

## Weed Management in Cotton - 2008<sup>1</sup>

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Successful weed control is essential for economical cotton production in Florida. Weeds compete with cotton for moisture, nutrients, and light. The greatest competition usually occurs early in the growing season. Late-season weeds, while not as competitive as early-season weeds, may interfere with insecticide applications and may cause harvesting difficulties.

### Crop Rotations

Crop rotations are an important part of a good cotton weed control program. Certain weeds, especially nutsedges, may be less difficult to control in a preceding crop such as peanut. Other benefits of crop rotation may include reduction in insect, disease, and nematode problems both in cotton and succeeding crops.

### Cultivation

Cultivation can be utilized if effective weed control is not achieved with herbicides. However, if weeds have been controlled with herbicides, there is generally little benefit from cultivation. If cultivation is needed, avoid throwing soil around small cotton plants to minimize disease problems.

### Herbicides

Herbicides are the most effective means for controlling weeds in cotton. To be effective, however, herbicides need to be matched with the weed problem. Therefore, before purchasing a herbicide, you should first know your weed problem. Once this has been determined, Tables 4, 5 and 6 can be helpful in choosing the herbicide which is best suited for your particular situation.

Preplant and/or preemergence applications are important for ensuring that the cotton has the initial competitive advantage over the weeds. Once this is achieved, then postemergence directed applications can be utilized to extend the weed control through the season. The herbicides listed in Table 1 are those that have performed well in trials conducted at the WFREC (Jay), the Gainesville area, and the NFREC (Quincy and Marianna).

### Herbicide Application

Calibrate accurately since rates too high may injure crop and rates too low may not provide adequate weed control. This is especially critical with

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1. This document is SS-AGR-04, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Revised January 2008. Please visit the EDIS Website at <http://edis.ifas.ufl.edu>

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banded applications, which often are utilized in cotton. In addition, all label instructions and precautions should be followed carefully. Be sure that the application is properly timed in relation to the stage of growth of both crops and weeds. Do not allow spray to drift to sensitive crops. Store herbicides behind locked doors, in original containers with intact labels, and separated from seed, fertilizer, and other pesticides.

It is very important to use a clean spray system prior to spraying any crop. After each use, rinse the system thoroughly and use a tank cleaner solution to ensure that no herbicide residue remains. See *SS-AGR-102 Calibration of Herbicide Applicators* for more information on cleaning spray equipment.

### Hooded Sprayers

Use of nonselective herbicides applied with a hooded sprayer may be desirable for row middles. Care should be taken to avoid contact with the crop. A residual-type herbicide may be used and will extend weed control which may delay layby herbicide applications.

## Herbicide -Tolerant Cotton

### Liberty Link

Liberty Link® cotton is a technology that allows the application of Ignite herbicide, glufosinate, over the top of green foliage. Glufosinate is completely different from glyphosate. Glufosinate inhibits glutamine synthase enzymes and toxic levels of ammonia quickly accumulate in plant tissues. Since this process are radically different from Roundup Ready technology - applications of Ignite to Roundup Ready Cotton will result in death of the crop. Likewise, glyphosate cannot be safely applied to Liberty Link cotton.

**Application timing** - The Liberty Link cotton allows an effective broadleaf herbicide to be applied postemergence over-the-top of cotton. Ignite can be applied to Liberty Link cotton from emergence until early bloom. A spray volume of 15 gallons/A or more with an operating pressure of 40 psi or greater is recommended for use with flat fan nozzles with a 50-mesh screen. It may be applied postemergence

without visible crop injury, yield reduction, or delay in maturity. No more than 80 oz/A can be made per growing season. Liberty Link cotton cannot legally be grown south of Tampa, Florida (Route 60).

### Herbicide Program

Ignite has no soil residual activity and will only control weeds that have emerged at time of application. A traditional preplant-incorporated or preemergence herbicide, such as Prowl, Treflan, Zorial or Cotoran may be needed to enhance the level of weed management. The suggested use rate for Ignite is 32 - 40 oz/A depending on weed size and species. No more than 40 oz per application, or 80 oz per season, may be applied to cotton. See the label for weed size and rate information. Ignite may be applied from emergence to early bloom. Cultivation should be delayed 5 to 7 days following application. Ignite is rainfast in 4 hours. Therefore, if rain is eminent, applications of Ignite should be delayed. Ammonium sulfate at 3 lb/A has been shown to enhance the activity of Ignite (Table 2).

Ignite fair to good grass activity; therefore, the addition of a herbicide for grass control may be desired. Postemergence grass control can be provided by several post-emergence grass herbicides. Select should be applied alone to avoid antagonism with Ignite. For other difficult to control weeds, such as pigweeds, Ignite may be tank-mixed with Staple.

*\* NOTE - Liberty Link cotton use is limited to the area located north of Tampa (Florida Route 60). Also, Ignite will kill Roundup Ready Cotton, and vice versa.*

**Rotation restrictions** - Ignite requires a 120 day restriction for all rotational crops, except for wheat, barley, sorghum and other crops contained on the label.

### Roundup Ready Cotton

Roundup Ready™ cotton has been genetically modified to tolerate glyphosate (Glyphomax, Glyphomax Plus, Ultra Touchdown and Roundup Weathermax, etc.). There are several products containing glyphosate, but all are **not** labelled for use on Roundup Ready™ cotton. Consult your county

agent or the labels; use only those glyphosate products that are labelled for use on Roundup Ready™ cotton. Glyphosate provides control of broadleaf weeds, grasses, and nutsedges. It must be applied at the proper timing to avoid crop injury (*See Application timing*).

**Application timing** - Proper glyphosate application timing is essential to avoid injury in Roundup Ready™ cotton. Glyphosate can be applied overtop of Roundup Ready™ cotton anytime from cotton emergence until the fourth true-leaf stage. Applications of glyphosate over the top of cotton are prohibited after the cotton exceeds the four-leaf stage, except in salvage situations. These late (after 4 leaf) overtop applications will result in bloom abortion and loss of yield.

Roundup can be applied post-directed until layby. Consult the label for the suggested use rate. Glyphosate can be applied twice over the top of Roundup Ready™ cotton when the following criteria are met. The two applications must be at least 10 days apart, there must be two nodes of new growth between the applications, and the second application must be made before cotton exceeds the four-leaf stage. Therefore, if you are going to use two over-the-top applications, the first must occur prior to the 2nd true leaf, and the second application during the 4th true leaf stage.

Directed glyphosate application must minimize contact with the cotton plant when applied after the four-leaf stage. Glyphosate can be applied late season after 20% of the bolls have cracked. At least 7 days between application and harvest are necessary.

## Herbicide Program

**Preemergence** - An advantage to the Roundup Ready™ system is the option to eliminate preemergence herbicides. Early season weed competition should be considered when determining the weed management program. This competition may be avoided by an early glyphosate application, i.e. one leaf stage. If a preemergence herbicide is used, the glyphosate application can be delayed until the three- or four-leaf stage. Consideration should be given to total cotton acreage, weed spectrum, and the acceptable risk level when weather delays

postemergence applications. Preemergence herbicides are a type of insurance policy and often maintain a grower's peace of mind. If there is any doubt that two glyphosate applications cannot be applied prior to the four-leaf stage, a soil-applied preemergence herbicide should be utilized in the program to provide early-season control of annual grasses and Florida pusley (Table 3).

## Tank Mixes

Glyphosate does not provide any soil or residual activity. Therefore, tank mixtures can be utilized for broad spectrum weed control and/or residual activity. A tank mix of Staple and glyphosate improves control of hemp sesbania, spreading dayflower, and morningglory species (all except tall). A premix of this combination is available under the trade name Staple Plus.

Tables 4, 5 and 6 can be helpful in choosing the herbicide that is best suited for your particular situation.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
<b>BURNDOWN HERBICIDES</b>		
Credit Dupont Glyphosate Gly-Flo Glyphos Glyphomax Gly-Star Glyphosate Original Rattler Roundup Original Roundup Weathermax Touchdown Touchdown 5	glyphosate (0.5 - 1.0 lb)	Use higher rate for larger weeds or heavy infestations. Use a 0.25% v/v surfactant with some formulations. Apply after weed emergence up to 3-7 days before planting. Touchdown must be applied at least 35 days before planting. If tillage is intended after treatment wait at least 3 days. Rainfall within 6 hours after application may decrease control.
glyphosate (several) + 2,4-D (0.5 - 1 pt)	glyphosate (0.5 - 1.0 lb) + 2,4-D (0.25 - 0.5 lb)	The addition of 2,4-D will increase control of cutleaf eveningprimrose, wild radish, horseweed, and other winter annuals. Cotton planting must be delayed for a minimum of 30 days after 2,4-D application.
glyphosate (several) + Clarity (8 fl oz)	glyphosate (0.5 - 1 lb) + dicamba (0.25 lb)	Following application of dicamba AND a minimum of 1 in. of rainfall, a waiting period of at least 21 days is required before planting. Dicamba can be applied alone with little to no effect on the small grain cover crop. Dicamba is less effective than 2,4-D on primrose.
glyphosate (several) or Gramoxone (several) + Envoke (0.1 oz)	glyphosate (0.5 - 1 lb) or paraquat (0.5 - 1 lb) + trifloxysulfuron	To be applied in the fall or early in the spring prior to planting cotton. Envoke must be applied a minimum of 90 days prior to cotton planting.  Envoke will improve control of henbit and horseweed.
glyphosate (several) + Valor (1 - 2 oz)	glyphosate (0.5 - 1.0 lb) + flumioxazin (0.032 - 0.047 lb)	The addition of Valor will increase control of cutleaf eveningprimrose and wild radish. A minimum of 14 days and the accumulation 1" of water must occur before planting cotton if 1 oz of Valor is used. If using 2 oz, delay planting for 21 days. Valor will give approximately 6 weeks of residual control of small seeded weeds (pigweeds, Florida pusley, smallflower morningglory) if adequate soil contact occurs.
Gramoxone Max or Firestorm (1.5 - 2.7 pt) Gramoxone Inteon (2.5 - 4 pt)	paraquat (0.5 - 1 lb)	Apply prior to, during or after planting but before crop emergence. Should be applied in at least 10 gal spray solution per acre. May be mixed with 2,4-D to improve activity on some broadleaf weeds. See information below for specifics on 2,4-D.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Gramoxone Max or Firestorm (1.5 - 2.7 pt) Gramoxone Inteon (2.5 - 4 pt) + Direx 4L (1.6 pt)	paraquat (0.5 - 1 lb) + diuron (0.8 lb)	Do not apply on sand or loamy sand soil. Higher rates of diuron may be used on heavier soils, see labels. Apply diuron 15 to 45 days ahead of planting. If Cotoran is applied preemergence, reduce rate to account for residual activity of diuron.
2,4-D ester or amine (various formulations)	2,4-D (0.37 to 1.0 lb)	The most consistent and effective burndown program for winter weeds in Florida would be a 2,4-D application in February when weeds are small and herbicide coverage is adequate followed by glyphosate or paraquat at or near planting. Primrose: Apply 0.37 to 0.5 lb ai/A Radish: Apply 0.5 to 0.75 lb ai/A Horseweed: Apply 0.75 to 1.0 lb ai/A Plant back restriction for 2,4-D is often 30 days, but see specific product label to determine cotton plant back interval.
<b>PREPLANT</b>		
Treflan/various (1 - 2 pt) <b>or</b> Prowl 3.3 EC/ Pendimax 3.3 EC (1.2 - 1.8 pt) <b>or</b> Prowl H <sub>2</sub> O 3.8 AS (2 pt)	trifluralin  pendimethalin	Good control of annual grasses and certain broadleaf weeds. Poor control of cocklebur, sicklepod (coffeeweed), morningglory, and ragweed. No nutsedge control. Incorporate thoroughly according to label directions. The spectrum of weeds controlled is similar for each of these herbicides. Treflan must be incorporated with tillage or irrigation within 24 hours of application. Prowl H <sub>2</sub> O will persist on the soil surface much longer than Prowl 3.3EC or Treflan.
Solicam (1.25 lb)	norflurazon (1.0 lb)	May be applied tank-mixed with Treflan or Prowl and can give good to excellent control of prickly sida with enhanced control of deep germinating weeds such as cocklebur or morningglory. Control may be superior to PRE applications when applied PPI if dry conditions predominate. If used PPI, do not exceed 2.5 lb of Solicam total per season in both PPI and PRE applications. See label for rotation restrictions.
<b>PREEMERGENCE</b>		
Cotoran 4L or Meturon 4L (2.0 - 3.2 pt) <b>or</b> Meturon 80 DF or Cotoran 80 DF (1.2 - 1.9 lb)	fluometuron (1 - 1.6 lb)	Apply after planting and before emergence of the crop or weeds. Good control of annual grass and broadleaf weeds. Use low rate on sandy soils.
Karmex DF (1.0 - 1.5 lb) <b>or</b> Direx (1.6 - 2.4 pt)	diuron (0.8 - 1.2 lb)	Similar to fluometuron but less effective on large-seeded broadleaf weeds.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Solicam (1.25 - 2.5 lb)	norflurazon (1.0 - 2.0 lb)	Apply after planting and before emergence of crop or weeds. Good control of annual grasses and many broadleaf weeds. May suppress nutsedge. May cause problems with rotational crops such as cereal grains and corn. Consult label for specific restrictions.
Staple LX 1.7 - 2.1 oz	pyrithiobac	Do not apply on soils with less than 0.5% organic matter. Can tank mix with diuron, Cotoran, or Prowl. Palmer amaranth biotypes resistant to Staple are present in Georgia. To ensure that resistant biotypes do not develop in Florida, do not apply Staple or Envoke more than once per season.
Command 3 ME (1 - 2 pt)	clomazone (0.315 - 0.75 lb)	For control of annual grass (except Texas panicum) and broadleaf weeds. To avoid serious crop injury, <b>must be used in conjunction with the in-furrow insecticides Di-Syston, Phorate, or Thimet.</b> Should be tank-mixed with Cotoran, Meturon, or Flo-Met for broad spectrum preemergence control. <b>Off-site movement or volatilization can cause highly visible injury (bleaching) to non-target plants.</b> Wet soils and/or windy conditions contribute to problems with off-target injury. Consult the label for specific rotational intervals.
<b>POSTEMERGENCE</b>		
Assure II (5 - 10 oz)	quizalofop (0.06 - 0.125 lb)	Apply for control of annual and perennial grasses. Apply 5 ozs. when johnsongrass is 10-24" tall and re-treat with 5 ozs. when grass regrowth reaches 6-10" tall. Add crop oil concentrate at 1 gal or non-ionic surfactant at 1 qt/100 gals. of spray mixture. Use 8-10 ozs. for control of bermudagrass, Texas panicum, and broadleaf signalgrass.
Dual Magnum (1 - 1.33 pt)	S-metolachlor (0.95 - 1.27 lb)	<b>DO NOT APPLY PREEMERGENCE OR SEVERE COTTON INJURY WILL OCCUR.</b> To control tropical spiderwort, apply at the 4 leaf stage of cotton. Dual will only control weeds that have NOT emerged. To increase effectiveness, efforts should be made to maximize soil contact by spray solution. Metolachlor containing products will often result in slight cotton leaf damage, especially if applied during hot humid conditions or when dew covers the leaf. This injury will persist approximately 7 days and yield will not be affected. Cinch and Dual II Magnum are not registered for use in cotton.
Envoke (0.1 oz)	trifloxysulfuron-sodium (0.0047 lb)	Excellent control of sicklepod, morningglory (except smallflower morningglory) and nutsedges. Apply with non-ionic surfactant (0.25% v/v) from the cotton 5 leaf stage until 60 days before harvest. <b>DO NOT</b> apply prior to 5 leaf stage or unacceptable cotton injury will result. Do not tank mix with other herbicides, oil adjuvants, fertilizers, or insecticides. Do not apply over the top of stripper type cottons. Do not apply more than 0.4 oz/A/yr.
Fusilade DX (6 - 12 oz)	fluazifop-butyl (0.094 - 0.19 lb)	Apply for control of most annual and perennial grasses before they exceed 4" in height. See label for specific rates and weeds. Add crop oil concentrate (1 gal) or nonionic surfactant (2 pts) per 100 gal spray mixture.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Poast (0.75 - 2.5 pt) <b>or</b> Poast Plus (1.0 - 3.75 pt)	sethoxydim (0.14 - 0.47 lb)	Apply for control of most annual and perennial grasses, before grasses exceed 4" tall. Include a crop oil concentrate at 2 pt/A. Herbicide applications must be made no later than 40 days before harvest.
Select, Arrow, or Trigger (6 - 16 oz)	clethodim (0.093 - 0.25 lb)	Apply for the control of annual and perennial grasses. For annual grasses up to 6" tall apply 6 oz/A. A second application may be made. Higher rates will be necessary for rhizome johnsongrass, bermudagrass, and other perennial grasses. Add crop oil concentrate at 1 gal per 100 gals. of spray mixture.
Select Max (12 - 32 oz)	clethodim	Control will be similar to Select, Arrow, or Trigger. <u>Select Max can be applied with either a crop oil or non-ionic surfactant.</u>
Staple LX (2.6 - 3.8 oz)	pyrithiobac	<p>Apply overtop of cotton from cotyledonary stage up to 60 days of harvest. Avoid applying shortly before or after cool weather. Include nonionic surfactant at 0.25% by volume (1 qt per 100 gal spray mix). Do not add crop oil. May make two applications per year, not exceeding a total of 5.1 fl oz. May mix with 1 pt/A of MSMA when cotton is 3 to 6 inches to improve sicklepod control; however, this mixture may reduce pigweed control by Staple.</p> <p>Suggest not mixing with grass control herbicides. May tank mix with most insecticides, but do not tank mix with any product containing malathion. <b>Do not mix with any Dual product.</b> Separate Staple and Dual applications by 5 or more days. See label for rotational restrictions.</p> <p><b>Palmer amaranth biotypes resistant to ALS inhibitors including Staple and Envoke are present in Georgia, but have not been detected in Florida. Over dependence and poor application procedures when using these herbicides will likely lead to resistance in Florida. Make only one TIMELY application of Staple and/or Envoke per season .</b></p>
<b>DIRECTED POSTEMERGENCE</b>		
Aim 2EC 0.8 - 1.6 oz	carfentrazone (0.0125 - 0.025 lb)	Apply as a directed spray after cotton has reached 12" in height with sufficient bark development. Direct spray below foliage or leaf burning will occur. For best activity weed height should be less than 4" in height. See herbicide label for specific rate information. Applications should be made with crop oil concentrate at 1 % v/v.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Cotoran 4L or Meturon 4L (2.4 pt) or Cotoran DF or Meturon DF (1.5 lb) + MSMA (several formulations)	fluometuron (1.2 lb) + MSMA (2.0 lb)	Apply as a directed spray after cotton is 3-4" tall. Add a surfactant if not included in MSMA formulation. Controls a broad spectrum of weeds. Do not apply over-the-top of cotton. Do not apply after cotton begins blooming.
Caparol 4L or Cotton Pro (1.0 - 1.3 pt) + MSMA (several formulations)	prometryn (0.5 - 0.65 lb) + MSMA (2 lb)	Apply this tank mixture as a directed spray after cotton is 6" tall. Add a surfactant if not included in MSMA formulation. Broad spectrum weed control. Do not apply over-the-top of cotton. Do not apply after cotton blooming.
Direx 4F (0.8 - 2.4 pt) + MSMA (2.5 pt)	diuron (0.4 - 1.2 lb) + MSMA (2.0 lb)	Apply in >12" cotton for grass, broadleaf and sedge control. Do not apply MSMA after 1st bloom. Higher diuron rates will provide increased soil residual activity. For control of large morningglory, Aim 2EC may be added. If including Aim, delay application until cotton reaches 16" in height.
ET (0.5 - 1 oz)	pyraflufen-ethyl (0.0008 - 0.0016)	Apply after cotton reaches 18" with 3" of basal bark. Weeds should be 6" or less at time of application. Avoid contact of spray with desirable foliage. Do not apply more than 1 oz per season. Glyphosate or MSMA may be added to improve grass or nutsedge activity. Information on the full weed spectrum controlled by this herbicide is currently limited.
Goal 2XL (1.0 - 2.0 pt)	oxyfluorfen (0.25-0.50 lb)	Apply as a directed spray to weeds less than 4" tall and after cotton is 8" tall. Cotton foliage sprayed will be injured.
Cobra (13 oz) + MSMA (several formulations)	lactofen (0.20 lb) + MSMA (2 lb)	Apply as a directed spray to weeds 4" tall and after cotton is 8" tall. Cotton foliage sprayed will be injured. Add a crop oil.
Harvade 5-F (6.0 - 14.0 oz) + MSMA (several formulations)	dimethipin (0.23 - 0.54 lb) + MSMA (2 lb)	Apply as a directed spray to weeds less than 4 inches tall and the cotton at least 10 inches tall. Direct contact of the spray mixture with cotton leaves and stems will result in crop injury. A minimum of one pint per acre of crop oil is recommended. Use in a minimum of 5 gallons of spray solution per acre.
Linex (1 - 3 pt)	linuron (0.5 - 1.5 lb)	Apply 1 pt at 6" cotton followed by 1.5 pt at 8" cotton. Alternatively, cotton reaching 20" may receive 2 or 3 pt. Use a non-ionic surfactant at 1 pt per 25 gal. Weed control will be similar to Diuron.

**Table 1.** Weed management in non-transgenic cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Prowl 3.3 EC/ Pendimax 3.3 EC (1.8 - 2.4 pt) <b>or</b> Prowl H <sub>2</sub> O 3.8 AS (2 pt)	pendimethalin (0.75 - 1.0 lb) (0.95 lb)	Do NOT spray over the top of cotton. Apply as a directed layby spray to cotton. Does NOT control emerged weeds. Apply after controlling existing weeds. Alternatively, pendimethalin may be tank mixed with any registered layby herbicide, including glyphosate in Roundup Ready cotton. With adequate rainfall or irrigation for activation, pendimethalin will provide residual control of annual grasses and pigweed species. <u>Avoid contact of spray with the non-woody portion of cotton stems and with cotton foliage or serious crop injury can result.</u> Apply at least 60 days prior to harvest.
Suprend (1.0 - 1.5 lb)	trifloxysulfuron-sodium + prometryne	For excellent control of morningglories, pigweeds, sicklepod and sedges. Do not apply more than 2.7 lb/A/yr. Sequential applications can be made after 14 days. Do not apply within 60 days of harvest.
Valor (1 - 2 oz)	flumioxazin (0.032 - 0.064)	For excellent control of morningglory and numerous other broadleaf weeds. For improved grass control glyphosate should be added, or MSMA to improve sedge activity. Applications should be made when cotton has reached 16 inches in height and spray should be directed to the bottom 2 inches of the stem. A non-ionic surfactant should be added to the spray mixture at 0.25% v/v. <b>DO NOT</b> apply Valor with crop oil or any other spray additive except non-ionic surfactants. The manufacturer recommends that a separate sprayer be dedicated to Valor since clean-out is difficult and Valor is extremely injurious to plant foliage.
<b>HOODED APPLICATIONS</b>		
ET 1 - 2 oz	pyraflufen-ethyl	Hooded applications are required for cotton with less than 3" of stem bark. Do not exceed 2 oz/A/yr with this use. Spray that escapes the hood will result in crop injury. ET can be mixed with glyphosate or other herbicides.
Several	glyphosate (0.56 - 0.75 lb)	Controls annual and perennial grasses and broadleaf weeds. In non-Roundup Ready Cotton, keep hoods in contact with the ground and avoid contact with foliage or stems. Do not exceed 5 mph. Allow 7 days between application and harvest. To control large morningglory plants, Aim, Caparol, Direx, or Harvade may be mixed with certain glyphosate formulations.
Gramoxone Inteon (19 - 38 oz)	paraquat (0.31 to 0.62)	<b>DO NOT CONTACT COTTON STEMS OR FOLIAGE.</b> Apply in a minimum of 10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Hoods should be kept as close to ground as possible. Cotton should be at least 8 inches tall. Add nonionic surfactant or crop oil concentrated according to the label. Caparol or diuron (Direx) may be mixed with paraquat. Tank mixes are usually more effective.
Valor 1 - 2 oz	flumioxazin (0.032 - 0.064)	Apply under hoods after cotton has reached 6 inches in height. Any spray solution that escapes the hood and contacts the cotton will result in crop injury. Valor may be mixed with glyphosate or MSMA to improve control of grasses and sedges.

**Table 2.** Herbicide Program for Liberty Link® Cotton.

Trade Name and Broadcast Rate/Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Ignite 280 (23 - 43 oz)	glufosinate	<b>Apply to Liberty Link® varieties only.</b> May be applied from cotton emergence to early bloom. Provides excellent control of morningglory, cocklebur and ragweed, but less effective on perennial weeds and grasses. Adequate spray coverage is essential for weed control. Do not apply more than 40 oz/A per application or 80 oz/A/yr. Not for use south of Tampa, FL (Route 60). Addition of ammonium sulfate (3 lb/A) often improves weed control. NOTE – ROUNDUP READY COTTON WILL NOT TOLERATE IGNITE APPLICATIONS.
Ignite 280 (23 - 29 oz) + Dual Magnum (1 - 1.33 pt)	glufosinate + S-metolachlor	<b>Apply to Liberty Link varieties only. Do not apply Dual Magnum preemergence or severe injury will occur.</b> Dual Magnum will provide residual control of grasses (except Texas panicum) and certain broadleaf weeds. Dual Magnum will only control weeds that have not emerged. Dual Magnum will provide good control of tropical spiderwort. Leaf burning may occur after application.
Ignite 280 (23 - 29 oz) + Staple 1.3 - 1.9 oz	glufosinate + pyrithiobac	<b>Apply only to Liberty Link varieties only.</b> Staple provides additional broadleaf control (particularly pigweeds) as well as residual soil activity.

**Table 3.** Herbicide Program for Roundup Ready™ Cotton.

Trade Name and Broadcast Rate/ Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
Credit, Dupont Glyphosate, Gly-Flo, Glyfos, Glyphomax, Gly-Star, Glyphosate Original, Rattler, Roundup Original max, Roundup Weathermax, Touchdown, Touchdown 5	glyphosate (0.5-1.0 lb)	<b>Apply only to Roundup Ready™ varieties.</b> Avoid drift to non-Roundup Ready cotton and other sensitive crops. Apply in 5-20 gallons of spray per acre over the top from crop emergence through four-leaf stage. Directed application is required if cotton has more than four leaves. May be applied otop twice up to the fourth true-leaf stage; separate applications by at least 10 days and two nodes of new growth. Different glyphosate brands contain differing amounts of active ingredient surfactant requirements. Read specific product labels prior to product use.

**Table 3.** Herbicide Program for Roundup Ready™ Cotton.

Trade Name and Broadcast Rate/ Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
glyphosate several + Dual Magnum (and others) (1.33 pt) or Sequence (2.5 pt)	glyphosate (0.75 lb) + S-metolachlor (1.25)	<b>Apply only to Roundup Ready™ varieties. Do not apply Dual Magnum preemergence or severe injury will occur.</b> Dual Magnum will provide residual control of grasses (except Texas panicum) and certain broadleaf weeds. Dual Magnum will only control weeds that have not emerged. Dual Magnum will provide good control of tropical spiderwort. Leaf burning may occur after application.
Glyphosate (Several brands) + Staple LX (1.3 - 3.8 oz)	glyphosate (0.75 lb) + pyriithiobac	<b>Apply only to Roundup Ready™ varieties.</b> See above comments. Apply over the top from one to four true leaves. Do not apply ovetop after cotton exceeds four-leaf stage unless it is Roundup Ready Flex. Staple LX provides additional broadleaf control as well as residual soil activity.  Avoid applying during periods of cool wet weather. Occasional injury has been associated with this mixture. Injury is worse when applications are made when humidity is high or dew is present.
glyphosate (0.75 lb ae) + Valor (1 - 2 oz)	glyposate + flumioxazin	Cotton must be 16" tall. Do not mix with crop oil. Direct spray to the bottom 2" of the stem. Valor provides excellent control of morningglory and significant soil residual activity. Applications of 1 oz per acre are generally sufficient to control weeds.
glyphosate (0.75 lb ae) + Caparol (1 - 2 pt)	glyphosate + prometryn	Cotton should be at least 8" tall for 1 pt of Caparol and 12" for rates higher than 1 pt.
glyphosate (0.75 lb ae) + Aim 2EC (0.8 - 1.6 oz)	glyphosate + carfentrazone	Cotton must be 16" tall. Aim provides excellent control of large morningglory. Aim can also cause severe cotton injury if application is not precisely made. See Aim label of precautions.
glyphosate (several) + Direx 4F (1 - 1.5 pt)	glyphosate (0.56 - 0.75 lb) + diuron	<b>APPLY POST-DIRECTED TO ROUNDUP READY CULTIVARS ONLY.</b> Use 1 pt of Direx on cotton 8 to 12 inches and 1.5 pt of Direx on cotton greater than 12 inches. Add surfactant according to label. Do not add other spray additives. Compared to glyphosate alone, this combination controls bigger morningglories and provides residual control of small-seeded broadleaf weeds, such as pigweed. However, the tank mix may give less grass control than glyphosate alone. Do not reduce the rate of glyphosate.

**Table 3.** Herbicide Program for Roundup Ready™ Cotton.

Trade Name and Broadcast Rate/ Acre of Commercial Product	Common Name and Broadcast Rate/Acre of Active Ingredient	Remarks
<b>Roundup Ready Flex™ Cotton</b>		
Glyphosate - 5.5 lb gallon such as (Roundup Weathermax) (22 - 32 oz) Glyphosate - 5 lb (24 - 35 oz) Glyphosate - 4 lb (30 - 44 oz)	glyphosate (0.95 - 1.38 lb)	<b>Roundup Ready Flex Cotton</b> allows over-the-top applications of glyphosate all season, until 7 days prior to harvest, without threat of boll loss or reduced yield. There are no restrictions on timing of sequential applications. Can apply as much as 4 quarts of Roundup Weathermax from emergence to 60% boll crack, but no more than 5.3 quarts per acre pre season. Some glyphosate brands have been shown to cause leaf burn when applied late in the season. Do not combine the instructions in this section with those for Roundup Ready Cotton.

**Table 4.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton.<sup>1</sup>

Weed Name	Treflan or Prowl	Solicam	Cotoran or Meturon	Karmex, Direx, Diuron	Command
Time of Application	<b>PPI</b>	<b>PPI</b>	<b>PRE</b>	<b>PRE</b>	<b>PRE</b>
amaranth, Palmer	F	F	G	F	P
anoda, spurred	G		P	P	E
barnyardgrass	E	E	G	F	E
beggarweed, Florida	P	G	G	G	F-G
bermudagrass	P	P	P	P	P
burgherkin	P	G	F-G	F	P
carpetweed	G	G	G	G	G
citronmelon	P	F	F-G	F	P
cocklebur, common	P	P	G	P	F
copperleaf, hophornbeam	P	E	E	E	E
cowpea	P	P	P	-	P
crabgrass	E	E	G	G	G
crotalaria, showy	P	-	G	G	-
croton, tropic	P	G-E	G	-	E
crowfootgrass	E	G	G	G	F
dayflower, spreading	P	-	P	P	-
eclipta	P	F	F	F	F
goosegrass	E	G	G	G	G
jimsonweed	P	F	G	G-E	G
johnsongrass (rhizome)	P	P	P	P	P
johnsongrass (seedling)	G	G	F	F	G
lambquarters, common	G	G	E	G	G
morningglory, cypressvine	P	F	G	-	F-G

**Table 4.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton.<sup>1</sup>

Weed Name	Treflan or Prowl	Solicam	Cotoran or Meturon	Karmex, Direx, Diuron	Command
Time of Application	<b>PPI</b>	<b>PPI</b>	<b>PRE</b>	<b>PRE</b>	<b>PRE</b>
morningglory, entireleaf	P	F	G	-	F-G
morningglory, ivyleaf	P	F	G	-	F-G
morningglory, pitted	P	F	G	-	F-G
morningglory, purple	P	F	G	-	F-G
morningglory, smallflower	P	F	G	-	F-G
morningglory, tall	P	F	G	-	F-G
nutsedge, purple	P	P-F	P	P	P
nutsedge, yellow	P	P-F	P	P	P
panicum, fall	E	G	P	P	G
panicum, Texas	E	F-P	P	P	F
pigweed, redroot	E	F-G	E	E	P
pigweed, smooth	E	F-G	G-E	G	P
poinsettia, wild	P	P	P	P	F
purslane, common	E	E	F	E	G
pusley, Florida	E	G-E	G	G	G
ragweed, common	P	G	G	G	G
redweed	P	G	G	G	G
sandbur, field	E	-	G	G	F-G
senna, coffee	P	P	P	P	F
sesbania, hemp	P	P	F	P	F
sicklepod	P	F	G	P	P
sida, prickly	P	E	E	F	G
signalgrass, broadleaf	E	G	G	G	E
smartweed, Pennsylvania	P	F	P	F	E
spurge, spotted	P	F	P	F	P
starbur, bristly	P	-	G	P	P
velvetleaf	P	F	P	F	E

<sup>1</sup> Estimated effectiveness based on rates recommended in this report. Effectiveness may vary depending on factors such as herbicide rate, size of weeds, time of application, soil type, and weather conditions.

Weed Control Symbols: E= 90-100% control; G= 80-90% control; F= 60-80% control; P= less than 60% control; -= insufficient observations.

Time of Application Symbols: PPI= preplant incorporated; PRE= pre-emergence.

**Table 5.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).<sup>1</sup>

Weed Name	Dual Magnum (and others)	Envoke	Ignite <sup>2</sup>	Glyphosate <sup>3</sup>	Poast, Fusilade DX, Assure II, Select	Staple
Time of Application	<b>POT<sup>4</sup></b>	<b>POT</b>	<b>POT</b>	<b>POT</b>	<b>POT</b>	<b>POT</b>

**Table 5.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).<sup>1</sup>

Weed Name	Dual Magnum (and others)	Envoke	Ignite <sup>2</sup>	Glyphosate <sup>3</sup>	Poast, Fusilade DX, Assure II, Select	Staple
Time of Application	POT <sup>4</sup>	POT	POT	POT	POT	POT
amaranth, Palmer	G	P-F	F	E	P	G
anoda, spurred	-	-	F	G	P	E
barnyardgrass/jungle	G	P	P-F	F	G-E	P
beggarweed, Florida	P	G	G	G-F	P	G
bermudagrass	P	P	P	F-G	G	P
burgherkin	P	-	G	G	P	G
carpetweed	G-E	-	G	E	P	G
citronmelon	P	-	G	E	P	-
cocklebur, common	P	E	G-E	E	P	G
copperleaf,	P	-	F-G	G	P	P
hophornbeam cowpea	P	-	F-G	G-E	P	G
crabgrass	E	P	G	E	E	P
crotalaria, showy	P	-	F-G	G	P	P
croton, tropic	P	P-F	G	E	P	P
crowfootgrass	G-E	P	G	E	E	P
dayflower, spreading	G-E	P-F	F	F	P	G-E
eclipta	P-F	G	F-G	G	P	-
goosegrass	G-E	P	F-G	E	E	P
jimsonweed	P	P	E	G-E	P	E
johnsongrass (rhizome)	P	P	P	E	G-E	P
johnsongrass (seedling)	F	F	P-F	E	E	P
lambsquarters, common	F-G	G	E	G-E	P	P
morningglory, cypressvine	P	G	G-E	F-G	P	G
morningglory, entireleaf	P	G	G-E	F-G	P	G
morningglory, ivyleaf	P	G	G-E	F-G	P	G
morningglory, pitted	P	G	G-E	F-G	P	G
morningglory, purple	P	G	G-E	F-G	P	G
morningglory, smallflower	P	P	G-E	F-G	P	G
morningglory, tall	P	G	G-E	F-G	P	G
nutsedge, purple	P	E	P-F	G	P	P
nutsedge, yellow	F-G	E	P-F	F	P	P
panicum, fall	G	P	G-E	E	E	P
panicum, Texas	P	P	G-E	E	G-E	P
pigweed, redroot	G	G	F	E	P	E
pigweed, smooth	G	G	F	E	P	E
poinsettia, wild	P	G	G	G-E	P	F-G
purslane, common		-	E	E	P	F
pusley, Florida	G-E	P	F-G	P-F	P	P-F
ragweed, common	P	G	E	E	P	P
redweed	P	G	E	E	P	G

**Table 5.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).<sup>1</sup>

Weed Name	Dual Magnum (and others)	Envoke	Ignite <sup>2</sup>	Glyphosate <sup>3</sup>	Poast, Fusilade DX, Assure II, Select	Staple
Time of Application	POT <sup>4</sup>	POT	POT	POT	POT	POT
sandbur, field	G	P	E	E	E	P
senna, coffee	P	-	E	E	P	E
sesbania, hemp	P	-	P-F	P-F	P	E
sicklepod	P	E	E	E	P	P-F
sida, prickly	P	P	G	G	P	F
signalgrass, broadleaf	F	P	E	E	E	P
smartweed, Pennsylvania	P	G	G	G	P	E
spurge, spotted	P	-	G	G	P	F
starbur, bristly	P	G	G	G	P	G
velvetleaf	P	-	G	G	P	E

<sup>1</sup> Estimated effectiveness based on rates recommended in this report. Effectiveness may vary depending on factors such as herbicide rate, size of weeds, time of application, soil type, and weather conditions.  
Weed Control Symbols: E= 90-100% control; G= 80-90% control; F= 60-80% control; P= less than 60% control; - = insufficient observations.  
Time of Application Symbols: POT= postemergence over-the-top.

<sup>2</sup> For use on Liberty Link® varieties only.  
<sup>3</sup> For use on Roundup Ready™ varieties only.  
<sup>4</sup> Dual Magnum is applied POT to cotton. However, Dual Magnum will not control emerged weeds. Dual Magnum must contact the soil in order to provide preemergence activity on germinating weed seeds.

**Table 6.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).

Weed Name	Fluometuron + MSMA	Caparol + MSMA	Cobra + MSMA	Diuron or Linex + MSMA	glyphosate + Diuron	Goal	Valor	Suprend
Time of Application	PDS	PDS	PDS	PDS	PDS	PDS	PDS	PDS
amaranth, Palmer	G	E	E	G-E	E	E	E	E
anoda, spurred	P	P	F	-	-	F	G	-
barnyardgrass	F	G	F	-	G	F	F	G
beggarweed, Florida	G	G	G	E	E	G	E	G
bermudagrass	P	P	P	P	F	P	P	-
burgherkin	P	G	G	G	G-E	G	E	G
carpetweed	G	G	G	-	G-E	G	E	-
citronmelon	P	F-G	G	F-G	G	G	G-E	G
cocklebur, common	G	G	G	E	E	E	E	E
copperleaf, hophornbeam	E	E	E	G	G-E	E	E	E
cowpea	G	G	G	G	G	F-G	-	-
crabgrass	G	G	G	F-G	G	F	F	P
crotalaria, showy	G	G	G	G	G	F	G	G

**Table 6.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).

Weed Name	Fluometuron + MSMA	Caparol + MSMA	Cobra + MSMA	Diuron or Linex + MSMA	glyphosate + Diuron	Goal	Valor	Suprend
Time of Application	PDS	PDS	PDS	PDS	PDS	PDS	PDS	PDS
croton, tropic	G	G	G	G	E	E	E	-
crowfootgrass	G	G	F	F-G	G	P	F	-
dayflower, spreading	F	F	E	-	-	-	F-G	-
eclipta	F	F	F	-	G	G	G-E	G
goosegrass	G	G	G	F-G	G	F	F	-
jimsonweed	E	G-E	G-E	G	E	E	E	G
johnsongrass	P	P	F-G	P	G	P	P	P
johnsongrass	G	G	G	F	G	F	F	P
landquart, sandbur	G	G	F	G	G-E	G	E	G
morningglory, common, cypressvine	G-E	G-E	G-E	G-E	G-E	G	E	G-E
morningglory, entireleaf	G-E	G-E	G-E	G-E	G-E	G	E	G-E
morningglory, ivyleaf	G-E	G-E	G-E		G-E	G	E	G-E
morningglory, pitted	G-E	G-E	G-E	G-E	G-E	G	E	G-E
morningglory, purple	G-E	G-E	G-E	G-E	G-E	G	E	G-E
morningglory, smallflower	G-E	G-E	G-E	G-E	G-E	G	E	G-E
morningglory, tall	G-E	G-E	G-E	G-E	G-E	G	E	G-E
nutsedge, purple	P	P-F	P	F	G	P	P-F	G-E
nutsedge, yellow	P-F	P-F	P-F	F	F	P	P-F	E
panicum, fall	G	G	G	F-G		F	F	E
panicum, Texas	G	G	G	F	G	F	F	-
pigweed, redroot	G	E	E	E	E	E	E	E
pigweed, smooth	G	E	E	E	E	E	E	E
poinsettia, wild	F	P	G	P	F-G	F-G	G	G
purslane, common	F	G	G	-	E	E	E	-
pusley, Florida	G	G	G	F	F	F	-	-
ragweed, common	G	G	G	G	G	G	G-E	-
redweed	G	G	G	G	F	F	-	-
sandbur, field	G	G	G	G	F-G	F	F	G
senna, coffee	P	F	P	G	G	G	G-E	F
sesbania, hemp	P	F	F	P-F	G	F	G	F
sicklepod	G	G	F-G	G-E	G-E	F	E	G-E
sida, prickly	F	G	G	G	G-E	G	E	G
signalgrass, broadleaf	G	G	G	-	G	G	F	G
smartweed, Pennsylvania	P	P	F	-	E	E	E	-
spurge, spotted	P	P	E	G	E	E	E	-
starbur, bristly	G	G	G	G	G	F	G-E	G
velvetleaf	F	F	G	G	G-E	G	E	-

**Table 6.** Estimated effectiveness of recommended herbicides on common weeds in Florida cotton (continued).

<b>Weed Name</b>	<b>Fluometuron + MSMA</b>	<b>Caparol + MSMA</b>	<b>Cobra + MSMA</b>	<b>Diuron or Linex + MSMA</b>	<b>glyphosate + Diuron</b>	<b>Goal</b>	<b>Valor</b>	<b>Suprend</b>
Time of Application	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>	<b>PDS</b>
<p><sup>1</sup> Estimated effectiveness based on rates recommended in this report. Effectiveness may vary depending on factors such as herbicide rate, size of weeds, time of application, soil type, and weather conditions.</p> <p><u>Weed Control Symbols:</u> E=90-100% control; G=80-90% control; F=60-80% control; P= less than 60% control; -= insufficient observations.</p> <p><u>Time of Application Symbols:</u> PDS = post-directed spray.</p>								