2007 Controlling Weeds in Cotton

LSU AgCenter Research & Extension

Preemergence Chemicals

Chemicals that can be used to control weeds in cotton from pre-plant through preemergence are covered in this section.

Stale Seedbed Weed Control

To reduce spring tillage, especially in heavier soils, fall or winter bed formation may be advantageous. Two options for weed control on stale seedbeds are available. Fall applications should not be made to highly erodible soils.

Fall Application - Use Goal at 1.25 to 2.50 pt/A, Valor at 2 to 3 oz./A or Envoke at 0.15 to 0.20 oz/A with 0.25% NIS to control many annual broadleaf weeds and grasses. Use Prowl, Treflan, Trilin, Trific, Tri-4 or Trifluralin at 2.5 pt/A soil incorporated to control many winter annuals.

Spring Application - Apply to emerged weeds on existing beds. Apply glyphosate as described. Control of henbit, wild geranium and cutleaf evening primrose has not been adequate. Apply Gramoxone Inteon at 2.5-4 pt/A to control most small annual weeds and grasses. The addition of Goal at 1.25 - 2.50 pt/A or Valor at 1 to 2 oz./A in combination with glyphosate or Gramoxone Extra may improve control of henbit, wild geranium, cutleaf evening primrose and smartweeds plus provide short-term residual control. Beds treated with Goal must be disturbed prior to planting. 2,4-D may be applied to control many hard-to-kill broadleaf weeds such as cutleaf evening primrose, dock, wild geranium and garlic. Consult labels for rates and planting interval restrictions when considering a 2,4-D application.

Clarity or Harmony Extra may also be used in combination with glyphosate. Clarity is good on smartweed but is somewhat weak on geranium. Harmony Extra XP is also good on smartweed but has a 14-day replant interval. Harmony GT has a seven-day replant interval and is similar to Harmony Extra. However, Harmony GT may not be as effective on primrose or vetch.

Direx may be applied 15 to 45 days prior to planting. Soil must have at least 1% organic matter content. Apply Direx 4L at 1.5 gpt/A to light soils or 2.0 pt/A to medium textured soils.

Zorial may be used in stale seedbed treatment before planting. Apply from 1.25 - 2.5 lb/A for the control of some annual grasses and prickly sida. Zorial will not control emerged weeds. If weeds have emerged, use either Gramoxone or glyphosate in accordance with the Zorial label.

To avoid damage by cutworms, vegetation should be killed three weeks before planting. For burndown applications closer to planting, consider using 2 oz./A of a pyrethroid insecticide.

For more specific spring application information see Research Information Sheet 105 available in your local LSU AgCenter Extension office or online at www.lsuagcenter.com.

Preplant Weed Control

1. **Gramoxone Inteon** (paraquat) can be used to kill most green vegetation in cotton fields. Most annuals will be controlled. Certain annuals such as horseweed will not be controlled. Only top-kill is accomplished on perennial weeds, and regrowth occurs rapidly. It gives best results when applied to weeds up to 6 inches tall, but will give some control of larger vegetation. Use it as a knock-down treatment. Apply Gramoxone Inteon at 2.5-4 pints per acre on a broadcast basis. Add 2 pints of non-ionic surfactant per 100 gallons of diluted spray. Apply 5-10 gallons of the spray mix per acre by air or 20 to 40 gallons with ground applications. This treatment is most useful on heavy clay soil that should not be disturbed in the spring before planting. Best results are obtained when applied during warm weather. Gramoxone Inteon may be tank mixed with most surface-applied preemergence herbicides.
2. **MSMA** can be applied as a burndown treatment for grasses, cocklebur and sedges before cotton is planted. Use at the rate of 2 lbs. active ingredient per acre with one-half percent surfactant by volume. Poor control may be expected if night temperature is below about 70 degrees F.
3. **Roundup** (glyphosate) can be used as a preplant treatment to help control johnsongrass, bermudagrass and other weeds. Allow grass plants to obtain enough top growth for treatment to be effective. Plants should be growing actively when treated.
   - *Rhizome johnsongrass* - Apply 1 to 2 quarts of glyphosate (4L) per acre after plants are 18 or more inches tall. If used in the fall, apply before plants have turned brown. Allow seven or more days after application before tillage.
   - *Bermudagrass* - Apply 5 quarts of glyphosate (4L) per acre after seed heads appear. Allow seven or more days after application before tillage. Bermudagrass is more difficult to control than johnsongrass.

- *Preplant burndown* - Apply 1.0 pt. to 1.0 quart of glyphosate (4L) per acre for control of annual weeds. Use the 1.0 pt. rate only on small weeds under good growing conditions.

  Note: No additional surfactant is recommended with some formulations. See Table 9 for examples.

  Note: Tank mixtures containing glyphosate and other herbicides may reduce the control of grasses when compared to glyphosate alone.

  Note: Other formulations of Roundup may be available. Consult label for rates and the addition of surfactants.

4. **Aim** may be used before planting to remove emerged broadleaf weeds prior to cotton emergence. Apply 0.5 to 1.9 oz./A in combination with 0.25% non-ionic surfactant or crop oil concentrate at 1.5 to 2 pts/A. Aim will not control emerged grasses. Aim may also be used to remove existing cotton in a re-plant situation with no replant restrictions.

Preemergence

Preemergence herbicides are listed in Table 1. Estimates of their performance on several important grasses and broadleaf weeds are in Table 2.

The ratings shown in Table 2 represent early season control. There may be differences in the residual activity of these herbicides. Pay careful attention to rate and method of application shown on the product label.

Incorporated Herbicides - (**Treflan, Trifluralin, Trific, Trilin, Tri-4, Prowl, Pendimax**). These compounds are chemically very similar and are sold to control the same general types of weeds. They have given good to excellent control of most annual grasses and fair to good control of pigweed. Prowl is also labeled for use as a surface application. Rainfall for activation is required within seven days for effective control.

Command 3ME has provided good to excellent control of wild poinsettia, velvetleaf, itchgrass and spurred anoda. Note! Follow all label restrictions concerning application restrictions and buffer areas to help avoid nontarget injury. Command 3ME must be used in combination with the soil-applied insecticides, Di-Syston or Thimet. Failure to use Command 3ME in combination with these insecticides can result in severe cotton injury.

Cotoran, Meturon and Fluometuron have been more active than Karmex, Direx or Zorial under low rainfall conditions. They have given good control of sesbania, morningglory, prickly sida and pigweed, and fair control of cocklebur. Do not reduce Cotoran, Meturon or Fluometuron rates if they are used in a combination treatment.

Karmex and Direx are labeled for use on light and medium textured soils and have generally provided less effective weed control than Cotoran, Meturon or Fluometuron on prickly sida, morningglory, cocklebur and sesbania.

> ***Note:*** Karmex, Direx, Cotoran, Meturon or Fluometuron following organophosphate (Thimet, Di-Syston) soil-applied insecticide applications have resulted in cotton injury.

Zorial - PPI or split application as alternatives. Zorial may be applied at the full rate preplant soil incorporated (PPI) or half-rate PPI and half-rate surface. Zorial applied PPI at 1/2 - 2/3 of label rates has normally ensured excellent control of prickly sida and suppression of nutsedges, especially when used in conjunction with other preemergence herbicide programs (Treflan, Prowl, Trifluralin, Trific, Tri-4 or Trilin and/or Cotoran, Meturon or Fluometuron). These rates are approximately 0.6 - 0.8 lb/A light soils, 1.0 - 1.25 lb/A medium soils, and 1.25 - 1.75 lb/A heavy soils. Cotton injury may occur on certain soils when full rates (1.25 - 2.5 lbs/A) of Zorial are used PPI for two or more years. Zorial has provided good control of prickly sida, purslane and pigweed, fair control of morningglory, poor control of sesbania and cocklebur and some suppression of nutsedge. Do not plant corn, grain sorghum or rice the following season after a Zorial application.

Dual Magnum and Dual II Magnum have given good control of annual grasses and some broadleaf weeds, but poor control of most broadleaf weeds and seedling johnsongrass.

Prowl and Prowl H20 has provided good control of annual grasses and pigweeds when used as a surface application provided sufficient rainfall for incorporation is received within five to seven days after application. This application may be beneficial in combination with a broadleaf herbicide in no-till or reduced-till culture where typical incorporation methods cannot be used. (See Stale Seedbed Weed Control.)

Staple LX and Staple + Cotoran, Meturon or Fluometuron has provided better control of yellow nutsedge and certain broadleaf weeds. A sequential application applied postemergence increases control of many species.

Combinations of herbicides are justified under certain conditions. (Full rates of each herbicide should be used unless otherwise specified on the labels.) Combinations of preemergence herbicides will be most useful in fields that have severe infestations of both grassy and broadleaf weeds.

Replanting - Several approaches can be taken if replanting becomes necessary where a preemergence herbicide has been used. With any of the herbicides, replanting can be accomplished simply by running the planter back in the original drill without any soil preparation, provided soil conditions permit it, placing seed at least 1 inch deep. If reworking of the beds is needed, this can be accomplished with shallow cultivation, such as light disking. Consult the label for information concerning retreatment or plant-back intervals when replanting.

If replanting is necessary where Command has been applied, the label requires the addition of more Di-Syston or Thimet soil-applied insecticide. Refer to label for rates.

Tips On Application

Leave Rows Smooth - Plant about 1 inch deep. Leave your rows smooth to make later applications of chemicals easier. Rolling helps with smoothing, but may result in crusting of the soil surface.

Nozzles Wear Rapidly - Brass nozzles wear more rapidly than do those of hardened stainless steel or nylon. Tests with brass nozzles on wettable powders indicate up to

a 20% increase in flow after two days' use. Start the season with new nozzles. If using brass, recheck calibration every day or two to compensate for wear. If this is inconvenient, try a "tougher" nozzle tip.

Agitation - Wettable powders and flowables require more agitation than emulsifiable concentrates. You can add a pressure by-pass line between the pump and the cut-off valve to improve agitation. Pump capacity will need to be 8 to 10 gallons per minute for this improvement.

Calibration Procedures - Two calibration procedures are shown. Use the one that fits your needs best.

A. Calibration Procedure Number 1:

This procedure can be used to calibrate your sprayer to apply 1/2 gallon of spray per inch of band width per acre when using a 40-inch row spacing.

Step 1 - Select band width from Column 1, Table 3. Note that Column 2 is the number of gallons to be applied per acre on the band -- 1/2 gallon per inch of width for preemergence spraying.

Step 2 - Measure off distance in the field as shown in Column 3 to the right of your band width. For example, for a 13-inch band, measure off 253 feet.

Step 3 - Time the sprayer in seconds as it travels over the distance measured in Step 2. The gear and throttle setting used should be the same as for spraying. Record the time carefully.

Step 4 - Put in correct size nozzle tips. Suggested nozzle sizes are found in Column 4. Use 80 degree even spray flat fan nozzle tips with 50 mesh screens.

Step 5 - Adjust pressure to catch 1 PINT of liquid per row in the same time as recorded in Step 3. Spraying pressure should normally be between 20 and 45 pounds. Change nozzle tips if pressure is too low or too high.

Step 6 - Adjust nozzle height to give selected band width. If drift caused by wind is a problem, the spray nozzle can be lowered and the band width left constant by angling the nozzle backward from the motion of the sprayer.

B. Calibration Procedure Number 2:

If for some reason you wish to apply a rate of spray other than that shown in Table 3, the following procedure will interest you. Tests have shown that broadcast spray rates ranging from 15 to 40 gallons per acre give good results. Smaller rates are more difficult to apply accurately.

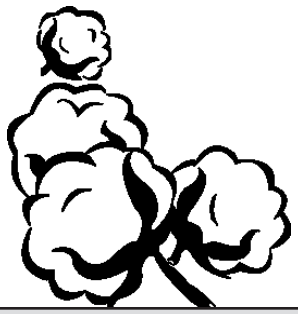
This procedure determines the volume of spray your sprayer is applying. For preemergence spraying, the pressure should be between 20 and 45 pounds. Even spray, 80 degree flat fan nozzles ranging in size from 80015E to 8005E or their equivalent should be used.

1. Measure off the number of feet of row for the respective row spacing:

Row Spacing (Inches)	Row Length Measured (Feet)
36	114
38	108
40	102
42	97
48	85
60	68

2. Time the sprayer in seconds as it travels over the distance measured above, and collect the spray from all nozzles on one row in the same length of time. The throttle and gear setting used both for timing the distance traveled and for collecting the spray should be the same as that to be used for spraying. Record in fluid ounces the quantity of spray collected. Each fluid ounce of spray collected is equivalent to 1 gallon per acre of crop. Adjust the chemical mix to the spray rate selected (see footnote (b) under Table 1).

Mixing the Chemicals - Fill the tank three-fourths full of water, put pump in gear, add the chemical and finish filling with water. Do not add wettable powders directly into the tank. Make a slurry in a 5-gallon can -- then add the slurry. When mixing various formulations, add dry herbicides first followed by flowables and finally emulsions.



Caution

If herbicides are handled or applied improperly, or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, and fish or other wildlife and may contaminate water supplies. Use herbicides only when needed, and handle them with care. Follow the directions and heed all precautions on the container label.

Table 1. Herbicides For Preemergence Weed Control [a]

Herbicide	Rate Per Acre [b] (Broadcast - 40 inch rows) [c] Fully Labeled Materials		
	Light (Coarse) Soil	**Medium Soil**	**Heavy (Fine) Soil**
Direx (4L)	1.00 pt.	2.00 pts.	-
Karmex (80DF)	10.00 ozs.	14.00 ozs.	-
Cotoran (85DF)	1.00 lb.	1.50 lbs.	2.40 lbs.
Cotoran 4L or Meturon 4L	.8 qt.	1.2 qts.	2.0 qts.
Meturon or Fluometuron (80DF)	1.00 lb.	1.50 lbs.	2.50 lbs.
Zorial Rapid 80	1.25 lbs.	1.90 lbs.	2.50 lbs.
Treflan, Trifluralin, Trific, Trilin, Tri-4 (4 lbs./Gal.)	1.00-1.50 pts.	1.50-2.00 pts.	3.00 pts.
Prowl (3.3 lbs./Gal.), Prowl H2O	1.2-1.8 pts.	1.8-2.4 pts.	3.6 pts.
Dual Magnum and Dual II Magnum	1.0-1.33 pts.	1.33 pts.	
Command 3ME	1.4-2.8 pts.	1.4-2.8 pts.	1.4-2.8 pts
Staple	0.6-0.8 oz.	0.6-0.8 oz.	0.6-0.8 oz.
Staple LX 3.2L	-	1.3-1.7 oz.	1.3-2.1oz.

[a] Where spaces are blank, the chemical is not suggested for that particular soil texture. All formulations of the products listed in Table 1 may not be labeled for use on cotton.

[b] Rates given are for the commercial material on a broadcast basis. For Calibration Procedure Number 1, mix the quantity of chemical shown in Table 1 with water to make each 20 gallons of solution and apply according to Table 3. For Calibration Procedure Number 2, mix the quantity of chemical shown in Table 1 with water to make the volume of solution you choose to use per acre on a broadcast basis.

[c] For band treatment the amount of herbicide to use can be determined by using the formula:

$$\frac{\text{band width in inches}}{\text{row width in inches}} \times \text{broadcast rate per acre} = \text{amount needed}$$

Table 2. The values listed are estimates of the degree of weed control that should be obtained with a specific herbicide(s) on selected weeds under average conditions. Many factors such as soil texture, moisture and the extent to which the seedbed is pulverized will affect the results obtained. These estimates are derived from research and experiences. This information may be helpful to you in developing the most effective control program for the weeds on your farm.

Herbicide — Preemergence	**Most Annual Grasses**	**Johnsongrass (seedlings)**	**Nutsedge**	**Spotted Spurge**	**Teaweed (Prickly sida)**	**Pigweed**	**Morning-glory**	**Cocklebur**	**Coffeebean (Sesbania)**	**Smell melon**
Command	9	8	0	-	8	4	6	6	1	0
Treflan, Trifluralin, Trific, Tri-4, Trilin or Prowl	9	8	0	2	2	8	4	1	1	3
Cotoran, Meturon or Fluometuron	8	7	0	5	8	9	8	6	8	9
Karmex or Direx	7	6	0	4	7	9	6	3	7	6
Dual Magnum, Dual II Magnum	8	6	-	6	4	8	4	1	3	4
Zorial	8	6	4	7	8	8	6	4	5	7
Combination Treatments										
PPI + Preemergence Surface Treflan, Trifluralin, Trific, Trilin, Tri-4 or Prowl, + Cotoran, Meturon or Fluometuron	9	9	0	6	8	9	9	8	8	9
Treflan, Trifluralin, Trific, Tri-4 or Prowl + Karmex or Direx	9	9	0	5	7	9	8	5	8	7
Treflan, Trifluralin, Trific, Trilin, Tri-4 or Prowl + Zorial	9	9	4	8	8	9	6	4	5	8
Staple + Cotoran	8	7	3	9	9	9	8	6	8	9

Table 3. Preemergence Calibration — 40-inch row spacing only

1	2	3	4
Band Width **Inches**	Total Solution in **Gallons/Acre**	Distance in feet to Apply One **Pint to each row**	Nozzle-Size* **(Range)**
13	6-1/2	253	8002E-8003E
16	8	204	8003E-8004E
20	10	164	8003E-8005E
24	12	138	8003E-8005E
40(broadcast)	20	82	8003-8005**

* Sizes are based on field speeds of 4 to 6 mph. If more than one nozzle is used per row, adjust nozzle capacity accordingly. Catch the PINT of spray from all nozzles on the row. Similar nozzle sizes are available from other manufacturers. Use of the nozzle listing above does not imply a recommendation of that brand only.

** Use two flat fan nozzles per row 20 inches apart, or one K5 flooding nozzle or its equivalent.

Postemergence Weed Control

Chemicals that can be used to control weeds in cotton from early postemergence through layby are covered in this section.

Early and Mid-Season Postemergence Practices

A. Overtop Applications

In some situations such as when fields are wet or when grass and weeds are too large to obtain coverage with directed sprays, overtop application may be the only method of obtaining satisfactory weed control. Preference should be given to directed applications when possible.

1. **DSMA/MSMA — Labels have been approved for overtop applications of DSMA or MSMA to fields after cotton has been planted, but no later than initial cracking of soil in fields before emergence of cotton, or a maximum of five days after planting, whichever occurs first.**

   Labels have also been approved for overtop application of some formulations of DSMA or MSMA after cotton emerges. Labels specify that applications be made from the time cotton plants have true leaves or are 3 inches tall until first square. Some labels specify that only one overtop application be made per season. Others state that a second application can be made one to three weeks after the first application if needed. *Overtop applications of DSMA or MSMA should not be made after cotton plants begin squaring.* If overtop applications are made, be sure to apply only at the rates and under conditions as specified on the label.

   Under some conditions, an overtop application of DSMA or MSMA may result in yield reductions. Detrimental effects are more likely to occur when the cotton is under drought stress at application time and drought conditions remain for a few days afterward. In no case should an overtop application be made after plants begin squaring. These treatments have provided good control of most annual grasses and cocklebur and suppression of nutsedge and rhizome johnsongrass. Some isolated populations of cocklebur are resistant to MSMA and DSMA.

2. **Cotoran, Meturon or Fluometuron —** Cotoran, Meturon or Fluometuron are labeled for application overtop with a suitable surfactant. Cotoran, Meturon or Fluometuron may be tank mixed with DSMA or MSMA and applied overtop. This practice should be used only in salvage situations because of the potential for excessive injury to cotton plants.

3. **Poast Plus, Fusilade DX, Select, Assure II and Fusion —** Poast Plus, Fusilade DX, Select, Assure II and Fusion are very effective in controlling grasses including johnsongrass and bermudagrass. Apply to annual grasses up to 4 inches tall, rhizome johnsongrass 1 to 2 feet tall, and bermudagrass when runners are 4 to 6 inches long. Application to larger grasses or grasses growing under drought stress will result in reduced control. Timing of application to annual grasses and bermudagrass is critical. Research has shown that vigorously growing rhizome johnsongrass can be effectively controlled before seed head formation. The activity of these herbicides has been markedly reduced when applied tank mixed with many other herbicides.

   Consult labels for rate for regrowth treatment. When using Poast, always add 2 pts/A nonphytotoxic oil concentrate. When using Fusilade DX, add 1% nonphytotoxic oil concentrate or 1/4 percent nonionic surfactant.

   Johnsongrass in certain fields has become resistant to one or more of the graminicides listed above. Fields showing high levels of resistance should be planted to Roundup Ready cotton or rotated to other crops with other grass control strategies.

Table 4. Herbicide rates for overtop graminicides

	Application Rates		
Herbicide	Annual Grasses	Johnson-grass	Bermuda-grass
Poast Plus	1.5 pts.	1.5 pts.	2.25 pts.
Fusilade DX*	.38-.75 pts.	.38-.75 pts.	.75 pts.
Select	6-8 oz.	8-10 oz.	8-16 oz.
Assure II	5-7 oz.	10 oz.	10 oz.
Fusion	---------	10 oz.	-------

*Lowest range of rates for shattercane and seedling johnsongrass. For other annual grasses and rhizome johnsongrass, use 1.0-1.5 pts.

4. **Staple, Staple LX —** Staple and Staple LX are effective on most morningglories, pigweeds, cocklebur, velvetleaf, wild poinsettia, hemp sesbania and several other broadleaf weeds. These products are poor on sicklepod and copperleaf. Apply early postemergence to small actively growing weeds. Staple and Staple LX are recommended for use with existing soil-applied preemergence programs.

   Apply 1.2 oz of Staple and 2.6 oz of Staple LX per acre. When using these products, add .25% nonionic surfactant or 1.0% crop oil concentrate.

   Follow directions on banding Staple and Staple LX. Failure to do so can result in cotton injury.

5. **Envoke —** Envoke can be applied overtop only to cotton that has at least five fully expanded leaves. Envoke may be applied at 0.10 to 0.15 oz. per acre. Always apply in combination with 0.25% non-ionic surfactant. Envoke applied overtop cannot be tank-mixed with fertilizer, insecticides, other herbicides or additives other than surfactant or excess injury will be observed. Do not apply an OP insecticide (such as malathion) within 24 hours before or after an Envoke application. Sequential applications of

Envoke should be made at least 14 days apart. Avoid applying Envoke when cotton is stressed caused by insects or environmental conditions. Envoke cannot be applied by air.

6. Herbicide Tolerant Cotton

Roundup Ready Cotton — Apply 2.0 pts. per acre of glyphosate (4L) overtop to no greater than 4-leaf cotton. Subsequent applications must be made post directed. Overtop applications made after the 4-leaf stage affect fruiting. If subsequent glyphosate treatments are applied, they must be directed by using equipment that prevents spray from contacting the cotton plant. Spray-to-plant contact may result in abnormal fruiting.

Sequence , a prepack mixture of Touchdown (glyphosate) + Dual Magnum can also be used overtop of Roundup Ready Cotton. Apply at 2.5 pts/A. Do not exceed 2.5 pts/A Sequence in a single application or 3.5 pts/A/season. Make over-the-top applications from 3 inch tall cotton to 4 leaf cotton. Do not include ammonium sulfate (AMS) or other adjuvants when making over-the-top applications.

Note: Several formulations can be used on Roundup Ready cotton. See Table 9 for examples of these labeled at this printing. Consult label carefully.

Roundup Ready Flex Cotton — This new generation of Roundup Ready Cotton will allow producers to make multiple over-the-top glyphosate applications that are not currently allowed with the original Roundup Ready Cotton. With this system producers must be careful to make timely glyphosate applications so as not to sacrifice yield to weed competition by delaying glyphosate applications to control multiple weed flushes. Cotton is extremely sensitive to early season weed competition. Producers should give thought to tank-mix combinations, especially if air induction spray nozzles are used. While plant growth regulator co-applications with glyphosate are not affected by the use of air induction nozzles, co-applications with insecticides may be adversely affected. Glyphosate efficacy is not affected since weed control with glyphosate is not strictly dependent on spray coverage. However, insecticides are dependent on proper coverage for maximum efficacy. Consult the label of the insecticide of choice and determine if air induction nozzles are acceptable. Current labeling allows for over-the-top glyphosate applications from cracking through 60% boll crack. However, as cotton plants get larger, the spray solution will be intercepted by the cotton plant and weeds beneath the canopy will not be controlled. Not all glyphosate formulations labeled for use on Roundup Ready Cotton will be labeled for use on Roundup Ready Flex cotton. Table 9 lists some of those formulations labeled for over-the-top use on both generations of Roundup Ready Cotton at the time of this writing. The list of products labeled for over-the-top use on Roundup Ready Flex Cotton is extremely limited as of this time. Using properly labeled products is extremely important. Higher temperatures at later application times can contribute to cotton injury from non-approved products. Producers who plant both generations of Roundup Ready cotton should take care to manage each technology properly. Roundup Ready Flex herbicide systems will cause yield loss if applied to Roundup Ready Cotton.

Liberty Link Cotton — Apply 22-29 oz. per acre Ignite 280 overtop of cotton from emergence to early bloom. Ignite 280 is much more effective on weeds less than 3 inches in size. Always time Ignite 280 applications to weed size, NOT cotton stage. Less effective on sedges, large goosegrass and signalgrass. Pigweeds may not be effectively controlled if larger than 4 to 5 inches at application. A PRE application of Prowl may aid in pigweed control in this system. Do not apply more than 80 oz./season. Do not apply within 70 days of harvest. Apply in a minimum of 15 gpa. Thorough spay coverage is essential. No additional surfactant is needed. Ignite 280 may be tank-mixed with Dual Magnum or Staple to enhance weed control and/or residual activity.

B. Wick Applications

Labels have been approved for the use of rope wick applicators to apply glyphosate to control johnsongrass in cotton. It is suggested that the treatment solution be one part glyphosate to two parts of water. Treat when johnsongrass is at least 12 inches taller than the crop. For longer control, repeated treatments will probably be necessary as more johnsongrass becomes taller than the cotton. Improved control may be obtained if two passes are made with the applicator in opposite directions. The rope wick must remain moist for best results. Contact by the applicator to the cotton will result in crop injury.

C. Directed Sprays

1. **MSMA or DSMA plus Surfactant —** Use as directed spray after the cotton is 3 inches tall and before bloom. MSMA or DSMA plus surfactant is effective on grasses, cocklebur and nutsedge. They perform best when the weather is dry and hot. If applied during cool weather, poor control may result. Except on johnsongrass, nutsedge and cocklebur where relatively large plants can be controlled satisfactorily, weeds should be small, about 2 inches or less. A second application will usually be needed in seven to 14 days.
2. **MSMA or DSMA plus Cotoran, Meturon or Fluometuron plus Surfactant —** Apply as a directed spray after cotton is 3 inches tall. Control of most small annual broadleaf or grassy weeds can be expected. If Cotoran, Meturon or Fluometuron has not been applied preemergence, two postemergence applications can be used if needed. If it has been used preemergence, use only one early postemergence application to prevent applying an excessive annual rate. This is especially true on light soils where damage from excessive uptake of the herbicide by cotton roots is more likely.
3. **MSMA or DSMA plus Caparol or Cotton-Pro (prometryne) plus Surfactant —** This mixture can be applied as a directed spray after cotton is 3 inches tall, and is effective on both broadleaf and grassy weeds, including teaweed, that are not more than 2

to 3 inches high. Extreme care should be taken in making applications to cotton 3 to 6 inches tall so that the spray does not contact the cotton foliage.

4. **MSMA or DSMA plus Karmex, Direx (diuron) plus Surfactant —** Apply as a directed spray after cotton is 6 inches tall and before bloom. Either of these mixtures will control a wide range of small grassy and broadleaf weeds. Injury will result if the mixture is sprayed on the cotton.
5. **MSMA plus Linex (linuron) plus Surfactant —** Apply as a directed spray to cotton at least 8 inches tall. Apply 1.0 to 1.5 pints per acre of Linex 4L plus 1.0 to 2.0 pounds of MSMA per acre. Add 1 pint of surfactant per 25 gallons finished spray.
6. **MSMA plus Goal (oxyfluorfen) plus Surfactant —** Apply as directed spray to cotton at least 8 to 12 inches tall. Apply 1.25 to 2.5 pints per acre of Goal plus 1.0 to 2.0 pounds of MSMA per acre. Goal has been effective on a wide range of broadleaf weeds, especially morningglory. Caution: To minimize the risk of injury to cotton, do not apply at pressures above 25 PSI or to wet soil. Use flat fan or flood spray tips.
7. **MSMA plus Cobra (lactofen) plus crop oil concentrate —** Apply as a directed spray to cotton at least 8 to 12 inches tall. Apply 12.5 ounces per acre of Cobra plus 1.0 to 2.0 pounds of MSMA. Cobra is effective on many broadleaf weeds. **Minimize contact with cotton leaves.**

   Karmex, Direx, Caparol, Cotton-Pro, Cotoran, Meturon, Fluometuron, Linex or Goal plus a surfactant can be used without DSMA or MSMA. In most instances, however, a wider range of weed control can be expected if the DSMA or MSMA is added to the mixture.
8. **Roundup Ready Cotton** — Residual herbicides can be applied post-directed to Roundup Ready cotton. Consult glyphosate label for approved tank mixes. If weeds are present, use the full rate of Roundup Ultra to avoid potential antagonism by the residual herbicide. Use extreme care to keep spray solution at or below cotyledon scars.
9. **Roundup Ready Flex Cotton —** Labeled formulations of glyphosate may be post-directed in Roundup Ready Flex Cotton. Other herbicides labeled for this use may also be tank-mixed with glyphosate to provide residual control or improve the weed control spectrum. If grasses are present, use the full rate of glyphosate to prevent antagonism, especially when tank-mixing with residual herbicides.
10. **Liberty Link Cotton —** Ignite 280 may be applied post-directed in a tank-mix with other herbicides labeled for post-directed use in cotton. Follow the most restrictive label of the two products. Thorough spray coverage is essential for good control. Consult the Ignite 280 label for approved spray nozzles.
11. **Envoke —** Apply 0.15 to 0.25 oz. per acre Envoke with Caparol, Dual Magnum, MSMA, Staple or Cotoran for post-directed applications. Include a

Figure 1 - Nozzle arrangements for post directed herbicides

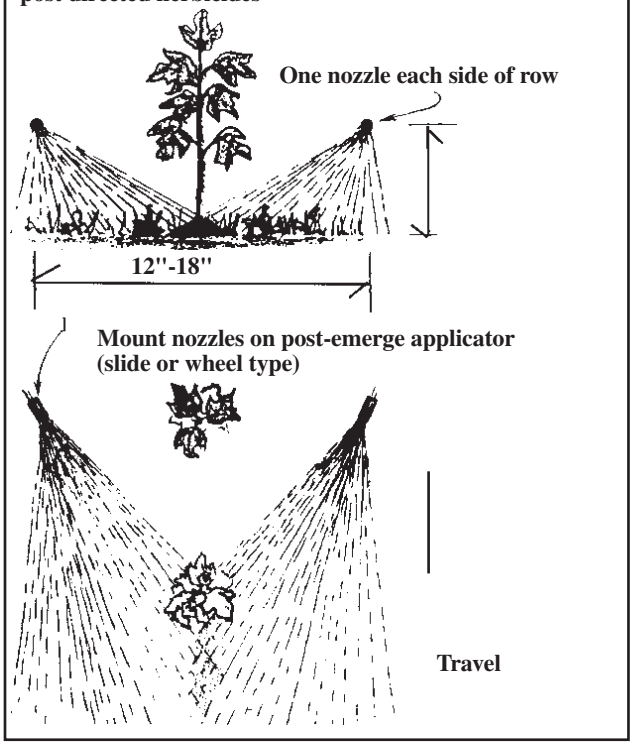


Table 5. Herbicide Rates for Postemergence Mixtures [1]

Herbicide [2]	Broadcast Rate Per Acre, 40 Inch Rows
DSMA (Active Ingredient)	1.5-3.0 lbs.
MSMA (Active Ingredient)	1.0-2.0 lbs.
Direx 4L	.4-.8 pt.
Karmex 80 DF	.25-.50 lb.
Caparol 80W	.60-.80 lb.
Caparol 4L or Cotton-Pro	1.0-1.3 pts.
Cotoran 85DF	1.0-1.5 lbs.
Cotoran 4L or Meturon 4L	.8-1.2 qts.
Meturon 80DF or Fluometuron 80DF	1.0-1.5 lbs.
Goal 1.6E	1.25-2.5 pts.
Cobra 2E	12.5 oz.
Staple	1.2 oz.
Staple LX 3.2 L	2.6 oz.
Roundup Weather Max [3]	22 oz.
Envoke	0.1 - 0.15 oz. OT 0.1 - 0.25 oz. PD
Ignite 280	22-29 oz.

[1] All formulations of the products listed in Table 4 may not be labeled for use on cotton. For mixtures of DSMA or MSMA with one of the other herbicides shown in Table 5, add each herbicide within the rate range shown above to the mixture.

[2] Except for DSMA or MSMA, rates given are for the commercial material on a broadcast basis. For calibration procedure Number 1, mix the quantity of chemical shown in Table 5 with water to make each 20 gallons of solution, and apply according to Table 7. For calibration procedure number 2, mix the quantity of chemical shown in Table 5 with water to make a volume of solution you choose to use per acre on a broadcast basis.

[3] Other glyphosate formulations are available. Consult Table 9 for products and rates.

non-ionic surfactant with at last 80% active constituents at 0.25% v/v (1 qt./100 gallons solution) or 0.5 to 1% crop oil concentrate (2 to 4 qts./100 gallons solution). Crop safety is much improved with Envoke when post directed.

Envoke may be applied post-directed with glyphosate to Roundup Ready cotton. No antagonism of grass activity of glyphosate has been observed with Envoke.

12. **Aim —** Apply 0.8 to 1.6 oz/A Aim in combination with 1% crop oil concentrate. Make applications to cotton that is a minimum of 6 inches in height. Do not allow Aim to contact foliage or green stems. Aim may be tank-mixed with a wide range of postemergence herbicide products. Do not apply more than 3.2 ounces of Aim in post-directed and layby applications. Aim will improve morningglory and hemp sesbania control in a glyphosate-based herbicide system. Aim is very good on many annual broadleaves, but MSMA or glyphosate must be used for annual grass control.
13. **Suprend —** Suprend contains Envoke + Caparol. Apply at 1 to 1.5 lbs/A after cotton is at least 6 inches tall. Suprend may be tank-mixed with Dual Magnum, MSMA, Aim, Direx, Linex, Cobra or Touchdown (glyphosate). For improved grass control, tank-mix with MSMA or glyphosate.
14. **ET** — ET is similar to Aim in its weed control spectrum. Apply ET at 0.5 to 1.0 oz./A to cotton with 3 inches or more of barked stem. ET will not control grasses. Tank-mix with MSMA or glyphosate if grasses are present. Thorough spray coverage is essential for control. Apply in 10 to 30 gallons of water per acre.

Spot Treatments

Glyphosate, Poast, Assure, Select and Fusilade DX are labeled for use as spot treatments. All are effective on grasses. Glyphosate is also effective on most broadleaf weeds.

- **Glyphosate** - Mix one to two parts of glyphosate Ultra with 100 parts of water and spot treat grasses, wetting the weeds thoroughly.
- **Poast Plus** - Mix 1.5 gallons of Poast Plus, plus 1.0 gallon oil concentrate per 100 gallons of water. Spray to wet.
- **Fusilade DX** - Mix 2.0 quarts of Fusilade DX plus 1.0 gallon oil concentrate or 1.0 quart nonionic surfactant per 100 gallons of water. Spray to wet.
- **Assure II** - Mix 48 ounces of Assure II plus 1.0 gallon oil concentrate or 1.0 quart nonionic surfactant per 100 gallons of water. Spray to wet.
- **Select** - Mix 2.0 quarts of Select plus 1.0 gallon of oil concentrate per 100 gallons of water. Spray to wet.

Layby Treatments

Broadcast applications of Karmex, Direx, Linex, Cotoran, Meturon, Fluometuron, Caparol or Cotton-Pro may also be used as a layby as previously discussed.

These herbicides can be applied to clean cultivated fields. Or, if surfactant is added, they will control actively growing small weeds less than 3 inches tall. MSMA or glyphosate (RR cotton only) can also be added to control existing weeds.

Additionally, Command 3ME (Louisiana label) or Valor can be integrated into layby herbicide programs as well.

Apply Valor at 1 to 2 oz/A as part of a post-direct or layby weed control program. Apply to cotton that is a minimum of 18 inches tall and has 2 inches of bark on the lower stem. Do not apply more than 2 oz/A in a single application or more than 4 oz/A/season. Use a nonionic surfactant (80% active constituents). Do not use crop oil concentrate, methylated seed oils or organo-silicant surfactants. Valor will control emerged broadleaf weeds if spray coverage is sufficient. For postemergence control of emerged grasses, sedges and perennial weeds, applications should include MSMA or glyphosate (RR Cotton only).

In cotton fields where a fall crop is to be seeded, consider using Linex or Valor as a layby treatment. Both herbicides have short residual activity and will usually have dissipated from the soil by fall seeding.

Layby can be applied as a single application or as a split application. If the applications are split, it is suggested that you apply one-half of the chemical when the cotton is 12 to 15 inches tall, and follow with the other half if needed.

Layby sprays can be applied with a four nozzle arrangement per row as shown in Figure 2, or with a single flooding nozzle (Figure 3).

Figure 2 - Four nozzle arrangement for applying layby sprays

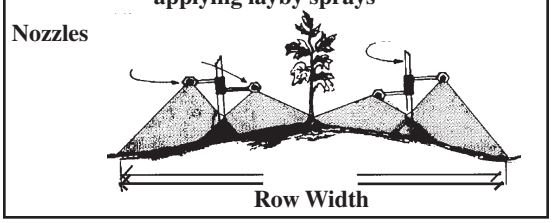


Figure 3 - Flooding nozzle for applying layby sprays

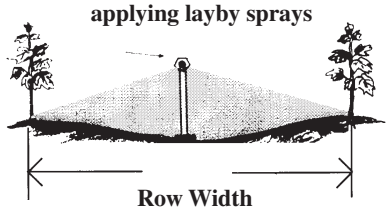


Table 6. Herbicide Rates for Layby Weed Control

Herbicide	Broadcast rate per acre* Soil Texture Light	Medium	Heavy
Linex 4L	-	2.0 pts.	3.0 pts.
Karmex 80DF	.5 lb.	1.0 lb.	1.5 lbs.
Direx 4L	-	1.5 pts.	2.0 pts.
Caparol 80% WP	1.5 lbs.	1.75 lbs.	2.0 lbs.
Caparol 4L or Cotton-Pro	2.4 pts.	2.8 pts.	3.2 pts.
Cotoran 85% DF	1.0 lb.	1.2 lbs.	-
Cotoran 4L or Meturon 4L	.8 qt.	1.0 qt.	-
Meturon 80DF or Fluometuron 80DF	1.0 lb.	1.25 lbs.	-
Valor	1-2 oz.	1-2 oz.	1-2 oz.

*Rates given are for the commercial material.

Calibration Procedures

Two calibration procedures are shown. Use the one that fits your needs best.

A. Calibration Procedure Number 1: This procedure can be used to calibrate your sprayer to apply 1/2 gallon of spray per inch of band width per acre when using a 40-inch row spacing.

- **Step 1.** Select band width from Column 1, Table 4. Note that Column 2 is the gallons to be applied per acre on weeds in the band - 1/2 gallon per inch of band width for post-directed spraying.
- **Step 2.** Measure off distance in the field as shown in Column 3 to the right of your band width. For a 12-inch band, measure off 273 feet.
- **Step 3.** Time the sprayer in seconds as it travels over distance measured in Step 2. Record the time carefully. The gear and throttle setting used should be the same as for spraying.
- **Step 4.** Put in correct size nozzle tips. Suggested nozzle sizes are in Column 4. Use 65 to 80 degree flat fan nozzle tips, properly screened. When wettable powders are applied, screens smaller than 50 mesh should not be used.
- **Step 5.** Adjust pressure to catch 1 pint of liquid per row in the same time as recorded in Step 3. Spraying pressure should normally be between 20 and 35 pounds. Change nozzle tips if pressure is too low or high.
- **Step 6.** Adjust nozzles to give coverage of weeds in the band area. Figure 1 shows suggested settings. Final adjustment must be made for weed and row conditions. Your equipment is set for applying post-directed sprays.

Caution

If herbicides are handled or applied improperly, or if unused portions are not disposed of safely, they may injure humans, domestic animals, desirable plants, and fish or other wildlife, and may contaminate water supplies. Use herbicides only when needed, and handle them with care. Follow the directions, and heed all precautions on the container label.

Table 7. Post-Directed Calibration 40-inch Row Spacing

1 Band Width Inches	2 Solution Total To Apply 1 in Gallons/A	3 Distance in Feet Size Pint to Each Row	4 Nozzle (Range)
12	6	273	8001-80015
14	7	233	8001-80015
16	8	204	8001-8002
20	10	164	80015-8002
Broadcast	20	82	80015-8002

For band spraying, use two nozzles per row, one on each side. For broadcast spraying, use four nozzles per row, two on each side. For layby, one flooding tip, K3 to K5, may be used per row, if desired. Refer to figures 2 and 3. Catch the PINT of spray from all nozzles on the row. Nozzle sizes are based on field speeds of 4 to 6 miles per hour. Similar nozzle sizes are available from other manufacturers. Use of the nozzle listing above does not imply a recommendation of that brand only. Difficulty may be experienced in applying wettable powders with nozzles smaller than 8002.

B. Calibration Procedure Number 2: If for some reason you wish to apply a rate of spray other than that shown in Table 7, the following procedure will be of interest. Tests have shown that broadcast spray rates ranging from 15 to 40 gallons per acre give good results. Lower volumes are more difficult to apply accurately.

This procedure determines the volume of spray your sprayer is applying. For postemergence spraying, the pressure should be between 20 to 45 pounds. Use 80 degree flat fan nozzles ranging in size from 80015 to 8005 or their equivalent.

1. Measure off the number of feet of row for the respective row spacing:

Row Spacing (Inches)	Row Length Measured (Feet)
36	114
38	108
40	102
42	97
48	85
60	68

2. Time the sprayer in seconds as it travels over the distance measured above, and collect the spray from all nozzles on one row in the same length of time. The throttle and gear setting used both for timing the distance traveled and for collecting the spray should be the same as that to be used for spraying. Record in fluid ounces the quantity of spray collected. Each fluid ounce of spray collected is equivalent to 1 gallon per acre of crop. Adjust the chemical mix to the spray rate selected. See footnote under Table 4.

   Mixing the chemicals: Fill tank three-fourths full of water, put pump in gear, add the chemical and finish filling with water. It is not a good idea to put wettable powders directly into the tank. Make a slurry in a 5-gallon can, then add.

Table 8. The values listed are estimates of the degree of weed control that should be obtained with a specific herbicide(s) on selected weeds under average conditions. Many factors such as soil texture, moisture and the extent to which the seedbed is pulverized will affect the results obtained. This information may be helpful, too, in developing the most effective control program for the weeds on your farm.

	copperleaf	smellmelon	bermudagrass	seedling johnsongrass	annual grasses	nutsedge	teaweed	pigweed	morningglory	cocklebur	coffeebean (sesbania)	spotted spurge	sicklepod
Aim	-	8	0	0	0	0	0	8	9	9	9	-	6
Aim + MSMA	5	5	0	8	8	8	7	8	9	9	9	-	8
Aim + glyphosate	9	9	7	9	9	7	8	9	9	9	9	-	9
Assure II	0	0	8	9	9	0	0	0	0	0	0	0	0
Cobra + MSMA + COC	9	9	0	9	7	6	8	9	9	8	8	7	6
Cotoran, Meturon or Fluometuron + surfactant	8	8	0	7	6	3	6	7	5	6	5	6	-
Caparol or Cotton-Pro + surfactant	8	8	0	8	7	5	7	8	8	7	6	6	-
Caparol or Cotton-Pro + DSMA or MSMA + Surfactant	9	9	0	9	8	7	8	9	9	8	7	6	8
Cotoran, Meturon + MSMA or DSMA + surfactant	9	9	0	8	8	6	7	9	8	8	6	7	8
Envoke	8	9	0	6	5	8	3	9	8	7	8	1	8
ET	9	9	7	9	9	7	8	9	9	-	-	-	-
Fusilade DX	0	0	8	9	9	0	0	0	0	0	0	0	0
Glyphosate	9	9	7	9	9	7	8	9	8	8	8	9	8
Goal+MSMA+ surfactant	9	9	0	9	8	7	7	8	9	8	7	8	8
Ignite 280	10	10	6	9	9	4	9	9	10	9	9	9	9
Karmex or Direx + surfactant	7	7	0	8	6	0	7	8	7	7	6	3	8
Karmex or Direx + DSMA or MSMA + surfactant	8	8	0	9	9	7	8	9	8	8	6	4	8
Linex + MSMA + surfactant	9	9	0	9	8	6	8	9	9	8	7	6	8
Poast Plus	0	0	8	9	9	0	0	0	0	0	0	0	0
Select	0	0	8	9	9	0	0	0	0	0	0	0	0
Sequence	9	9	7	9	9	7	8	9	8	8	8	9	8
Staple LX	2	4	0	6	5	5	8	9	8	7	8	1	6
Staple + Glyphosate	9	9	7	9	9	7	9	9	9	9	9	9	8
Suprend	8	9	0	8	7	8	7	9	8	7	8	6	8
Valor	9	9	0	0	0	3	8	9	9	9	9	-	8

*Control rating estimates are for weeds 2 inches or less. Less control will be obtained with larger weeds. For perennial weeds, top kill only should be expected.

CONTROL RATING SCALE: 0 equal to no control and 10 equal to 100% control.

Table 9. Glyphosate products labeled on Roundup Ready and Roundup Ready Flex cotton.[1]

Trade Name[2]	lb ai/gal or %	Manufacturer	Use rate[3]	Surf. needed	RR Flex cotton[4]	RR cotton[4]
Buccaneer	4	TENKOZ, Inc.	32 oz/A	0.5%		X
Buccaneer Plus	4	TENKOZ, Inc.	32 oz/A	None		X
Clearout 41	4L	Chem. Prod. Tech.	32 oz/A	0.5%		
Clearout 41 Plus	4L	Chem. Prod. Tech.	32 oz/A	None		X
Clearout 41 Unloaded	4	Chem. Prod. Tech.	32 oz/A	None		
Cornerstone	4L	Agrilliance	32 oz/A	0.5%		X
Cornerstone Plus	4L	Agrilliance	32 oz/A	None		X
Credit	4	Nufarm	32 oz/A	0.5%		X
Credit Duo	4	Nufarm	32 oz/A	None		X
Credit Duo Extra	4	Nufarm	32 oz/A	None		X
Credit Extra	4	Nufarm	32 oz/A	None		X
Credit systemic Extra Herbicide	4L	Nufarm	32 oz/A	None		X
Debit TMF	5.4L	Nufarm	26 oz/A	0.5%		
Eagre	5.4	Griffin	26 oz/A	0.5%		
Extra Credit 5	5	Nufarm	26 oz/A	0.375%		X
Gly-4	4	Univ. Crop Prot.	32 oz/A	0.5%		X
Gly-4 Plus	4	Univ. Crop Prot.	32 oz/A	None		X
Gly-Flo	4	Micro–Flo	32 oz/A	0.5%		
Glyfos	4L	Cheminova	32 oz/A	0.5%		X
Glyfos Extra	4L	Cheminova	32 oz/A	None		X
Gly Star 5	5.4	Albaugh	26 oz/A	0.5%		X
Gly Star Original	4L	Albaugh	32 oz/A	0.5%		X
Gly Star Plus	4L	Albaugh	32 oz/A	None		X
Glyphogan	4	Makteshim	32 oz/A	0.5%		X
Glyphomax	4L	Dow AgroSciences	32 oz/A	0.5%		X
Glyphomax Plus	4L	Dow AgroSciences	32 oz/A	None		X
Glyphomax XRT	5.4	Dow AgroSciences	24 oz/A			X
Glyphosate 4	4L	Farmsaver	32 oz/A	0.5%		X
Glyphosate 41%	4	Helm Agro	32 oz/A	None		X
Glyphosate Original	4	Griffin	32 oz/A	0.5%		X
Glyphosate Herbicide	4L	DuPont	32 oz/A	0.5%		
Glypro	5.4	Dow	26 oz/A	0.5%		
Glypro Plus	4	Dow	32 oz/A	None		
Helosate	4	Helm Agro	31 oz/A	0.5%		X
Honcho	4L	Monsanto	32 oz/A	0.5%		X
Honcho Plus	4L	Monsanto	32 oz/A	None		
Mirage	4	UAP	32 oz/A	0.5%		
Mirage Plus	4	UAP	32 oz/A	None		
Rascal	4	Agriliance	32 oz/A	None		X
Rascal Plus	4	Agriliance	32 oz/A	0.25%		
Rattler	4L	Helena	32 oz/A	0.5%		X
Rattler Plus	4	Helena	32 oz/A	None		X
Roundup Custom[5]	4L	Monsanto	32 oz/A	0.5%		
Roundup D-Pak[5]	6.42L	Monsanto	20 oz/A	0.5%		
Roundup Original	4L	Monsanto	32 oz/A	0.5%		
Roundup Original II[5]	4L	Monsanto	32 oz/A	None		
Roundup Original Max	5.5L	Monsanto	22 oz/A	None	X	
Roundup UltraDry	71.4	Monsanto		None		
Roundup WeatherMax	6L	Monsanto	22 oz/A	None	X	X
Touchdown 5	5	Syngenta	26 oz/A	None		
Touchdown	4L	Syngenta	32 oz/A	None		X
Touchdown Hi Tech	5	Syngenta	26 oz/A	0.25%		X
Touchdown Total	5.5L	Syngenta	24 oz/A	None		X

[1] This list may not contain all available formulations of glyphosate. The omission of a specific product does not mean that the product is not recommended by the LSU AgCenter. Not all formulations are available in Louisiana, and some may not have been registered for use in Louisiana at the time of printing. Product labeling may change from year to year. Be certain to read and follow all label directions.

[2] Some formulations may be labeled for both over-the-top and post-directed applications. Some, however, may only be labeled for post-directed applications. Some may only be labeled for burndown applications prior to planting. Read label carefully to make the proper determination.

[3] To provide 0.75 lb ae/A glyphosate

[4] Products with an "X" in these columns are labeled for over-the-top applications. The availability of products for use on RR Flex cotton is incomplete at the time of this writing.

[5] May not be available in 2006

This material was prepared by the following personnel of the LSU Agricultural Center:

- P.R. Vidrine, Professor, Dean Lee Research Station
- D.K. Miller, Associate Professor, Northeast Research Station
- D.E. Sanders, Professor, Idlewild Research Station
- D.M. Scroggs, Research Associate, Dean Lee Research Station
- A.M. Stewart, Associate Professor, Dean Lee Research Station

Visit our Web site: www.lsuagcenter.com

Louisiana State University Agricultural Center
William B. Richardson, Chancellor

Louisiana Agricultural Experiment Station
David J. Boethel
Vice Chancellor and Director

Louisiana Cooperative Extension Service
Paul D. Coreil
Vice Chancellor and Director

Pub. 2746 **2/07 Rev.**

Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. The Louisiana Cooperative Extension Service provides equal opportunities in programs and employment.