



## Weed Management in Texas Cotton

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## **Tables for Herbicide Application Timings**

1. Preplant Burndown
2. Preplant Incorporated
3. Preemergence
4. Postemergence
5. Post-Directed or Hooded
6. Wick or Wiper Applications
7. Herbicides, Formulations, Group Numbers, and Mechanism-of-Action

The suggestions contained herein are based primarily on herbicide labels and research conducted by Texas A&M AgriLife Extension Service and Texas A&M AgriLife Research. The use of product names is not intended as an endorsement of the product or of a specific manufacturer, nor is there any implication that other formulations containing the same active chemical are not equally effective. Product names are included solely to aid readers in locating and identifying the herbicides suggested.

## **Overview of Weed Management in Cotton**

Weed control in cotton can be accomplished through the integrated use of cultural, mechanical and chemical means. Used judiciously, these individual methods or a combination of them can effectively manage weeds without causing economic loss or adverse environmental effects.

Deciding which practices to employ will depend largely on the infestation level and the weed(s) being controlled. Also, the planting date, herbicide tolerance traits, presence of herbicide resistant weeds, and other crop management practices will play a major role in determining the most economical and effective management strategy.

## **Considerations for cultural and mechanical weed control should include:**

- Remove light or spotty infestations of weeds by spot cultivation to prevent spreading weed seed, rhizomes or roots. This is of particular importance with perennial weeds because of the way they propagate (by seed and root tissue). Be careful when plowing perennial weeds so that you don't spread plant parts to other areas of the field.
- Use weed-free planting seed to protect against weed infestations in the row and the introduction of new weed species or herbicide resistant weeds.
- Use mechanical tillage to remove initial weed flushes before planting, thereby eliminating or at least reducing the potential for continued infestation.
- Consider the economics of using mechanical cultivation alone for weed control in the crop, especially where only light infestations of annual weeds are present.

- Practice rotation to crops which physically out-compete certain weeds, resulting in their gradual decline.
- Thoroughly clean harvesting equipment before moving from one field to the next, or require it of the custom harvesters before they enter your fields.
- Consider using herbicides with different mechanisms of action (site of action) during the growing season to help prevent the development of herbicide resistant weed populations (Table 7).

Early-season weed management, including preplant burndown (PPB), preplant incorporated (PPI), and preemergence (PRE) herbicides are critical part(s) to each weed management program, especially in cotton. Due to cotton's perennial nature, it devotes much of its early-season energy to its root system and less energy to shoot growth. As a result of the slow early-season shoot growth and wide row spacing, cotton is not very competitive with weeds and weed control is essential to preserving cotton yields. Also, the use of residual herbicides provides additional flexibility when employing postemergence application timings. Last, applications PPB, PPI, and PREs provide a good opportunity to rotate herbicides, which will assist in managing and preventing the development of herbicide resistant weeds.

### **Strategies for managing Herbicide Resistant weeds.**

1. Employ integrated weed management strategies. Use herbicides only when necessary, and combine their use with mechanical, cultural, or biological methods.
2. Rotate or mix herbicides with different Mechanisms-of-Action. See Table 7 for listing of herbicide, Group Number, and its Mechanism-of-Action.
3. If possible, rotate crops where herbicide rotations are feasible.
4. Scout fields regularly to determine if resistant weeds populations may be present and control the weed escapes before they produce seed.
5. Make sure harvest equipment is cleaned, if being transported from regions with herbicide resistant weeds.
6. Clean tillage and harvest equipment to prevent the spread of resistant species to other regions.

*Information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by Texas A&M AgriLife Extension Service is implied.*

*This publication is no substitute for the herbicide product labels. It is intended to serve only as a guide for controlling weeds in cotton. Labeled rates and restrictions change constantly; therefore, consult the product label before use.*

**Table 1. PrePlant Burndown Weed Management Options**

Weeds controlled	Product, Rate/A, Herbicide name	Time to apply	Remarks
Henbit, seedling dock	Caparol® 4L 1.2–1.6 pt (prometryn)	Fall or winter either preemergence or postemergence to small winter weeds.	Use in Gulf Coast and Blacklands only. For best results, apply before weed emergence. If henbit has emerged but is less than 4–6 in tall, add a surfactant or emulsifiable oil. This is for winter weed control only. Additional herbicides will be needed for spring and summer weed control.
Annual and perennial broadleaf weeds	Clarity 8 fl oz (diglycolamine)	Fall or winter when weeds are 2-4 lf stage and rosettes are less than 2 inches across	Do not make applications in regions with less than 25 inches of average annual precipitation. Plant cotton only after a minimum of 1 inch of rainfall or overhead irrigation and 21 days after application.
Horseweed, henbit, shepherd's purse	Envoke® 0.10 oz (trifloxysulfuron)	Early preplant.	Currently labeled in Texas east of I-35. Apply alone or in tank mixture for residual control or suppression with a minimum of 90 days before planting cotton. Refer to label for tank mix options.
Annual broadleaf weeds	Firstshot 0.5-0.8 oz/a (thifensulfuron-methyl (25%) plus tribenuron (25%))	Postemergence to weeds before planting.	Allow 30 days after application before planting cotton. Allow 37 days on sands, loamy sands or sandy loams before planting. Allow 37 days on high pH soils (>7.9) before planting. Maybe tank mixed with other herbicides to control additional weeds.
Henbit, sunflower Refer to label	Glyphosate products 1 pt–1 qt (glyphosate + surfactant)	Postemergence to weeds before planting.	Allow at least 2 weeks after application before tillage. If glyphosate resistant weeds are present, add a tank mix partner to control emerged and provide residual weed control.

Selected broadleaf weeds Refer to label	Goal® 2XL 1–2 pt (oxyfluorfen)	Preemergence or postemergence to weeds.	Some residual weed control may be expected. Apply to weed seedlings not exceeding four true leaves. Fallow beds should be worked thoroughly to a minimum depth of at least 2.5 in before planting. Do not apply within 7 days before planting. Failure to meet these requirements may result in stand reduction and/or vigor reduction. Postemergence applications require 20 gal/a of water by ground or 10 gal/a of water aerially.
Emerged annual broadleaf weeds and grasses and topkill suppression of perennials	Gramoxone Inteon™ 2.5–4.0 pt (paraquat dichloride)	Before planting, by ground application to weeds and grasses 1–6 in tall.	Before planting, prepare land to permit maximum weed and grass emergence before treatment. Seeding should be done with minimum soil disturbance. Weeds and grasses emerging after application will not be controlled. This is a restricted-use herbicide. Apply in a minimum of 10 gal water/a by ground plus 1 qt nonionic surfactant per 100 gal spray solution or 1 gal crop oil concentrate per 100 gal spray solution. At lower spray volumes a drift control or spray deposition additive should be used. Check label for tank mix options.
Numerous annual broadleaf weeds Refer to label	LeadOff® 1.5 oz (thifensulfuron-methyl (16.7%) plus rimsulfuron (16.7%))	Postemergence at least 30 days before planting.	Add nonionic surfactant to spray mixture. Multiple tank mix partners are labeled. Consult label for additional information.
Refer to label for list of weeds controlled or suppressed	Liberty® 280 SL 22–43 oz (glufosinate-ammonium)	Application may be made in fallow fields, postharvest, before planting or emergence of cotton.	Refer to label for specific rates, weeds controlled and tank mix options. Apply in 15 gal/a of water minimum by ground or a minimum of 10 gal aerially. Do not apply if rain is expected within 4 hours after application. Season total application may not exceed 72 or 87 oz/a depending on initial application rate. Warm temperatures, high humidity, and bright sunlight improve performance. Sequential applications should be made at least 10-14 days apart.
Many annual broadleaf and grass weeds. Refer to label for weed-specific rates	Roundup WeatherMax® 11–32 oz (glyphosate)	Before emergence of cotton.	Apply when weeds are vigorously growing and are 6 in or less tall. Consult label for specific rate and weed heights. Do not apply by ground when winds are gusty or more than 10 mph. For aerial applications, do not apply during inversion conditions when winds are gusty or under other conditions that will allow drift. Do not store, mix or spray in galvanized or unlined steel tanks (except stainless steel). Do not mix with any residual pesticide. Allow 3 days before tillage. Roundup WeatherMax® has no soil activity. For burndown of johnsongrass, apply 11 oz/A before johnsongrass is 12 in tall. For best results, apply when johnsongrass is in the boot-to-head growth stage. Wait 3 days before tillage. Add 8.5–17 lb of ammonium sulfate per 100 gal water to improve performance.

Perennials: bermudagrass, bindweed, johnsongrass, silverleaf nightshade, Texas blueweed, nutsedge (yellow and purple)	Roundup WeatherMax® 11–32 oz (glyphosate) See label for rate of specific weeds.	Before planting or after harvest.	Apply when weeds are actively growing and have reached early head or early bud growth stage. See label for exact growth stage and rate and water carrier volume per acre. If weeds have been mowed or tilled, do not treat until regrowth has reached recommended stage. Allow 7 days or more after application before tillage. Do not graze treated cotton fields or feed forage to livestock within 8 weeks of application.
Annual and perennial grasses, broadleaves and sedges Refer to label	Touchdown Total™ 12–48 oz OR Touchdown Hi- Tech 12–48 oz	Postemergence to annual weeds. Before emergence of crops.	Refer to label for tank mix options for perennial weed control. Many tank mix partners can be added to provide residual weed control. Use ammonium sulfate at 8.5–17 lb/100 gal spray solution for improved control.  Does not control glyphosate resistant weeds
Annual and perennial grasses, broadleaves, and sedges Refer to label	Sequence 2.5–3.5 pt (glyphosate + S- metolachlor)	Postemergence to weeds, before emergence of crop.	Do not use on sand or loamy soils. Maximum of 2.5 pt on sandy loams and 3.5 pt on medium and fine soils. No replant restrictions for cotton. If heavy rainfall occurs immediately following planting, crop injury may occur, especially where poor drainage occurs or the seed furrow was not closed.  Does not control emerged glyphosate resistant weeds.
Selected broadleaf weeds	Sharpen 1.0 fl oz (saflufenacil)	Postemergence to actively growing weeds.	Use the recommended adjuvants for maximum efficacy, including MSO (1%v/v) + AMS or UAN. Plant cotton only after <b>42</b> days have passed and 1 inch of rainfall or irrigation. In areas with less than 25 inches annual rainfall, the 42 day preplant interval is required <u>after the 1 inch rainfall or irrigation</u> . <b>Do not</b> apply to sandy soils with less than 1.5% organic matter. Commonly used as a tank mix partner with glyphosate in West TX to broaden weed spectrum.
Annual and perennial broadleaf weeds	2,4-D (6 lb ai/gal) 0.66-2.66 pt	Rates of 0.66-1.66 pt for annual weeds and higher rates for perennial weeds.	Wait a minimum of 30 days following the application and a minimum of a 1 inch rainfall or irrigation within a 24 hr period.
Selected weeds Refer to label.	Valor® SX 1–3 oz (fall burndown and residual with labeled burndown herbicide (flumioxazin)	Preemergence or postemergence to weeds before planting with residual control.	If weeds are emerged, a postemergence tank mix partner should be included. Minimum of 30 days must pass and 1 in rainfall or overhead irrigation must occur between application and planting in conventional tillage. Minimum of 21 days and 1 inch rainfall or irrigation on no-till or strip-tillage fields. Refer to label for specific weeds, rates and treatment intervals. Include a crop oil concentrate or methylated seed oil.

**Table 2. PrePlant Incorporated Weed Management Options**

Weeds controlled	Product, Rate/A, Herbicide name	Time to apply	Remarks
<p>Many annual grasses and small-seeded broadleaf weeds. Refer to label for weed-specific rates.</p>	<p>Prowl® 3.3EC 1.2–4.8 pt (pendimethalin)</p>	<p>Immediately before planting or up to 140 days before planting.</p>	<p>Incorporate as soon as possible and no later than 7 days after application 1–2 in deep with a disk harrow, bed conditioner, PTO-driven tiller, cultivator, or rolling cultivator. If loss of crop occurs, cotton or soybeans may be replanted. Other crops can be rotated with cotton the following year. Do not feed forage or graze livestock in treated cotton fields. Winter wheat or barley can be planted in the fall 4 months after application. Prowl® may be applied at 2.4–4.8 pt/A and incorporated up to 60 days before planting for rhizome johnsongrass suppression.</p>
<p>Refer to label for list of grasses and broadleaf species controlled or suppressed.</p>	<p>Prowl®H2O 1–4 pt (pendimethalin)</p>	<p>Up to 60 days before planting and incorporate.</p>	<p>Apply up to 60 days before planting and incorporate uniformly in 1–2 in of soil surface by rainfall, sprinkler irrigation, or mechanical incorporation. Non-uniform incorporation may result in reduced herbicide efficacy. Two-pass incorporation should result in more consistent efficacy. Do not feed forage or graze livestock in treated fields. Not recommended for soils with more than 3% organic matter. See label for more information.</p>
<p>Many annual grasses and small-seeded broadleaf weeds. Refer to label for weed-specific rates.</p>	<p>Treflan®4L 1.0–2.5 pt (trifluralin) Treflan®HFP 1.0–2.5 pt (trifluralin) Several other trifluralins are available. Consult individual product labels for specifics.</p>	<p>October 15–December 31. Anytime after January 1 preplant or preemergence.</p>	<p>Best results are obtained by incorporating with a disk or power incorporator within 24 hours after application. Ground may be left flat or bedded over winter. If land is left flat, take care during spring bedding operations to prevent turning up untreated soil. Do not apply in fall to soils that are wet or in poor condition or to soils subject to flooding. Do not plant sorghum or oats for 12 months after application unless 25 in or more of irrigation and/or rainfall was used to produce the crop. If less than 20 in of irrigation and/or rainfall was received, do not plant either crop for 18 months. On the High Plains, do not plant sorghum until May 15. Cotton, guar, peanuts, southern peas, soybeans, sunflowers and some vegetables may be replanted after Treflan® in the same or the following year. Incorporate with double disk, power incorporator, field cultivator, rolling cultivator or bed conditioner. The first incorporation should occur within 24 hours after application. Make a second pass with ground-driven equipment. Rolling cultivators and bed conditioners should be used only on coarse- to medium-textured soils. In Brazoria, Calhoun, Chambers, Fort Bend, Galveston, Harris, Jackson, Jefferson, Liberty, Matagorda, Orange, Victoria, Waller and Wharton counties, rates of 1.5–3.0 pt (4L) can be used. Do not use on any crop grown in Pecos or Reeves counties. Band or broadcast with properly calibrated granular applicator.</p>

<p>Many annual grasses and broadleaf weeds Refer to label for weed-specific rates.</p>	<p>Treflan® TR-10 5–20 lb (trifluralin)</p>	<p>Refer to supplemental label for remarks concerning preplant and preemergence applications.</p>	<p>For use in conservation tillage cotton. Refer to supplemental label. May be applied in fall, in spring before or at planting, after planting, but before crop emergence. Do not use on any crop grown in Pecos or Reeves counties. Band or broadcast with properly calibrated granular applicator.</p>
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**Table 3. Preemergence Weed Management Options**

Weeds controlled	Product, Rate/A, Herbicide name	Time to apply	Remarks
Many annual broadleaf weeds and a few annual grasses Refer to label for weed-specific rates.	Caparol® 4L 1.6–4.8 pt (prometryn) Several other prometryn products are available.	Preemergence.	Do not use on sand or loamy sand. Rainfall or irrigation is needed after application to obtain good weed control. Avoid broadcast applications to cotton planted in furrows more than 2 in deep. Band applications should be no wider than the bottom of furrows. Cotton may be replanted through treated soil. Do not retreat. If Caparol® is applied only as a single preemergence treatment during the season, several vegetables and oats, winter barley, wheat or rye may be planted. However, the small grains cannot be used for food or feed. Do not use on glandless cotton varieties, as the crop will be injured. Consult individual product labels for recommendations and precautions.
Annual grasses and broadleaf weeds	Command 1.33-2.66 pt (clomazone)	Preemergence	Disulfoton or phorate organophosphate insecticides must be applied in-furrow with the seed at planting time with a minimum of 0.75 lb ai as a crop safener or cotton injury will occur. Injury may be observed on sandy soils. Off-site movement of the Command can cause foliar whitening of some plants. Avoid spraying within 300 ft of desirable plants.
Many annual grasses and broadleaf weeds Refer to label for weed-specific rates.	Cotoran® 4L 2.0–4.0 pt or (fluometuron)	Preemergence or at planting after a preplant incorporated application of Prowl® or Treflan®.	Where dry weather conditions prevail, the herbicidal activity of fluometuron may be delayed or reduced. Do not plant crops other than cotton within 6 months of the last application. West Texas: Do not use on sand, loamy sand or fine sandy loam soils nor on cotton planted in furrows. Do not feed foliage from treated fields or gin trash to livestock. A suspendibility agent may be necessary.
Many annual grasses and some small-seeded broadleaf weeds	Dual® Magnum or Dual II® Magnum 1.0–1.33 pt (S-metolachlor) other S-metalachlor products are available.	Preplant incorporated or preemergence.	Do not apply on sand or loamy sand soils. Do not apply to furrow-planted cotton. Apply preemergence or incorporate no more than 1 in deep before, at or after planting. Plant cotton at least 1 in deep on fine soils and 1.5 in deep on medium or coarse soils. For best control of yellow nutsedge, apply preplant incorporated.

<p>Many annual grasses and broadleaf weeds Refer to label for weed-specific rates.</p>	<p>Karmex® 80DF 1.0–2.75 lb (diuron) or Direx® 4L 0.8–2.2 qt (diuron) Other diuron products available include Drexel® Diuron® 4L or 80W and Riverside® Diuron® 80DF. Consult these product labels for recommendations and precautions.</p>	<p>Preemergence.</p>	<p>Use on sandy loam or heavier soils. Do not apply to sand or loamy-sand soils. Do not use with furrow-planted cotton. Cotton may be replanted through treated band or rework beds before planting. Do not retreat if banded preemergence; any crop can be planted after 4 months. If broadcast or banded preemergence, then followed by postemergence application, only cotton, soybeans, corn or grain sorghum can be planted the next spring. Do not replant areas to crops other than corn or cotton within 4 months following band treatment or within 6 months after broadcast treatment, as injury to subsequent crops may result. Do not replant to any other crop within 1 year after application. See label for applicationspecific instructions. Do not use on soils containing less than 1.0% organic matter. Do not use in preplant or preemergence where soil-applied organophosphate insecticides are used because of the potential for severe cotton injury and possible stand loss. Do not allow livestock to graze treated land.</p>
<p>Annual grasses and small seeded broadleaf weeds.</p>	<p>Prowl (3.8 lb ai/gal) 2-3 pt (pendimethalin)</p>	<p>Preemergence</p>	<p>Surface applications are most effective when adequate rainfall or overhead irrigation is received. BASF recommends shallow cultivation if soil crusting or compaction occurs. If adequate rainfall or irrigation does not occur, a shallow tillage is recommended to incorporate and activate the herbicide.</p>
<p>Grasses and small seeded broadleaf weeds.</p>	<p>Sequence 2.5-3.5 pt (glyphosate + s-metolachlor)</p>	<p>Preplant or Preemergence</p>	<p>Do not use preplant or preemergence on sand or loamy soils. Do not exceed 2.5 pt/a on sandy loam soils or 3.5 pt/a on medium and fine soils. Do not use in Gaines county, TX. If heavy rainfall occurs soon after application, crop injury may occur, especially where water stands or where seeding slit was not properly closed. Do not exceed 2.5 pt/a on sandy loam soils. Do not exceed 3.5 pt/a on medium to fine soils.</p>
<p>Selected broadleaf weeds such as pigweed spp., lanceleaf sage, Venice mallow. Refer to label for weed-specific rates.</p>	<p>Staple® LX 1.3–2.1 fl oz (pyrithiobac)</p>	<p>Preemergence.</p>	<p>Do not apply to sandy or loamy sand soils. Staple® LX can be combined with diuron, flumeturon or prometryn products for expanded weed control. Refer to the Staple® LX label for more information. Observe crop rotation restrictions. Do not apply more than 2.1 fl oz preemergence. Do not apply preemergence aerially.</p>
<p>Many annual grasses and some small-seeded broadleaf weeds</p>	<p>Warrant 1.25-2.0 qt/a (acetochlor)</p>	<p>Preemergence</p>	<p>See label for appropriate rate based on soil type. Broadcast apply and do not incorporate. Crop injury may occur under cool conditions and saturated soils. Do not exceed 4 qt/a for the season.</p>

**Table 4. Postemergence – Over-the-Top Weed Management Options**

Weeds controlled	Product, Rate/A, Herbicide name	Time to apply	Remarks
<p>Selected annual broadleaf weeds, including Palmer amaranth, lanceleaf sage, Venice mallow, common cocklebur, morningglory.</p>	<p>Cotoran® 4L 2.0–4.0 pt (fluometuron)</p>	<p>Postemergence when cotton is at least 3 in tall and weeds less than 2 in.</p>	<p>Add 1 qt of surfactant per 50 gal of spray mix. Apply as directed, semi-directed or over-the-top spray. Use higher rate after weeds have emerged. Do not plant crops other than cotton within 6 months of last application. Do not feed foliage or gin trash to livestock. Cotoran® may be combined with MSMA or DSMA for enhanced weed control to cotton from 3 in high to first bloom. Refer to the label for more information. West Texas: Do not use on sand, loamy-sand or fine-sandy-loam soils.</p>
<p>Selective control of grasses, sedges and broadleaf weeds, including Palmer amaranth, annual morningglory (Red, ivyleaf)</p>	<p>Envoke® 0.10–0.15 oz over-the-top 0.10–0.25 oz post-directed (trifloxysulfuron sodium)</p>	<p>Postemergence over-the-top when cotton has reached a minimum of 5 true leaves.</p>	<p>See label for tank mix combinations. Can be applied either over-the-top or post-directed. Envoke® can be tank mixed with MSMA, Cotoran® or glyphosate for hooded treatments. Do not exceed 0.4 oz Envoke® per acre per season. Envoke® is currently labeled for use in Texas cotton grown east of I-35. Consult label for rotational crop information. For use in Roundup-Ready Flex® cotton: apply with approved Roundup® formulations from the 5–12 leaf stage up to 60 days before harvest. Applications can be over-the-top or post-directed to ensure adequate coverage. Do not apply Envoke® aerially.</p>
<p>Many grasses and broadleaf weeds, including devil'sclaw, RR volunteer cotton, pigweeds</p> <p><b>Use only on glufosinate tolerant crops</b></p>	<p>Liberty® 280 SL 22–29 oz (glufosinate-ammonium)</p>	<p>Apply over the top of Liberty Link® (glufosinate tolerant) cotton only. May be applied through hoods to non-Ignite®-tolerant cotton, being careful to avoid contact with cotton plants.</p>	<p><b>Use only on glufosinate tolerant crops.</b> Consult label for specific weeds and weed heights and tank mix combinations. Efficacy is increased with actively growing weeds. Use a minimum of 15 gal/a carrier volume. Add Ammonium sulfate to increase consistency of efficacy.</p>

<p>Broad spectrum of annual and perennial weeds, including Palmer amaranth, Russian thistle, kochia preemergence, activity on grasses and small seeded broadleaf</p>	<p>Sequence® 2.5–2.75 pt (glyphosate) + (S-metolachlor)</p>	<p>Postemergence up to 10 lf stage on glyphosate tolerant cotton and post-directed</p>	<p>Apply over-the-top in Roundup ReadyFlex® cotton from cotyledon to 10 leaf stage. Do not exceed 2.5 pt/a in a single application on cotton with less than 5 leaves. Apply up to 2.75 pt/a from 5-10 leaf cotton. Do not use if cotton plants are under stress caused by drought, insects, diseases, or cultivation. Necrotic lesions may occur on leaves under stressed crop conditions. Do not harvest cotton within 100 days of a post-directed application. Do not include Ammonium Sulfate in postemergence applications. Effective option in no-till or reduced tillage. Do not use in Gaines County, TX.</p> <p>Does not control <b>emerged</b> glyphosate resistant weeds</p>
<p>Many annual broadleaf weeds including Palmer amaranth, annual morningglory</p> <p>Refer to label for weed-specific rates.</p>	<p>Staple® LX 2.6–3.8 fl oz (pyrithiobac sodium)</p>	<p>Postemergence to most weeds when they are 1–4 in tall. Consult label for specific weed, timing and application rates. Add nonionic surfactant or crop oil concentrate.</p>	<p>Primarily a broadleaf weed herbicide but can be tank-mixed with MSMA, DSMA or Assure® II for grass control. Staple® LX has soil residual activity for preemergence control of some weeds. Do not mix with metolachlor herbicides because crop injury may result. Do not tank mix with malathion containing insecticides. Temporary leaf yellowing and/or leaf crinkling may occur. Apply with a minimum of 10 gpa and increase from 20-40 gpa under heavy weed pressure. Do not exceed 3.8 fl oz in any single postemergence application. Do not apply more than 3.2 fl oz per acre per year of Staple® LX in areas west of Highway 83 in Texas. Do not apply more than 5.1 fl oz per acre per year in all other areas. Staple® LX may be applied postemergence over-the-top with to Roundup-Ready Flex® cotton until 60 days before harvest.</p>
<p>Many annual and perennial grass weeds only, including Johnsongrass, bermudagrass, barnyardgrass, junglerice, large crabgrass, Texas millet</p>	<p>Fusilade® DX 2E 6-24 oz (fluazifop-p-butyl)</p>	<p>Postemergence when annual grasses are small. Bermudagrass should be treated when no more than 3 in tall or when runners are 6–12 in. Rhizome Johnsongrass should be 12–18 in tall and before the boot stage.</p>	<p>Do not apply a total of more than 48 oz/A per season. Do not apply to cotton after boll set. Always add COC at 0.5-1% v/v or NIS at 0.25-0.5%v/v. Bermudagrass and rhizome johnsongrass may require two applications (see label). Higher rates or repeat applications are needed in West Texas on some grasses (see label). Where rainfall is adequate, soil residual may occur, which will suppress new flushes of annual grasses. Do not plant rotational crops other than cotton or soybeans within 60 days after application. Avoid drift to grass-type crops. Do not apply if rainfall is expected within 1 hour. Cultivation from 7 days before until 7 days after application may reduce control. Cultivation after 7 days will often help grass control. When grasses are drought stressed, control will be reduced. Do not use whirl chamber or flood-type nozzle tips that produce large droplets. Fusilade® DX may be applied as a spot treatment, using a 0.5% solution (0.5 qt per 25 gal water). Add 1/2 pt of nonionic surfactant to this 25-gal mixture.</p>

<p>Many annual and perennial grass weeds only including Johnsongrass, bermudagrass, barnyardgrass, junglerice, large crabgrass, Texas millet</p>	<p>Fusion® 6–12 oz (Fluazifop-p-butyl + fenoxaprop-p-ethyl)</p>	<p>Postemergence over the top of cotton to actively growing grasses..</p>	<p>Do not apply more than 24 oz per acre of Fusion® to the same crop per year. Always add COC at 0.5-1% v/v or NIS at 0.25-0.5%v/v. Do not apply to cotton after boll set. Do not plant grass crops such as corn, sorghum or wheat within 60 days of last Fusion® application. Avoid application to stressed weeds. May be tank mixed glyphosate.</p> <p>Fusion® may be applied as a spot treatment using a 0.5 percent solution (1 pt in 25 gal water). Add 8 oz of a nonionic surfactant to this mixture.</p>
<p>Many annual and perennial grasses only, including Johnsongrass, bermudagrass, barnyardgrass, junglerice, large crabgrass, Texas millet</p>	<p>Select® 2EC Annual grasses 6–16 oz (clethodim)</p> <p>Select Max (0.97 lb ai/gal) 9-32 oz</p>	<p>Postemergence over the top of actively growing grasses. Treat rhizome johnsongrass from 12–18 in tall. Treat bermuda-grass up to 3 in tall or up to 6-in runners.</p>	<p>Always use COC at 1.0 qt/a or 1%v/v. Do not apply a broadleaf herbicide within one day following Select 2 EC applications or reduced grass control may result. Do not cultivate treated grasses 7 days before or after herbicide application. Perennial grasses may require sequential applications. Consult label for recommendations specific to East and West Texas.</p> <p>Select® may be applied as a spot treatment by mixing 8 oz into 25 gal water for a 0.25 percent solution.</p>
<p>Many annual and perennial grasses only including Johnsongrass, bermudagrass, barnyardgrass, junglerice, large crabgrass, Texas millet</p>	<p>Assure® II 0.88EC 5–12 oz (quizalofop)</p>	<p>Postemergence over the top of actively growing grasses.</p>	<p>Always add 1% v/v (4 qt per 100 gal spray solution) crop oil concentrate or 0.25% v/v (1 qt per 100 gal spray solution) of a nonionic surfactant. Do not cultivate treated grasses 7 days before or 7 days after herbicide application. Perennial grasses may require sequential applications. Consult label for recommendations specific to East and West Texas. Use a minimum of 10 gpa carrier volume. Do not apply more than 18 oz of product per acre per season. May be tank mixed with glyphosate and numerous other herbicides.</p> <p>Assure® II may be applied as a spot treatment by mixing 12 oz of product into 25 gal water or as a 0.375% solution. Refer to label for more instructions. Do not apply within 80 days of harvest.</p>
<p>Many annual and perennial grasses only including Johnsongrass, bermudagrass, barnyardgrass, junglerice, large crabgrass, Texas millet</p>	<p>Poast Plus® 1E 12–48 oz (sethoxydim)</p>	<p>Postemergence over the top of actively growing grasses. See label for stages of various grasses.</p>	<p>Do not apply more than 7.5 pt/A in one season. Bermudagrass and rhizome johnsongrass may require two applications (see label). Do not apply to grasses under stress such as lack of moisture or herbicide injury, or unsatisfactory control will result. Cultivation no sooner than 7 days after application may aid season-long control. See label for rates for various grasses and growth stages. Do not cultivate within 5 days before or 7 days after treatment.</p> <p>Poast Plus® may be applied as a spot or small area treatment using a 1–1.5% solution (1.0 to 1.5 gal. Poast Plus per 100 gals. of spray solution). Refer to the label for more information.</p>

<p>Numerous grasses and broadleaf weeds, including Palmer amaranth, annual morningglories, devils-claw, silverleaf nightshade, woollyleaf bursage, puncturevine, venice mallow, lanceleaf sage, common cocklebur, sunflower. Suppression of some perennial weeds.</p>	<p>Roundup WeatherMax® Up to 1 qt/A (glyphosate + surfactant)</p>	<p>Postemergence over-the-top of cotton from ground cracking to 7 days before harvest.</p>	<p>Use only in Roundup Ready® Flex cotton varieties. Do not apply Roundup WeatherMax® over the top beyond first bloom cotton grown for seed. Do not exceed 32 oz/A for ground application. Maximum in-crop applications of Roundup WeatherMax®, from ground cracking to 60% open bolls, cannot exceed 4.0 qt/A. Total Roundup WeatherMax® applied from 60% open bolls to 7 days, before to harvest may not exceed 44 fl oz per acre. Up to 22 oz/A by air.</p> <p>Does not control glyphosate resistant weeds.</p>
<p>Numerous grasses and broadleaf weeds including Palmer amaranth, annual morningglories, devils-claw, silverleaf nightshade, woollyleaf bursage(lakeweed), puncturevine, venice mallow, lanceleaf sage, common cocklebur, sunflowers. Suppression of some perennial weeds may be expected</p>	<p>Touchdown Total™ 12–24 fl oz (glyphosate)</p>	<p>Postemergence over-the-top of cotton to actively growing weeds.</p>	<p>Use only on cotton tolerant to glyphosate. Make postemergence applications from ground cracking until the four-leaf stage of cotton at a maximum of 48 fl oz/A per season with no more than 24 fl oz/A in any single application. Apply no more than 48 fl oz/season by precision, post-directed or hooded application methods between the five-leaf stage and layby. Apply no more than 24 fl oz per single application. Refer to label for tankmix options.</p> <p>Does not control glyphosate resistant weeds.</p>

<p>Numerous grasses and broadleaf weeds, similar to Touchdown Total™</p>	<p>Touchdown Hi-Tech™ 10–20 fl oz (glyphosate)</p>	<p>Postemergence over-the-top of cotton to actively growing weeds.</p>	<p>Use only on cotton tolerant to glyphosate. Apply a maximum of 40 fl oz from ground cracking to four-leaf stage (quarter-sized fifth) with no more than 20 fl oz in any single application. Apply no more than 40 fl oz/season by precision, post-directed or hooded application methods between the five-leaf stage and layby, with no more than 20 fl oz for any single application by these methods. Refer to label for tank mix options.</p> <p>Does not control glyphosate resistant weeds.</p>
<p>Numerous annual grasses and broadleaf weeds, including Palmer amaranth, Russian thistle, kochia</p>	<p>Warrant 1.25-2 qt (Acetachlor)</p>	<p>Postemergence to cotton but prior to weeds emerging. Cotton should be completely emerged but before first bloom.</p>	<p>This product only has preemergence activity on weeds. If weeds are emerged, add a postemergence herbicide to Warrant. Apply when cotton is small or direct spray to the soil surface to optimize weed control. Optimum timing and rate is 2-3 leaf cotton and prior to weed emergence at a rate of 1.5 qt/a. Rain or irrigation is necessary to activate the herbicide. If no rain or irrigation occurs in 10 days, shallow incorporation. Do not tank mix with fertilizer, because crop injury may result.</p>

**Table 5. Post-directed or Hooded Weed Management Options**

Weeds controlled	Product Rate/A, Herbicide name	Time to apply	Remarks
Annual grasses and broadleaves including cocklebur, pigweed, gumweed, morningglory, common lambsquarters, devil'ssclaw, pie melon	Caparol® 4L 1.6–3.2 pt/A (prometryn)	Postemergence as a directed spray when cotton is at least 12 in tall and weeds are less than 2 in tall.	Omit surfactant if no weeds are present at treatment time. In the High Plains, 1.6–2.4 pt/A of Caparol® 4L is sufficient. Do not use in the Rio Grande Valley. See Caparol® preemergence for rotational crop suggestions. Do not apply when cotton is under stress.  Apply in 25 gal water + 1 pt of surfactant per acre.
Many annual broadleaf weeds Refer to label for weed-specific rates. Small Palmer amaranth, devil'sclaw	Cobra® 2E 12.5 oz (lactofen)	Postemergence directed only. Cotton must be 6–8 in tall, or apply at layby.	Use as a directed spray only; use equipment designed to keep spray off cotton foliage while maintaining weed coverage. Keep spraying pressure at 20–30 PSI to reduce potential for spray mist getting on cotton foliage. Susceptibility of individual weeds varies; therefore, consult label for specific application recommendations regarding stage of growth. Pigweeds must be small to obtain adequate postemergence control. Cobra® may be used in combination with MSMA, Bladex® and Karmex® to help control certain weeds. Consult specific product labels for recommendations and precautions. See label for layby tank mixes.
Annual grasses and many seedling including cocklebur, pigweed, gumweed, morningglory, common lambsquarters, devil'sclaw, pie melon Refer to label for weed-specific rates	Direx® 4L 0.4–0.6 qt or Karmex® 80DF 0.25–0.5 lb (diuron)	Postemergence directed spray after cotton is 6–12 in high, as needed, up to two applications.	Spray young, actively growing weeds less than 2 in tall. Provides residual control of numerous weeds. Apply to cotton plants over 12 inches tall and avoid contact with cotton leaves. Any crop may be planted 4 months after the last application. If multiple applications are made, see label for rotational crops. Direx® or Karmex® may be combined with MSMA or DSMA for enhanced weed control. Apply in 25 gal water + 1 pt surfactant per acre. Consult label for weed and rate specifics.



<p>Many annual grasses and broadleaf weeds including cocklebur, pigweed, gumweed, morningglory, common lambsquarters, devil'sssclaw, pie melon Soil residual activity on numerous weeds</p>	<p>Goal® 2 XL 1–2 pt (oxyfluorfen)</p>	<p>Postemergence as a directed spray to succulent weeds in 2- to 3-leaf stage can usually be controlled at the low rate. Apply to cotton 6–8 in tall.</p>	<p>Cotton height should be a minimum of 6-8 inches tall or severe crop injury may occur. Precision ground spray equipment with fenders or shields should be used to avoid contact with cotton foliage. Apply at 20 gpa carrier volume. Add 2–4 pt nonionic surfactant per 100 gal spray solution. Two flat fan nozzles on each side of the row are suggested. May be tank mixed with MSMA or Karmex®.</p>
<p>Many annual grasses and broadleaf weeds , including cocklebur, pigweed, gumweed, morningglory, common lambsquarters, devil'sssclaw, pie melon Soil residual activity on numerous weeds</p>	<p>Linex (4lb ai/gal) 1-3 pt (linuron)</p>	<p>Postemergence as a directed spray. Weeds should height should not exceed 2 inches.</p>	<p>Cotton height should be a minimum of 12 inches tall for the 1.0 pt/a rate. When cotton is at least 18 inches tall the 1-1.5 pt/a rate may be used. When cotton is at least 20 inches tall a single application may be made at a rate of 2-3 pt/a. Add 1 pt/25 gallons of spray mixture for controlling emerged weeds.</p>
<p>Woollyleaf bursage (lakeweed), cocklebur, johnsongrass, nutsedge, puncturevine, ragweed, sandbur and some annual grasses</p>	<p>MSMA 1.0–1.25 pt of 6 lb/gal product</p>	<p>Postemergence directed, only after cotton is 3 in tall and before first bloom.</p>	<p>Apply as directed spray after cotton is 3 inches tall but before first bloom. Make a second application if necessary. Apply to small broadleaves and grasses. Most effective at temperatures of between 80 °F and 90 °F. Do not graze treated fields or feed foliage. Phytotoxic properties are quickly inactivated on contact with the soil</p>
<p>Preemergence activity on many annual grasses and small-seeded broadleaf weeds and postemergence control of broadleaf and selected grass weeds</p>	<p>Prefix 2-2.33 pt/a (s-metolachlor + fomesafen)</p>	<p>Postemergence directed, only after cotton is 6 in tall.</p>	<p>Avoid contact with foliage and non-barked parts of the cotton plant. Apply when broadleaf weeds have 2-4 true leaves in a minimum of 10 gpa carrier volume. Surfactant should be added. Do not add liquid nitrogen fertilizer. May be tankmixed with other herbicides to broaden weed spectrum. Do not apply within 80 days of harvest. Do not exceed 2.33 pt/a for the entire season.</p>

<p>Selected grass, broadleaf weeds, and sedges</p>	<p>Suprend® 1.0–1.5 lb (prometryn + trifloxysulfuron sodium)</p>	<p>Postemergence directed on weeds less than 6 in tall.</p>	<p>Apply when cotton is at least 6 inches tall. Use only in picker and Pima cotton varieties. Do not use in the Rio Grande Valley. Apply post-directed or under hoods to minimize crop injury. Cotton may be replanted 30 or more days after Suprend® application if not more than 1.0 lb of Suprend® has been applied or 14 or more days after the first significant rainfall (0.5 in) after Suprend® application. Suprend® is labeled only for Texas cotton grown east of I-35. Do not exceed 2.7 lb/A of Suprend® per season. Do not apply Suprend® within 60 days of harvest. See the label for more specific information.</p>
<p>Preemergence activity on many annual grasses and small-seeded broadleaf weeds.</p>	<p>Treflan® HFP 1.0–2.0 pt or Treflan® 4EC 1.0–2.0 pt (trifluralin)</p>	<p>Directed application from four true-leaf stage until layby up to but not less than 90 days before harvest.</p>	<p>Drop nozzles are suggested if cotton foliage prevents uniform coverage of soil surface. Maximum must not exceed 4 pt/A within the same crop year (fall, spring and layby applications).</p>
<p>Preemergence activity on many annual grasses and small-seeded broadleaf weeds.</p>	<p>Prowl H2O® 1.0–4.0 pts (pendimethalin)</p>	<p>Over the top or as a directed spray to provide soil residual activity.</p>	<p>Rate of 1–3 pt on conventional or minimum till, 2–4 pt on no-till. Apply directly to the soil between the rows as a directed spray following the last normal cultivation. Check label for maximum labeled rates for given soil types. Glyphosate products may be tankmixed and applied to glyphosate tolerant cotton. May be tank mixed with Liberty and applied to Liberty tolerant cotton varieties.</p>
<p>Many annual and perennial grasses and broadleaf weeds.</p>	<p>Roundup® WeatherMax Refer to label for weed control rates. (glyphosate + surfactant)</p>	<p>Apply after sufficient bolls have developed to produce the desired yield of cotton. Applications before this time could affect maximum yield potential.</p>	<p>Applications of up to 44 oz product may be made over-the-top after 20% boll crack. Allow a minimum 7 days between application and harvest.</p> <p>Application volume of 10–20 gal water by ground or 3–15 gal water by air.</p>
<p>Many annual broadleaf weeds and with soil residual activity on numerous weeds</p>	<p>Valor® SX 1–2 oz/A (flumioxazin)</p>	<p>Postemergence directed spray through a hood or shielded sprayer to actively growing weeds.</p>	<p>Application should be made only to cotton that has reached a minimum height of 6 for hooded applications. Layby applications may be made when cotton is a minimum height of 16 inches. Valor® SX application must be directed toward the lower 2 in of bark to avoid crop injury. Do not till after application or reduced weed control will result. Do not make a sequential application of Valor® SX within 30 days of first Valor® application. Refer to the label for further instructions. Apply in 10 gal water/acre minimum. Use only NIS.</p>

**Table 6. Wick or Wiper Applicator Weed Management Options**

Weeds controlled	Product Product rate/A broadcast Herbicide common name	Time to apply	Remarks
Numerous annual and perennial grasses and broadleaf weeds.	Roundup® WeatherMax 33-75% solution (glyphosate + surfactant)	When weeds are a minimum of 6 in above the crop. Better results are obtained when more of the weed is exposed. Do not wipe any closer than 2 in above desirable vegetation as injury may result.	Some wick applicators may require a less-concentrated solution. Keep wiper surface clean. Weeds not contacted by the herbicide will not be affected. Do not operate at speeds greater than 5 mph. As weed density increases, reduce speed. Wiping a second time in opposite directions may improve control. Do not use wiper when weeds are wet. Repeat treatment may be necessary. Oversaturation of wiper may cause dripping which will injure crop. Mix only enough solution for one day's operation. Drain and flush with water after use of applicators.

**Table 7. Herbicide Product, Formulations, Group Number, and Mechanism-of-Action**

*(Rotating or mixing different mechanisms-of-action herbicides can delay the development of herbicide resistant weeds. Refer to the Mechanism-of-action or Group Number column to determine the mechanism-of-action of the labeled herbicides).*

<b>Product</b>	<b>Active Ingredient(s)</b>	<b>Group Number<sup>a</sup></b>	<b>Mechanism-of-action</b>
Aim EC	carfentrazone (22.3%); 2 lb ai/gal	14	PPG oxidase
Aim EW	carfentrazone (21.3%); 1.9 lb ai/gal	14	PPG oxidase
Assure II	quizalofop (10.3%); 0.88 lb ai/gal	2	ACCCase
Caparol	prometryn (44.4%); 4 lb ai/gal	5	Photosystem II inhibitor
Clethodim 2E	clethodim (26.4%); 2 lb ai/gal	1	ACCCase
Cobra	lactofen (24%); 2 lb ai/gal	14	PPG oxidase
Command 3ME	clomazone (31.1%); 3 lb ai/gal	13	Carotenoid Biosynthesis Inhibitor
Cotoran	fluometuron (41.7%); 4 lb ai/gal	7	Photosystem II inhibitor
Cotton Pro	prometryn (44.0%); 4 lb ai/gal	5	Photosystem II inhibitor
Direx	diuron (40.0%); 4 lb ai/gal	7	Photosystem II inhibitor
Dual II Magnum	s-metolachlor (82.4%); 7.64 lb ai/gal	15	Long chain fatty acid inhibitor
Dual Magnum	s-metolachlor (83.7%); 7.62 lb ai/gal	15	Long chain fatty acid inhibitor
Envoke	trifloxysulfuron (75.0%)	2	ALS Inhibitor
Firstshot	thifensulfuron-methyl (25%)	2	ALS Inhibitor
	tribenuron (25%)	2	ALS Inhibitor
Flexstar GT 3.5	fomesafen (5.88%); 0.56 lb ai/gal	14	PPG oxidase
	Glyphosate (22.4%)	9	EPSP
Flexstar GT	fomesafen (6.72%); 0.66 lb ai/gal	14	PPG oxidase
	glyphosate (25.6%); 2.63 lb ae/gal	9	EPSP
Flexstar	fomesafen (22.1%); 1.88 lb ai/gal	14	PPG oxidase
Fusilade DX	fluazifop (24.5%); 2 lb ai/gal	1	ACCCase
Fusion	fluazifop (24.15%); 2 lb ai/gal	1	ACCCase
	fenoxaprop (6.76%); 0.56 lb ai/gal	1	ACCCase
Goal 2X	oxyfluorfen (22.3%); 2 lb ai/gal	14	PPG oxidase
GoalTender	oxyfluorfen (41.0%); 4 lb ai/gal	14	PPG oxidase
Gramoxone Inteon	paraquat (30.1%); 2 lb/gal	22	Photosynthesis I diverter

LeadOff	thifensulfuron-methyl (16.7%)	2	ALS inhibitor
	rimsulfuron (16.7%)	2	ALS inhibitor
Liberty	glufosinate (24.5%); 2.34 lb ai/gal	10	Glutamine Synthetase inhibitor
Karmex DF	diuron (80%)	7	Photosynthesis II inhibitor
Layby Pro	linuron (20.3%)	7	Photosynthesis II inhibitor
	diuron (20.0%)	7	Photosynthesis II inhibitor
Linex 4L	linuron (40.6%); 4 lb ai/gal	7	Photosynthesis II inhibitor
MSMA Plus	MSMA (35.43%); 4 lb ai/gal	17	Unknown
MSMA	MSMA (51.0%); 6.6 lb ai/gal	17	Unknown
Poast Plus	sethoxydim (13.0%); 1 lb ai/gal	1	ACCCase
Poast	sethoxydim (18.0%); 1.5 lb ai/gal	1	ACCCase
Prefix	s-metolachlor (46%); 4.34 lb ai/gal	14	Long chain fatty acid inhibitor
	fomesafen (9.7%); 0.95 lb ai/gal	15	PPG oxidase
Prowl 3.3 EC	pendimethalin (37.4%); 3.3 lb ai/gal	3	Microtubule assembly inhibitor
Prowl H2O	pendimethalin (38.7%); 3.8 lb ai/gal	3	Microtubule assembly inhibitor
Reflex	fomesafen (22.8%); 2 lb ai/gal	14	PPG oxidase
Roundup WeatherMax	glyphosate (48.8%); 4.5 lb ae/gal	9	EPSP
Select 2EC	clethodim (26.4%); 2 lb ai/gal	1	ACCCase
Select Max	clethodim (12.6%); 0.97 lb ai/gal	1	ACCCase
Sequence	glyphosate (21.8%); 2.25 lb ae/gal	9	EPSP
	s-metolachlor (29.0%); 3 lb ai/gal	15	Long chain fatty acid inhibitor
Sharpen	saflufenacil (29.74%); 2.85 lb ai/gal	14	PPG oxidase
Staple LX	pyrithiobac (33.6%); 3.2 lb ai/gal	2	ALS inhibitor
Suprend	prometryn (79.3%)	5	Photosynthesis II inhibitor
	trifloxysulfuron (0.70%)	2	ALS inhibitor
Touchdown CT	glyphosate (36.5%); 4.17 lb ae/gal	9	EPSP
Touchdown HiTech	glyphosate (52.3%); 5 lb ae/gal	9	EPSP
Treflan HFP	trifluralin (43.0%); 4 lb ai/gal	3	Microtubule assembly inhibitor
Treflan TR-10	trifluralin (10.0%); 5 lb ai/50 lb bag	3	Microtubule assembly inhibitor
Valor SX	flumioxazin (51.0%); 51% ai	14	PPG oxidase
Warrant	acetochlor (33.0%); 3 lb ai/gal	15	Long chain fatty acid inhibitor

<sup>a</sup> Herbicide Group Number was obtained from a C.A. Mallory-Smith and E.J. Retzinger. 2003. Revised Classification of Herbicides by Site-of-Action for Weed Resistance Management Strategies. Weed Technology 17:605-619.



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The suggestions contained herein are based primarily on herbicide labels and research conducted by Texas A&M AgriLife Extension Service and Texas A&M AgriLife Research. The use of product names is not intended as an endorsement of the product or of a specific manufacturer, nor is there any implication that other formulations containing the same active chemical are not equally effective. Product names are included solely to aid readers in locating and identifying the herbicides suggested.

*Information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by Texas A&M AgriLife Extension Service is implied.*

*This publication is no substitute for the herbicide product labels. It is intended to serve only as a guide for controlling weeds in cotton. Labeled rates and restrictions change constantly; therefore, consult the product label before use.*