequently encountered with early maturing varieties which may be ready for harvest prior to a killing frost. Harvest aid chemicals do not speed-up maturity of the soybean plant; they merely reduce moisture in weeds and may improve harvest efficiency, in addition to timeliness. Producers are encouraged to make harvest aid decisions by comparing cost with anticipated benefits. Also, care must be taken to minimize chances of drift to adjacent crops. Be sure to read labels thoroughly and follow required preharvest intervals (PHI).

Harvest Aid	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Aim EW	0.023 lbs.	1 - 2 ozs.	Aim has a 3 day pre-harvest interval.
Roundup PowerMax (Glyphosate 4.5ae)	0.75-1.5 lbs. (a.e.)	22-43 ozs.	Apply after pods have set and lost all green color. Allow a minimum of 7 days between application and harvest of soybeans. Use a spray volume of 10 to 20 gallons of water per acre for ground applications, or 3 -10 gallons of water for aerial applications. Do not graze or harvest treated crop for livestock feed within 25 days of application. Do not apply to soybeans grown for seed as a reduction in germination or vigor may occur. Avoid spraying during conditions which favor drift.
Touchdown Total (Glyphosate 4.17ae)		32-64 ozs.	
Generic Glyphosate (Glyphosate 4.0 ae)		32-48 ozs.	
Sodium Chlorate, Defol 5, other tradenames (Sodium Chlorate)	5.0 - 7.5 lbs.	4.8 qt of a 5 lb/gal formulation or 3.2 qt of a 7.5 lb/gal formulation	Make application 7 to 10 days before anticipated harvesting date when soybeans are mature and ready for harvest. Apply in a minimum spray volume of 20 gallons per acre by ground or 5 gallons per acre by air. Do not graze treated fields or feed treated soybean foliage. Do not apply under conditions which favor drift.
Gramoxone SL(u) (Paraquat)	0.13-0.26 lb.	8-16 ozs.	For indeterminate varieties (maturity Group III or IV) apply when at least 65% of the seed pods have reached a mature brown color or when seed moisture is 30% or less. For determinant varieties (maturity Group V) apply when plants are mature, i.e., beans fully developed, one-half of leaves have dropped, and remaining leaves are yellowing. Immature soybeans will be injured. Use the higher rate when cocklebur is present. Use a minimum spray volume of 20 gallons per acre by ground or 5 gallons per acre by air. Do not apply within 15 days of harvest. Do not graze or harvest for forage or hay. Do not apply under conditions which favor drift.

(u)--Restricted Use Herbicide.

* NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates, addition of surfactant and registration on Roundup Ready crops. Always read the label before application.

EXPECTED SOIL APPLIED HERBICIDE RESPONSE OF COMMON WEEDS IN SOYBEANS

	PPI	PREPLANT INCORPORATED/PREEMERGENCE						PREEMERGENCE					
	Treflan	Boundary	Canopy 75DG	Prowl	Python	Scepter	Sencor	Sharpen	Command	Dual II Magnum	Prefix	Pursuit	Valor
Hericide Site of Action	3	15+5	2+5	3	2	2	5	14	13	15	5+14	2	14
Annual Morningglories	6	5	9	6	6	6	5	5	3	2	6	7	8
Broadleaf Signalgrass	8	8	8	8	4	4	6	2	9	8	8	6	2
Cocklebur	0	5	8	0	7	9	5	2	5	0	6	8	5
Common Ragweed	0	7	8	0	----	7	8	---	6	0	6	8	8
Crabgrass, Foxtails, Goosegrass	9	9	8	9	5	6	8	2	9	9	9	8	4
Groundcherries/Black Nightshade	0	7	8	0	9	5	6	2	3	7	7	8	2/8
Hophornbeam Copperleaf	0	6	9	0	----	6	6	2	2	4	4	5	9
Jimsonweed	0	7	----	0	----	5	8	----	5	0	-	8	----
Lambsquarters	7	8	----	8	----	9	8	8	7	6	9	7	9
Pigweed, Palmer	8	7	7	8/6 ^{tt}	4	3	7	6	0	6	9	3	9
Pigweed, Smooth or Redroot	8	9	9	7	9	9	9	6	2	8	9	9	9
Prickly Sida	0	8	8	0	9	7	8	---	9	0	5	8	----
Seedling Johnsongrass	9	8	6	8	4	5	4	2	8	8	8	8	2
Sicklepod	0	6	5	0	7	7	6	4	0	3	4	0	4
Smartweed	4	7	----	3	9	8	7	5	6	0	5	8	5
Spotted Spurge	0	7	----	0	9	7	8	---	8	7	7	9	----
Spurred Anoda	0	6	----	0	9	4	7	---	9	0	--	8	----
Velvetleaf	2	6	----	2	9	6	7	---	9	0	6	8	----
Yellow Nutsedge	0	7	9	0	----	4	0	0	0	8	8	3	0
Soybean Tolerance	1	2	T	2	1	3	3	2	0	1	1	1	2

(u) Restricted Use Pesticide: Refer to label for precautions to be taken during handling and application.

KEY TO SYMBOLS: 0=No control or crop injury; 10=100% control or severe, yield-reducing crop injury; ----=data not available

(Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed)T-Tolerance related to variety and environmental conditions. ^{tt}- 8 for PPI; 6 for PRE

EXPECTED WEED RESPONSE FROM POSTEMERGENCE SOYBEAN HERBICIDES

	Aim	Basagran	Classic	Cobra	FirsRate	Pursuit	Reflex, Dawn, Rhythm	Roundup PowerMax/ Touchdown/others* ^a	Scepter	Ultra Blazer	Assure II	Fusilade DX	Poast, Poast Plus	Select Max
Hericide Site of Action	14	6	2	14	2,14	2	14	9	2	14	1	1	1	1
Annual grasses	0	0	1	4	----	7	5	9	4	4	8	8	9	9
Burcucumber	0	3	8	6	----	----	5	----	5	6	0	0	0	0
Cocklebur	6	9	9	7	9	8	8	10	9	7	0	0	0	0
Common Ragweed	-	5	7	7	9	7	7	9	7	7	0	0	0	0
Giant Ragweed	2	3	5	7	8	6	7	6	5	6	0	0	0	0
Groundcherry/Nightshade	7	1	2	8	----	8	8	6	4	8	0	0	0	0
Hemp Sesbania	9	0	9	9	2	0	9	4	2	9	0	0	0	0
Hophornbeam Copperleaf	7	2	2	9	----	4	9	7	2	9	0	0	0	0
Jimsonweed	7	8	5	7	5	9	7	8	5	7	0	0	0	0
Johnsongrass (rhizome)	0	0	1	1	0	6	2	9	1	1	9	9	6	9
Johnsongrass (seedling)	0	0	1	4	2	7	5	10	2	4	9	9	8	9
Lambsquarters	8	7	0	6	----	5	5	8	1	5	0	0	0	0
Morningglory Entireleaf/Ivy ^a	7	2	8	8	8	8	8	8	1	8	0	0	0	0
Morningglory Pitted ^b	7	5	8	9	8	8	9	7	4	9	0	0	0	0
Morningglory Tall ^c	7	3	7	9	5	9	9	8	2	9	0	0	0	0
Pigweed, Palmer	7	0	4	8	4	3	8	2	3	8	0	0	0	0
Pigweed, Smooth or Redroot	8	0	8	8	4	9	8	9	9	8	0	0	0	0
Prickly Sida	4	7	0	6	3	6	2	6	1	2	0	0	0	0
Sicklepod	1	0	8	1	8	0	1	9	5	1	0	0	0	0
Smartweed	7	8	5	7	----	6	7	8	5	7	0	0	0	0
Spotted Spurge	6	0	3	7	----	8	7	9	3	7	0	0	0	0
Velvetleaf	9	9	8	4	6	8	4	7	2	3	0	0	0	0
Yellow Nutsedge	0	8	4	1	----	3	6	7	2	1	0	0	0	0
Soybean Tolerance	3	0	2	3	0	0	1	0*	1	2	0	0	0	0

*Soybean variety must be Roundup Ready.

^a Many hairs on upper leaf surface

^b No hairs on upper leaf surface

^c A few hairs on upper leaf surface

KEY TO RESPONSE RATINGS: 0=No control or crop injury; 10=100% control or severe, yield reducing crop injury; ----=No data available

Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed.

BURLEY AND DARK TOBACCO WEED CONTROL

Tobacco and Pasture/Grass Hay Herbicide Residues

Certain pasture herbicides (ForeFront R&P, GrazonNext HL, Grazon P+D, Milestone and Surmont) contain active ingredients which may persist in treated soil, grass, harvested hay, and in Cattle manure and urine. Tobacco and numerous other broad leaf crops are very sensitive to minute amounts of these active ingredients. Because of this, careful planning is required regarding use of treated pastures and hay, in the movement of animals which have been grazing in treated pastures or which have been fed treated hay. These herbicides are for use in permanent grass pastures and grass hay fields only. They should not be used in fields which will be rotated to tobacco.

Manure from animals which have been grazing treated pastures of which have been fed treated hay should not be used to fertilize tobacco fields unless the animals have been withdrawn from treated pastures or hay (3 days for ForeFront R&P, GrazonNext HL and Milestone; 7 days for Grazon P+D and Surmont). Likewise, treated hay should not be used for mulch. Do not transfer animals that have been grazing treated pastures or that have been fed treated hay to field which will be rotated to tobacco unless been withdrawn from treated pastures or hay (3 days for ForeFront R&P, GrazonNext HL and Milestone, 7 days for Grazon P+D and Surmont).

For more information on tobacco and pasture herbicides, please see UT Extension Fact Sheets W290-A: *Preventing Off-target Herbicide Problems in Tobacco Fields*, and W290-B: *Diagnosing Suspected Off-target Herbicide Damage to Tobacco*.

Weed Control in the Field

Growers should give consideration to weed problems when selecting fields for tobacco production. Many weeds, such as groundcherry, jimsonweed, horsenettle, cocklebur, and bermudagrass are not controlled by tobacco herbicides. When rotating with other crops, care should be taken to avoid herbicide carryover into tobacco. Tobacco is very sensitive to persistent herbicides such as atrazine, Princep and some soybean herbicides. Always know the field history, and read the herbicide labels to know the required waiting periods for tobacco. Dry weather, high herbicide rates and lack of post-season tillage will all increase the risk of carryover.

A combination of soil-applied herbicides and timely, shallow cultivation will be required for adequate weed control in most fields. Recommended herbicides are listed on the following pages. Begin shallow (no deeper than 2 inches) cultivation as soon as weeds begin to emerge after transplanting. Deep cultivation only brings more weed seed to the surface. Cease cultivation before tobacco leaves or roots are damaged.

HERBICIDES FOR TOBACCO FIELDS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Command 3ME (Clomazone)	0.75-1 lb.	2-2.67 pts.	Apply Command 3ME on the surface prior to transplanting, or otopop up to 7 days following transplanting. If Command is applied prior to transplanting and field conditions require the need for additional preparation, tillage should be shallow (no deeper than 2 inches). Excellent control of hairy galinsoga, prickly sida and annual grasses. Good control of ragweed. For use only where application buffer zones can be observed (1200 feet from towns and housing developments, commercial fruit/nut or vegetable production, commercial greenhouses or nurseries). See label for other restrictions and drift control measures. Weak on pigweed and morningglory. Command may persist and cause injury to small grain cover crops. Consider using vetch as a cover crop, and a tobacco variety resistant to black root rot.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Devrinol (Napropamide)	1 lb. 1.5 lbs. 2.0 lbs.	2 lbs. 50DF (coarse textured or sandy soils) 3 lbs. 50DF (medium-textured or loamy soils) 4 lbs. 50DF (fine-textured or silty clay loams)	Apply preplant incorporated by shallow disking or overtop transplants immediately after transplanting. If rainfall is not received within 24 hours of a post-transplant application, irrigation or tillage is necessary for activation. Controls hairy galinsoga, pigweed, ragweed and several other broadleaf weeds. Will not control morningglories. Apply full labeled rate to control hairy galinsoga. Devrinol may persist and cause injury to winter cover crops. Consider using vetch as a winter cover crop where Devrinol is used and use a tobacco variety resistant to black root rot. Some growers have had good success with reduced rates of Devrinol (1 lb. 50 DF on sandy soils or 2 lbs. on heavier soils) tank-mixed with Prowl. The reduced rate gives good weed suppression with reduced carryover potential.
Prowl 3.3 EC (Pendimethalin)	1.0 lb. 1.5 lb.	2.4 pts. (coarse-textured soils) 3.6 pts. (fine-textured soils)	Apply on soil surface and incorporate with a disk set to cut 3-4" deep. Disk twice for thorough mixing. Use the higher rate of chemical in each rate range where weed pressure is heavy or where high rates of manure have been applied. Controls most annual grasses and pigweeds. Note: Generic versions of EC formation are available. See labels.
Prowl H ₂ O 3.8 CS (Pendimethalin)	0.95 lb. 1.43 lb.	2.0 pts.-(coarse-textured soils) 3.0 pts. (medium-to-fine textured soils)	
Spartan 4F (Sulfentrazone)	0.25-0.31 lb.	8.0-10.1 ozs. 4F formulation (See label)	Apply to the soil surface following land preparation prior to transplanting. Use a well calibrated sprayer with good agitation. Avoid excessive overlap of spray swaths. Spartan may be mechanically incorporated, but no deeper than 2 inches. Do not apply overtop after transplanting, as severe crop injury will occur. Excellent control of morningglory, pigweed, lambsquarters and yellow nutsedge. Good annual grass suppression. For improved grass control, use with Command 3ME or Prowl. Weak on ragweed and hairy galinsoga. For improved control of these weeds, apply with Command 3ME or Devrinol.
Spartan Charge (Sulfentrazone+ Carfentrazone)	0.25+0.027 lb. to 0.32+0.035 lbs.	10.2-12.8 oz. Spatan Charge	Apply to the soil surface following land preparation prior to transplanting. Use a well calibrated sprayer with good agitation. Avoid excessive overlap of spray swaths. May be mechanically incorporated, but no deeper than 2 inches. Do not apply overtop after transplanting, as severe crop injury will occur. Excellent control of morningglory, pigweed, lambsquarters and yellow nutsedge. Good annual grass suppression. For improved grass control, use with Command 3ME or Prowl. Weak on ragweed and hairy galinsoga. For improved control of these weeds, apply with Command 3ME or Devrinol.
Poast 1.5 EC (Sethoxydim)	0.28 lb.	1.5 pt. (See label)	Apply overtop to control annual grasses, johnsongrass and bermudagrass. Two applications at 1.5 pt./A may be made up to 7 weeks after transplanting. Always add crop oil concentrate at 2 pt./A. Be sure to use a clean sprayer. Johnsongrass and bermudagrass will likely require 2 applications for satisfactory control. Poast may also be applied to conventional tobacco transplant beds. See label.

Each of these recommended chemicals has proven to be safe to tobacco and provide effective weed control when used properly. However, if cold, wet weather or hot, dry weather persists after transplanting, some crop stunting may occur. Command, Devrinol and Prowl are persistent herbicides which may injure crops planted after tobacco harvest. For best safety to rotational or cover crops (1) use no more than recommended rates, (2) disk or break soil after harvesting tobacco, (3) delay planting for two or more weeks, and (4) plant a combination of a legume and a grass.

WARNING: Poor stands and/or growth of rotational or cover crops have been observed in some fields where "Prime+" sucker control material has been used in conjunction with dinitroaniline herbicides such as Prowl. Although crop injury has not occurred in all cases where these materials were used in the same field, the potential for such problems definitely exists.

EXPECTED HERBICIDE RESPONSE OF COMMON WEEDS IN TOBACCO

Weed	Command	Devrinol	Poast	Prowl	Spartan 4F/Spartan Charge
Cocklebur	5	0	0	0	6
Common ragweed	6	7	0	0	2
Crabgrass	9	8	9	9	7
Fall panicum	9	8	9	9	7
Foxtail	9	8	9	9	7
Goosegrass	9	8	9	9	7
Groundcherry	3	0	0	0	-----
Hairy galinsoga	9	7*	0	0	5
Horsenettle**	0	1	0	0	0
Jimsonweed	5	0	0	0	7
Johnsongrass, rhizome	2	0	7	2	1
Johnsongrass, seedling	8	7	8	8	6
Lambsquarters	7	8	0	7	8
Morningglories	3	1	0	5	9
Pigweed (carelessweed)	2	9	0	8	9
Purslane	-----	9	0	7	-----
Smartweed	6	6	0	2	7
Spiny Amaranth	2	9	0	8	9
Yellow nutsedge (nutgrass)	0	0	0	0	8

*2 lb. a.i./acre required for this level of control.

**Horsenettle is a deep-rooted perennial. For best results, spray mature weeds after tobacco harvest with a cupful of Roundup mixed with two gallons of water. Wet foliage thoroughly and wait seven days before disking or turning. This application will also give excellent control of rhizome johnsongrass.

RATING SCALE: 0=No Control; 9=90% Control or Greater; -----=Data not available. These ratings are based on labeled herbicide rates and proper application methods.

WHEAT WEED CONTROL

Wild garlic, annual ryegrass and cheat are major weed problems in Tennessee wheat fields. Wild garlic infestations may cause dockage at harvest. Annual ryegrass and cheat compete with wheat for light, nutrients and water, and will reduce wheat yield. Weeds which infest wheat may delay harvest in the spring. Thus, an effective weed management program should be used for producing optimum wheat yields.

Good production practices aid in the control of weeds. Using weed-free seed, proper seeding rate, proper seedbed preparation and planting following a good weed management program in a summer cultivated crop will assist in effective weed control.

Wild Garlic

A major weed problem in our wheat fields is wild garlic (commonly called wild onion). To obtain the best control of wild garlic and the least amount of injury to the wheat crop, the following procedure should be followed:

1. Apply 0.45 to 0.90 ounces Harmony Extra SG with TotalSol per acre.
2. Apply at least 15 gallons spray volume per acre to ensure coverage.
3. Add nonionic surfactant (80% active or greater) at a rate of 1 quart per 100 gallons of water. Liquid nitrogen fertilizer may be used as a spray carrier for Harmony Extra Total Sol. Surfactant must be included (1 to 2 pints per 100 gallons of spray solution). Wheat plants may exhibit temporary yellowing and stunting when sprayed with the liquid nitrogen.
4. Apply when wild garlic plants are less than 12 inches tall, with 2 to 4 inches of new growth. New growth is essential for control. See instructions in the table on the following page for wheat stage.
5. Apply when daytime temperatures of at least 60 F are expected for three or more days. Adequate soil moisture before, during and immediately after application will improve control.
6. Harvest wheat early, prior to excessive lodging, in order to remove as few aerial bulblets with the combine as possible.

No-till Wheat

A burndown application of Gramoxone SL may be needed to desiccate summer weeds such as broadleaf signalgrass, pigweed and cocklebur for easier planting and reduction of competition with emerging wheat. Additionally, Gramoxone SL will control winter annuals such as chickweed and henbit if they are already present at planting. Prior to planting wheat is also a good opportunity for control of perennial weeds such as johnsongrass, bermudagrass and some vines with Roundup PowerMax/Touchdown/others.

Ryegrass can be troublesome in no-till wheat just as it is in conventionally-tilled wheat. If Hoelon is used preemergence, it can be tank-mixed with Gramoxone SL.

Fall applications of Harmony Extra have performed very well in no-till wheat on weeds such as wild garlic and dock. Harmony Extra can be applied after wheat reaches the two-leaf stage. In most studies, the fall application has eliminated the need for a late-winter or spring application.

Wheat Harvest Aid

Roundup PowerMax (22 ozs./A), Touchdown (24 ozs/A) or Generics (32 ozs./A) may be applied preharvest in wheat for control or suppression of johnsongrass, smartweed and several other weeds (see label). Make applications after the hard-dough stage of grain (30 percent or less grain moisture) and at least seven days prior to harvest. May be applied either by ground or air. It is not recommended that wheat grown for seed be treated because a reduction in germination or vigor may occur.

HERBICIDES FOR USE IN WHEAT

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Axial XL (pinoxaden +Adigor adjv.)	0.05 lb.	16.4 ozs.	Can be applied anytime regardless of nitrogen fertilizer applications.
Axiom DF	0.255 – 0.34	6 – 8 ozs.	Axiom De may be used to control certain annual grass and broadleaf weeds when applied after the crop has fully germinated to early postemergence in winter wheat.
Buctril 4EC (Bromoxynil)	0.375-0.5 lb.	0.75-1 pt.	For postemergence control of several small, annual broadleaf weeds. Buctril may be applied anytime after wheat emergence, but for best results, use only in the fall. May be tank-mixed with Hoelon for broader spectrum weed control. See label for tank-mix instructions.
Finesse Cereal and Fallow (Chlorsulfuron + metsulfuron methyl)	0.0313	0.5 oz	Finesse controls weeds by both preemergence and postemergence activity.
Finesse Grass & Broadleaf (Chlorsulfuron + flucarbazone)	0.033-0.040 lb.	0.75-0.90 oz.	Apply in the fall. Plant STS beans only if double cropped.
Harmony Extra SG with TotalSol 50 DF (Thifensulfuron + tribenuron)	0.014-0.028 lb.	0.45-0.90 oz.	For postemergence control of actively growing weeds such as wild garlic, buttercup and dock. Apply to wheat in at least the two-leaf stage but before the third node is detectable. Add nonionic surfactant (80% active or greater) at 0.25% (1 qt./100 gallons of water) to the spray solution. Use in at least 15 gallons spray volume per acre for ground application and in 3-5 gallons with aerial application. May be tank-mixed with 2, 4-D for improved vetch control. Add Clarity (3 oz.) for control of cornflower and horseweed. See label for directions.
Harmony SG with TotalSol (Thifensulfuron)	0.014 -0.028 lb	0.45-0.9 oz.	Apply 0.75 oz to wheat for postemergence broadleaf weed control. Use 0.9 oz/A when weed infestation is heavy
Hoelon 3EC (Diclofop) (u) Note: Hoelon-resistant ryegrass is in Tennessee. Growers are encouraged to rotate infested fields where possible, and avoid yearly applications of Hoelon to the same field.	0.75-1.0 lb. 0.5-1.0 lb.	2.0-2.6 pts. 1.3-2.6 pts.	For preemergence control of annual ryegrass in fall-planted wheat use 2 pts/A. Increase rate to 2.6 pts. for areas having a history of heavy annual ryegrass pressure. Do not incorporate. For postemergence control of annual ryegrass in fall-planted wheat apply 1.3 to 2 pts/A on 1- to 5-leaf ryegrass prior to wheat jointing. Increase rate to 2.0 to 2.6 pts./A for ryegrass with 4 to 5 leaves. NOT EFFECTIVE ON CHEAT. Apply in at least 10 gallons of water/A with ground equipment or in at least 5 gallons of water/A by airplane. Use a minimum pressure of 40 PSI. Do not tank mix with Harmony Extra.
Osprey (mesosulfuron-methyl)	0.013 lb.	4.75 ozs.	For control of Hoelon-resistant ryegrass and other annual grass and broadleaf weeds in winter wheat. Applications may be made from time of wheat emergence up to the jointing stage of development. Apply with NIS 2 qt/100 gal and UAN at 1-2 qts/A or AMS at 1.5-3 lbs/A. Methylated seed oil at a rate of 1.5pts./A in 10 gallons or more of water carrier per acre may be substituted for the NIS and Nitrogen additives. Do not apply Osprey within 14 days before or after nitrogen fertilizer application, or crop injury may result.
PowerFlex HL (Pyroxsulam)	0.0166lb.	2 ozs.	Apply with NIS at 2 qt/100 gal and UAN at 1-2 qts/A or AMS at 1.5-3 lbs/A Methylated seed oil at a rate of 1.5 pts/A in 100 gallons or more of water carrier per acre may be substituted for the NIS and nitrogen additives. Do not apply within 14 days before or after nitrogen fertilizer application, or crop injury may result.

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Sencor 75DF (Metribuzin)	0.14-0.19 lb. ^A 0.19-0.23 lb. ^B 0.23-0.28 lb. ^C (See label for other formulations of Sencor)	3-4 oz. ^A 4-5 oz. ^B 5-6 oz. ^C	Apply after the wheat plants have developed 3 to 4 tillers and have at least 4 secondary roots, 2 inches long. High moisture conditions may cause an underdeveloped root system. Crop tolerance is related to a good root system and healthy wheat plants prior to and at the time of application. Wheat varieties vary in their tolerance to Sencor. Various degrees of injury have been observed. Correct timing is critical or increased crop injury should be expected. Decisions regarding Sencor use on sensitive wheat varieties should be made by comparing expected yield loss from Sencor injury with yield loss from expected weed competition. See label for further instructions. Do not apply Sencor to wheat which has begun to joint. <u>Alternative low rate program</u> : Reduced rates of Sencor (1-3 ozs. /A of the 75DF formulation) may be applied on young wheat (2-leaf to 2-tiller stage). This treatment for cheat, little barley, chickweed and henbit has performed well in UT research and demonstrations. The 3 oz. rate will be required for control of one-leaf cheat and other weeds. This will normally require a fall application.
2,4-D	0.33 lb. Low volatile ester or 0.5-0.75 lb. amine	See label See label	For postemergence control of weeds such as vetch, wild mustard and turnips, apply when wheat is well tillered but prior to jointing.
	0.75-1.0 lb. Low volatile ester	See label	For postemergence control of above weeds plus wild garlic.

(U) Restricted Use Pesticide--See label for precautions to be taken during handling and use.

^A Coarse--sandy loam

^B Medium--silt loam

^C Fine--silty clay loam

NOTES:

EXPECTED WEED RESPONSE TO WHEAT HERBICIDES

	POSTEMERGENCE							
	Axial XL	Harmony Extra	2,4-D	Buctril	Hoelon (u)	Osprey	Powerflex HL	Sencor
Hericide Site of Action	1	2	4	5	1	2	2	5
Buttercup	0	9	9	6	0	0	3	-----
Cheat	--	0	0	0	0	0	6	9
Chickweed	0	8	2	5	0	0	3	9
Corncockle	0	7	3	7	0	0	---	-----
Cornflower	0	5	5	8	0	0	0	6
Dock, curly/broadleaf	0	9	7	7	0	0	2	3
Downy brome	-----	0	0	0	-----	-----	---	5
Eveningprimrose (Cutleaf)	0	5	8	3	0	0	2	-----
Garlic (onion), wild	0	9	7	5	0	0	7	4
Geranium, Carolina	0	5	9	3	0	0	3	8
Henbit/deadnettle	0	7	1	5	0	0	3	7
Horseweed (marestail)	0	6	9	8	0	0	3	8
Mayweed	0	9	6	6	0	0	---	7
Mustard, wild	0	9	8	8	0	0	---	6
Pepperweed, Virginia	0	8	9	7	0	0	1	9
Poa (annual bluegrass)	1	0	0	0	0	6	2	
Ragweed, common	0	-----	9	8	0	0	---	9
Ryegrass, annual	8	0	0	0	8*	8	8	4
Shepherdspurse	0	9	7	3	0	0	---	4
Turnip, wild	0	9	8	8	0	0	----	6
Vetch	0	7	8	7	0	0	----	5

(u) *Restricted Use Pesticide*--Refer to label for precautions to be taken during handling and application.

KEY TO RESPONSE RATINGS: 0=No control; 10=100% control; -----=Data not available.

Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed.

* *Hoelon resistant bio-types will not be controlled.*

SUNFLOWER WEED CONTROL

Sunflowers are routinely grown for doves and clean fields have historically produced better results. Although herbicides labeled for sunflower production are limited, good weed control can be obtained with proper application. It is recommended that sunflowers be drilled or seeded so that all seed are properly covered with soil. Broadcast seeding may result in poor seed to soil contact and herbicide applications may result in sunflower injury. Reduced rates of preemergence herbicides may be necessary for sunflowers planted on sandy or lighter textured silt loam soils to reduce the potential for injury. Activating rainfall or irrigation is needed for optimum preemergence herbicide activity and weed control.

PREPLANT INCORPORATED HERBICIDES FOR SUNFLOWERS

**For proper incorporation, a disk should be set to cut about twice as deep as placement is desired. A second mixing with shallow disking or field cultivator usually improves weed control. See label for incorporation instructions with other implements.*

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Dual Magnum	sandy loam: 0.96-1.27 lbs. silt loam: 1.27-1.59 lbs. silty clay loam: 1.27-1.59 lbs.	1.0-1.33 pts. 1.33-1.67 pts. 1.33-1.67 pts.	Good control of annual grasses, nutsedge and small-seeded broadleaf weeds. Use higher rate to control seedling johnsongrass. Avoid high rates on sandy or silt loam soils. Rates higher than 1.27 lbs. ai (1.33 pts/A) could result in crop injury.
Prowl 3.3 EC or Pendimax 3.3 EC	sandy loam: 0.5-0.74 lbs. silt loam: 0.74-1.0 lbs. silty clay loam: 1.0-1.5 lbs.	1.2-1.8 pts. 1.8-2.4 pts. 1.8-3.6 pts.	Good control of annual grasses and small-seeded broadleaf weeds. Use higher rate to control seedling johnsongrass. For maximum weed control, the herbicide must be incorporated within 7 days of application.
Sonalan HFP	sandy loam: 0.56-0.75 lbs. silt loam: 0.75-0.9375 lbs. silty clay loam: 0.9375-1.125 lbs.	1.5-2.0 pts. 2.0-2.5 pts. 2.5-3.0 pts.	Good control of annual grasses and small-seeded broadleaf weeds. Sonalan HFP must be incorporated after application. Follow soil preparation, application and incorporation application procedures recommended by the label.
Treflan HFP, Trilin, Trifluralin 4 EC	sandy loam: 0.5 lbs.	1.0 pts. 1.25-1.5 pts. 1.5-2.0 pts.	Good control of annual grasses and small-seeded broadleaves. Trifluralin must be incorporated immediately after application.

PREEMERGENCE HERBICIDES FOR SUNFLOWERS

Herbicide	Rate/Acre Broadcast		Remarks
	Active Ingredient	Formulation	
Broadaxe	1.04 – 1.15 lbs. 1.04 – 1.37 lbs. 1.15 – 1.64 lbs.	19-21 oz/A coarse 19-25 oz/A medium 21-30 oz/A fine	Broadaxe can be applied preemergence up to 3 days after planting as a soil surface application if seedlings have not broken the soil surface and if the seed furrow is completely closed and completely covered with soil.
Dual Magnum	sandy loam: 0.96-1.27 lbs. silt loam: 1.27-1.59 lbs. silty clay loam: 1.27-1.59 lbs.	1.2-1.0 pts. 1.33-1.67 pts. 1.33-1.67 pts.	Good control of annual grasses, nutsedge and small-seeded broadleaf weeds. Use higher rate to control seedling johnsongrass. Dual Magnum must be applied immediately after planting to avoid crop injury. Avoid high rates on sandy or silt loam soils. Rates higher than 1.27 lbs. ai (1.33 pts/A) could result in crop injury. Tank mix with Spartan 4F for improved broadleaf weed control.
Prowl 3.3 EC or Pendimax 3.3 EC	sandy loam: 0.5-0.74 lbs.	1.2-1.8 pts.	Good control of annual grasses and small-seeded broadleaf weeds. Pendimethalin must be applied immediately after planting to avoid crop injury. Preemergence applications of pendimethalin on conventional tillage sunflowers may increase the likelihood of crop injury and decrease the herbicide performance when compared to preplant incorporated applications. Tank mix with Spartan 4F to improve broadleaf weed control.
Spartan 4F	0.125 lbs.	4.0 oz	Spartan 4F may be applied on the soil surface at planting to control broadleaf weeds. Spartan must be applied within 3 days of planting to reduce the potential for injury. Tank mixes with Dual Magnum, Prowl 3.3 EC or Pendimax will improve grass control. DO NOT apply Spartan 4F as a postemergence treatment.
Spartan Charge	0.16 – 0.25 lbs	3.75 – 5.75 oz	Apply Spartan Charge alone or with other herbicides or liquid fertilizers as a burndown or preemergence treatment prior to planting or up to 3 days after planting sunflowers to control or suppress weeds.

Postemergence Weed Control in Sunflowers

Postemergence herbicides work best under the following conditions: weeds are young and rapidly growing, high humidity, good soil moisture, and good spray coverage. Performance is reduced when weeds are stressed due to drought, disease or cultivation, or when weeds are too large. Select the most effective weed management program for the money you can afford to spend. The following tables should assist with selection of a program for controlling your weeds.

POSTEMERGENCE HERBICIDES FOR SUNFLOWERS

Herbicide	Rate/Acre Broadcast*		Remarks**
	Active Ingredient	Formulation	
Select 2 EC	0.094-.25 lbs.	6-16 oz	For best results, add 1% v/v Crop Oil Concentrate. The addition of AMS has shown improved control for difficult to control weeds like quackgrass, rhizome johnsongrass, and wild oats.
Clearfield Sunflowers Only			
Beyond	0.031 lbs.	4 oz	APPLY to Clearfield Sunflowers ONLY. Applications should be made to actively growing sunflowers during the 2-8 true leaf stage. A nonionic surfactant and a nitrogen based fertilizer must be added for optimum weed control.

Notes:

EXPECTED WEED RESPONSE TO SUNFLOWER HERBICIDES

	Preplant Incorporated				Preemergence			Postemergence	
	Treflan	Prowl	Dual Magnum	Sonalan	Prowl	Dual Magnum	Spartan	Select	Beyond
Hericide Site of Action	3	3	15	3	3	15	14	1	2
Annual Morningglories	6	6	2	3	6	2	8	0	7
Broadleaf Signalgrass	8	8	8	8	8	8	6	9	7
Cocklebur	0	0	0	1	0	0	6	0	8
Common Ragweed	0	0	0	3	0	0	5	0	6
Crabgrass, Foxtails,	9	9	9	9	9	9	7	9	7
Groundcherries/Black	0	0	7	8	0	7	--	0	--
Hophornbeam Copperleaf	0	0	4	--	0	4	--	0	3
Jimsonweed	0	0	0	3	0	0	7	0	6
Lambsquarters	7	8	6	8	8	6	7	0	5
Pigweed, Palmer	8	8	7	--	6	6	8	0	3
Pigweed, Smooth or	8	7	8	8	7	8	8	0	8
Prickly Sida	0	0	0	3	0	0	6	0	6
Seedling Johnsongrass	9	8	8	9	8	8	6	9	8
Sicklepod	0	0	3	--	0	3	6	0	0
Smartweed	4	3	0	6	3	0	6	0	6
Spotted Spurge	0	0	7	--	0	7	--	0	8
Spurred Anoda	0	0	0	--	0	0	--	0	--
Velvetleaf	2	2	0	--	2	0	7	0	8
Yellow Nutsedge	0	0	8	1	0	8	8	0	0

(u) Restricted Use Pesticide: Refer to label for precautions to be taken during handling and application.

KEY TO SYMBOLS: 0=No control or crop injury; 10=100% control or severe, yield-reducing crop injury; ---=data not available

(Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed.)

FORAGE CROP AND PASTURE WEED CONTROL

*HERBICIDES FOR ALFALFA AND OTHER LEGUME HAY CROPS**

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
Alfalfa-Preplant, No-Till	Gramoxone Inteon 2SL (Paraquat)	0.63-1.0 lbs.	2.5-4.0 pts.	Use to control most annual and some perennial weeds prior to seeding. In sod, best results have been obtained with a split application (1.25-2.5 pts./A, 10 days to 3 weeks prior to planting, followed by 1.25 pts./A at planting). Apply in a minimum of 10 gals. of water/A. Add nonionic surfactant at 2 pts. per 100 gal. of spray mix.
	Cornerstone/others** (Glyphosate 3ae)	0.75-2.25 lbs. (a.e.)	32-96 ozs. 3ae	For control of most annual weeds and better control of perennial weeds than Gramoxone Inteon. On most perennial weeds, glyphosate performs better in the fall than in the spring. See label for rates on individual weed species.
	Roundup PowerMax or Roundup WeatherMax** (Glyphosate 4.5ae)		22-64 ozs. 4.5ae	
Alfalfa, Birdsfoot Trefoil, Ladino or Red Clover - Seedling	Butyrac 200 2SC (2,4-DB)	1-1.5 lbs.	4-6 pts.	Controls small seedlings of musk thistle, turnips, cocklebur and ragweed. Does not control chickweed or henbit. Treat before weeds exceed 3 inches tall and when legume has two or more trifoliolate leaves.
Alfalfa, Birdsfoot Trefoil, Ladino or Red Clover – Seedling or Established	Kerb 50WP (Pronamide)	0.75-1 lb.	1.5-2 lbs.	On pure alfalfa stands, use to control chickweed and several winter grasses such as ryegrass, cheat and annual bluegrass. Apply after legumes have reached the trifoliolate stage. Do not apply if temperatures are above 55 F.
Alfalfa, Seedling or Established	Pursuit 2AS or 70DG (Imazethapyr)	0.063-0.094 lb.	4-6 ozs. 2AS or 1.44-2.16 ozs. 70DG	Apply overtop in seedling or established alfalfa to control several annual broadleaf weeds and some annual grasses. Higher rate required for grass control. Seedling alfalfa must be in the 2 trifoliolate stage or larger. Apply before most weeds exceed 3 inches in height. Good control of pigweed, morningglory, cocklebur, foxtails and seedling johnsongrass. Always add nonionic surfactant at 1 qt./100 gal. of spray mix.
Alfalfa, SEEDLING or ESTABLISHED <u>Roundup Ready Varieties Only</u>	Roundup WeatherMax (Glyphosate 4.5ae)	0.75-1.5 lbs.	22-44 ozs.	Seedling alfalfa: Due to the biology and breeding constraints of alfalfa, up to 10 percent of the seedlings may not contain a Roundup Ready gene and will not survive the first application of this product. To eliminate the undesirable effects of stand gaps created by this loss of plants, a single application of a least 22 ozs./A should be applied at or before the 4 trifoliolate growth stage. Later applications may be made at up to 44 ozs./A. In established stands, apply up to 44 ozs./A. Do not apply within 5 days of cutting of first-year or established stands. Do not apply more than a total of 4.1 qts/A for in-crop applications.
Alfalfa- Established	Butyrac 200 2SC (2,4-DB)	1-1.5 lbs.	4-6 pts.	Controls small seedlings of musk thistle, turnips, cocklebur and ragweed. Does not control chickweed, henbit, plantain or dock. Treat before weeds exceed 3 inches tall.
Alfalfa, Clover, Birdsfoot Trefoil - Seedling or Established	Poast 1.5E (Sethoxydim)	0.19-0.28 lb.	1-2.5 pts. 1.5E	Apply low rate overtop to seedling or established crop for control of crabgrass, goosegrass, foxtails and other annual grasses. Use higher rate for johnsongrass and bermudagrass. A second application may be needed for control of regrowth. Always add crop oil concentrate at 2 pts./A.
Alfalfa, Birdsfoot Trefoil - Seedling or Established	Select Max (Clethodim)	0.07 – 0.12 lb.	9 – 16 ozs.	Apply overtop to control crabgrass, fall panicum, broadleaf signalgrass or other annual grasses and johnsongrass. Use 9 to 16 ozs./A in seedling alfalfa and 12 to 16 ozs./A in established alfalfa for annual grasses. Use 12 ozs./A for johnsongrass or bermudagrass and follow with a second application if needed. See label. Always add crop oil concentrate at 1 qt./A.

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
Alfalfa - Dormant Fall-Seeded Established	Gramoxone Inteon 2SL (Paraquat)	0.19-0.31 lb. 0.25-0.5 lb.	0.75-1.25 pts. 1.0-2.0 pts.	Apply to dormant, pure alfalfa during late fall or winter months for control of chickweed, henbit, bluegrass and downy brome, and suppression of perennial grasses including orchardgrass, timothy, and smooth brome. Use a minimum of 10 gallons of water by ground, or 5 gallons of water by air. Always add a nonionic surfactant at 0.25% (1 qt. per 100 gallons of spray mix.) Application to alfalfa that is not dormant, or has broken dormancy, may result in stand and/or yield reductions. Replanting may be necessary. Green alfalfa foliage present at the time of application will be burned. Make only one application per season.
Alfalfa - Dormant Established	Sencor or Lexone 4 L or 75 DF (Metribuzin)	0.5-0.75 lb.	1-1.5 pts. 4L, or 0.67-1 lb. 75 DF	Apply to dormant pure alfalfa or alfalfa-grass mixtures to control chickweed, henbit and several other broadleaf weeds. A partial reduction in grass stand may occur. Do not apply after new growth starts.
Alfalfa – Established or First-Year Between Cuttings	Gramoxone Inteon 2SL (Paraquat)	0.25 lb.	1 pt.	Apply immediately after alfalfa hay is removed for control of many seedling broadleaf and annual grass weeds. Do not treat more than 5 days after cutting. Add surfactant at 1 pt./100 gal. of spray mix. Alfalfa foliage present at time of application will be burned. First year alfalfa stands and yields may be reduced if alfalfa is allowed to regrow more than 2 inches.

^aCoarse-textured soils

^bMedium-textured soils

^cFine-textured soils

*See Table for Grazing and Hay Cutting Restrictions

**NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates and addition of surfactant. Always read the label before application.

Grazing and Cutting Restrictions for Alfalfa Herbicides - Lactating Dairy Animals (Days to Wait)

Herbicide	Grazing	Hay Cutting
Butyrac 200 Seedling Established	60 30	60 30
Gramoxone Inteon Between cuttings Dormant	30 60	30 60
Kerb	120	120
Poast	7	14
Pursuit	30	30
Roundup WeatherMax and other glyphosate formulations (burndown)	56	56
Roundup Weathermax In-crop, Roundup Ready Alfalfa	5	5
Select Max	15	15
Sencor/Lexone	28	28

EXPECTED WEED RESPONSE TO AT-PLANTING AND POSTEMERGENCE ALFALFA HERBICIDES

	Butyrac	Pursuit	Poast	Select Max	Gramoxone Inteon Between Cuttings
Annual grasses	0	7	9	9	7
Annual ryegrass	0	-----	8*	8*	NA
Chickweed	2	-----	0	0	NA
Cocklebur	8	8	0	0	6
Curly dock	1	-----	0	0	2
Deadnettle	1	-----	0	0	NA
Henbit	1	-----	0	0	NA
Johnsongrass, Rhizome	0	6	7	9	2
Johnsongrass, Seedling	0	7	9	9	6
Lambsquarters	4	5	0	0	6
Morningglory	8	8	0	0	7
Musk thistle	7**	-----	0	0	2
Nutsedge	1	3	0	0	2
Pigweed	6	9	0	0	7
Plantain	2	-----	0	0	2
Ragweed	6	7	0	0	7

*Fall application

**Newly-emerged seedlings

NA = Not applicable

KEY TO RESPONSE RATINGS: 0=No control; 10=100% control; --=Data not available.

Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed.

HERBICIDES FOR GRASS PASTURES AND HAY FIELDS*

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
Bermudagrass only Established, Dormant	Gramoxone Inteon 2SL (Paraquat)	0.25-0.5 lb.	1.0-2.0 pts.	Apply to dormant bermudagrass for control or suppression of emerged winter annual weeds. For control of little barley, apply before the mid-boot stage. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Bermudagrass only Established, Dormant	Roundup PowerMax 4.5 ae or Roundup WeatherMax 4.5 ae (glyphosate)	0.28-0.39 lb.	8-11 oz.	Apply 8-11 oz./A to Dormant bermudagrass in late winter to early spring. Higher rates may be used, but injury will occur if bermudagrass has broken dormancy. Applications may be made in late fall, also, if bermudagrass is dormant.
Bermudagrass only Established, Dormant	Prowl H2O (Pendimethalin)	1 -4 lb.	1.1-4.2 qt.	Apply to dormant, established bermudagrass prior to weed germination. Rainfall required for activation. Good control of several annual grasses and small-seeded broadleaf weeds. Use higher end of rate range for heavy weed pressure and/or longer residual control. May be tank mixed with Gramoxone Inteon 2SL, Roundup PowerMax or Roundup WetherMax.
Bermudagrass only First-year or Established	Cimarron Plus 63WG (metsulfuron+Chlorsulfuron)a	0.06 + 0.019 oz. to 0.3+0.094 oz.	0.125-0.625 oz.	Bermudagrass should be established at least 60 days prior to application. Apply before weeds are 4 inches tall or in diameter. Rate depends upon target weeds. See label. Add nonionic surfactant at 1 to 2 pts./100 gal. of spray mix
Bermudagrass only Established	Maverick 75 DF or Outrider 75 DF (sulfosulfuron)	0.56-1.5 oz.	0.75-2 oz.	Apply overtop for control of johnsongrass and nutsedge. Does not control summer annual grasses nor most broadleaves. Always add nonionic surfactant at 1 qt./100 gal. of spray mix. Applications of 1.25 oz./A have performed well on 18-24 in. johnsongrass. Temporary bermudagrass stunting may occur. Grass may be grazed immediately; do not harvest for hay for 14 days.
Bermudagrass only Established	Pastora 71.2 WG (Nicosulfuron + metsulfuron)	0.56+0.15 oz. To 0.84+0.23 oz.	1-1.5 oz.	Pastora is a premixture of the active ingredients in Accent and Escort herbicides. Apply overtop to control johnsongrass, broadleaf signalgrass, barnyardgrass, fall panicum, foxtails and many broadleaf weeds. Does not control crabgrass nor dallisgrass. Always add nonionic surfactant at 1 qt./100 gal. of spray mix. Noticeable growth reduction and discoloration following application usually occurs, but bermudagrass will recover. Injury may be reduced by applying when bermudagrass has less than 2 in. of new growth following green-up, or within 7 days following hay harvest. Pastora has no grazing nor hay cutting restrictions.
Seedling Forage Grasses	Aim 2EC (carfentrazone)	0.016-0.023 lb.	1.0-1.5 oz.	Apply to seedling forage grasses no sooner than 7 days following emergence. Use for control of a limited number of broadleaved weeds, under 4 inches tall, such as pigweeds, black nightshade, lambsquarters, and velvetleaf. Do not make applications less than 7 days apart. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Seedling Forage Grasses	2,4-D Amine 4L	0.5- 0.75 lb.	1- 1.5 pts.	Can be used on all forage grasses for control of buttercup, thistles, wild turnip, horseweed and plantain. Apply when weeds are less than 4 in. tall and actively growing. This treatment will kill clovers and other legumes in the seedling stage. Do not apply if seedling grasses do not show good vigor. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
First-Year and Established Forage Grasses	GrazonNext HL (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.2 – 2.1 pts.	During the year of establishment, apply after grasses have begun to tiller, develop a good secondary root system, and show good vigor. Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed, plantains, and several others. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later (see label). Always add a nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
First-Year and Established Forage Grasses	GrazonNext HL (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.2-2.1 pts.	During the year of establishment, apply after grasses have begun to tiller, develop a good secondary root system, and show good vigor. Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed, plantains, and several others. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later (see label). Always add a nonionic surfactant at the rate of 1 qt./100 gal. of spray mix. Note-New restrictions are in place for GrazonNext HL: <ul style="list-style-type: none"> • Do not use grasses treated with GrazonNext HL in the preceding 18 months for hay intended for export outside the United States. • Do not use hay or straw from areas treated with GrazonNext HL within the preceding 18 months, or maure from animals feeding on hay treated with GrazonNext HL, in compost. • Do not use grasses treated within the preceding 18 months for seed production.
First-Year and Established Forage Grasses	Grazon P+D (picloram + 2,4-D) For use only in approved TN counties.	0.14 + 0.5 – 0.2 + 0.75 lb.	2-3 pts.	This is a Restricted Use Pesticide (RUP) which requires a license to purchase and apply. Apply after newly seeded grasses have begun to tiller and develop a secondary root system (usually around the 4-leaf stage of grasses). Use for thistles, horsenettle, ragweed, cocklebur, buttercup and others. Will kill pasture legumes, but reseeding may be possible one year later. On most weeds apply in March to mid-summer when actively growing. Most perennials will require higher rates (see label). Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
First-Year and Established Forage Grasses	Milestone (aminopyralid)	0.063 – 0.011 lb	4 – 7 ozs.	During the year of establishment, apply after grasses have begun to tiller and develop a secondary root system and show good vigor. Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed and several others. Weak on plantains, Control may be improved by tankmixing with 2,4-D. A limited number of weeds such as cocklebur and smartweed may be controlled with 3 oz/A. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later. Always add a nonionic surfactant at the rate of 1 qt./100 gal of spray mix.
Established Grass and White Clover Mixtures	2,4-D Amine 4L OR 2,4-D Low Volatile Ester 4EC	0.75-1.0 lb.	1.5-2 pts.	Can be used on all established mixtures of grass and white clover. Apply in March to early April for control of buttercup, musk thistle, dandelion and plantain. Apply in June for control of cocklebur, bitter sneezeweed, pigweed, spiny amaranth and ragweed. NOTE: The amine formulation is less volatile than low volatile ester formulations, but is less effective on hard-to-control species such as thistles, plantain and other perennials. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Established, GRASS and Annual Lespedeza Mixtures	2,4-D Amine 4L	0.5-0.75 lb.	1-1.5 pts.	Can be applied when lespedeza is 3 to 7 inches tall (normally mid-June). Earlier applications will result in more severe injury. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
Established Forage Grasses	2,4-D Ester 4EC	2.0 lb.	2 qts.	For wild garlic control, apply in October to mid-November or March to mid-April when daytime temperature is at least 65 F. Repeat twice annually for 2 years to eliminate wild garlic. This same program is effective on buckhorn plantain. This rate of 2,4-D will kill all legumes, including established white clover. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Established Forage Grasses	PastureGard or PastureGard HL (triclopyr + fluroxypyr)	0.38 + 0.13 - 1.5 + 0.5	2-8 pts. PastureGard or 1-4 pts. PastureGard HL	Use when brush or woody plants have begun to establish in pasture. May be tank-mixed with other products to improve control of herbaceous weeds. Excellent control of serecia lespedeza. Especially good on blackberry and other woody plants. For woody plant control, apply in summer after plants have fully leafed out. For blackberry, apply in summer after fruit drop when good moisture is available. Usual broadcast rates for woody plant control: 3-4 pints/acre. May be used on fencerows and for individual plant treatments of trees and brush. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Established Forage Grasses	Surmount (picloram + fluroxypyr) For use only in approved TN counties.	0.13 + 0.13- 0.5 + 0.5	1.5 – 6 pts.	This is a Restricted Use Pesticide (RUP) which requires a license to purchase and apply. Use for brush control plus residual broadleaf weed control. Especially good on blackberry, ironweed, horsenettle, thistles, etc. For woody plant control, apply in summer after plants have fully leafed out. For blackberry, apply in summer after fruit drop when good moisture is available. Usual broadcast rates for woody plant control: 3-4 pints/acre. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Established Forage Grasses	Brash/Range Star/ Weedmaster 3.87SL (Dicamba + 2,4-D Amine)	(0.125 + 0.36) to (0.5 + 1.4 lbs.)	1-4 pts.	Will usually give control of a wider range of weeds than either herbicide alone. Only partially effective on difficult-to-control perennials such as dock, brambles and horsenettle. High rates (see label) required for difficult-to-control species. Will kill all pasture legumes. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Sorghum-Sudangrass Hybrids - Postemergence	AAtrex 4L or 90WDG (Atrazine)	2.0 lbs.	2 qts. or 2.2 lbs.	Apply overtop once a stand is obtained and before weeds exceed 1.5 inches in height. Do not apply after crop is 12 inches in height. See label for surface and groundwater protection measures. Atrazine is not labeled on sweet sorghum.

*See Table for Grazing, Hay Cutting and Slaughter Restrictions.

Pasture and Grass Hay Herbicide Residues – Precautions and Reminders

Certain pasture herbicides (GrazonNext HL, Grazon P+D, Milestone and Surmount) contain active ingredients which may persist in treated soil, grass, harvested hay, and in cattle manure and urine. Numerous broadleaf crops, garden vegetables and ornamentals are very sensitive to minute amounts of these active ingredients. Because of this, careful planning is required regarding use of treated pastures and hay, in the movement of animals which have been grazing in treated pastures or which have been fed treated hay, and in the use of manure from animals which have been grazing in treated pastures or which have been fed treated hay. **These herbicides are for use in permanent grass pastures and grass hay fields only. They should not be used in fields which will be rotated to broadleaf crops.**

Manure from animals which have been grazing treated pastures or which have been fed treated hay should not be used to fertilize broadleaf crops or home gardens unless the animals have been withdrawn from treated pastures or hay (3 days for GrazonNext HL and Milestone, 7 days for Grazon P+D and Surmount). Likewise, treated hay should not be used for mulch in

vegetable production, gardens or landscape beds. Do not transfer animals which have been grazing treated pastures or which have been fed treated hay to fields which will be rotated to sensitive crops unless they have been withdrawn from treated pastures or hay (3 days for GrazonNext HL and Milestone, 7 days for Grazon P+D and Surmount).

For more information on tobacco and pasture herbicides, please see UT Extension Fact Sheets W290-A: *Preventing Off-target Herbicide Problems in Tobacco Fields*, and W290-B: *Diagnosing Suspected Off-target Herbicide Damage to Tobacco*.

Note-New restrictions are in place for GrazonNext HL: Do not use grasses treated with GrazonNext HL in the preceding 18 months for hay intended for export outside the United States. Do not use hay or straw from areas treated with GrazonNext HL within the preceding 18 months, or maure from animals feeding on hay treated with GrazonNext HL, in compost. Do not use grasses treated within the preceding 18 months for seed production.

EXPECTED WEED RESPONSE TO PASTURE HERBICIDES

	LATE WINTER TO EARLY SPRING APPLICATIONS						FALL (NOVEMBER TO EARLY DECEMBER) APPLICATIONS				
	2,4-D Ester	2,4-D Amine	GrazonNext HL	Grazon P+D*	Milestone	Brash/ Range Star/ Weedmaster	2,4-D Ester	2,4-D Amine	Grazon P+D*	Milestone	Brash/ Range Star/ Weedmaster
Bedstraw	3	3	9	9	9	3	2	2	9	9	2
Broadleaf plantain	8	7	8	8	2	9	8	7	8	2	9
Buckhorn plantain	7	6	7	7	2	8	7	6	8	2	8
Bull thistle	8	7	9	9	9	8	9	7	9	9	9
Buttercups	9	8	9	9	8	9	9	8	9	8	9
Carolina geranium	5	4	9	9	9	7	4	3	9	9	6
Common chickweed	2	1	-----	8	-----	5	3	2	9	-----	8
Curly dock	4	3	9	9	9	4	5	3	9	9	6
Dandelion	9	8	9	9	9	8	9	8	9	9	8
Henbit	2	1	-----	8	-----	4	3	2	8	-----	7
Horseweed	9	8	9	9	9	9	9	8	9	9	9
Musk thistle	8	7	9	9	9	7	9	8	9	9	8
Prickly lettuce	8	7	9	9	9	8	8	6	9	9	8
Red sorrel	3	3	-----	8	-----	5	3	3	8	-----	6
Sowthistle	8	8	9	9	9	9	7	7	9	9	8
Wild garlic	8	6	6	5	4	6	8	6	5	5	6

Key to Response Ratings: 0=No control; 10=100% Control; -- = Data not available

Ratings are based on labeled rates of each herbicide, applied at the optimum time for each weed.

*For use only in approved TN counties.

EXPECTED WEED RESPONSE TO PASTURE HERBICIDES: LATE-SPRING TO SUMMER APPLICATIONS

	2,4-D Ester	2,4-D Amine	Grazon Next HL	Grazon P+D*	Milestone	Brash/ Range Star/ Weedmaster
Beggarweed	3	2	8	9	9	4
Bitter sneezeweed	8	7	9	9	9	8
Brambles	4	2	4	6	3	5
Chicory	5	4	----	8	----	8
Common cocklebur	9	9	9	9	9	9
Common lambsquarters	9	9	9	9	9	9
Cudweed	3	2	9	9	9	6
Dogfennel	6	6	7	8	4	7
Goldenrod	6	4	5	8	4	7
Horsenettle	3	2	8	9	8	4
Jimsonweed	8	7	8	4	8	8
Maypop passionflower	0	0	4	4	3	0
Milkweed	3	2	----	5	3	6
Oxeye daisy	5	4	9	8	9	8
Pigweeds	9	9	8	7	8	9
Pokeweed	5	4	8	4	8	6
Prickly pear	0	0	0	6	0	0
Prickly sida	4	4	8	5	8	5
Purple (perilla) mint	8	7	8	7	8	8
Ragweeds	9	8	9	9	9	9
Smartweed	7	5	9	----	9	8
Spiny amaranth	9	7	9	7	8	9
Sumpweed	9	8	----	7	----	9
Tall ironweed	7	6	8	6	8	7
Trumpetcreeper	0	0	0	0	0	0
White heath aster	7	5	----	8	----	7
White snakeroot	6	6	9	8	9	7
Wild carrot	7	7	8	8	6	7
Wingstem	8	7	9	8	9	8

Key to Response Ratings: 0=No control; 10=100% Control; -- = Data not available

Ratings are based on labeled rates of each herbicide, applied at the optimum time for each weed.

*For use only in approved TN counties.

Spurge Control in Tall Fescue Pastures and Hay Fields

Problems with nodding spurge (*Chamaesyce nutans*) in tall fescue pastures and hay fields have increased dramatically across Tennessee in recent years. The recent dry summers and their impact on grass stands have certainly helped create this situation. Nodding spurge is a summer annual broadleaf weed which generally appears in June in pastures or after first hay cutting in hay fields. Unfortunately, most all of our herbicides commonly used (2,4-D, GrazonNext HL, Grazon P+D, Milestone, Brash/Range Star/Weedmaster, etc.) are ineffective on nodding spurge. Cimarron Plus (metsulfuron+chlorosulfuron) and other products which contain metsulfuron (Escort, Chaparral), however, provide excellent control. While metsulfuron is safe on bermudagrass and established orchardgrass, it causes noticeable temporary yellowing, stunting and seedhead suppression in tall fescue. Producers who are experiencing problems with nodding spurge and who are willing to accept the injury to tall fescue may want to consider applying Cimarron Plus at 0.2 to 0.3 oz/A. Add nonionic surfactant at the rate of 1 qt/100 gal of spray mixture. Tall fescue must be established for at least 24 months before applying metsulfuron-containing products.

SPOT TREATMENTS FOR SPECIFIC WEEDS IN PASTURES*

Weed	Herbicide	Amount of Formulation Per		Remarks
		1 gal.	100 gal.	
Bermudagrass	Roundup Ultra 4L (Glyphosate)	5 Tbsp.	2 gal.	Apply a 2% mixture of Roundup Ultra in water to actively growing bermudagrass when seed heads are present. Retreatment may be required. See labels for other glyphosate formulations.
Brambles	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray to runoff in the spring after brambles are fully leafed. Complete coverage of leaves and green stems is needed.
	PastureGard/ PastureGard HL (triclopyr + fluroxypyr) + surfactant	1.3 to 2 oz. PastureGard or 0.67 to 1 oz. PastureGard HL + 4 tsp.	1 to 1.5 gal. PastureGard or 0.05 to 0.75 gal. PastureGard HL + 2 qt.	Apply as a foliar spray after fruit drop in summer. Apply when moisture is adequate. Spray to wet, avoiding runoff. Spray all leaves and branches
	Remedy Ultra 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray to thoroughly cover all leaves and green stems in the spring after brambles are fully leafed.
	Roundup Ultra 4L (Glyphosate)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray in late summer or early fall after berries have set or dropped. See labels for other glyphosate formulations.
Honeysuckle	2,4-D Amine 4L + surfactant	2 Tbsp. + 2 Tbsp.	3 qts. + 1 qt.	Apply as a foliar spray when plants are actively growing, prior to bloom stage. Thorough coverage is needed. Add a nonionic surfactant at the rate of 2 qts./100 gal. of spray mix (2 Tbsp./1 gal.).
	Remedy Ultra 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray when plants are actively growing, prior to bloom stage. Complete coverage is necessary.
	Roundup Ultra 4L (Glyphosate)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray when plants are actively growing, at or beyond the bloom stage. Use the higher rate for plants that have reached the woody stage. Thorough spray coverage is needed. See labels for other glyphosate formulations.

Weed	Herbicide	Amount of Formulation Per		Remarks
		1 gal.	100 gal.	
Ironweed	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray in late spring to early summer when plants are actively growing. Thorough coverage is needed.
	PastureGard/ PastureGard HL (triclopyr + fluroxypyr) + surfactant	1.3 to 2 oz. PastureGard or 0.67 to 1 oz. PastureGard HL + 4 tsp.	1 to 1.5 gal. PastureGard or 0.05 to 0.75 gal. PastureGard HL + 2 qt.	Apply as a foliar spraying late spring through early summer when plants are actively growing.
Multiflora Rose	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray to runoff in spring when plants are at the early to mid-flower stage. Complete coverage of leaves and green stems is needed.
	PastureGard/ PastureGard HL (triclopyr + fluroxypyr) + surfactant	1.3 to 2 oz. PastureGard or 0.67 to 1 oz. PastureGard HL + 4 tsp.	1 to 1.5 gal. PastureGard or 0.05 to 0.75 gal. PastureGard HL + 2 qt.	Apply as a foliar spray after plants have complete foliage. Apply when moisture is adequate. Spray to wet, avoiding runoff. Spray all leaves and branches.
	Remedy Ultra 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray to runoff in spring when plants are at the early to mid-flower stage. Complete coverage of leaves and green stems is needed.
	Roundup Ultra 4L (Glyphosate)	2.5 Tbsp.	1 gal.	Apply as a foliar spray in the summer after full bloom stage. Apply before Japanese beetles or other leaf-feeding insects damage leaves. Complete leaf coverage is needed. See labels for other glyphosate formulations.
Osage orange (bois d`arc) Locust, Sassafras, Sumac, Sweetgum	Remedy Ultra 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray following full leaf development. Thorough coverage of all foliage is necessary for control.
Thistle, Canada	Metsulfuron 60DF (various brands)	0.01 oz.	1 oz.	Apply as a foliar spray in the spring when plants are at least 6 to 10 inches tall and before flowering. Thorough coverage is needed. Add a nonionic surfactant at the rate of 1 to 2 qts./100 gal. (2 to 4 tsp./gal).
Thistle, Musk	2,4-D Ester 4EC OR 2,4-D Amine 4L	2 Tbsp.	3 qts.	Apply ester formulation as a foliar spray to the point of runoff to small plants, less than 6-8 inches tall in late winter to early spring, or in the fall. If treating regrowth following mowing in the summer, use the amine formulation to reduce vapor drift.
Yucca (Beargrass)	Remedy Ultra 4EC (Triclopyr) in basal or crop oil	5 Tbsp.	2 gal.	Prepare a 2% (by volume) solution of Remedy Ultra in basal or crop oil. Thoroughly wet the center of the plant including growing point and leaf bases to the soil surface. Complete coverage of leaves is not necessary.

*See Table for Grazing, Hay Cutting and Slaughter Restrictions

Grazon P+D and Surmount Guidelines for Tennessee

Grazon P+D and Surmount are marketed in a limited number of counties in Tennessee. These counties were chosen because they have little or no acreage of cotton, tobacco, and certain other sensitive crops or because the counties have had a history of Grazon P+D use without non-target problem. The University of Tennessee does not recommend the use of Grazon P+D or Surmount outside of these counties. See figure on page 83 of this manual.

Grazon P+D and Surmount are safe on established cool-and warm-season grasses used for pasture and hay production. They provide good control of a number of broadleaf weeds. Both provide some residual control. The residual effect will depend on temperature, soil type, moisture and plant sensitivity. These products will kill all pasture legumes and re-seeding should not be attempted within one year of application.

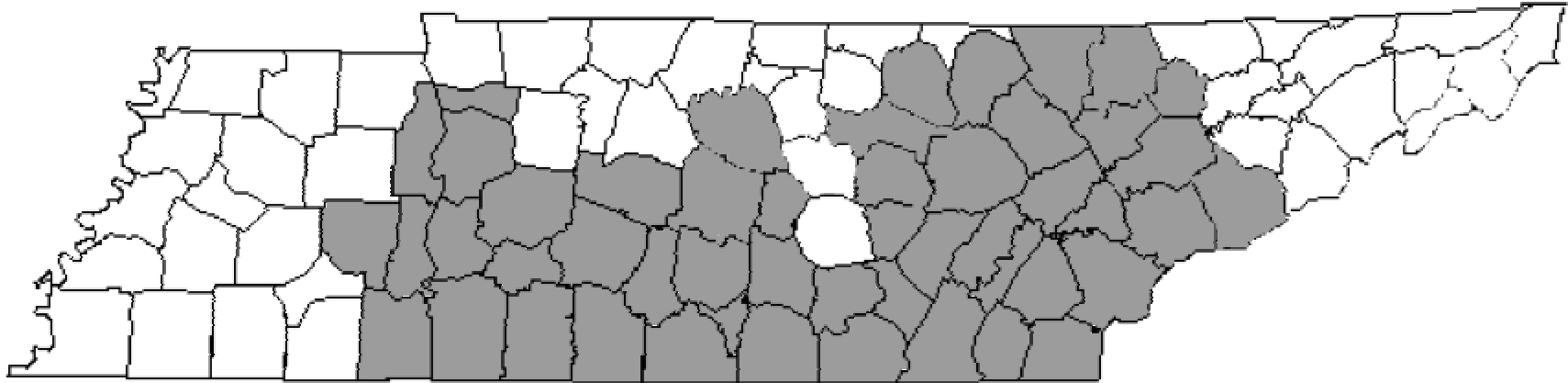
Grazon P+D and Surmount are restricted use pesticides, requiring applicators to have a commercial pesticide applicator certification card. They are restricted use due to the risk of injury to susceptible, non-target plants. Broadleaf crops, like cotton, tobacco, tomatoes and others, are very sensitive to both herbicides. Care must be taken in use of hay from fields treated with Grazon P+D or Surmount. Do not spread manure from animals which have grazed on, or have been fed hay on fields where picloram sensitive crops will be grown. Due to this sensitivity, it is recommended to use a sprayer dedicated to pasture applications only. Read and understand the label restrictions before use of this product.

Check List for Grazon P+D and Surmount Use

If all of the following are answered as “satisfactory,” then an application of Grazon P+D or Surmount may be recommended.

- G Is the site located within one of the approved counties for this herbicide?
- G Does the applicator have a restricted use applicator certification or use a custom applicator?
- G Is the site properly buffered from sensitive crops and other off-target species, including ornamentals?
- G Is there surface water (ponds or streams) on site? If so, does the applicator know to keep a 50 foot buffer?
- G Has the required personal protective equipment been prepared?
- G Are the wind conditions calm enough to prevent drift?
- G Is rain in the forecast? If so, the application should be delayed.
- G Does the applicator / land manager understand the grazing, haying and manure restrictions (see label)?
- G Is there a risk of surface runoff of the herbicide, including erosion? (e.g., does the site contain steep slopes with bare soil?) If so, the application is not recommended.
- G Is the site a permanent pasture? (If there is intention to rotate to any field crops, ornamentals, tobacco, vegetables or other vegetation, application is not recommended.)
- G Does the applicator understand the sprayer cleanout requirements?

**Tennessee Counties Approved for
Grazon P+D and Surmount Application***



*Shaded counties are approved for Grazon P+D and Surmount application.

Anderson	Cannon	Grundy	Knox	Maury	Polk	Sevier	Wilson
Bedford	Coffee	Hamilton	Lawrence	McMinn	Putnam	Scott	
Benton	Cumberland	Hardin	Lewis	Meigs	Overton	Union	
Bledsoe	Decatur	Henderson	Lincoln	Monroe	Rhea	Van Buren	
Blount	Fentress	Hickman	Loudon	Moore	Roane	Wayne	
Bradley	Franklin	Houston	Marion	Morgan	Rutherford	White	
Campbell	Giles	Humphreys	Marshall	Perry	Sequatchie	Williamson	

Grazing, Hay Cutting and Animal Slaughter Restrictions for Pasture Herbicides (Days to Wait or Withdraw Animals)

Herbicide	Beef cattle, Non-lactating dairy cattle and other livestock			Lactating Dairy Cattle		
	Grazing	Hay Cutting	Slaughter	Grazing	Hay Cutting	Slaughter
Aim	0	0	**N	0	0	**N
Metsulfuron	0	0	0	0	0	0
Crossbow*	0	7	3	14	1 yr.	3
GrazonNext HL	0	7	3	0	7	**N
Gramoxone SL (dorm. bermuda)	40	40	**N	40	40	**N
Grazon P+D (picloram + 2,4-D)	0	30	3	7	30	3
Milestone	0	0	3	0	0	3
Maverick/Outrider	0	14	**N	0	14	**N
Pastora	0	0	**N	0	0	**N
PastureGard/PastureGard HL (triclopyr + fluroxypyr)	0	14	3	Next growing season	14	3
Prowl H ₂ O (dorm. Bermuda)	45	60	**N	45	60	**N
Remedy Ultra	0***	7***	3	14***	1 yr.	3
Roundup PowerMax or WeatherMax (spot tmt.)	14	14	**N	14	14	**N
Roundup PowerMax or WeatherMax (spot tmt.)	0	0	**N	0	0	**N
Surmount (picloram + fluroxypyr)	0	30	3	Next growing season	30	3
2,4-D	0	7	3	7	7	3
Brash/Range Star/ Weedmaster	0	37	30	7	37	30

*2 gals./A or less

**N = no information on label

*** = 2 qt./A or less

2013 Pasture Herbicide Price List

Trade Name	Container Price (\$)	Formulation Rate Per Acre	Approx. Cost (\$) Per Acre
Aim	266.00/qt.	1 - 2 oz.	8.31 – 16.63
Cimarron Plus	146.00/10 oz.	0.125 – 0.5 oz.	1.83 – 7.30
GrazonNext HL	102.00/2 gal.	1.2 - 2.1 pt.	7.66-13.40
Grazon P+D	94.00/2.5 gal.	2 – 3 pt.	9.40 – 14.10
Maverick	350.00/20 oz.	0.75 – 2.0 oz.	13.13-35.00
Milestone	117.00/qt.	3 – 7 oz.	10.98 – 25.62
Pastora	335.00/20 oz.	1 – 1.5 oz.	16.75 – 25.13
PastureGard	163.00/2.5 gal.	2 – 8 pt.	16.30 – 65.20
PastureGard HL	320.00/2.5 gal.	1 – 4 pt.	16.00 – 64.00
Brash	80.00/2.5 gal.	1 – 4 pt.	4.00 – 16.00
Remedy Ultra	71.00.00/gal.	-----	-----
Surmount	162.00/2.5 gal.	1.5 – 6 pt.	12.15 – 48.60
2, 4-D Amine	47.00/2.5 gal.	1 – 4 pt.	2.35 – 9.40
2, 4-D Ester	62.00/2.5 gal.	1 – 4 pt.	3.10 – 12.40

Note: These are estimates of retail prices of commonly-used pasture herbicides and they are intended for use for planning purposes only. They do not include any volume discounts, rebates, etc. Consult your agricultural chemical supplier for current, local prices.

Weed Control in Switchgrass Grown for Biofuel Feedstock

The Tennessee Biofuels Initiative is a unique partnership among the State of Tennessee, The University of Tennessee, Oak Ridge National Laboratory (ORNL), and DuPont Cellulosic Ethanol LLC. The centerpiece of the program is a 250 thousand gallon per year cellulosic ethanol pilot research plant in Vonore. One of the feedstocks used for ethanol production at this plant is switchgrass, and the University of Tennessee has contracted with area producers to grow it. The following weed control suggestions are intended for those producers who are growing switchgrass for biofuel production.

Weed Competition during establishment

Our previous experience with switchgrass establishment for wildlife food plots and subsequent experience with switchgrass grown for biofuel has shown that the stand is slow to establish, and weed problems during the first two years, particularly during year one, can be severe. While it was found that most broadleaf weeds can be effectively managed with existing herbicides used in grass pastures and hay fields, grass weeds such as large crabgrass, broadleaf signalgrass, goosegrass and johnsongrass are more challenging.

Site selection and planning

As with other crops, one of the first steps in a well-planned weed management program begins with site selection and preparation. Because switchgrass is not a strong competitor with weeds during the first two years of growth, producers are encouraged, if possible, to avoid planting switchgrass into fields which have a history of heavy weed pressure. If this is not possible, a number of steps can be taken during the year prior to switchgrass planting to reduce weed pressure. For converted crop fields, producers are encouraged to consider planting these fields to Roundup Ready soybeans during the year prior to switchgrass. This will allow the use of sequential applications of glyphosate to control weeds. For converted pastures with a history of broadleaf weed pressure, several effective herbicide options are available to control broadleaf weeds and still utilize these pastures for grazing during the year prior to switchgrass.

Plant no-till if possible

Because many candidate switchgrass fields in East Tennessee are rolling and subject to soil erosion, producers are encouraged to establish switchgrass using no-till. In converted cropland, apply at least one burndown application of glyphosate or Gramoxone Inteon in the spring prior to planting. As with other no-till crops, make the burndown choice based upon weeds present. For converted pastures where no fall grazing is planned, consider making an application of glyphosate in the fall prior to planting switchgrass. Research at the University of Tennessee has shown that tall fescue is much easier to kill in the fall than in the spring. Also, this same research has shown that soil erosion over the winter is not a problem where a dense tall fescue sod has been killed during the previous fall. Orchardgrass is more difficult to kill than is tall fescue. A follow-up application of glyphosate will likely be needed. Gramoxone Inteon is weak on orchardgrass. Also, a follow-up application may be required the next spring to control winter weeds which can emerge after the fall glyphosate application.

Conventional tillage situations

Certain weeds such as bermudagrass, dallisgrass and broomsedge cannot be effectively controlled in no-till. These are warm season perennial grasses which will be strong competitors with switchgrass seedlings. **Avoid fields which are heavily infested with bermudagrass.** Producers are encouraged to consider tillage in the fall prior to planting switchgrass in fields infested with dallisgrass and broomsedge. Producers are also strongly advised to sow a wheat cover crop following fall tillage so as to reduce soil erosion over the winter. The wheat cover crop may be harvested in spring or easily killed with an application of glyphosate the following spring prior to planting switchgrass.

Herbicides for use in switchgrass

Currently there are no labeled preemergence herbicides for use in switchgrass grown for biofuel in Tennessee, but there are a number of postemergence options. Because of this, producers are encouraged to closely monitor newly-planted fields for weed emergence. While weeds should be controlled while they are small, care must be taken regarding use of most herbicides on small, seedling switchgrass so as to minimize the chances of crop injury. In certain situations, clipping weeds at a height above the switchgrass may be an option to open the canopy and allow sunlight to reach the crop. This will allow the switchgrass to grow to a stage where it will be more tolerant of herbicides such as Pastora. As with other perennial grasses, herbicide tolerance of switchgrass is related to the plant's developmental stage. Plants which have developed a healthy secondary root system and which have begun to tiller are tolerant of most labeled herbicides. The following table contains suggested postemergence herbicides for use in switchgrass.

HERBICIDES for USE IN SWITCHGRASS GROWN FOR BIOFUELS

Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
	Active Ingredient	Formulation	
AAtrex 4L (atrazine) Restricted use herbicide Special Local Need 24 (c) Label for the following Tennessee counties only: Anderson, Blount, Bradley, Cumberland, Gibson, Greene, Hamilton, Knox, Loudon, Meigs, McMinn, Monroe, Morgan, Polk, Rhea, Roane and Sevier.	1-2 lb.	1-2 qts.	For use only in the year of establishment or the year following establishment. Apply overtop to control small broadleaf weeds and a limited number of grasses. Use 1 qt./A on soils containing from 1-2% organic matter, and 2 qt./A on soils with 2% or more organic matter. Use only on loam, silt loam, silty clay loam, clay loam, and silty clay soils with at least 1% organic matter. Add crop oil concentrate at the rate of 1 gal./100 gal. of spray mix. <u>Do not feed treated switchgrass for hay or allow cattle to graze on areas that have been treated.</u>
Cimarron Plus (metsulfuron+Chlorsulfuron)a	0.06 + 0.019 oz. to 0.3+0.094 oz.	0.125-0.625 oz.	Apply at 0.125-0.2 oz./A anytime after emergence of switchgrass during the year of establishment. Higher rates can be used once switchgrass is established (second or later years after planting). See label. Add nonionic surfactant at 1 to 2 pts./100 gal. of spray mix. Do not apply with crop oil concentrate. There are no grazing or hay restrictions for Cimarron Plus.
Pastora 71.2 WG (Nicosulfuron + metsulfuron)	0.56+0.15 oz. To 0.84+0.23 oz.	1-1.5 oz.	Pastora is a premixture of the active ingredients in Accent and Escort herbicide. Apply overtop to control johnsongrass, broadleaf signalgrass, barnyardgrass, fall panicum, foxtails and many broadleaf weeds. Does not control crabgrass nor dallisgrass. Always add nonionic surfactant at 1 qt./100 gal. of spray mix. Noticeable growth reduction and discoloration following application usually occurs, but bermudagrass will recover. Injury may be reduced by applying when bermudagrass has less than 2 in. of new growth following green-up, or within 7 days following hay harvest. Pastora has no grazing nor hay cutting restrictions.
2,4-D Amine 4L	0.5- 0.75 lb.	1- 1.5 pts.	Can be used on seedling switchgrass for control of cocklebur, ragweed, pigweed, sicklepod and a few other summer annual weeds. Apply when weeds are less than 4 in. tall and actively growing. Do not apply if seedling switchgrass does not show good vigor. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
GrazonNext HL (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.2-2.1 pts.	During the year of establishment, apply after switchgrass has begun to tiller and develop a good secondary root system. Do not apply if switchgrass does not show good vigor. Use for control of thistles, cocklebur, pigweeds, ragweed, sicklepod, horsenettle, tall ironweed, and several others. See label for individual weed rates. Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
Milestone (Aminopyralid)	0.063 - 0.11 lb.	4 - 7 oz.	For use primarily in areas where 2,4-D drift is of concern. During the year of establishment, apply after grasses have begun to tiller and develop a secondary root system, and show good vigor. Use for control of thistles, cocklebur, pigweeds, ragweed, sicklepod, horsenettle, tall ironweed, and several others. A limited number of weeds such as cocklebur and smartweed may be controlled with 3 oz. /A. See label for individual weed rates. Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
PastureGard or PastureGard HL (triclopyr + fluroxypyr)	0.38 + 0.13 - 0.57 + 0.195	2- 3pts. PastureGard or 1-1.5 pts. PastureGard HL	For use in converted pastures or other fields where sericea lespedeza, brambles and woody plants are troublesome. Apply in summer after plants have fully leafed out. Always add nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix. For spot sprays, mix at the rate of 1 gal. of PastureGard, or 2 qts. of PastureGard HL, + 1 qt. of nonionic surfactant / 100 gal. of spray mix and spray to thoroughly wet the foliage.

WEED MANAGEMENT IN FARM PONDS

G. Neil Rhodes, Jr. and Ronald E. Blair, Extension Director Henderson Co.

Introduction

Ponds are valuable resources in our state. Many producers and landowners rely on them for watering livestock, irrigating tobacco, vegetables and other crops, recreational fishing and swimming. Aquatic plants (algae and higher plants) are essential for a balanced aquatic ecosystem. First and foremost, plants (particularly planktonic algae) provide oxygen for fish and other aquatic animals, and they provide cover and breeding habitat for these same organisms. Unfortunately, this balance is often hard to maintain and aquatic plants can become weeds due to excessive growth.

Aquatic weeds may be divided into four general groups: algae (planktonic, filamentous); floating weeds (duckweed, watermeal, water hyacinth, etc.); submersed weeds (naiads, pondweeds, coontail, hydrilla, watermilfoil, etc.); and emersed or marginal weeds (cattail, waterlilies, grasses, arrowhead, etc.).

Aquatic weed management begins with pond construction. Ponds which have extensive areas of shallow (less than 2 feet deep) water are prone to have weed problems due to ready penetration of sunlight to the bottom of the pond. Planktonic algae growths can actually reduce certain submersed weed problems in properly constructed ponds due to shading of the bottom. This is one of the reasons why fertilization of farm ponds is recommended. Fertilization must, however, be done properly. For information on farm pond fertilization, please obtain a copy of Publication 1231 - *Management of Farm Ponds in Tennessee* from your local county extension office. In general, aquatic weeds grow in response to nutrient inputs. Ponds which receive runoff from livestock holding areas or fertilized fields, or ponds where livestock have free access will usually have weed problems every year. The most common problems in these areas are algae (planktonic and filamentous), duckweed and watermeal. Herbicide treatments will only provide temporary control. Grass carp may be useful for biological control of certain aquatic weeds. In general, these plant-eating fish are much more effective on submersed weeds than on emersed or floating weeds. Information on grass carp and stocking rates may be found also in Publication 1231. Also, consider contacting the Southern Regional Aquaculture Center (<http://srac.tamu.edu>) for a complete listing of current aquatic weed control fact sheets.

Herbicides

Triploid Hybrids

New ponds can be stocked with 2- to 6-inch grass carp at a rate of 5 fish/acre as a preventative measure. In ponds with existing bass populations, grass carp at least 8 to 10 inches long must be stocked to avoid having them eaten by the bass. If you have a problem with a weed that grass carp are known to consume, stocking rates of at least 15 to 30 fish/acre are required to provide control within a year or two. When more immediate results are required, applying a herbicide followed by stocking of grass carp (once the treated weeds have decomposed) may be the best option. Grass carp are capable of fast growth and can reach 20 to 25 pounds in weight. As these fish become older and mature, their rate of weed consumption declines, and additional fish should be stocked every 3 to 5 years.

Aquashade

Aquashade is a non-toxic dye that controls filamentous algae by blocking light penetration for up to six weeks after application. It may be used in lakes, ponds, ornamental ponds and fountains, and commercial fish ponds that have little or no outflow. Apply 1.0 gallon of Aquashade per one acre of water that averages 4.0 feet deep in the early spring before weed growth begins, or apply when plants are seen on the bottom of the pond. Additional applications will be necessary through the year. Aquashade is non-toxic to livestock.

Watermeal

A surface layer of this floating weed will prevent sunlight from reaching into the pond. As a result, algae and submerged plants can no longer produce oxygen through photosynthesis. This lack of oxygen can greatly stress or even kill fish. This plant is typically found in nutrient rich environments ranging from trees around the edge, failing septic fields, or livestock (including waterfowl) waste. Bottom sediments will be black and have a disagreeable odor. Watermeal can be spread to ponds by "hitchhiking" on livestock, pets, and birds. Herbicidal control has not been consistent. Reducing nutrient loading and consider using tilapia. Tilapia, however, will not overwinter in Tennessee. Restocking will be required.

Filamentous Algae

This group of algae, commonly referred to as "pond scum" or "moss", form mats on the pond surface in early spring. This algae usually begins along edges or in the bottom, often attached to underwater structure. The use of copper complexes, including granules, have given excellent control to most species when applied to the area in early spring. Barley straw applied at 250 pounds/acre has shown mixed results.

Aquatic herbicides should be used only as a last resort. The use of these chemicals is very restrictive due to use of water for domestic consumption, livestock watering, irrigation, swimming and fishing. **It is essential that aquatic herbicides be used in strict accordance with label directions.** Also, just because a herbicide is labeled for one aquatic site does not mean that it can be used in all aquatic situations. For example, some materials are labeled for ditchbanks, but not for ponds or lakes. Most herbicides also have specific waiting periods between application and various uses of the water (fishing, irrigation, livestock watering, etc.). **Be sure to thoroughly read the label prior to purchasing aquatic herbicides. Do not attempt to use them if you do not understand the instructions on the label, or if you do not intend to follow them.** Most aquatic herbicides, when used according to the label, are not toxic to fish. The greatest risk of harm to fish comes from oxygen depletion which occurs as the weeds

die. **Applications should be made early in the season.** At this time, weeds are actively growing, the amount of vegetation for decay is lower, and the cooler water generally contains higher levels of dissolved oxygen. Most aquatic weeds begin growth in the early spring when water temperatures are 55 to 60 F. **Early treatment, treatment of only portions of the pond at one time, and mechanical aeration will reduce the risk of oxygen depletion.**

Copper Sulfate

Copper sulfate is recommended for algae control in this publication. However, even the low rates listed on the label for “soft” waters could cause a fish kill in very low alkalinity waters common in Tennessee farm ponds, particularly if large areas are treated at one time. Trout are particularly sensitive to copper.

Where loss of fish is of concern, it is important to check the total alkalinity of the water before recommending treatment with copper sulfate. If the alkalinity is below 50 mg/L, copper sulfate should not be used. It is important to treat only one-third of a body of water at a time to avoid dissolved oxygen problems or direct toxicity to fish. Fish can sense copper in the water and will move away from treated areas. Mechanical aeration will reduce the risk of oxygen depletion.

Aquatic herbicide rates are expressed in different ways, depending on the individual chemical. Some are expressed as amount of chemical per surface acre of water, and others are expressed as amount per acre-foot of water. One acre-foot of water is one surface acre of water, one foot deep. For example, a three-acre pond averaging five feet deep would contain 15 acre-feet of water. Other rates are expressed as parts per million (ppm). One ppm is 2.7 lbs. of chemical per acre foot.

RESTRICTIONS AND WAITING PERIODS

Herbicide	Restrictions
Copper sulfacte	No restrictions on use of treated water. If treated water is to be used as a source of potable water, the copper residual must not exceed 1 ppm (4 ppm copper sulfate pentahydrate). Check tolerance of crop to copper applied in irrigation water. Trout are very susceptible to copper. Toxicity to other fish increases with decreasing hardness of water.
Reward (Diquat)	Fishing and Swimming: no restrictions. Livestock Watering: 24 hrs. Human consumption, and use of treated water for irrigating turf and ornamentals: 3 days for 2 gal./surface acre; 2 days for 0.75 to 1.0 gal./surface acre; 1 day for 0.5 gal./surface acre or less. Irrigating food crops: 5 days, regardless of rate.
Navigate (2,4-D)	Do not apply to water used for irrigation, agricultural sprays, watering dairy animals or domestic water supplies.
Rodeo (Glyphosate)	Do not apply within 0.5 mile of an active, potable water intake. No restrictions on the use of treated water for irrigation, recreation or domestic purposes.
Sonar (Fluridone)	Fishing, Swimming, Livestock Watering: no restrictions. Irrigation restrictions are based upon concentration in water. See label. A waiting period of 30 days may not be adequate for sensitive crops such as tobacco, tomatoes and peppers.

AQUATIC HERBICIDES FOR WEED CONTROL IN FARM PONDS

Weed	Herbicide	Amount of Formulation	Precautions and Remarks*
ALGAE, blue-green	Copper sulfate (various)	3-6 lb/acre foot see label	Apply as a surface spray dissolved in at least 3-5 gals. of water. For best results, apply on a clear day. Do not apply to muddy water. Warning: Copper is toxic to fish.
ALGAE, filamentous, planktonic, chara, etc.	Copper sulfate (various)	3-6 lb/acre foot see label	Same as under Algae, blue-green. For best results break up floating mats of filamentous algae before treatment. Warning: Copper is toxic to fish.
	Reward (Diquat)	2 gal/surface acre see label	For suppression of certain filamentous algae - <i>Pithophora</i> spp. and <i>Spirogyra</i> spp. Check label for application instructions. For best results, break up floating mats before treatment.
Submersed Weeds	Reward (Diquat)	2 gal/ surface acre see label	Weeds controlled: bladderwort, coontail, elodea, naiads, pondweeds. Apply early in season by pouring directly into water in strips or as a diluted spray in water. Not effective in muddy water.
	Navigate (2,4-D)	100-200 lb/surface see label	Rate depends upon weed to be controlled and depth of water. Check labels for species and rates. Apply uniformly with a rotary seeder.
Floating Weeds (except watermeal)	Reward (Diquat)	0.5-0.75 gal/ surface acre see label	Weeds controlled: pennywort, salvinia, waterhyacinth, waterlettuce. Apply in a spray volume of 150 to 200 gal of water per acre plus 1 pt. nonionic surfactant per acre. Spray volume may be reduced to 100 gal. for pennywort.
		1 gal/surface acre see label	For duckweed control - apply in a spray volume of 50 to 150 gal of water per acre. Take care to cover all plants on water and damp marginal areas. Will require retreatment. Add nonionic surfactant at 1 pt./acre.
Floating Weeds (duckweed and watermeal)	Sonar (Fluridone)	See label	Apply maximum labeled rate for the average depth of pond. Do not apply when there is substantial outflow from the pond. Take care to cover all plants in damp and marginal areas. Not effective as a spot treatment. See label for other weeds controlled.
Emersed and Marginal Weeds	Navigate (2,4-D)	150-200 lb/surface area see label	Weeds controlled: spatterdock, waterchestnut, water lily, watershield. Rate depends upon species and depth of water. Check label. Apply early, when weeds are actively growing with a rotary seeder. Spatterdock may require retreatment.
	Reward (Diquat)	1 gal/surface area see label	For control of cattails in ponds or lakes. For top kill, apply in 100 gal of water per acre with 1 pt. nonionic surfactant. Apply before flowering for best results. Thorough coverage is necessary. Retreat as needed.
	Rodeo 5.4 lb/gal (Glyphosate)	see label	For control of cattail, spatterdock, American lotus, waterprimrose and several other aquatic weeds, prepare a 0.75% by volume spray mixture (3 qts./100 gal. of spray mix) and spray to wet foliage. For cattail control, apply at or following the bloom stage. Always add a nonionic surfactant, labeled for use with herbicides, at 2 qts./100 gal. of spray mix.

*Also see comments for specific herbicides under "Restrictions and Waiting Periods."

Sprayer Calibration

Accurate application of herbicides is essential to adequately control weeds, avoid excessive crop injury and to get the most for your investment in chemicals. This has become even more critical in recent years as we have seen some herbicide rates go from pounds per acre to fractions of one ounce per acre. Sprayer calibration, unfortunately, is often neglected or avoided. There are many ways to calibrate a sprayer, some more difficult than others. The bottom line is if you have a reliable method with which you are comfortable, stick with it. The following information is provided as a guide to a couple of simple, straightforward methods.

Regardless of the method, sprayer calibration should be done with clean water, not with the chemical mix in the spray system. Prior to beginning calibration, thoroughly clean your sprayer. Procedures for this are outlined on page 87 of this publication. Also, be sure to check for nozzle uniformity, as defects or uneven wear may cause some nozzles to put out significantly more than others of the same type. To do this, catch and measure the output of *each* nozzle for a specific length of time (30 seconds, 1 minute, etc.) and determine the average output per nozzle (total combined output of all nozzles divided by the number of nozzles). Discard and replace any nozzle that varies more than 5 percent from the average.

Spray-an-acre method

This is perhaps the most direct method. The procedure is as follows:

1. Measure and flag the boundaries of one acre of ground similar to your fields.
2. Select a gear and engine speed combination which will allow you to comfortably drive across your fields and develop adequate spray pressure for the particular spray nozzles on your rig.
3. On level ground, fill the spray tank completely or to a recorded mark on the tank or sight gauge.
4. With the sprayer operating, drive the rig over the measured acre while spraying water at the preselected engine speed and gear combination.
5. Return to the level spot where you filled the sprayer. Measure how many gallons of water it takes to refill the sprayer or to return the water level to your recorded mark. This number of gallons equals gallons per acre.

A modification of this procedure involves spraying one-half acre. Follow the above procedure and multiply the gallons required to refill by 2.

1/128 acre method

This is perhaps the most frequently used and quickest method of calibration. Unlike the previous method, it involves measuring a specific driving distance rather than an area. Follow these steps to calibrate by the 1/128 acre method.

1. Measure a specific distance in a field according to the table below. Select a driving distance which matches the nozzle spacing on your boom (for broadcast sprays) or row spacing you use (for band applications). The distance should be measured in a field typical of those you will be spraying.

Nozzle or Row spacing (inches)	Distance to time for calibration (feet)	Nozzle or Row spacing (inches)	Distance to time for calibration (feet)
40	102	26	157
38	107	24	170
36	113	22	185
34	120	20	204
32	127	18	227
30	136	16	255
28	146	14	291

2. Select a gear and engine speed combination which will allow you to comfortably drive across your fields and develop adequate spray pressure for the particular nozzles on your rig. Drive the measured distance at the preselected gear and engine speed combination and record the time required to drive the distance in seconds. To improve precision, you may want to time two separate runs and take the average of two runs.
3. Park the sprayer and using a measuring cup or bucket, catch the spray output from a single nozzle for the length of time it took you to drive the measured distance in step one. Be sure the sprayer is running at the same engine speed and spray pressure. Note: For banding rigs where you used row spacing to determine the distance in step 1 and where more than one nozzle is directed to the row, catch the output for *all* nozzles directed to a single row.
4. The total amount of water, measured in ounces, collected per nozzle or row in step 3 equals gallons per acre (GPA).

Determining how much chemical to add to the tank

Now that you have successfully calibrated your sprayer, the next step is to determine how much chemical you need to add to the tank.

1. Divide the tank capacity by gallons per acre to calculate the number of acres a full tank can spray.

$$\frac{\text{Tank capacity (gallons)}}{\text{GPA}} = \text{Number of acres covered by one full tank}$$

2. Multiply the recommended herbicide rate (pts./A, oz./A, lbs./A, etc.) by the number of acres covered by a full tank.
3. Note: All herbicide rates in this weed control manual are expressed as *broadcast rates*. For band applications, you must adjust the rate using the following formula:

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

Use the previous formula to adjust rates if you have calibrated your sprayer on a *row width* basis for band applications.

Calibration Examples

Broadcast Application

A producer plans to spray Gramoxone Max plus nonionic surfactant for burndown on corn ground. His sprayer has a uniform nozzle spacing of 18 inches. He has thoroughly cleaned his sprayer and replaced all nonuniform nozzles.

1. From the chart, note that the distance to drive is 227 feet. Measure this distance in the field to be sprayed.
2. At the desired engine speed and gear combination, let's assume it took 39 seconds to cover 227 feet. This is 4 mph.
3. At the same engine speed and spray pressure, catch the output in ounces. Our producer caught 20 ounces during the 39 second time period. Output is therefore 20 GPA.
4. After reading the Gramoxone Max label and the weed control manual recommendations for corn, he decides to spray Gramoxone Max at 1.5 pts./A plus nonionic surfactant at 1 qt./100 gallons of spray mix. Let's assume he has a 300 gallon spray tank.

$$\frac{300 \text{ gal per tank load}}{20 \text{ GPA}} = 15 \text{ acres covered by one tank load}$$

$$1.5 \text{ pts./A} \times 15 \text{ acres} = 22.5 \text{ pints (2.8 gallons) of Gramoxone Max per tank load}$$

What about the surfactant?

$$300 \text{ gal.} \times 1 \text{ qt. / 100 gal} = 3 \text{ qts. per tank load}$$

Band Application

A producer wants to apply Staple plus nonionic surfactant in a 19 inch band on 38 inch rows. His banding rig is set up with three nozzles directed to the band on each row. The sprayer has been thoroughly cleaned, and the nozzles are uniform in output.

1. The distance to travel for a 38 inch row is 107 feet. The course is measured and he drives it. Let's assume it took 18 seconds (4 mph).
2. Park the sprayer and at the same engine speed and pressure, collect the output of each of the three nozzles for 18 seconds. If the combined total output of the three nozzles is, for example, 25 ounces, the sprayer is applying 25 gallons per acre.
3. The sprayer has a 200 gallon tank. The *broadcast rate* for Staple is 1.2 oz./A, and nonionic surfactant is to be added at 1 qt./100 gal. of spray mix.

$$\frac{200 \text{ gal. tank}}{25 \text{ GPA}} = 8 \text{ acres covered per tank}$$

4. Now, reduce the rate for a 19 inch band.

$$\frac{19 \text{ inch band}}{38 \text{ inch row}} \times 1.2 \text{ oz./A} = 0.6 \text{ oz.}$$

$$8 \text{ acres} \times 0.6 \text{ oz./A} = 4.8 \text{ oz. Staple per tank}$$

$$200 \text{ gallons} \times 1 \text{ qt./100 gal.} = 2 \text{ qts. nonionic surfactant per tank}$$

Note that since the surfactant rate in this example is based on amount per volume of spray mix, rather than amount per acre, it is calculated the same as for broadcast applications.

Post-Directed and Hood Applications

A producer plans to use a hooded sprayer to make post-directed and hooded applications in his 38 inch row cotton. The producer realizes that the gallons per acre (GPA) under the hood needs to be as close as possible to the GPA of his post-directed band. The hooded rig is set up to use two nozzles post-directing on a 13 inch band and has three nozzles under the hood spraying a 25 inch band.

Scenario 1: One pump applying one tank mix.

1. The distance to travel for a 38 inch row is 107 feet. The course is measured and he drives it. Lets assume it took 18 seconds (4mph).
2. Park the sprayer and at the same engine speed and pressure, collect the output of the three nozzles under the hood for 18 seconds. Combine the output of the three nozzles and measure. The combined total, for example 20 ounces, equals the application rate in GPA. In this case the hoods are applying at 20 GPA.
3. Next, with the sprayer running at the same engine speed and pressure, collect the output of the two post-directing nozzles. Combine the output from these two nozzles and measure. The combined total, for example 13 ounces, equals the application rate in GPA. In this case the post directing nozzles are applying at 13 GPA.
4. Remember, you want the application rate to be the same for both the post-directed and hooded application. To accomplish this, decide which application rate fits your particular needs. In this example we will assume that 13 GPA post-directed is ideal. To get your hooded application to be 13 GPA instead of 20 GPA, reduce the size of the spray tips under the hood and re-run the calibration procedure. Continue this process until your hooded application rate and post-directed application rate are similar.

Scenario 2. Two pumps applying separate tank mixes.

1. The distance to travel for a 38 inch row is 107 feet. The course is measured and he drives it. Lets assume it took 18 seconds (4mph).
2. Park the sprayer and at the same engine speed and pressure, collect the output of the three nozzles under the hood for 18 seconds. Combine the output of the three nozzles and measure. The combined total, for example 18 ounces, equals the application rate in GPA. In this case the hoods are applying at 18 GPA.
3. Next, with the sprayer running at the same engine speed and pressure, collect the output of the two post-directing nozzles. Combine the output from these two nozzles and measure. The combined total, for example 15 ounces, equals the application rate in GPA. In this case the post directing nozzles are applying at 15 GPA.
4. Remember, you want the application rate to be the same for both the post-directed and hooded application. To accomplish this, decide which application rate fits your particular needs. In this example we will assume that 15 GPA post-directed is ideal. To get your hooded application to be 15 GPA instead of 18 GPA, you have two options. First reduce the pressure for the pump applying under the hood. Caution: Be sure that after reducing the pressure the spray tip still produces an acceptable spray pattern. Re-run the calibration procedure. Continue this process until your hooded application rate and post-directed application rate are similar. The second option is to change to a smaller spray tip size under the hood to reduce the application rate to 15 GPA. Then re-run the calibration procedure. Continue this process until your hooded application rate and post-directed application rate are similar.

SUMMARY OF HERBICIDE MECHANISM OF ACTION ACCORDING TO THE WEED SCIENCE SOCIETY OF AMERICA (WSSA)

Site of Action Group	Herbicide Mode of Action
1	Acetyl CoA Carboxylase (ACCase) Inhibitors
2	Acetolactate Synthase (ALS) or Acetohydroxy Acid Synthase (AHAS) Inhibitors
3, 15, 23	Mitosis Inhibitors
4	Synthetic Auxins
5, 6, 7	Photosystem II Inhibitors
8, 16	Fatty Acid and Lipid Biosynthesis Inhibitors
9	Enolpyruvyl Shikimate-3-Phosphate (EPSP) Synthase Inhibitors
10	Glutamine Synthetase Inhibitors
11, 12, 13, 27	Carotenoid Biosynthesis Inhibitors
14	Protoporphyrinogen Oxidase (PPG Oxidase or Protox) Inhibitors
17, 25, 26	Potential Nucleic Acid Inhibitors or non-descript mode of action
18	Dihydropteroate Synthetase Inhibitors
19	Auxin Transport Inhibitors
20, 21, 28, 29	Cellulose Inhibitors
22	Photosystem I Inhibitors
24	Oxidative Phosphorylation Uncouplers

www.wssa.net/weeds/resistance/heribicidemoaclassification.pdf

RAINFREE REQUIREMENT FOR POSTEMERGENCE HERBICIDES

Trade Name	Restrictions
Accent Q	Accent Q is rainfast in 4 hours.
Achieve Liquid	Achieve is not affected by rain falling 1 hour or more after application.
Aim EC	To avoid significant crop response, applications should be made within 6-8 hours of either rain or irrigation.
Ally XP	Weed control may be reduced if rainfall or snowfall occurs within 4 hours after application.
Assure II	Assure II is rainfast 1 hour after application.
Atrazine	No information on label.
Authority First	Half inch of rainfall is required for activation.
Axial XL	Axial XL herbicide applied alone is not affected by rain falling 30 minutes or more after application.
Axiom DF	Excessive rainfall after application may cause crop injury to young seedlings.
Banvel	No information on label.
Basagran	Rainfall or overhead irrigation within 4 hours after application may reduce the effectiveness of Basagran.
Beacon	Rainfall occurring within 4 hours after Beacon application may reduce weed control.
Buctril	No information on label.
Butyrac 200	No information on label.
Callisto	No information on label.
Canopy	When used for burndown, Canopy is rainfast after 1 hour
Canopy EX	Do not apply if rain is expected in 2 hours
Celebrity Plus	For best performance, rainfall or irrigation should not occur for 4 hours after application.
Cimarron Plus	Weed and brush control or suppression may be reduced if rainfall occurs within 4 hours after application.
Clarity	Rainfall or irrigation occurring within 4 hours after postemergence applications may reduce the effectiveness of Clarity.
Classic	Do not apply Classic if rain is expected within 1 hour or weed control may decrease.
Cobra	Under conditions of normal weed growth Cobra is rainfast in 30 minutes after application.
Crossbow	No information on label.
Distinct	Distinct is rainfast 4 hours after application when used with the recommended adjuvants.
Durango	Heavy rainfall soon after application may wash off product off of the foliage and a repeat application may be required for adequate control.
Envoke	Envoke is rainfast within 3 hours of application.
ET	1 hour
Equip	Equip is rainfast in 2 hours.
Extreme	Extreme should be applied a minimum of 1 hour before rainfall or overhead irrigation.
Finesse Cereal and Fallow	Rainfall is needed to move Finesse into the soil. Postemergence weed control may be reduced if rainfall occurs within 6 hours after application.
FirstRate	FirstRate is rainfast in 2 hours.
First Shot SG	No information on label
Flexstar	Flexstar requires a 1-hour rainfree period for best results.
Flexstar GT	Heavy rainfall or irrigation shortly after application may reduce performance.
Frontrow	Frontrow is rainfast in 2 hours.
Fusilade DX	Do not apply Fusilade DX herbicide if rainfall is expected within 1 hour.

Trade Name	Restrictions
Gangster FR	Rainfast 2 hours after application.
Ganster V	Rainfast 2 hours after application.
Goal	No information on label.
Gramoxone SL	Because Gramoxone SL is rapidly absorbed by the weed foliage, rain occurring 30 minutes or more after application will have no effect on the activity of Gramoxone SL. Sufficient rainfall or sprinkler irrigation to cause washoff prior to planting may be needed to prevent damage to the crop.
Harmony Extra SG with TotalSol	Several hours of dry weather are needed to allow Harmony Extra SG to be sufficiently absorbed by weed foliage.
Harmon SG with TotalSol	Weed control may be reduced if rainfall or snowfall occurs soon after application. Several hours of dry weather are needed to allow Harmony SG to be sufficiently absorbed by weed foliage.
Hoelon	No information on label.
Hornet	Hornet is rainfast in 2 hours.
Impact	Should be applied a minimum of 1 hour before rainfall/irrigation
Intro	Excessive rainfall or excessive irrigation after application may reduce control.
Karmex	Moisture is required to activate the herbicide: Best results occur if rainfall (or sprinkle irrigation) occur within 2 weeks after application.
Laudis	Rainfast 1 hour after application
Leadoff	Residual weed control is dependent on rainfall or irrigation for herbicide activation.
Lexar	If a significant rainfall does not occur within 7 days after application, weed control may be decreased.
Liberty	Liberty is rainfast 4 hours after application to most weed species, therefore, rainfall within 4 hours may necessitate retreatment or may result in reduced weed control.
Lightning	Lightning should be applied a minimum of 1 hour before rainfall or overhead irrigation.
Linex	Since moisture is needed to activate Linex, rainfall or irrigation is needed within 2 weeks of application.
Lumax	If a significant rainfall does not occur within 7 days after application, weed control may be decreased.
Marksman	Rainfall or irrigation occurring within 4 hours after postemergence applications may reduce the effectiveness of Marksman herbicide.
MSMA	No information on label.
Osprey	Rainfast 4 hours after application. Rainfall within 4 hours may result in reduced weed control.
Parrlay	If at least one-half inch of rainfall does not occur within 10 days after application, cultivate with a rolling cultivator or similar implement that provides uniform shallow incorporation of this product.
Permit	Rainfall or irrigation occurring within 4 hours after application may reduce effectiveness.
Poast	Poast is rainfast 1 hour after application.
Poast Plus	Poast Plus is rainfast 1 hour after application.
Power Flex HL	Rainfast within 4 hours after application
Prowl H2O	It is most effective in controlling weeds when adequate rainfall or overhead irrigation is received after application.
Pursuit	Pursuit should be applied a minimum of one hour before rainfall or overhead irrigation.
Raptor	Raptor should be applied a minimum of 1 hour before rainfall or overhead irrigation.
Realm Q	No information on label.
Reflex	Reflex herbicide requires a 1 hour rainfree period for best results.
Resource	Resource is rainfast 1 hour after application.
Roundup Power Max Roundup WeatherMax/ Glyphos/Glyphomax Plus (Roundup Ready)	Heavy rainfall soon after application may wash this product off of the foliage and a repeat application may be required for adequate control.
Scepter	No information on label.
Select	Do not apply if rain is expected within 1 hour of application as control may be unsatisfactory.
Select Max	Apply under favorable soil moisture and humidity that exist a few days after rainfall or within 7 days after irrigation.
Sequence	Heavy rainfall or irrigation shortly after application may require retreatment.

Trade Name	Restrictions
Sonic	Rainfall or irrigation is required to activate the herbicide.
Staple LX	Rainfall (0.5- 1 inch) following the postemergence application is required for residual control.
Status	Rainfast 4 hours after application
Steadfast Q	Steadfast is rainfast in 4 hours.
Steadfast ATZ	Steadfast ATZ is rainfast in 4 hours.
Storm	Rainfall or overhead irrigation within 4 hours after application may reduce the effectiveness of Storm.
Suprend	Suprend is rainfast within 3 hours.
Touchdown Total Hi Tech	Heavy rainfall or irrigation shortly after application may require retreatment.
Ultra Blazer	Rainfall or overhead irrigation within 4 hours after application may reduce the effectiveness of Ultra Blazer.
Valor XLT	Rainfast 1 hour after application.
Verdict	Rainfast 1 hour after application
Yukon	No information on label.
2,4-D	No information on label.

NOTES:

FORAGE, FEED, AND GRAZING RESTRICTIONS FOR HERBICIDES

C-Cor Ct-Cotton S-Soybeans GS-Grain Sorghum W-Wheat

* - Herbicide Tolerant Varieties Only

X = Recommended for use in respective crop in this publication.

Chemical	C	Ct	S	GS	W	Restrictions and Remarks
AAtrex	X			X		Do not graze or feed forage from treated areas for 60 days following application, or illegal residues may result.
Accent Q	X					Do not graze or feed forage, hay, or straw from treated areas to livestock within 30 days of application.
Achieve Liquid					X	Immature crops (forage) maybe grazed or cut for hay 30 days after treatment. Mature straw and grain may be fed to livestock 45 days after treatment.
Aim EC	X				X	Barley, oats and wheat (Forage after 7 days).
Assure II		X	X			Do not graze livestock in treated areas. In addition, do not feed forage, hay, or straw to livestock.
Atrazine	X			X		Do not graze or feed forage from treated areas for 21 days following application.
Authority First			X			Do not feed treated soybean forage or soybean hay to livestock.
Authority MTZ			X			Do not graze treated soybean or harvest for forage or hay.
Authority XL			X			Do not feed treated soybean forage or soybean hay to livestock.
Axial XL					X	Do not graze or feed forage from wheat within 30 days of application.
Axiom DF					X	Do not allow animals to graze treated fields for a minimum of 30 days following application.
Balance Flexx	X					Corn may be grazed 45 days after application.
Banvel	X	X		X	X	Corn may be harvested or grazed for feed once the crop has reached the ensilage (milk) stage or later in maturity. Do not graze or feed treated sorghum forage or silage prior to mature grain stage.
Basagran	X		X	X		(Corn and Grain sorghum) Do not graze treated fields for at least 12 days after the last treatment with Basagran. Do not graze or cut treated soybean fields for forage or hay for at least 36 days after the last treatment of Basagran.
Beacon	X					Do not graze or feed forage from Beacon treated corn to livestock within 30 days after application. Do not harvest silage within 45 days after application.
Bicep II Magnum	X			X		To avoid possible illegal residues, do not graze or feed forage from treated areas for 60 days following application.
Boundary 6 SEC			X			Treated soybean plants may be grazed or fed to livestock 40 days after the last application of Boundary.
Broadaxe			X			Do not rotate to food or feed crops other than those listed on the label. Sunflowers. Do not graze or feed treated soybean forage, hay or straw to livestock for 30 days after treatment.
Buctril	X	X*		X	X	Do not cut crop for feed, fodder, or graze within 45 days of application. (BXN cotton only) Do not graze any portion of crop. Do not cut crop for feed or fodder.
Bullet	X			X		(Corn) Do not graze treated area or feed treated forage to livestock for 60 days following application. (Sorghum) Do not graze or harvest forage for 70 days following application of this product.
Butyrac 200			X			Do not graze or feed soybean hay within 60 days after application of a Butyrac 200 tank mixture application.
Callisto	X					Do not harvest forage, grain, or stover within 45 days after application.
Canopy			X			Do not feed treated soybean forage or soybean hay to livestock.
Canopy EX			X			Do not feed treated soybean forage or soybean hay to livestock. Allow 14 days after application before grazing or feeding forage or hay.
Caparol		X				Do not feed treated forage to livestock, or graze treated areas, or illegal residues may result.
Celebrity Plus	X					Do not apply within 32 days of forage harvest. Do not apply within 72 days of corn grain and stover harvest.
Cinch	X	X	X	X		For all applications to corn, do not graze or feed forage from treated areas for 30 days following application. To avoid possible illegal residues, do not graze or feed forage or fodder from cotton to livestock.
Cinch ATZ	X			X		To avoid possible illegal residues, do not graze or feed forage from treated areas for 60 days following application.

Chemical	C	Ct	S	GS	W	Remarks
Clarity	X	X	X			Corn may be harvested or grazed for feed once the crop has reached the ensilage stage or later in maturity. Do not feed soybean fodder or hay following Preharvest application.
Classic			X			Do not graze treated fields or harvest for forage or hay.
Cobra		X	X			Do not graze animals on green forage or stubble. Do not utilize hay or straw for animal feed or bedding. Do not feed treated soybean silage (ensiled soybeans) to cattle.
Command		X	X			Do not allow livestock to graze on, or feed treated cotton forage or trash to livestock. Cover crops, may be planted anytime but stand reduction may occur in some areas. Do not graze or harvest for food or feed cover crops planted less than 9 months after Command treatment. Do not allow livestock to graze on treated soybean vines or feed treated vine trash to livestock.
Cotoran 4L		X				Do not feed foliage from treated cotton plants or gin trash to livestock.
Cotton Pro		X				Do not allow livestock to feed or graze on treated cotton crops.
Crossbow						Except for lactating animals, there are no grazing restrictions.
Define	X	X				Do not graze or feed to livestock the forage or fodder of cotton. Do not harvest for 75 days for silage
Degree	X					Do not graze area or feed treated forage for 60 days after application.
Degree Xtra	X			X		Do not graze area or feed treated forage for 60 days after application.
Direx		X				Do not allow livestock to graze treated cotton.
Distinct	X					Do not apply within 32 days of corn forage harvest. Do not apply within 72 days of corn grain and stover harvest.
Dual II Magnum	X	X	X	X		For all applications to corn, do not graze or feed forage from treated areas for 30 days following application. To avoid possible illegal residues, do not graze or feed forage or fodder from cotton to livestock.
Durango	X	X	X	X	X	Do not graze or feed corn forage or fodder following applications of this product through hooded sprayers. Do not feed or graze treated areas for 8 weeks following application.
Enlite			X			Do not graze treated fields or harvest for forage or hay.
Envoke		X				No information on label.
ET		X				Do not apply within 7 days of harvest.
Equip	X					Do Not graze within 45 days of application
Extreme			X			Do not graze or feed treated soybean forage, hay or straw to livestock.
Fierce	X					No information on label.
Finesse Cereal and Fallow					X	No grazing restrictions.
FirstRate			X			Do not harvest soybeans for forage or hay for 14 days after application.
First Shot SG						Do not graze livestock in treated areas.
Flexstar GT			X			Do not graze treated areas or harvest for forage or hay.
Frontrow			X			Do not graze or feed treated soybean forage, hay or straw to livestock.
Fusilade DX		X	X			Do not graze or harvest for forage or hay.
Gangster FR			X			Do not graze treated fields or treated forage or hay to livestock.
Gangster V			X			Do not graze treated fields or treated forage or hay to livestock.
Goal 2 XL		X				Do not use any plants treated with Goal herbicide for feed or forage. Do not feed or allow animals to graze on any areas treated with Goal herbicide.
Gramoxone SL	X	X	X	X	X	Do not graze treated areas or feed treated forage to livestock.
Guardsman Max	X			X		Corn may be grazed or fed to livestock at 60 or more days after application of Guardsman Max. Sorghum forage may be grazed or fed to livestock 45 days or more after application of Guardsman Max. Grain and fodder may be harvested and fed 80 days or more after application of Guardsman Max.
Halex GT	X					Do not graze or feed forage from treated area for 45 days of application.

	C	Ct	S	GS	W	Remarks
Harmony Extra SG with TotalSol					X	Allow 7 days between application and grazing of treated areas. In addition, allow 7 days between application & feeding of forage from treated areas to livestock. Allow at least 30 days between application and feeding of hay from treated areas to livestock. Harvested straw may be used for bedding and/or feed.
Harmony SG with TotalSol					X	Allow 7 days between application and grazing of treated areas. In addition, allow 7 days between application & feeding forage or hay from treated areas to livestock. (Harvested straw may be used for bedding or feed).
Harness	X					No information on label.
Harness Xtra	X					For field corn forage use, allow 60 days preharvest interval
Hoelon					X	Do not allow livestock to graze treated fields for 28 days after treatment. Do not harvest forage, hay, or straw from treated fields prior to grain harvest.
Hornet	X					Application must occur before corn reaches 20 inches in height or V6 growth stage and an interval of at least 45 days is required between application and harvest.
Impact	X					Do not graze or feed treated forage for at least 45 days after application.
Instigate	X					Do not graze, feed forage, grain or fodder from treated areas to livestock with 45 days of application.
Intro	X		X	X		Do not graze or harvest forage for 70 days following application of this product or tank mixtures of this product.
Karmex DF		X				Do not allow livestock to graze treated cotton.
Lariat	X			X		(Corn) Do not graze treated area or feed treated forage to livestock for 21 days following application. (Sorghum) Do not graze or harvest forage for 70 days following application of this product.
Laudis	X					Do not graze livestock or harvest corn forage within 45 days of application.
Leadoff	X					Do not graze, feed forage, grain or fodder (stover) from treated areas to livestock with 30 days of application.
Lexar	X					To avoid illegal residues, do not graze or feed forage from treated areas for 45 days following last application.
Lexone			X			Treated forage may be grazed or fed to livestock 40 days after application unless specified otherwise on the companion product.
Liberty 280 SL	X		X			Do not apply herbicide within 60 days of harvesting corn forage and within 70 days of harvesting corn grain and corn fodder. Do not graze treated crop or cut for hay.
Lightning (IR or IT Corn)	X*					Do not graze or feed treated corn forage, silage, fodder, or grain for at least 45 days after application. Only rotational crops harvested at maturity may be used for feed or food.
Linex	X			X		Do not graze treated fields or feed forage from treated areas to livestock. Do not feed gin trash to livestock. Do not graze or feed plants to livestock within 3 months of application
Lumax	X					To avoid illegal residues, do not graze or feed forage from treated areas for 45 days following application.
Marksman	X			X		Corn may be harvested or grazed for feed after it has reached the ensilage (milk) stage or later maturity. Do not graze or feed forage from treated area 21 days or more following application.
MSMA		X				Do not feed foliage to livestock or graze treated areas.
Osprey					X	Do not graze treated areas within 35 days of application.
Outlook	X		X	X		Corn may be grazed or fed to livestock 40 days or more after application. (Soybeans) Do not graze or feed forage, hay, or straw to livestock.
Parrlay		X	X			Do not graze or feed forage or fodder from cotton to livestock. To avoid possible illegal residues, do not feed treated forage or gin trash to livestock, or graze treated areas.
Permit	X			X		Following application to foliage, allow 30 days before grazing domestic livestock, harvesting forage, or harvesting silage.
Poast		X	X			Processed meal may be fed from cotton. (Soybeans) Only processed meal from seed or hay may be fed to animals. Do not graze treated cotton fields and do not feed forage to livestock.
Poast Plus		X	X			Processed meal may be fed from cotton. (Soybeans) Only processed meal from seed or hay may be fed to animals. Do not graze treated cotton fields and do not feed forage to livestock.
Power Flex HL					X	Do not graze treated crop within 7 days of application
Prefix						Do not graze or feed treated forage or hay from soybeans to livestock following or post app. of Prefix.
Princep	X					Do not graze treated areas, or illegal residues may result.

	C	Ct	S	GS	W	Remarks
Prowl/Pendimax 3.3/ Prowl H2O	X	X	X	X		Do not feed forage or graze livestock in treated cotton fields. Livestock can graze or be fed forage from treated corn or grain sorghum after 21 days following application. Livestock can graze or be fed forage from treated soybean fields. Do not feed forage or graze livestock for 75 days after planting wheat or barley in treated land.
Pursuit			X			Do not graze or feed treated soybean forage, hay or straw to livestock. Do not harvest corn (silage, fodder, or grain) for at least 45 days after Pursuit application. Do not graze or feed treated corn forage, silage, fodder or grain for at least 45 days after an application of Pursuit.
Python	X		X			Do not graze or feed treated soybean forage, hay or straw to livestock.
Realm Q	X					Do not graze, feed forage, grain or fodder from treated areas to livestock with 45 days of application.
Reflex			X			Do not graze treated areas or harvest for forage/ hay. Do not graze rotated small grain crops or harvest forage or straw for livestock.
Resource	X		X			(Corn) Do not graze animals on green forage or use as feed less than 28 days after Resource application. (Soybeans) Do not graze treated fields or harvest for forage or hay.
Resolve						Do not graze, feed forage, grain or fodder within 30 days of app.
Roundup WeatherMax	X	X	X	X	X	For broadcast postemergence treatments do not harvest or feed treated vegetation for 8 weeks following application unless otherwise specified. Preharvest Wheat- Stubble may be grazed immediately after harvest. Allow 7 days between application and grazing. Allow a minimum of 7 days between application and harvest or feeding of treated vegetation. Do not graze or harvest treated hay or fodder for livestock feed within 25 days of last preharvest application.
Roundup WeatherMax (Roundup Ready)	X*	X*	X*			Allow a minimum of 50 days between application and harvest of corn forage. Allow a minimum of 14 days between final application and harvest of soybean grain or feeding of soybean grain, forage or hay.
Scepter 70 DG			X			Do not graze or feed treated soybean forage, hay or straw to livestock.
Select/Select Max		X	X			Do not graze treated fields or feed treated forage or hay to livestock.
Sencor	X		X		X	Soybean vines or hay treated with Sencor may be grazed or fed to livestock 40 days after application. Do not graze wheat treated fields for 14 days following application. Corn treated with Sencor may be harvested for silage or grain 60 days after treatment.
Sequence		X	X			Do not graze or feed forage or fodder from treated cotton to livestock. Do not feed Sequence-treated soybean forage or hay following a postemergence application.
Sharpen				X		Small grain forage and hay can be fed or grazed 30 or more days after application. Soybean forage may be fed or grazed 65 or more days after application.
Sonic			X			Do not feed treated soybean forage or soybean hay to livestock.
Spartan Charge						Do not graze or feed forage harvested from Spartan Charge treated areas. Sod.
Staple LX		X				No information on label
Status	X					
Steadfast Q	X					Do not graze or feed forage, hay, or straw from treated areas to livestock within 30 days.
Steadfast ATZ	X					Do not graze or feed forage, hay, or straw from treated areas to livestock within 30 days.
Storm			X			Do not use treated plants for feed or forage.
Suprend		X				Do not feed treated forage to livestock or graze treated fields.
Surpass	X					No information on label.
TopNotch	X					No information on label.
Touchdown Total/ Hi Tech	X	X	X	X	X	For broadcast postemergence treatments, do not harvest or feed treated vegetation for 8 weeks following application, unless otherwise specified.(Soybean) Allow at least 25 days before grazing or harvesting for livestock feed following harvest aid application. Do not feed or graze treated cotton forage or hay following preharvest application. Do not graze or harvest for forage or hay or fodder following hooded sprayer application.

	C	Ct	S	GS	W	Remarks
Touchdown Total (Roundup Ready)	X*	X*	X*			(Soybean) Do not graze or harvest for forage or hay. Allow a minimum of 50 days between postemergence application and harvest of forage. Do not feed or graze treated cotton forage or hay following preharvest application. Do not graze or harvest for forage or hay or fodder following hooded sprayer application.
Treflan 4 / Tri-4	X					Do not apply 6 weeks prior to harvesting forage.
Ultra Blazer			X			Do not use treated plants for feed or forage.
Valor/Valor XLT			X			Do not graze treated fields or feed treated forage or hay to livestock.
Verdict	X		X	X		Corn forage and silage can be harvested, fed, or grazed 80 or more days after application. Sorghum forage/graze 70 or more days.Soybeans: DO NOT graze or feed forage, hay, or straw to livestock.
Yukon	X					Following application to foliage, corn may be grazed or harvested for feed after the crop reaches the ensilage (milk) stage, at least 30 days after foliar application.
Zidua	X					No information on label.
2,4-D	X			X	X	Do not forage or feed corn fodder for 7 days following application. Do not forage or graze treated grain fields within 14 days after treatment. Do not feed treated straw to livestock.

POSTEMERGENCE HERBICIDE PREHARVEST INTERVALS (PHI) IN D (DAYS)

Chemical	Corn	Cotton	Soy	Grain Sorghum	Wheat	Remarks
Aatrex						No information on label.
Accent Q						No information on label.
Achieve Liquid					60 D	
Aim EC		7D	**	***	****	** Soybeans must have 3 trifoliates or less, *** grain sorghum<6 collars, **** prior to jointing stage.
Assure II		80 D	80 D			Do not apply to soybeans after pod set.
Atrazine						No information on label.
Authority First			65 D			Allow 65 days between application and harvest of soybeans.
Axial XL					60D	Do not harvest grain for 60 days after application.
Axiom DF						No information on label.
Balance Flexx	45 D					
Banvel						Corn may be harvested or grazed for feed once the crop has reached the ensilage (milk stage) or later in maturity.
Basagran						Do not apply to sorghum that is heading or blooming.
Beacon	60 D					Do not harvest grain 60 days after application.
Boundry 6.5 EC						
Buctril		75 D*				
Butyrac 200			60 D			
Callisto	45 D					
Canopy EX						No information on label.
Caparol						No information on label.
Capreno	45 D					
Canopy						No information on label.
Celebrity Plus	72 D					
Cinch			90 D			
Clarity			14D			Corn may be harvested or grazed for feed once the crop has reached the ensilage (milk stage) or later in maturity.
Classic			60 D			Classic may be applied anytime after the first trifoliolate has opened, but no later than 60 days before soybean maturity.
Cobra		70 D	45 D			Do not apply Cobra less than 45 days before harvesting soybeans or after growth stage R6 (full seed).
Cotoran		60 D				
Cotton Pro						No information on label.
Corvus	45 D					
Crossbow						Do not harvest hay for 14 days.
Degree Xtra	60D					Preharvest Interval for forage.

Chemical	Corn	Cotton	Soy	Grain Sorghum	Wheat	Remarks
Direx						No information on label.
Distinct	72D					
Durango		7D	7D		7D	Applications must be made at least 7 days prior to planting corn.
Enlite						No info on label
Envive						No info on label
Envoke		60 D				
Equip	70D					
Extreme			85 D			Extreme applications should be made before soybean bloom.
Finesse						No info on label
FirstRate			65 D			Prior to 50% flowering of soybeans.
First Shot SG						
Flexstar			45D			Apply Flexstar before soybeans bloom. Do not apply within 45 days of harvest.
Flexstar GT			45D			
Frontrow			70 D			
Fusilade DX		90 D				Make the last Fusilade DX herbicide application to soybeans before bloom. Do not apply to cotton after boll set.
Glyphos/Glyphomax Plus (Harvest Aid)	7 D	7 D	7 D	7 D	7 D	Apply after the hard-dough stage of grain (30% or less grain moisture) and at least 7 days prior to harvest.
Glyphos/Glyphomax Plus (Roundup Ready)	7 D	7 D	14 D			
Gangster FR						No information on label.
Gangster V						No information on label.
Goal 2 XL		90 D				Do not apply within 5 days of harvest.
Gramoxone SL	7 D	3 D	15 D			Allow 7 days between application and harvest of corn. Allow 3 day between application and harvest of cotton. Allow 15 days between application and harvest of soybeans.
Halex GT						
Harmony Extra SG with TotalSol					45 D	
Harmony SG with TotalSol						No information on label.
Hornet	85 D					If field corn is grown for forage or ensilage, application must occur before corn.
Impact						Do not apply within 45 days of harvest.
Instigate	None					
Integrity	80 D					
Intro			70 D	70 D		Allow 70 days between application and harvest of soybeans and grain sorghum.
Karmex DF						No information on label.
Laudis						No information on label.
Lexar	60 D					Allow 60 days between application and harvest of corn.
Liberty 280 SL		70 D*				
Lightning	45 D*					
Linex 4L	57 D	76 D				Do not apply within 76 days of harvest.
Lumax	60 D					Allow 60 days between application and harvest of corn.

Chemical	Corn	Cotton	Soy	Grain Sorghum	Wheat	Remarks
Marksman	60 D					Corn may be harvested or grazed for feed once the crop has reached the ensilage (milk stage) or later maturity.
MSMA						Apply only when cotton is 3 inches high to first bloom. Do not apply after first bloom.
Poast Plus	60D	40 D	75 D			
Optill			85 D			
Osprey					30D	Do not apply within 30 days of harvesting wheat.
Parrlay	90 D	90 D	90 D	90 D		Allow 90 days between application and harvest of soybeans
Permit						No information on label.
Poast	60D	40 D	75 D			
Power Flex HL					60D	Do not apply within 60 days of harvest. Do not cut the treated crop for hay within 28 days of application.
Prefix						Do not apply within 90 days of harvest
Prowl/Pendimax 3.3	60D	60D	60D	60D		Allow 60 days between application and harvest of corn, cotton, grain sorghum, and soybeans.
Prowl H2O	60 D	60 D	60 D	60 D		Allow 60 days between application and harvest of corn, cotton, grain sorghum, and soybeans.
Pursuit			85 D			Pursuit applications should be made before soybean bloom.
Raptor			85 D			Raptor application must be made before soybean bloom.
Realm Q	70D					
Reflex						Apply Reflex before soybeans bloom.
Resolve						Do not apply to field corn grown for seed.
Resource						Do not apply Resource to field corn after the 10-leaf stage.
Roundup PowerMax (Harvest Aid)	7 D	7 D	7 D	7 D	7 D	Apply after the hard-dough stage of grain (30% or less grain moisture) and at least 7 days prior to harvest.
Roundup PowerMax (Roundup Ready)	7 D	7 D	14 D			
Scepter 70 DG		90 D				
Select		60 D	60 D			
Select Max		60 D	60 D			Allow 60 days between application and harvest of soybeans. Allow 30 days between application and harvest of cotton.
Sencor	60 D	70 D		21 D		
Sequence		100 D				Do not harvest within 100 days of postemergence application of Sequence.
Sonic			65 D			Allow 65 days between application and harvest of soybeans.
Staple LX		60 D				Allow 60 days between application and harvest of cotton.
Status	32D					Allow 32 days after the application to harvest corn.
Steadfast Q						No information on label.
Steadfast ATZ						No information on label.
Storm			50 D			
Suprend		60 D				
Touchdown IQ/ Total IQ/ Hi Tech (Harvest Aid)	7 D	7 D	7 D	7 D	7 D	Must be made at least 7 days before harvest of corn, cotton, soybean, grain sorghum, and wheat.

Chemical	Corn	Cotton	Soy	Grain Sorghum	Wheat	Remarks
Touchdown IQ (Roundup Ready)	7 D	7 D	14 D			
Ultra Blazer			50 D			
Valor XLT			3 D			Can be applied 3 days after planting but before soybean emergence.
Verdict						No information on label.
Yukon						No information on label.
Zidua	37D					Do not harvest sweet corn for human consumption less than 37 days after application of Zidua.
2,4-D						No information on label.

~ D-Day

~ * - Tolerant Varieties

HERBICIDE PRICE LIST

These prices are average for retail and are provided for planning purposes only. They do not reflect dealer or manufacturer rebates. Prices vary location to location and month to month. Consult your supplier for current prices. All rates and costs expressed on a broadcast basis.

Trade Name	Container Price (\$)	Formulation Rate Per Acre	Approx. Cost (\$) Per Acre
AAtrex 90 DF 4L	101.00/25# bag 45.93/2.5 gal.	1.11-2.22 lbs. 1-2 qts.	4.49-8.98 4.59-9.19
Accent Q	590.58/18 oz.	0.67 oz.	21.98
Aim EC	259.87/qt.	0.5 oz.	4.06
Assure II	306.00/2.5 gal.	5-10 oz.	4.78-9.56
Atrazine Nine-O DF Atrazine 4L	86.75/25# bag 39.80/2.5 gal.	1.11-2.22 lbs. 1-2 qts.	3.85-7.70 3.98-7.96
Authority First	429.30/5 lb	6.45 – 8 oz	34.61 – 42.93
Authority MTZ	141.38/ 6.25 lb	8 - 12 oz	11.31 – 16.97
Authority XL	311.45/ 5 lb	5 – 9.6 oz	19.47 – 37.37
Axial XL	341.76/2.5 gal.	16.4 oz.	17.11
Axiom	754.25/25 lbs.	6-8 oz.	11.31 -15.08
Balance Flexx	1734.40/2.5 gal.	3 -6 oz.	16.26 -32.52
Banvel	140.00/2.5 gal.	0.25-4 pts.	1.75-28.00
Basagran	270.50/2.5 gal.	1.5-2 pts.	20.29-27.05
Beacon 75 WDG	55.78/1.52 oz. bag	0.76 oz.	27.89
Bicep II Magnum	126.20/2.5 gal.	1.3-2.6 qts.	16.41-32.81
Boundary	205.25/2.5 gal.	1-3 pts.	10.26-30.79
Broadaxe	191.20/ 2.5 gal.	19 – 30 oz	11.35 – 17.93
Buctril 4EC	371.78/2.5 gal.	0.5-1 pt.	9.29-18.59
Butyrac 200	41.87/gal.	2 oz.-6 pts.	0.65-31.40
Cadet	404.19/qt	0.6-0.9 oz	7.57 -11.36
Callisto	182.50/gal.	3 oz.	4.28
Canopy DF	205.10/5 lbs.	4 oz.-6 oz.	10.26-15.38
Canopy EX	656.00/80 oz.	3 oz.	24.60
Caparol	60.50/2.5 gal.	1 pt.	3.03
Celebrity Plus DF	586.25/7.5 #	4 oz.	22.96
Cimarron Plus	136.20/10 oz.	0.25-0.5 oz.	3.41-6.81
Cinch	335.85/2.5 gal.	0.66-1.67 pts.	11.08-28.04
Cinch ATZ	124.83/2.5 gal.	1.3-2.6 qts.	16.23-32.46
Clarity 4EC	229.68/2.5 gal.	0.5-1 pt.	5.74-11.48
Classic	170.00/10 oz.	0.5-0.75 oz.	8.50-12.75
Cobra	200.33/gal.	12.5 oz.	19.56

Trade Name	Container Price (\$)	Formulation Rate Per Acre	Approx. Cost (\$) Per Acre
Command 3ME	389.05/2.5 gal.	2-2.67 pts.	38.91-51.94
Cotoran 4L	99.98/2.5 gal.	2-4 pts.	9.99-19.99
Cotton Pro*	87.89/2.5 gal.	1 pt.	4.39
Crossbow	122.50/2.5 gal.	1-4 qts.	12.25-49.00
Degree	40.00/gal.	1.75-4.25 pts.	8.75-21.25
Degree Xtra	115.23/2.5 gal.	2.9-3.7 qts.	33.42-42.65
Devrinol 2E	93.10/2.5 gal.	2-4 qts.	18.60-37.20
Devrinol 50DF	36.20/4# bag	2-4 lbs.	18.10-36.20
Direx 4L	81.15/2.5 gal.	1 pt.	4.06
Distinct DF	278.25/7.5 lb.	4-6 oz.	9.28-13.91
Domain	324.25/25 # bag	9-16 oz.	7.30-12.97
Dual Magnum	319.33/2.5 gal.	1-2 pt.	15.97-31.93
Dual II Magnum	339.50/2.5 gal.	0.66-1.67 pts.	11.20-28.35
Envive	460.24/88 oz.	3 oz.	15.69
Envoke	295.74/3 oz.	.1-1.15 oz.	9.86-14.79
Eptam	116.68/2.5 gal.	3.5 pts.	20.42
Extreme	67.73/2.5 gal.	3 pts.	10.16
Fierce	589.68/6 lbs	3-4.5 oz	18.42 – 27.64
Finesse Cereal and Fallow	334.00/ 20 oz	0.5 oz	8.35
FirstRate	250.92/6 oz	0.3 oz.	12.55
Firstshot SG	172.40/20 oz	0.5-0.8 oz	4.31-6.90
Flexstar GT 3.5	98.75/2.5 gal.	66-71 oz.	20.37-21.91
Flexstar	351.68/2.5 gal.	1-1.5 pts.	17.58-26.38
Forefront R & P	148.50/2.5 gal.	1.5-2.6 oz.	11.14-19.3
Frontrow	46.65/2.1 oz.	0.42 oz.	9.33
Fusilade DX	162.63/gal.	6-12 oz.	7.62-15.25
Gly-4 Plus	101.85/2.5 gal. 1057.50/30 gal.	0.75-4 qts.	7.64-40.76 6.61-35.24
Goal 2XL*	204.18/2.5 gal.	1-2 pts.	10.21-20.42
Gramoxone SL	91.25/2.5 gal.	40-48 oz.	11.41-13.69
Grazon P+D	86.10/2.5 gal.	2-3 pts.	8.61-12.91
Guardsman Max	148.03/2.5 gal.	1.2-2 qts.	17.76-29.61
Harmony Extra Total Sol	673.44/48 oz.	0.5-0.6 oz.	7.02-8.42
Halex GT	134.08/2.5 gal	3.6-4 pts.	24.13-26.81

Trade Name	Container Price (\$)	Formulation Rate Per Acre	Approx. Cost (\$) Per Acre
Harness	290.10/2.5 gal.	1.75-2.5 pts.	25.38-36.26
Harness Xtra 5.6	137.60/2.5 gal.	1.4-3 qts.	19.26-41.28
Hoelon 3EC	180.43/2.5 gal.	1.3-2.6 pts.	14.43-28.87
Hornet	463.38/6 lbs.	1.6-4 oz.	7.72-19.31
Instigate	596.40/210 oz	6 oz	17.04
Integrity	431.54/2.5 gal.	10 oz.	13.49
Intrro	80.35/2.5 gal	2-3 qts	16.07-24.11
Karmex* XP	34.70/5#	0.25-0.5 lb.	1.74-3.47
Kerb	107.25/3 lbs.	1.5-2 lbs.	53.63-71.50
Lariat 4L	79.58/2.5 gal.	2.5-4.5 qts.	19.90-35.81
Lasso Micro-Tech 4L	75.00/2.5 gal.	1.75-3 qts.	13.13-22.50
Leadoff	510/60 oz	1 oz	8.50
Liberty 280 SL	183.75/2.5 gal.	32-40 oz	18.38-22.97
Lightning DG	211.97/12.8 oz.	1.28 ozs	21.20
Marksman	79.25/2.5 gal.	2-3.5 pts.	7.93-13.87
Metribuzin DF (Generic Sencor)	69.13/5#	3 oz.-1 lb.	2.59-13.82
Milestone	92.35/qt.	3-7 oz.	8.67-20.23
MSMA	48.00/2.5 gal.	0.33 gal.	6.34
Oracle	92.94/2.5 gal.	8 oz.-16 oz.	2.32-4.64
Osprey	322.05/95 oz.	4.76 oz.	19.96
Outlook	323.9/2.5 gal.	12-21 oz.	12.15-21.26
Permit	413.3/20 oz.	0.67-1.33 oz.	13.85-27.69
Poast	250.85/2.5 gal.	1-2.5 pts.	12.54-31.36
PowerFlex HL	1045/10 lbs.	2 oz/A	13.06
Prefix	146.35/2.5 gal	1 qt.	14.64
Princep 90DF 4L	49.70/10# bag 60.93/2.5 gal.	1.1-1.7 lbs. 2-3 pts.	5.47-8.45 6.09-9.14
Prowl 3.3	113.68/2.5 gal.	1.2-3.6 pts.	6.82-20.46
Prowl H2O	90.75/2.5 gal.	2-3 pt.	9.07-13.61
Pursuit	435.78/gal.	4 oz.	13.62
Python WPG	564.68/2.5#	0.8-1 oz.	11.29-14.12
Rage D-Tech	80.48/2.5 gal	8-32 oz.	2.01-8.05
Raptor	547.86/gal.	4-5 oz.	17.12-21.40
Realm Q	394.40/80 oz	4 oz	19.72
Redeem R&P	57.00/0.5 gal.	1-3 pts.	14.25-42.75
Reflex	336.03/2.5 gal.	1-1.5 pts.	16.80-25.20
Remedy Ultra	166.68/2.5 gal.	1-4 qts.	16.68-66.67
Resource	229.67/gal.	4 oz.	7.17
Reward 2L	115.25/gal	0.5-2 gal.	57.63-230.50
Rodeo	147.00/2.5 gal.	not applicable	not applicable

Trade Name	Container Price (\$)	Formulation Rate Per Acre	Approx. Cost (\$) Per Acre
Roundup WeatherMax	75.98/2.5 gal. 903.3/30 gal.	1.0-2.7 pts.	3.80-10.26 3.76-10.16
Roundup PowerMax	56.95/2.5 gal.	22 oz.-44 oz.	3.92-7.83
Scepter 70DG	672.53/8.75 lbs.	2.1-2.8 oz.	10.09-13.45
Select Max	265.00/2.5 gal	6-16 oz.	4.97-13.66
Sencor DF (Bayer)	73.25/5 lbs.	3 oz.-1 lb.	2.74-14.65
Sequence	119.98/2.5 gal	2.5 pt.	15.00
Sharpen	750.01/gal	1 oz.	5.86
Sodium Chlorate 6 lb. gal. (harvest aid)	12.25/2.5 gal.	0.75-1 gal.	3.68-4.90
Sonar	585.00/qt	not applicable	not applicable
Spartan 4F	169.66/ qt.	8.0-10.1 oz.	42.42-53.55
Spartan Charge	132.27/ 1 qt	3.75 – 5.75 oz	15.50 – 23.77
Squadron	92.25/2.5 gal.	3 pts.	13.84
Staple LX	587.52/0.5 gal.	1.2 oz.	11.02
Steadfast Q	724.20/60 oz.	0.75 oz.	9.05
Storm	223.53/2.5 gal.	1.5 pts.	16.76
Suprend	270.40/20#	1-1.5 #	13.52-20.28
Trifluralin 4EC	50.00/2.5 gal	1.5 pts.-2 pts.	3.75-5.00
Touchdown Total	58.35/2.5 gal. 668.10/30 gal.	0.75-4 qts.	4.38-23.34 4.18-22.27
Treflan	67.50/2.5 gal.	1-2 pts.	3.38-6.75
Typhoon	140.00/2.5 gal.	1.6 qts.	22.40
Ultra Blazer	197.05/2.5 gal.	0.5-1.5 pt.	4.93-14.78
Valor	488.80/5 #	2.0-2.5 oz.	12.22-15.28
Verdict	559.45/2.5 gal	5 oz.	8.74
Warrant	88.53/2.5 gal	3 pt.	13.28
Weedmaster	68.25/2.5 gal.	1-4 pts.	3.41-13.65
Yukon	248.80/80 oz.	4-8 oz.	12.44-24.88
Zidua		2 -3 oz	
2,4-D amine	44.40/2.5 gal.	0.5-2 pt.	1.11-4.44
2,4-D ester (4 lb./gal. formulation)	58.28/2.5 gal.	0.33-2 qt.	1.92-11.66

*Normally applied in combination with MSMA.

CROP ROTATIONAL GUIDELINES FOR HERBICIDES

Chemical	C	Ct	S	GS	T	W	Remarks
Accent Q	None	10 M	15 D	10 M	10 M	4 M	Grain sorghum 10 months with a pH<7.5. Tobacco 10 months with a pH< 6.5 or 18 months with a pH>6.5.
Achieve Liquid	106 D	106 D	106 D	106 D	106 D	30 D	Rotational crops of cereal grains and leafy crop groups may be planted 30 days after application. All other rotational crops may be planted 106 days after application.
Aim	None	None	None	None	12 M	None	Following application of Aim, any registered crop may be planted at any time. All other crops may be planted after 12 months after an application of Aim.
Assure II	120 D	80D	80D	120 D	120 D	120 D	Do not rotate to crops other than canola, cotton, crambe, dry beans, lentils, mint (spearmint and peppermint), peas (dry and succulent), snap beans, soybeans or sugarbeets within 120 days after application.
Atrazine (AAtrex, Bicep II Magnum, Cinch ATZ, Marksman)		8M					Land treated with Atrazine should not be planted to any crop except corn or sorghum until the following year or injury may occur. If Atrazine is applied after June 10, do not rotate with other crops other than corn or sorghum the next year or injury may occur. Do not plant sugarbeets, tobacco, vegetables(including dry beans), spring seeded small grains or small seeded legumes and grasses the year following Atrazine application or injury may occur. Injury may occur to soybeans planted the year following application on soils with a calcareous surface layer.
Authority First	10M	18M	None	12M	30M	4M	Corn – Observe an 18 month rotational interval if 6.45 – 8 oz of Authority First DF herbicide is applied to soils of 1.5% OM or less, and pH is above 7.
Authority MTZ	10,4M	12M	None	18,12M	12M	4M	Field corn may be planted after 4 months where Authority MTZ DF herbicide was applied at 14 oz/A or less. Sorghum may be planted after 12 months where Authority MTZ was applied at 20 oz/A or less.
Authority XL	10M	12M	None	10M	10M	4M	
Axial XL	30D	30D	30D	30D			
Axiom DF	None	8 M	None	12 M	12 M	12 M	
Balance Flex	None	18M	6M	6M	18M	4M	
Banvel	Spring		Spring	Spring		Fall	Corn, sorghum, and soybeans may be planted in the spring following applications made during the previous year. Soybeans in areas with greater than 30 inches of rainfall, delay planting for 30 days per pint of Banvel per treated acre. In areas with less than 30 inches of rainfall, delay planting for 45 days per pint of Banvel per treated acre. Delay wheat planting for 20 days per pint of Banvel.
Basagran							No information on label.

Chemical	C	Ct	S	GS	T	W	Remarks
Beacon	14 D	8 M	8 M	8 M	8 M	3 M	Injury may occur to sorghum, alfalfa, winter cereals, or sunflowers if dry weather prevails during much of the time between Beacon application and seeding of these crops. IR or IMR corn hybrid may be planted immediately.
Boundary 6.5 EC	8 M	8 M	None	12 M	12 M	4.5 M	If planting is necessary in fields, field may be planted with soybeans or potatoes.
Broadaxe	10M	18M	None	10M	10M	4.5M	
Buctril							Do not plant rotational crops within 30 days following treatment.
Bullet	F Y	#	F Y	F Y	#	FY	If soybeans or other non-labeled crops are planted the year following, there is the possibility of crop injury due to atrazine carryover. Corn, peanuts, sorghum (milo) or soybeans can be planted the year following the use of this mixture.
Butyrac 200							No information on label.
Callisto	None	10M	10M	1 year	Spring	120 D	Small grains may be planted 120 days after application.
Canopy	10 M	10 M	None	10 M	10 M	4 M	Rotational intervals based on a soil pH of 7.0 or less. See label for high pH soils.
Canopy EX	10 M	10 M	None	10 M	10 M	4 M	Rotational intervals based on a soil pH of 7.0 or less.
Caparol 4L		None					The cover crop marked may be planted in the fall when Caparol was applied on cotton by no more than one of these methods that year; preplant incorporated, preemergence, or only one chemical hoe treatment. Where layby or multiple applications are made, do not plant rotational crops until the following year as indicated. Cover crops must be plowed down and not used for food or feed.
Capreno	None	10M	10M	10M	18M	4M	
Celebrity Plus	1 Wk	10 M	4 M	10 M	10 M	4 M	Grain sorghum 10 months with a pH<7.5. Tobacco 10 months with a pH<6.5 or 18 months with a pH>6.5.
Cinch	None	None	None	None	Spring	4.5 M	If crop treated with Cinch alone is lost, any crop on the label may be planted immediately.
Clarity							No rotational cropping restrictions apply at 120 days or more following application. For barley, oats, wheat, and other grass seedlings, the interval between application and planting is 15 days per 8 fluid ounces per acre applied east of the Mississippi River.
Classic	10 M	10 M	None	12 M	10 M	4 M	If Classic is applied after August 1, extend recrop interval 2 months on alfalfa, clover, corn (non-IR), cotton, popcorn, rice, sorghum, tobacco and tomato. Field Corn (IR) - 7.
Cobra							No information on label.
Command	9 M	9M	None	9 M	None	12 M	Cover crops may be planted anytime but stand reduction may occur in some areas. Cotton may be replanted immediately provided Di-Syston safener is used.
Corvus	None	None	9M	17M	17M	4M	
Cotoran 4L	6 M	None	6 M	6 M	6 M	6 M	Do not make more than 3 applications of this herbicide to the same crops or field in any one year. Do not plant crops other than cotton within 6 months of the last application of this herbicide, or injury may result.
Define DF	None	4 M	None	12 M	12 M	12 M	
Degree							Do not rotate to crops other than soybeans, corn (all types including sweet corn), milo (grain sorghum), wheat or tobacco.
Degree Xtra							Do not rotate to crops other than soybeans, corn, milo (grain sorghum), wheat or tobacco.
Devrinol 2-EC	12 M	12 M	12 M	12 M	None	12 M	After harvest or prior to planting of succeeding crops, a deep moldboard or disc plowing operation must be carried out.

	C	Ct	S	GS	T	W	Remarks
Direx 4L	Spring	Spring	1 Y	Spring	1 Y	1 Y	Broadcast postemergence (Lay-by); Cotton, corn, grain sorghum (not sorgos or forage sorghums nor grass sorghums) the next spring. Do not replant treated area to any other crop within one year after last application as injury to subsequent crops may result.
Distinct	120D	120D	120D	120D	120D	120D	Except with 1 in. rainfall or irrigation after last application (4 oz/A) then replant can occur in 30 days.
Dual II Magnum	None	None	None	None	Spring	4.5 M	If crop treated with Dual II Magnum alone is lost, any crop on the label may be planted immediately.
Enlite	9M	9M	None	9M	9M	4M	
Envive	10M	10M	None	10M	10M	4M	
Finesse	18M	18M	18M	4M	18M	None	
Envoke	7 M	7 M	7 M	7 M	7 M	3 M	
Equip		9 M	9 M	9 M	18 M	2 M	
Extreme	8.5 M	18 M	None	18 M	9.5 M	4 M	Clearfield corn no restrictions.
Fierce	7D						30 days for corn if conventional till. See Label.
FirstRate	9 M	9 M	None	9 M	3 M	3 M	Transplanted tobacco may be planted 10 months after application of 0.3 oz/A postemergence.
First Shot SG	14D	14D	7D	14D	45D	None	
Flexstar GT	10 M	10 M	None	18 M	18 M	4 M	
Frontrow	9 M	9 M	None	9 M	30M	3 M	Transplanted tobacco may be planted 10 months after application of 0.42 oz/A of Frontrow.
Fusilade DX	60 D	None	None	60 D		60 D	Do not plant rotational grass crops such as corn, sorghum, and cereals within 60 days of last application of Fusilade DX.
Goal	10 M			10 M		10 M	Do not direct seed any crops, other than labeled crops, within 60 days following a Goal treatment. Do not transplant seedling crops, other than labeled crops , within 30 days following a Goal treatment.
Guardsman Max	None	F Y	F Y	None	#		Injury may occur to soybeans planted on soils having a calcareous surface layer. If the original treatment was broadcast do not make a second application of Guardsman Max if the combined rate exceeds the maximum rate per season.
Halex GT	None	None	None	None	None	None	
Harmony Extra SG with TotalSol	14 D	14D	7 D	14 D	45 D	None	Sugarbeets, winter rape and canola can be planted 60 days after the application of Harmony Extra. Any other crop may be planted 45 days after the application of Harmony Extra.
Harmony SG with TotalSol	None	7D	None	None	45D	None	
Harness	None	#	F Y	F Y	F Y	Fall	Do not rotate to crops other than soybeans, corn, milo(sorghum), wheat, or tobacco.
Harness Xtra	None	#	F Y	F Y	#	F Y	
Hoelon						None	No information on label on other crops.

Chemical	C	Ct	S	GS	T	W	Remarks
Hornet	None	18 M	10.5 M	12 M	18 M	4 M	For low moisture (less than 15 inches annual rainfall) and low organic matter (less than 2%) areas, dry beans and soybeans should not be planted until 18 months after treatment.
Impact	None	9M	9M	9M	18M	3M	
Instigate	None	10 M	10M	10M	18M	4M	
Integrity							
Intro	None	None	None	None	None	None	
Karmex DF	Spring	Spring	1 Y	Spring	1 Y	1 Y	Broadcast Postemergence (Layby): Cotton, corn, grain sorghum (not sorgos or forage sorghums nor grass sorghums) the next spring. Do not replant treated areas to any other crop within one year after last application as injury may result.
Laudis	None	10M	8M	10M	18M	4M	Corn may be planted right after application
Lariat	F Y	#	FY	FY	#	F Y	Corn, peanuts, sorghum (milo) or soybeans can be planted the year following use of this mixture. If soybeans or other non-labeled crops are planted the following year, there is the possibility of crop injury due to atrazine carryover. For replanting grain sorghum, use Screen-treated seed.
Leadoff	None	30D	30D	10M	10M	3M	
Liberty 280 SL	None	None	None	70 D		70 D	Do not plant rotational crops in a field treated with Liberty herbicide within 120 days after the last application of this product with the exception of wheat, barley, buckwheat, millet, oats, rye, sorghum, and triticale which may be planted 70 days after the last application of this product. The crops listed on the label may be planted at any time.
Lightning	8.5 M	18M	9 M	18 M	9.5 M	4 M	No restrictions for Clearfield corn. 9.5 months for cotton if greater than 16 inches of rainfall and/or irrigation received following application of Lightning through October of the application year.
Linex	12M	12M	12M	12M	12M	12M	Unless otherwise directed, any crop may be planted after 4 months except for cereals where only barley, oats, rye, wheat and corn (field) may be planted.
MSMA							No information on label.
Optill	None	18M	1M	18M	9M	4M	
Osprey	12M	90D	90D	10M	10M	7D	
Outlook	None	Spring	None	None	Spring	4 M	There are no rotational crop restrictions in the spring following the previous years' application of Outlook. If the original application was broadcast, do not make a second application of Outlook.
Parrlay	None	None	None	None	None	None	
Permit	1M	4M	9 M	2M	None	2 M	
Poast	30D	30D	30D	30D	30D	30D	Do not plant any other crop to be harvested for 120 days following application unless Poast is registered for use in that crop.
Poast Plus							No information on label.
PowerFlex HL	9M	9M	5M	9M	12M	1M	Min. rotation interval for Soybeans after wheat is 3 months.
Prefix	10M	1M	None	18M			To avoid injury do not plant any crops within 18 months.
Princep 4L					#		Do not plant any crop except corn until the year following, or injury may occur.

Chemical	C	Ct	S	GS	T	W	Remarks
Prowl/Pendimax 3.3	None	None	None	F Y	None	4 M	Land treated with Prowl may be planted to other crops the following year. Injury may occur when replanting corn due to stand failure. See label.
Pursuit	8.5 M	18 M	None	18 M	9.5 M	4 M	Clearfield corn (resistant/tolerant to Pursuit), no restrictions.
Python	None	18 M	None	12 M	9 M	4 M	
Raptor	8.5 M	9 M	None	9 M	9 M	3 M	
Realm Q	None	10M	10M	10M	18M	4M	If Realm Q is applied postemergence following a mesotrione-containing preemergence herbicide, only corn (all types) or grain sorghum may be replanted the year following application, or severe crop injury may occur.
Redeem R&P							Do not plant broadleaf crops such as tobacco, cotton, soybeans, sunflower, clover, alfalfa, and many others in treated areas until an adequately sensitive bioassay shows that clopyralid is no longer detectable in the soil.
Reflex	10 M		None	10 M	18 M	4 M	
Remedy							No information on label.
Resolve	None	10M	10M	10M	None	3M	
Resource	None	30 D	None	30 D	30 D	120 D	Do not rotate to crops other than soybeans or field corn within 30 days after last application.
Roundup WeatherMax/ Glyphos/Glyphomax Plus	None	None	None	None	30 D	None	
Scepter 70 DG	9.5 M	18 M	None	11 M	9.5 M	3 M	Field corn may be planted in the spring of the year following Scepter application, unless extreme drought conditions develop (less than 15 inches of rainfall or irrigation is received within 6 months following date of last application). A minimum of 10 inches of rainfall is needed for a postemergence application if the total amount does not exceed 1.4 ounces per acre. Tobacco may be planted 9.5 months following an application at up to 2.8 ounces per acre and no more than a total of 0.125 pounds of imazaquin applied per acre.
Select							Do not graze treated fields or feed forage or hay to livestock.
Sencor	4 M	8 M	None	12 M	12 M	4 M	If initial seeding fails to produce a stand, crop registered for the rate of Lexone that has been applied maybe replanted into the treated area. Do not retreat during the same crop year as injury to the crop may result.
Sequence	None	None	None	Spring	Spring	4.5 M	
Sharpen	None	3M	1-2M	0	5M		This is based on using a 2 oz/A rate of Sharpen. See Label.
Spartan	10 M	18 M	None	10 M	None	4 M	
Spartan Charge	4M	12M	Nome	10M	None	4M	
Squadron	9.5 M	18 M	None	11 M	9.5 M	4 M	Field corn may be planted in the spring of the year following Squadron application, unless extreme drought conditions develop (less than 15 inches of rainfall or irrigation is received within 6 months following date of last application). Tobacco may be planted 9.5 months following an application of Squadron at 3 pints per acre and no more than a total of 0.125 pounds of imazaquin applied per acre.
Staple	10 M	None	10 M	#	10 M	4 M	Do not rotate to grain sorghum in the season following a Staple application. Field corn grown for grain or silage may be planted at indicated interval provided all the Staple applications made in cotton do not exceed a total of 1.8 oz. broadcast per acre per season. IR corn may be planted 9 months following application.
Status	None	None	None	None	None	None	
Steadfast	None	10 M	15 D	10 M	10 M	4 M	Grain sorghum 10 months with a pH<7.5. Tobacco 10 months with a pH<6.5 or 18 months with a pH>6.5.

Chemical	C	Ct	S	GS	T	W	Remarks
Steadfast ATZ	None	10 M	10 M	10 M	18 M	10 M	If Steadfast ATZ is applied after July 1, do not rotate with crops other than corn or sorghum the next year or injury may occur.
Storm	100 D	100D	None	100D	100D	100D	In the case of crop failure, only soybeans, rice or peanuts may be replanted immediately. Root crops must not be planted in fields treated with Storm for a period of 18 months.
Suprend	7 M	7 M	7 M	7 M	7 M	3 M	
Surpass	None	#	Spring	Spring	Spring	4 M	Do not rotate to crops other than corn, soybean, sorghum, tobacco, or wheat.
Touchdown Total							There are no rotational crop restrictions following application of this product.
Treflan HFP		None	None	12 M			Unless crop injury is acceptable, do not plant proso millet, sorghum (milo), oats, and annual or perennial grass crops or grass mixtures for 12 months after a spring application or 14 months after a fall application of Treflan.
Typhoon	10 M	10 M	None	10 M	18 M	4 M	
Ultra Blazer	100D	100D	100D	100D	100D	100D	In case of crop failure, only peanuts, soybeans, or rice may be immediately replanted. Root crops (such as carrots, turnips, sweet potatoes, etc.) must not be planted in fields treated with Ultra Blazer for a period of 18 months following treatment.
Valor	1M	14D	None	30D	2M	2M	
Valor XLT	10M	10M	None	10M	12M	10M	Cotton, field corn, rice, sorghum, sunflowers, tobacco and wheat can be planted 30 days after an application, provided no more than 2 oz./A of Valor had been used on the lost crop.
Verdict	None		1			4	Soybean: 1 month after 5 oz/A rate
Yukon	1 M	4 M	9 M	2 M		2 M	IR/IMR field corn no restrictions.
Zidua	None	12M	12M	12M	12M	12M	
2,4-D							Do not replant fields treated with this product in the same growing season with crops other than those labeled for 2,4-D use.

C-Corn
Ct-Cotton
D-Day
GS-Grain Sorghum

F Y-Year Following Application
M-Months
S-Soybeans
T-Tobacco
Application

W-Wheat
Wk-Weeks
Y-Years
#-Do Not Rotate to This Crop the Year Following

HERBICIDE NAME AND INGREDIENT INDEX

NOTE: This list is provided as a reference only. It includes some herbicides not recommended by The University of Tennessee in addition to those that are recommended in this publication.

Trade Name with Formulation	Common Name	Formulation	EPA Registration Number	Manufacturer
AAtrex 4L AAtrex 9-0 DF	Atrazine	4 lbs ai/gal 90% ai	100-497 100-585	Syngenta
Accent Q	Nicosulfuron	54.5% ai	352-773	DuPont
Achieve Liquid	Tralkoxydim	3.33 lbs ai/gal	100-1130	Syngenta
Aim EC	Carfentrazone	2 lb ai/gal	279-3241	FMC
Ally XP	Metsulfuron	60% ai	352-435	DuPont
Arrow EC	Clethodim	2 lbs ai/gal	66222-60	Makhteshim-Agan
Assure II EC	Quizalofop-P	0.88 lbs ai/gal	352-541	DuPont
Atrazine FL	Atrazine	4 lbs ai/gal	Various	Various
Authority First DF	Sulfentrazone + Cloransulam-methyl	0.7 lbs ai/gal	279-3246	FMC
Authority MTZ	Sulfentrazone + Metribuzin	18.0% + 27.0% ai	279-3326	FMC
Authority XL	Sulfentrazone + Chlorimuron	62.22% + 7.78%	279-3413	FMC
Axial XL	Pinoxaden	0.42 lb ai/gal	100-1256	Syngenta
Axiom DF	Flufenacet+Metribuzin	54.4+13.6% ai	3125-488	Bayer
Balan DF	Benefin	60% ai	34704-746	UAP
Balance Flexx	Isoxaflutole	2.0 lb ai/gal	264-1067	Bayer
Banvel SL	Dicamba	4 lbs ai/gal	66330-276	Arysta
Basagran SL	Bentazon	4 lbs ai/gal	7969-45-66330	Arysta
Beacon DG	Primisulfuron	75% ai	100-705	Syngenta
Bicep II Magnum	S-Metolachlor+Atrazine+Benoxacor	2.4+3.1 lbs ai/gal	100-817	Syngenta
Blazer SL	Acifluorfen	2 lbs ai/gal	23315	United Phosphorus
Boundary SC	S-Metolachlor+Metribuzin	6.3+1.5 lbs ai/gal	100-958	Syngenta
Broadaxe	Sulfentrazone + S-metolachlor	0.7 lb + 6.3 lb ai/gal	279-3442	FMC
Buctril 2EC Buctril 4EC	Bromoxynil	2 lbs ai/gal 4 lbs ai/gal	264-437 264-540	Bayer
Butyrac 200 SL	2,4-DB	2 lbs ae/gal	42750-38	Agri-star
Cadet	Fluthiacet	0.91 lb ai/gal	279-3338	FMC
Callisto	Mesotrione	4 lbs ai/gal	100-1131	Syngenta
Canopy	Metribuzin + Chlorimuron	75% ai	352-444	DuPont
Canopy Ex	Tribenuron+Chlorimuron	6.8+22.7% ai	352-635	DuPont
Caparol 4L	Prometryn	4 lbs ai/gal	100-620	Syngenta
Caperno	Thiencarbazone +Tembotrione	0.57 lb + 2.88 lb ai	264-1063	Bayer
Celebrity Plus	Dicamba+Diflufenzopyr+Nicosulfuron	42.4+17.0+10.6% ai	7969-175	BASF
Cimarron Plus	Metsulfuron + Chlorsulfuron	48 + 15% ai	352-670	DuPont
Cimarron Extra	Metsulfuron + Chlorsulfuron	30.0 + 37.5% ai	352-669	DuPont
Cinch EC	S-Metolachlor	7.64 lbs ai/gal	352-625	DuPont
Cinch ATZ SC	S-Metolachlor+Atrazine	2.4+3.1 lbs ai/gal	352-624	DuPont

Trade Name with Formulation	Common Name	Formulation	EPA Registration Number	Manufacturer
Clarity SL	Dicamba	4 lbs ae/gal	7969-137	BASF
Classic DG	Chlorimuron	25% ai	352-436	DuPont
Cobra EC	Lactofen	2 lbs ai/gal	59639-34	Valent
Command 3ME	Clomazone	3 lbs ai/gal	279-3158	FMC
Corvus	Thiencarbazone + Isoxaflutule	0.75 lb + 1.88 lbs ai	264-1066	Bayer
Cotoran 4L Cotoran 80DF	Fluometuron	4 lbs ai/gal 80% ai	1812-439 1812-323	DuPont
Crossbow EC	2,4-D+Triclopyr	2+1 lbs ae/gal	62719-260	Dow AgroSciences
Define DF	Flufenacet	60% ai	3125-487-264	Bayer
Degree ME	Acetochlor	3.8 lbs ai/gal	524-496	Monsanto
Degree Xtra ME	Acetochlor+Atrazine	2.7+1.34 lbs ai/gal	524-511	Monsanto
Devrinol 2E Devrinol 50DF	Napropamide	2 lbs ai/gal 50% ai	100-1024-70506 100-1035-70506	United Phosphorus
Diquat SL, Reward	Diquat	2 lbs cation/gal	10182-353	Syngenta
Direx 4L Direx 80DF	Diuron	4 lbs ai/gal 80% ai	1812-257 1812-362	
Distinct	Diflufenzopyr+Dicamba	20+50 % ai	7969-150	BASF
Domain DF	Flufenacet+Metribuzin	24+36 % ai	3125-527	Bayer
Dual Magnum	S-Metolachlor	7.64 lbs ai/gal	100-816	Syngenta
Dual II Magnum EC	S-Metolachlor+Benoxacor	7.64 lbs ai/gal	100-818	Syngenta
Durango	Glyphosate	5.4 lbs ae/gal	62719-517	Dow AgroSciences
Enlite	Chlorimuron + Flumioxazin Thifensulfuron	2.85 +36.21 + 8.87% ai	352-757	DuPont
Envive	Chlorimuron + Flumioxazin + Thifensulfuron	9.2 + 29.2 + 2.9% ai	352-756	DuPont
Envoke	trifloxysulfuron-sodium	75% ai	100-1132	Syngenta
Epic DF	Flufenacet+Isoxaflutole	48+10% ai	3125-522	Bayer
Eptam 7-E EC	EPTC	7 lbs ai/gal	10163-283	Gowan
Escort XP	Metsulfuron	60% ai	352-439	DuPont
ET	Pyraflufen ethyl	0.208/gal	71711-7	Nichino America Inc.
Equip	Foramsulfuron + Iodosulfuron	30.0 + 2.0% ai	264-686	Bayer
Expert	Atrazine+S-Metolachlor+Glyphosate	1.74+2.14+1 lbs ai/gal	100-1161	Syngenta
Express DF	Tribenuron	75% ai	352-509	DuPont
Extreme SL	Imazethapyr+Glyphosate	0.17 lbs ae/gal+2 lbs ai/gal	241-405	BASF
Field Master	Acetochlor+Atrazine+Glyphosate	2+1.5+0.75 lbs ai/gal	524-497	Monsanto
Fierce	Flumioxazin + Pyroxasulfone	33.5% + 42.5%	63588-93-59639	Valent
Finale SL	Glufosinate	1 lb ai/gal	432-1229	Bayer
Finesse DF	Chlorsulfuron+Metsulfuron	62.5+12.5% ai	352-827	DuPont
FirstRate DF	Cloransulam	84% ai	62719-275	Dow AgroSciences
First Shot SG	Thifensulfuron + Tribenuron	25% + 25% ai	352-755	DuPont
Flexstar GT	Fomesafen + Glyphosate	0.66 lb + 2.63 lb ai/gal	100-1325	Syngenta
Flexstar SL	Fomesafen+Adjuvants	1.88 lbs ai/gal	10182-418	Syngenta
ForeFront	Aminopyralid + 2,4-D	6.58 +51.06% ai	62719-524	Dow AgroSciences

Trade Name with Formulation	Common Name	Formulation	EPA Registration Number	Manufacturer
Frontrow DF	Cloransulam+Flumetsulam	84+80% ai	62719-299	Dow AgroSciences
Fusilade DX EC	Fluazifop-P	2 lbs ai/gal	100-1070	Syngenta
Gangster V	Flumioxazin	51% ai	59639-131	Valent
Gangster FR	Cloransulam-methyl	84% ai	59639-131	Valent
Garlon EC or SL	Triclopyr	4 or 3 lbs ai/gal	62719-40 or 62719-37	Dow AgroSciences
Glean DF	Chlorsulfuron	75% ai	352-522	DuPont
Glyfos	Glyphosate	4 lbs ai/gal	4787-31	Cheminova
Glyfos X-TRA	Glyphosate	4 lbs ai/gal	4787-23	Cheminova
Glyphomax Plus	Glyphosate	4 lbs ai/gal	62719-322	Dow AgroSciences
Goal XL EC	Oxyfluorfen	2.0 lbs ai/gal	62719-424	Dow AgroSciences
Gramoxone SL	Paraquat	2.0 lbs ai/gal	100-1217	Syngenta
Grazon P+D SL	Picloram+2,4-D	0.54+2 lbs ai/gal	62719-182	Dow AgroSciences
Guardsman Max	Dimethenamid-P+Atrazine	1.7+3.3 lbs ai/gal	7969-192	BASF
Halex GT	S-metolachlor+Glyphosate + Mesotrione	20.50 + 20.50 + 2.05 lbs ai/gal	100-1282	Syngenta
Harmony Extra SG with TotalSol	Tribenuron+Thifensulfuron	16.67+33.33% ai	352-714	DuPont
Harmony SG with TotalSol	Thifensulfuron-methyl	50% ai	352-633	DuPont
Harness EC	Acetochlor+MON-4660	7.0 lbs ai/gal	524-473	Monsanto
Harness Xtra 5.6 SL	Acetochlor+Atrazine+MON-4660	3.1+2.5 lbs ai/gal	524-485	Monsanto
Hoelon EC	Diclofop	3 lbs ai/gal	264-641	Bayer
Hornet DG	Flumetsulam+Clopyralid	18.5+60.0% ai	62719-315	Dow AgroSciences
Impact	Topramezone	2.8 lb ai/gal	5481-524	Amvac
Instigate	Rimfulfuron + Mesotrione	4.17% + 41.67%	352-873	DuPont
Integrity	Saflufenacil+dimethenamid	0.57 lb + 5.0 lbs ai	7969-279	BASF
Intro	Alachlor	4.0 lbs ai/gal	524-314	Monsanto
Karmex DF	Diuron	80% ai	1812-362	DuPont
Kerb 50-W WP	Pronamide	51% ai	62719-397	Dow AgroSciences
Laudis	Tembotrione	3.5 lb ai/gal	264-860	Bayer
Leadoff	Rimsulfuron + Thifensulfuron	16.7% + 16.7%	353-853	DuPont
Lexar	S-metolachlor+mesotrione+ atrazine	1.74 + 0.224 + 1.74 lbs ai/gal	100-1201	Syngenta
Liberty 280 SL	Glufosinate	2.34 lbs ai/gal	264-829	Bayer
Lightning	Imazethapyr+Imazapyr	52.5+17.5% ai	241-377	BASF
Linex DF	Linuron	50% ai	1812-320	DuPont
Linex 4L	Linuron	4 lbs ai/gal	1812-245	DuPont
Lorox DF	Linuron	50% ai	1812-320	DuPont
Lumax	S-Metolachlor+Atrazine+Mesotrione	2.68+1+0.268 lbs ai/gal	100-1152	Syngenta
Marksman SC	Atrazine+Dicamba	2.1+1.1 lbs ai/gal	7969-136	BASF
Milestone	Aminopyralid	40.6% ai	62719-519	Dow AgroSciences
MSMA SC	MSMA	Various	Various	Various
Optill	Saflufanacil + imazethepr	0.178 lbs + 0.502 ai	7969-280	BASF
Osprey	Mesosulfuron	4.5% ai	264-802	Bayer
Outlook	Dimethenamid-P	6 lbs ai/gal	7969-156	BASF
Parrlay	Metolachlor	8 lbs ai/gal	60063-24-524	Monsanto

Trade Name with Formulation	Common Name	Formulation	EPA Registration Number	Manufacturer
Permit DF	Halosulfuron	75% ai	524-465	Monsanto
Poast EC	Sethoxydim	1.5 lbs ai/gal	7969-58	BASF
Poast Plus EC	Sethoxydim+Adjuvant	1 lb ai/gal	7969-88	BASF
PowerFlex HL	Pyroxsulam	13.13% ai	62719-643	Dow AgroSciences
Prefix	S-metolachlor + Fomesafen	46.5 + 10.2% ai	100-1268	Syngenta
Princep Caliber 90 DF	Simazine	90% ai	100-603	Syngenta
Princep 4L		4 lbs ai/gal	100-526	
Prowl 3.3 EC	Pendimethalin	3.3 lbs ai/gal	241-337	BASF
Prowl H2O	Pendimethalin	3.8 lbs ai/gal	241-418	BASF
Pursuit DG	Imazethapyr	70% ae	241-350	BASF
Pursuit SL		2 lbs ae/gal	241-310	
Pursuit Plus EC	Imazethapyr+Pendimethalin	0.2 lbs ae/gal+2.7 lbs ai/gal	241-331	BASF
Python DG	Flumetsulam	80% ai	62719-277	Dow AgroSciences
Rage D-Tech	Carfentrazone + 2,4-D	1.44 + 65.52%ai	279-3316	FMC
Raptor	Imazamox	1 lb ai/gal	241-379	BASF
Ready Master ATZ	Atrazine+Glyphosate	2+2 lbs ai/gal	524-509	Monsanto
Realm Q	Rimsulfuron + Mesotrione	7.5% + 31.25%	352-837	DuPont
Redeem R&P EC	Triclopyr+Clopyralid	2.25+0.75 lbs ai/gal	62719-337	Dow AgroSciences
Reflex SL	Fomesafen	2 lbs ai/gal	10182-83	Syngenta
Remedy EC	Triclopyr	4 lbs ai/gal	62719-70	Dow AgroSciences
Resolve DF	Rimsulfuron+safener	25% ai	352-556	DuPont
Resolve Q	Rimsulfuron + Thifensulfuron	18.4 + 4.0% ai	352-777	DuPont
Resource EC	Flumiclorac	0.86 lbs ai/gal	59639-82	Valent
Require Q	Rimsulfuron + Sodium salt of dicamba	6.25 + 52.94% ai	352-761	DuPont
Rifle SL	Dicamba	4 lbs ai/gal	42750-40-34704	UAP-Loveland
Roundup Original Max	Glyphosate+surfactants	5.5 lbs ai/gal	524-539	Monsanto
Roundup Power Max	Glyphosate	5.5 lb ai/gal	524-549	Monsanto
Roundup Weather Max	Glyphosate+surfactants	5.5 lbs ai/gal	524-537	Monsanto
Scepter DG	Imazaquin	70% ae	241-30	BASF
Select EC	Clethodim	2 lbs ai/gal	59639-3	Valent
Select Max EC	Clethodim	0.97 lbs. ai/gal	59639-132	Valent
Sencor DF	Metribuzin	75% ai	3125-325	Bayer
Sequence EW	Glyphosate + S-metolachlor	2.25 + 3.0 lbs ai/gal	100-1185	Syngenta
Sharpen	Saflufenacil	2.85 lbs ai	7969-278	BASF
Sonic	Sulfentrazone + Cloransulam-methyl	0.7 lbs ai/gal	279-3246-62719	Dow AgroSciences
Spartan F	Sulfentrazone	4 lbs ai/gal	279-3220	FMC
Spartan Charge	Carfentrazone + Sulfentrazone	0.35 lbs + 3.15 lb ai/ gal	279-3337	FMCS
Staple LX	Pyriothiobac sodium	3.2 lbs ai/gal	352-613	DuPont
Status	Sodium salt of diflufenzopyr + Sodium salt of dicamba	17.1 + 44.0% ai	7969-242	BASF
Steadfast Q	Nicosulfuron+Rimsulfuron	25.2+12..5% ai	352-774	DuPont
Steadfast ATZ DG	Nicosulfuron+Rimsulfuron+Atrazine	2.7+1.3+85.3 % ai	352-619	DuPont

Trade Name with Formulation	Common Name	Formulation	EPA Registration Number	Manufacturer
Stinger EC	Clopyralid	3 lbs ae/gal	62719-73	Dow AgroSciences
Storm	Bentazon + Acifluorfen	2.67 lb ai + 1.33 lb ai/gal	70506-59	United Phosphorus
Suprend 80 WG	Prometryn+trifloxysulfuron-sodium	79.3 + 0.7 % ai	100-1163	Syngenta
Sutan + EC	Butylate+R-29148	6.7+0.14 lbs ai/gal	73637-3-74530	Helm Agro
Synchrony XP	Chlorimuron+Thifensulfuron	21.5+6.9%	352-648	DuPont
Tillam EC	Pebulate	6 lbs ai/gal	10182-158	Monterey Chemical Co.
Touchdown Hi Tech	Glyphosate	5 lbs ae/gal	100-1182	Syngenta
Touchdown Total	Glyphosate	4.17 lbs ai/gal	100-1169	Syngenta
Treflan HFP EC	Trifluralin	4 lbs ai/gal	62719-250	Dow AgroSciences
Trifluralin 4 EC	Trifluralin	4 lbs ai/gal	5905-519	Helena
Ultra Blazer	Acifluorfen	2 lbs ai/gal	70506-60	United Phosphorus
Valor DG	Flumioxazin	51% ai	59639-99	Valent
Valor XLT	Flumioxazin + Chlorimuron-ethyl	43.3% ai	59639-117	Valent
Vapam SL	Metham	4.26 lbs ai/gal	5481-468	Amvac
Verdict	Saflufenacil + Dimethenamid-P	5.57 lb ai/gal	7969-279	BASF
Weedar 64 SL	2,4-D amine	3.8 lbs ai/gal	71368-1	Nufarm
Weedmaster SL	2,4-D+Dicamba	2.87+1 lbs ai/gal.	7969-133	BASF
Weedone LV4 EC	2,4-D low volatile ester	3.8 lbs ai/gal	228-139-71368	Nufarm
Zidua	Pyroxasulfone	0.85 lb WG	7969-338	BASF
2,4-D EC,SL	2,4-D	Various	Various	Various

ai=Active Ingredients
ae=Acid Equivalent
DF=Dry Flowable

DG=Dispersable Granule
EC=Emulsifiable Concentrate
FL=Flowable

ME=Microencapsulated Liquid
SC=Suspension Concentrate
SL=Soluble Liquid

Printing of this publication made possible through support from the following:



PB1580-6M-12/11(Rev) R12-5110-174-021-13

Programs in agriculture and natural resources, 4-H youth development, family and consumer sciences, and resource development.
University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating.
UT Extension provides equal opportunities in programs and employment.