

# COTTON: COTTON INSECT CONTROL

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PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Aphid (Cotton)	<i>acetamiprid</i> Assail 30SG Strafer Max 70 WP	4A	1.5-2.5 oz 0.6-1.3 oz	0.028-0.047	12 H/ 28 D	Apply when aphids are abundant and seedling leaves are severely curled, or when “honeydew” is present in older cotton. A naturally occurring fungal disease often eliminates the need for sprays, but this epidemic occurs only after aphid populations reach high levels and tends to be less effective late in the season.
	<i>dicrotophos</i> Bidrin 8 Dicromax 8	1B	4-8 oz 4-8 oz	0.25-0.5	6 H/ 30 D	
	<i>flonicamid</i> Carbine 50WG	9C	1.4-2.8 oz	0.044-0.088	12 H/ 30 D	
	<i>imidacloprid</i> Admire Pro 4.6	4A	0.9-1.7 oz	0.032-0.061	12 H/ 14 D	
	<i>sulfoxaflor</i> Transform 50 WG	4C	0.75-1.0 oz	0.023-0.031	24 H/ 14 D	
	<i>thiamethoxam</i> Centric 40 WG	4A	1.25-2.0 oz	0.031-0.05	12 H/ 21 D	
Beet Armyworm	<i>diflubenzuron</i> Dimilin 2L	15	4-8 oz	0.0625-0.125	12 H/ 14 D	Apply when 10% of squares or terminals are damaged, 10% of blooms are damaged and/or infested, or when 10 active “hits” are observed per 300 row feet. Beet armyworms may infest Palmer amaranth and move to cotton as larvae develop. Bt cottons will not control large beet armyworms moving from Palmer amaranth.
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 oz	0.09-0.11	12 H/ 14 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-10 oz	0.0625-0.156	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	
Bollworm/ Tobacco Budworm	<b>NON-PYRETHROIDS</b>					On non-Bt cotton apply when 8 small larvae are found per 100 terminals prior to first insecticide treatment, or when 5 larvae are found after first spray.  Due to the threat of pyrethroid resistance, non-pyrethroid insecticides are recommended for control of tobacco budworm.  Resistance management: Do not treat successive generations with insecticides that have the same mode of action.  Bt cotton containing Bt genes are effective tools for use in bollworm and tobacco budworm management programs. Apply insecticide on Bt cotton when 8 larvae (1/4” or greater in length) are found per 100 plants.
	<i>indoxacarb</i> Steward 1.25EC	22	11.3 oz	0.11	12 H/ 14 D	
	<i>methomyl</i> Lannate LV 2.4	1A	1.5-2 pt	0.45-0.6	72 H/ 15 D	
	<i>spinetoram</i> Radiant 1 SC	5	4.25-8 oz	0.0332-0.0625	4 H/ 28 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	

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Bollworm/ Tobacco Budworm  (continued)	<b>PYRETHROIDS</b>					
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D	Tobacco budworm is resistant to pyrethroid insecticides. Pyrethroids should not be used for control of tobacco budworm.
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.6 oz	0.0125-0.02	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC Fanfare 2EC	3A	2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz	0.04-0.1	12 H/ 14 D	
	<i>cypermethrin</i> Up-Cyde 2.5EC	3A	2-5 oz	0.04-0.1	12 H/ 14 D	
	<i>esfenvalerate</i> Asana XL 0.66	3A	5.8-9.6 oz	0.03-0.0495	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-2.05 oz 1.28-2.05 oz	0.0125-0.02	24 H/ 21 D	
	<i>lambda-cyhalothrin</i> Warrior II Zeon 2.08 Silencer 1	3A	1.6-2.56 oz 3.2-5.12 oz	0.025-0.04	24 H/ 21 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8	3A	2.64-3.6 oz	0.0165-0.0225	12 H/ 14 D	
Cutworm (seedling cotton)	<i>acephate</i> Orthene 97 Acephate 97	1B	0.75 lb 0.75 lb	0.72	24 H/ 21 D	
	<i>chlorpyrifos</i> Lorsban 4E Chlorpyrifos 4E	1B	1.5-2 pt 1.5-2 pt	0.75-1	24 H/ 14 D	
	pyrethroids	3A	See Remarks			Pyrethroids provide good control of cutworms at low rates. See insecticide label for use rate.

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Fall Armyworm	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	Apply when 15 larvae are found per 100 plants. Control of large larvae (> 1/2" in length) is difficult; higher rates should be used.
	<i>diflubenzuron</i> Dimilin 2L	15	4-8 oz	0.0625-0.125	12 H/ 14 D	
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 oz	0.09-0.11	12 H/ 14 D	
	<i>methomyl</i> Lannate LV 2.4	1A	1.5-2 pt	0.45-0.6	72 H/ 15 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-10 oz	0.0625-0.156	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	pyrethroids	3A	See Remarks			Pyrethroids at high rates provide good suppression of larvae less than 1/8" in length.
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	
Plant Bugs and Fleahoppers	<i>acephate</i> Orthene 97 Acephate 97	1B	0.25-0.50 lb 0.25-0.50 lb	0.24-0.49	24 H/ 21 D	Apply insecticide when plants are retaining less than 80% of pinhead squares and numerous plant bugs are observed. Sweep nets and drop cloths may also be used to monitor plant bugs. Sweep nets (15" in diameter) are an effective tool for monitoring adult plant bug populations. Drop cloths are more effective for monitoring immatures.  Thresholds: First 2 weeks of squaring: Sweep Net: 8 plant bugs/100 sweeps Drop Cloth: 1 plant bug/6 row feet  Third week of squaring through bloom: Sweep Net: 15 plant bugs/100 sweeps Drop Cloth: 3 plant bugs/6 row feet  Diamond is an insect-growth regulator and will not control adults.
	<i>dicrotophos</i> Bidrin 8 Dicromax 8	1B	4-8 oz 4-8 oz	0.25-0.5	6 H/ 30 D	
	<i>imidacloprid</i> Admire Pro 4.6	4A	0.9-1.7 oz	0.032-0.061	12 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	9-12 oz	0.058-0.077	12 H/ 30 D	
	<i>oxamyl</i> Vydate C-LV 3.77	1A	8.5-17 oz	0.25-0.50	48 H/ 14 D	
	<i>sulfoxaflor</i> Transform 50 WG	4C	1.5-2.25 oz	0.047-0.071	24 H/ 14 D	
	<i>thiamethoxam</i> Centric 40 WG	4A	2 oz	0.05	12 H/ 21 D	

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Soybean Looper	<i>indoxacarb</i> Steward 1.25EC	22	6.7-9.2 oz	0.065-0.09	12 H/ 14 D	Treatment is necessary when soybean loopers threaten to defoliate cotton with immature bolls.
	<i>methoxyfenozide</i> Intrepid 2F	18	4-10 oz	0.0625-0.156	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.052-0.072	4 H/ 28 D	
Spider Mites	<i>abamectin</i> Abba 0.15 Agri-Mek 0.7SC	6	8-16 oz 1.75-3.5 oz	0.009-0.018	12 H/ 20 D	Apply when 50% of plants are symptomatic and populations are increasing. Spot treatment may be adequate. Thorough coverage is essential; a second application may be necessary.  In fields where mites are observed, conservation of beneficial insects should be a priority; insecticides prone to flare mites should be avoided when targeting other pests.  * <i>Bifenthrin</i> may provide suppression of mites.
	<i>etoxazole</i> Zeal 72 WSP	10B	0.66-1 oz	0.03-0.045	12 H/ 28 D	
	<i>fepyroximate</i> Portal 0.4	21A	16-32 oz	0.05-0.1	12 H/ 14 D	
	<i>propargite</i> Comite II 6	12C	1.25-2.25 pt	0.937-1.687	6 D/ 50 D	
	<i>spiromesifen</i> Oberon 2SC	23	8-16 oz	0.125-0.25	12 H/ 30 D	
Stink Bugs	<b>ORGANOPHOSPHATES</b>					The boll injury threshold should be adjusted up or down based on the number of susceptible bolls present. Use a 10-15% boll injury threshold during weeks 3-5 of bloom (numerous susceptible bolls present), 20% during weeks 2 and 6 of bloom, and 30%(+) during weeks 7+ of bloom (fewer susceptible bolls present). Detection of 1 stink bug/6 row feet would also justify treatment.  Higher stink bug populations are typically observed on late-planted cotton compared with early-planted cotton.  Organophosphates should be used for control of brown stink bugs.
	<i>acephate</i> Orthene 97 Acephate 97	1B	0.75 lb 0.75 lb	0.72	24 H/ 21 D	
	<i>dicrotophos</i> Bidrin 8 Dicromax 8	1B	4-8 oz 4-8 oz	0.25-0.5	6 H/ 30 D	

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Stink Bugs (continued)	<b>PYRETHROIDS</b>					
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.6 oz	0.0125-0.0205	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC Fanfare 2EC	3A	2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz	0.04-0.1	12 H/ 14 D	
	<i>esfenvalerate</i> Asana XL 0.66	3A	5.8-9.6 oz	0.03-0.0495	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-2.05 oz 1.28-2.05 oz	0.0125-0.02	24 H/ 21 D	
	<i>lambda-cyhalothrin</i> Warrior II Zeon 2.08 Silencer 1	3A	1.6-2.56 oz 3.2-5.12 oz	0.025-0.04	24 H/ 21 D	
<i>zeta-cypermethrin</i> Mustang Max 0.8	3A	2.64-3.6 oz	0.0165-0.0225	12 H/ 14 D		
Thrips (seedling cotton), At-Plant Treatments	<i>acephate</i> Orthene 97ST Orthene 97 Acephate 97	1B	Commercial Seed Treatment 1 lb 1 lb	0.97 0.97	24 H/ 21 D	Apply <i>acephate</i> as a spray into the seed furrow at planting.
	<i>imidacloprid</i> Admire Pro4.6	4A	9.2 oz	0.33	12 H/ 14 D	Apply Admire Pro as an in-furrow spray during planting directed on or below seed.
	<i>thiamethoxam</i> Cruiser	4A	Commercial Seed Treatment		12 H/ –	Thrips populations in some areas of the US have shown reduced susceptibility to neonicotinoid seed treatments (IRAC Group 4A). Neonicotinoid seed treatments are active for 14-21 days but may need a supplemental foliar insecticide application if thrips populations are high.
	<i>imidacloprid</i> Gaucho 600	4A	Commercial Seed Treatment		12 H/ –	
Thrips (seedling cotton), Foliar Spray	<i>acephate</i> Orthene 97 Acephate 97	1B	3 oz 3 oz	0.18	24 H/ 21 D	Apply when 2-3 thrips per plant are counted and immatures are present. Expect higher thrips populations on early planted cotton. Seedlings are most susceptible to thrips during early growth stages; economic damage rarely occurs once seedlings reach the 4-leaf stage and are growing rapidly. Thrips injury is more severe when seedlings are not growing rapidly (i.e. stress from cool temperatures or PRE herbicides). Rapidly growing seedlings can better tolerate thrips feeding.
	<i>dicrotophos</i> Bidrin 8 Dicromax 8	1B	1.6-3.2 oz 1.6-3.2 oz	0.1-0.2	6 H/ 30 D	
	<i>dimethoate</i> Dimethoate 4	1B	0.25-0.5 pt	0.125-0.25	48 H/ 14 D	

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PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Whitefly (banded winged)	<i>acephate</i> Orthene 97 Acephate 97	1B	0.5-1 lb 0.5-1 lb	0.49-0.97	24 H/ 21 D	Apply when 50% of terminals in rapidly growing cotton are infested, or when honeydew is found on foliage or lint of older cotton with open bolls.
	<i>thiamethoxam</i> Centric 40 WG	4A	2 oz	0.05	12 H/ 21 D	
Whitefly (silverleaf)	<i>acetamiprid</i> Assail 30 SG Strafer Max 70 WP	4A	4-5.3 oz 1.7-2.3 oz	0.075-0.1	12 H/ 28 D	Apply when 50% of sampled leaves (sample 5th expanded leaf below the terminal) are infested with multiple immatures. Silverleaf whitefly is difficult to control with insecticides. Early detection and conservation of natural controls are important. Hairy leaf cottons are preferred by silverleaf whiteflies compared with smooth leaf varieties.
	<i>dinotefuron</i> Venom 70WDG	4A	1-3 oz	0.045-0.134	12 H/ 14 D	
	<i>flupyradifurone</i> Sivanto Prime 1.67	4D	10.5-14 oz	0.1369-0.1826	4 H/ 14 D	
	<i>pyrifluquinazon</i> PQZ 1.87	9B	2.4-3.2 oz	0.035-0.047	12 H/ 7 D	
	<i>pyriproxyfen</i> Knack 0.86	7C	8 oz 5 oz fb 5 oz	0.05375 0.033 fb 0.033	12 H/ 28 D	Vegetative cotton; 5 oz followed by 5 oz. See Label.
	<i>spiromesifin</i> Oberon 2	23	8-16 oz	0.125-0.25	12 H/ 30 D	
	<i>buprofezin</i> Courier 3.6SC	16	9-12.5 oz	0.25-0.35	12 H/ 14 D	

#### Premixed or Co-Packaged Insecticide Products:

Products listed below are available as premixes or co-packages of 2 insecticidal active ingredients. When using premixed or co-packaged products, be sure the use of all active ingredients is necessary. Unnecessary applications or use of reduced rates of an active ingredient may lead to or intensify insecticide resistance. Labeled rates are listed with product names. However, see label for specific rates for target pests.

<i>bifenthrin, acetamiprid</i> (Argyle: 6-9 oz)	<i>imidacloprid, cyfluthrin</i> (Leverage: 2.8-3.2 oz)
<i>bifenthrin, avermectin B1</i> (Athena: 7-17 oz)	<i>lambda-cyhalothrin, chlorantraniliprole</i> (Besiege: 5-12.5 oz)
<i>bifenthrin, imidacloprid</i> (Brigadier: 3.8-7.7 oz)	<i>lambda-cyhalothrin, thiamethoxam</i> (Endigo: 4.5-6 oz)
<i>chlorpyrifos, bifenthrin</i> (Tundra Supreme: 5.6-16.8 oz)	<i>methoxyfenozide, spinetoram</i> (Intrepid Edge: 4-8 oz)
<i>chlorpyrifos, lambda-cyhalothrin</i> (Cobalt Advanced: 11-42 oz)	<i>spinosad, gamma-cyhalothrin</i> (Consero: See label)
<i>dicrotophos, bifenthrin</i> (Bidrin XP II: 8-12.8 oz)	<i>zeta-cypermethrin, bifenthrin</i> (Hero: 3.6-10.3 oz)
<i>fluopyram, imidacloprid</i> (Velum Total: 14-18 oz)	<i>zeta-cypermethrin, chlorpyrifos</i> (Stallion: 3.75-11.75 oz)

## INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM**	FALL ARMYWORM	BEE T ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS***	PARASITES***	CHEMICAL CLASS (MOA)	REI (Hours)*
<i>abamectin</i> Agri-Mek 0.15	-	-	-	-	-	-	-	-	-	1	-	-	-	M	M	6	12
<i>acephate</i> Orthene 97	2	2	5	4	4	5	4	1	5	5	5	2	1	H	H	1B	24
<i>acetamiprid</i> Assail 30SG	4	4	5	5	5	5	5	3	1	5	1	5	3	E	E	4A	12
<i>alpha-cypermethrin</i> Fastac 0.83	2	4	2	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>beta-cyfluthrin</i> Baythroid XL 1	1	3	2	3	3	5	4	2	4	5	5	2	4	H	M	3A	12
<i>bifenthrin</i> Brigade 2, Discipline 2, Fanfare 2	1	2	2	3	3	5	4	2	3	3	4	2	4	H	M	3A	12
<i>buprofezin</i> Courier 40 SC	-	-	-	-	-	-	-	-	-	-	1	-	-	E	E	16	12
<i>chlorantraniliprole</i> Prevathon 0.43	5	5	1	1	2	1	2	5	5	5	4	4	5	E	E	28	4
<i>chlorpyrifos</i> Lorsban 4	4	4	4	4	3	3	4	3	4	3	5	1	3	H	H	1B	24
<i>cypermethrin</i> Up-Cyde 2.5EC	2	4	2	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>dicrotophos</i> Bidrin 8	1	1	5	5	5	5	5	1	3	4	5	5	1	H	H	1B	6 days

**Efficacy Ratings:**

1 – Very Effective

5 – Not Effective

\* Read and follow label directions.

\*\* Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.

\*\*\* Effects on beneficial insects: E – Easy; M – Moderate; and H – Hard

Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.

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<b>INSECTICIDE</b>	<b>SOUTHERN GREEN STINK BUG</b>	<b>BROWN STINK BUG</b>	<b>CORN EARWORM</b>	<b>TOBACCO BUDWORM**</b>	<b>FALL ARMYWORM</b>	<b>BEE T ARMYWORM</b>	<b>SOYBEAN LOOPER</b>	<b>PLANT BUGS</b>	<b>APHIDS</b>	<b>SPIDER MITES</b>	<b>SILVERLEAF WHITEFLY</b>	<b>CUTWORMS</b>	<b>THRIPS</b>	<b>PREDATORS***</b>	<b>PARASITES***</b>	<b>CHEMICAL CLASS (MOA)</b>	<b>REI (Hours)*</b>
<i>diflubenzuron</i> Dimilin 2L	5	5	5	5	3	3	4	5	5	5	5	5	5	E	E	15	12
<i>dimethoate</i> Dimethoate 4	4	4	5	5	5	5	5	3	3	3	5	5	2	M	H	1B	48
<i>dinotefuron</i> Venom 70 WDG	-	-	-	-	-	-	-	-	-	-	2	-	-	M	M	4A	12
<i>esfenvalerate</i> Asana XL 0.66	2	4	2	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>etoxazole</i> Zeal 72 WSP	-	-	-	-	-	-	-	-	-	1	-	-	-	E	E	10B	12
<i>feproximate</i> Portal 0.4	-	-	-	-	-	-	-	-	-	1	3	-	-	E	E	21A	12
<i>flonicamid</i> Carbine 50 WG	4	4	5	5	5	5	5	3	1	5	5	5	3	E	E	9C	12
<i>gamma-cyhalothrin</i> Declare 1.25, Prolex 1.25	1	3	2	3	3	5	4	2	4	5	5	2	4	H	M	3A	24
<i>imidacloprid</i> Admire Pro 4.6	4	4	5	5	5	5	5	3	3	5	4	5	3	M	M	4A	12
<i>indoxacarb</i> Steward 1.25	4	4	2	1	2	1	1	4	5	5	5	4	5	M	E	22A	12
<i>lambda-cyhalothrin</i> Warrior II Z 2.08, Silencer 1	1	3	2	3	3	5	4	2	4	5	5	2	4	H	M	3A	24

**Efficacy Ratings:**

1 – Very Effective

5 – Not Effective

\* Read and follow label directions.

\*\* Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.

\*\*\* Effects on beneficial insects: E – Easy; M – Moderate; and H – Hard

Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.



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<b>INSECTICIDE</b>	<b>SOUTHERN GREEN STINK BUG</b>	<b>BROWN STINK BUG</b>	<b>CORN EARWORM</b>	<b>TOBACCO BUDWORM**</b>	<b>FALL ARMYWORM</b>	<b>BEE T ARMYWORM</b>	<b>SOYBEAN LOOPER</b>	<b>PLANT BUGS</b>	<b>APHIDS</b>	<b>SPIDER MITES</b>	<b>SILVERLEAF WHITEFLY</b>	<b>CUTWORMS</b>	<b>THRIPS</b>	<b>PREDATORS***</b>	<b>PARASITES***</b>	<b>CHEMICAL CLASS (MOA)</b>	<b>REI (Hours)*</b>
<i>methomyl</i> Lannate LV 2.4	4	4	3	3	3	4	3	3	4	5	5	3	5	H	M	1A	72
<i>methoxyfenozide</i> Intrepid 2F	5	5	4	4	2	1	2	5	5	5	5	4	5	E	E	18	4
<i>novaluron</i> Diamond 0.83EC	3	3	4	4	1	2	2	3	5	5	4	5	5	M	3	15	12
<i>oxamyl</i> Vydate C-LV 3.77	3	3	5	5	5	5	5	3	5	5	5	5	3	M	M	1A	48
<i>propargite</i> Comite II 6	5	5	5	5	5	5	5	5	5	1	5	5	5	M	E	12C	6 days
<i>pyriproxyfen</i> Knack 0.86	5	5	5	5	5	5	5	5	5	5	1	5	5	E	E	7C	12
<i>spinosad</i> Blackhawk	5	5	2	1	2	2	2	5	5	5	5	4	4	E	M	5	4
<i>spiromesifen</i> Oberon 2 SC	–	–	–	–	–	–	–	–	–	1	2	–	–	E	E	23	12
<i>thiamethoxam</i> Centric 40 WG	3	4	5	5	5	5	5	2	2	5	3	5	3	M	M	4A	12
<i>zeta-cypermetherin</i> Mustang Max 0.8	1	3	2	3	3	5	4	2	4	5	5	2	4	H	M	3A	12

**Efficacy Ratings:**

1 – Very Effective

5 – Not Effective

\* Read and follow label directions.

\*\* Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.

\*\*\* Effects on beneficial insects: E – Easy; M – Moderate; and H – Hard

Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.

# COTTON DISEASE CONTROL

Bob Kemeraït, Extension Plant Pathologist

DISEASE	CHEMICAL	MOA	RATE PER ACRE <sup>a</sup> (38" Row Basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS	
Seedling Diseases	<i>azoxystrobin</i> Quadris 2.08SC	11	5.5-11 fl oz	4 H/ 45 D	Liquids gives better coverage than granular or hopperbox treatments. Liquid fungicides should be applied in-furrow using two cone-type nozzle tips. Mount the first behind the seed-drop tube to treat the soil around seed; direct the second to treat soil as it falls into the seed furrow. Maximum rate is 27 fl oz/A/season.	
	<i>prothioconazole</i> Proline	3	5.7-7.1 fl oz			
	<b>ADDITIONAL SEED TREATMENTS</b>					
	<i>azoxystrobin</i> + <i>fludioxonil</i> + <i>mefenoxam</i> Dynasty CST		3.1-3.95 fl oz/cwt	24 H/ –	<b>NOTE:</b> These seed treatments are in addition to fungicide treatments that are already applied to the seed by the supplier.	
	<i>chloroneb</i> + <i>metalaxyl</i> Delta Coat		8.75-11.85 oz/cwt			
	Kodiak FL		0.5 fl oz/cwt			
	Kodiak HB (biological)		4 oz/cwt			
	System 3 (biological)		12 oz/cwt			
	<i>trifloxystrobin</i> + <i>metalaxyl</i> Trilex 2000		2 fl oz/cwt			
<i>trifloxystrobin</i> + <i>metalaxyl</i> + <i>triademinol</i> Trilex Advanced		1.6 fl oz/cwt				

<sup>a</sup> In-furrow fungicide rates are presented on a per acre basis for cotton planted on 38" rows. To convert these rates to cotton planted on 36" rows, multiply the 38" rate by 1.05. To convert the rates to cotton planted on 40" rows, multiply the 38" rate by 0.95. To convert the rates from a per acre basis to a rate per 1000 feet of row, divide the 36" rate by 14.42, divide the 38" rate by 13.76, and divide the 40" rate by 13.07.

<sup>b</sup> Apply all liquids in 5-10 gal of water/A.

# COTTON NEMATODE CONTROL

Bob Kemeraït, Extension Plant Pathologist

NEMATICIDE TREATMENT	RATE/ACRE	oz/1000 ft of row (38" row basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
<i>abamectin</i> + <i>thiamethoxam</i> AVICTA Duo Cotton	seed treatment		48 H/ –	
<i>aldicarb</i> AgLogic 15G	3.5-7 lb			Apply granules in seed furrow and immediately cover with soil by mechanical means. OR Apply granules in a 4-6" band (T-Band) over open seed furrow and immediately cover with soil by mechanical means.  In the States of AL, FL, GA, and SC, if a vulnerable soil is present and the water table is less than 25 feet below ground surface, do not apply within 700 feet of a drinking water well unless it is known or reasonably believed based upon authoritative sources that such wells are either cased to 100 feet below the ground level or a minimum of 30 feet below the water table. If it is not known whether the water table is greater than 25 feet below ground surface, assume that the water table is less than 25 feet below ground surface.
<i>aldicarb</i> AgLogic 15G sidedress application	5 lb			<b>Side Dress Application:</b> From 3 weeks after planting through first squaring. Side dress granules in a furrow that is 6-10" to one or both sides of plant row to a depth of 2-3". Adjust applications to minimize root pruning.
AERIS Seed-Applied System	seed treatment			AERIS Seed-Applied System is a combination of <i>thiodicarb</i> (nematode control) and <i>imidacloprid</i> (thrips control) with the option of adding the TRILEX Advanced Seed-Applied System for additional control of seedling diseases. AERIS Seed-Applied System should only be considered for use in fields with low-to-moderate populations of plant parasitic nematodes. Maximum rate of 25.6 fl oz/100 lb of seed (de-linted seed only).
derived from the bacterium, <i>Burkholderia rinojensis</i> BIOST Nematicide 100	seed treatment			The active ingredient is 'Heat Killed' <i>Burkholderia rinojensis</i> and spent fermentation media that contains enzymes and toxins that have broad spectrum activity on nematodes and activity on soil-dwelling insects.
<i>fluopyram</i> COPeO Prime	seed treatment			COPeO Prime contains <i>fluopyram</i> for the management of nematodes affecting cotton.
<i>fluopyram</i> + <i>imidacloprid</i> Velum Total	14-18 fl oz		12 H/ 30 D	<b>Apply specified dosage in the following methods:</b> 1) In-furrow spray during planting directed on or below seed; 2) Chemigation into the root-zone through low pressure drip or trickle irrigation. Do not apply more than 19 fl oz/A of Velum Total per year. Do not apply Velum Total within 30 days of harvest. Regardless of formulation or method of application, apply no more than 0.5 lb <i>imidacloprid</i> or 0.45 lb <i>fluopyram</i> active ingredient per acre per year (ai/A/year), including seed treatment, soil, and foliar uses.
Telone II <sup>1</sup>	3 gal	30 fl oz	5 D Post Application/ –	Apply Telone II at least 7 days prior to planting by injecting 12" below final soil surface. Temik may be used at planting or as a side-dress following the use of Telone II. NOTE: Telone II is now labeled for at-plant application in Georgia for nematode control on cotton. Growers who choose to apply Telone II at plant must ensure that soil conditions are correct (see label) otherwise the at-plant fumigation may result in poor germination and plant stand.
Vydate C-LV	17 fl oz	1.24 fl oz	48 H/ 14 D	Make one application between 2nd and 5th true leaf stage. Alternatively, sequential applications of Vydate C-LV may be made at 8.5-11 fl oz/A beginning at 2nd-5th leaf stage of growth followed by a second 8.5-11 fl oz/A applied 10-14 days later. Applications of Vydate C-LV typically follow use of Telone II or nematicide seed treatments. Vydate C-LV is a supplemental application. Maximum rate is 102 fl oz/A/season.
<i>tioxazefen</i> Acceleron NemaStrike ST				Acceleron NemaStrike ST is a seed treatment nematicide for use on cotton.

<sup>1</sup> If Telone II is used for nematode control, you must use an additional chemical for thrips control.

<sup>2</sup> Temik applied at 3.5 lb/A is often recommended for insect management, but 3.5 lb/A will not provide sufficient nematode control in Georgia.

# COTTON FOLIAR DISEASE CONTROL

Bob Kemeraït, Extension Plant Pathologist

FUNGICIDE TREATMENT	RATE/ACRE	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
<i>azoxystrobin</i> AzoxyStar	6-9 fl oz	– 45D	
<i>azoxystrobin</i> Quadris	6-9 fl oz	4 H/ 45 D	Maximum rate is 27 fl oz/A/season.
<i>azoxystrobin + benzobendiflupyr</i> (solatenol) Elatus	5-7.3 fl oz	12 H/ 45 D	Do not apply more than 14.6 fl oz/A per season.
<i>azoxystrobin + difenconazole</i> Amistar Top	8-11.6 fl oz	– 0 D	Do not apply more than two sequential applications before alternating to a fungicide with a different mode of action.
<i>difenoconazole + pydiflumetofen</i> Miravis Top	13.6 fl oz	12H/ 45D	
<i>flutriafol</i> Topguard	7-14 fl oz	12 H/ 30 D	
<i>flutriafol + azoxystrobin</i> TopGuard EQ	5-7 fl oz	12H/ 45 D	
<i>prothioconazole</i> Proline	5.0-5.7 fl oz	12H/	Do not make more than three total applications per season.
<i>pyraclostrobin</i> Headline	6-12 fl oz	12 H/ 30 D	
<i>pyraclostrobin + fluxapyroxad</i> Priaxor	4-8 fl oz	12H/ 30 D	Do not apply more than 24 fl oz/A per season.
<i>pyraclostrobin + metconazole</i> Twinline	7-8.5 fl oz	12 H/ 30 D	Maximum rate is 26 fl oz/A/season.

# COTTON WEED CONTROL

A. Stanley Culpepper, Extension Agronomist – Weed Science

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT BURNDOWN – ANY VARIETY</b>						
<p>Emerged primrose, wild radish, spiderwort, small horseweed.</p> <p>Data suggests the choline formulation of 2,4-D has reduced volatility potential when compared to other 2,4-D formulations; however, volatility can still occur.</p>	<p><i>2,4-D amine</i></p> <p>4 S 4.7 S 5 S</p>	4	<p>12-24 fl oz 10-20 fl oz 9-18 fl oz</p>	0.38-0.75	48 H/ N/A	<p>The MOST CONSISTENT and effective burndown program for winter weeds in Georgia is a 2,4-D application in February when weeds are small and herbicide coverage is adequate followed by <i>glyphosate</i> or <i>paraquat</i> mixtures at or near planting. Most, but not all brands, may be applied 30 days prior to planting.</p> <p>PRIMROSE: apply 0.24-0.38 lb ai/A RADISH: apply 0.5-0.75 lb ai/A HORSEWEED: apply 0.75+ lb ai/A GLYPHOSATE-RESISTANT HORSEWEED: apply 0.95 + lb ai/A</p>
	<p><i>2,4-D choline</i></p> <p>Enlist One 3.8 S</p>	4	24-32 fl oz	0.7-0.95	48 H/ N/A	<p><b>Make certain the appropriate training requirements have been fulfilled before applying this product in 2020.</b> Apply at least 30 days ahead of planting any variety not containing the Enlist trait. <b>See section below for cotton with the Enlist trait.</b> Current labeling allows mixtures with several products including numerous <i>glyphosate</i> formulations, Direx, Valor, and Liberty.</p> <p>Be certain to study the label regarding requirements for training, buffers, wind speeds, ground speeds, spray tip requirements, and boom heights.</p> <p>User also must review website <a href="http://Enlisttankmix.com">Enlisttankmix.com</a> for approved adjuvants, drift reduction agents, and other tank mixtures.</p>
<p>Burndown of mature primrose and morningglory. Inadequate control of immature radish, pigweeds over 3" or grain cover crops without mature seed.</p>	<p><i>glufosinate</i></p> <p>Liberty 2.34S</p>	10	29-43 fl oz	0.53-0.79	12 H/ N/A	<p>Application can be made prior to cotton emergence. <b>To maximize control:</b> &gt; 15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset.</p> <p>For Palmer amaranth, apply 29 oz/A when less than 3"; 32 oz/A when 3"; 36 oz/A when 4"; and 43 oz/A when taller than 4". Cheetah and Interline have been tested and performed similarly to Liberty, see labels. Other brands are available.</p>
<p>Burndown of emerged annual weeds, but does not adequately control primrose, geranium, large radish, field pansy, resistant horseweed, or resistant Palmer amaranth.</p> <p><i>For ryegrass, spray glyphosate and follow with paraquat 5 to 7 days later.</i></p>	<p><i>glyphosate</i></p> <p>4 S (3 lb ae) 5.4 S (4 lb ae) 5 S (4.17 lb ae) 5.5 S (4.5 lb ae) 6 S (5 lb ae)</p>	9	<p>32-96 fl oz 24-72 fl oz 23-68 fl oz 22-64 fl oz 19-58 fl oz</p>	0.75-1.13 (lb ae)	4 H/ N/A	<p>Apply anytime prior to planting. Sequential applications can be made not to exceed 3.7 lb ae/A for burndown.</p> <p><b>Control of cover crops:</b></p> <p>Wheat &lt; 12": 0.56 lb ae Wheat &gt; 12": 0.75 lb ae Rye &lt; 12": 0.56 lb ae Rye &gt; 12" (no seed head): 0.75 lb ae Rye with seed head: 0.56 lb ae</p>

Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT BURNDOWN – ANY VARIETY (continued)</b>						
<p>Burndown of most emerged weeds. <i>2,4-D</i> is more effective than <i>dicamba</i> on primrose and spiderwort; less effective on horseweed.</p> <p>Data suggests the choline formulation of <i>2,4-D</i> has reduced volatility potential when compared to other <i>2,4-D</i> formulations; however, volatility can still occur.</p> <p>Alternatively, Enlist One (<i>2,4-D</i> choline) can be used in mixture with several <i>glyphosate</i> brands, see above.</p>	<i>glyphosate</i> + <i>2,4-D choline</i> Enlist Duo 3.3 S	9 + 4	3.5-4.75 pt	0.74-1.0 (lb ae) + 0.7-0.95	48 H/ N/A	<p><b>Make certain the appropriate training requirements have been fulfilled before applying this product in 2020.</b></p> <p>Apply at least 30 days ahead of planting non-Enlist traired cultivars. <b>See section below for cotton with the Enlist trait.</b></p> <p>Be certain to study the label regarding requirements for training, buffers, wind speeds, tractor speeds, spray tip requirements, and boom heights.</p> <p>Users also must review website <a href="http://Enlisttankmix.com">Enlisttankmix.com</a> for approved adjuvants, drift reduction agents, and other tank mixtures.</p>
	<i>glyphosate</i> + <i>2,4-D amine</i> 4 S 4.7 S 5 S	9 + 4		see <i>glyphosate</i> + 8-32 fl oz 6-24 fl oz 6-22 fl oz		
Aim improves control of emerged morningglory, tropical spiderwort, and very small (< 1”) <i>glyphosate</i> -resistant Palmer amaranth.	<i>glyphosate</i> + <i>carfentrazone</i> Aim 2 EC	9 + 14	see <i>glyphosate</i> + 0.5-1 fl oz	0.75-2.25 (lb ae) + 0.008-0.016	12 H/ N/A	<p>May be applied as a burndown treatment anytime prior to planting.</p> <p>Aim does not provide residual weed control.</p>
<p>Burndown of most weeds. Suppresses geranium and curly dock.</p> <p><i>2,4-D</i> is more effective on primrose and spiderwort; <i>dicamba</i> is more effective on horseweed.</p> <p>This is a low <i>dicamba</i> rate for non-<i>dicamba</i> cotton. See section below for XtendFlex cotton.</p>	<i>glyphosate</i> + <i>dicamba</i> Clarity, other 4S or Engenia 5S or XtendiMax 2.9S	9 + 4	see <i>glyphosate</i> + 8 fl oz or 6.4 fl oz or 11 fl oz	0.75-2.25 (lb ae) + 0.25	24 H/ N/A	<p><b>All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b></p> <p>For non-XtendFlex cotton: following application of <i>dicamba</i> and a minimum of 1” of rainfall, a waiting period of at least 21 days is required before planting. <i>Dicamba</i> can be applied alone with little to no effect on the small grain cover crop. See section below for XtendFlex cotton.</p> <p>Data suggests Engenia, FeXapan, and XtendiMax are the least volatile formulations of <i>dicamba</i> currently available; however, volatility can still occur. One must study the label regarding requirements for training, buffers, wind speeds, ground speeds, spray tip requirements, sprayer speeds, and boom heights. Also, one must review each product’s website (<a href="http://Xtendimaxapplicationrequirements.com">Xtendimaxapplicationrequirements.com</a> or <a href="http://Engeniatankmix.com">Engeniatankmix.com</a>) for approved adjuvants, drift reduction agents and other tank mixtures.</p>

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT BURNDOWN – ANY VARIETY (continued)</b>						
<p><i>Diuron</i> improves control of emerged Palmer amaranth and offers residual control if activated on the soil.</p> <p>The addition of <i>2,4-D</i> or Valor will likely improve weed control; follow most restrictive plant-back interval.</p>	<p><i>glyphosate</i> + <i>diuron</i> Direx 4F</p>	<p>9 + 7</p>	<p>see <i>glyphosate</i> + 1-1.5 pt</p>	<p>0.75-2.25 (lb ae) + 0.5-0.75</p>	<p>12 H/ N/A</p>	<p>Federal label requires Direx application 15-45 days ahead of planting. Check with your Extension agent to determine if a state label has been approved that allows “applications up to the day ahead of planting if strip tillage implement with ripper shank is run between application and planting, and if no tillage occurs between application and planting then wait at least 10 days prior to planting.”</p> <p>Label prohibits use on soils with less than 1% organic matter. Do not apply another application of <i>diuron</i> or Cotoran within 21 days.</p> <p>Many <i>diuron</i> formulations are available but may not have the shortened plant-back intervals, see labels.</p>
<p>Valor improves emerged primrose and radish control; also provides residual control of pigweed, pusley, and other sensitive weeds for up to 6-8 weeks if activated on soil.</p> <p>The addition of <i>2,4-D</i> (8-16 oz/A of 3.8 lb ai material) improves control of radish and primrose; follow most restrictive plant-back interval.</p> <p>For PPO-resistance management, make only 3 applications of Reflex or Valor (including generics) on a field in 3 years.</p>	<p><i>glyphosate</i> + <i>flumioxazin</i> Valor SX 51 WDG</p>	<p>9 + 14</p>	<p>see <i>glyphosate</i> + 2 oz</p>	<p>0.75-2.25 (lb ae) + 0.063</p>	<p>12 H/ N/A</p>	<p>A Georgia 24c Valor label allows reduced plant-back intervals. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the following use patterns:</p> <p><b>In strip-till cotton</b> where the strip till rig (including ripper shank) is run after application and before planting, Valor plant-back intervals are as follows:</p> <ol style="list-style-type: none"> <li>1) &gt; 30% ground cover = 7 days</li> <li>2) 10-30% ground cover = 14 days and 0.5 inch rain/irrigation</li> <li>3) &lt;10% ground cover or tillage = 21 days plus 1” rain/irrigation</li> </ol> <p><b>In no-tillage production</b> or when the strip is implemented prior to application. Valor plant-back interval should be 28 days. Additionally, 0.5” (&gt;10% ground cover) or 1” (&lt;10% ground cover) rainfall/irrigation is needed.</p> <p><b>If Reflex (or generic) will be applied PRE, suggest adding an additional 7 days to planting intervals.</b></p> <p>Add a nonionic surfactant or crop oil concentrate (preferred), regardless of <i>glyphosate</i> brand.</p> <p>Carefully follow label directions for cleaning sprayer after each use.</p>
<p>ET improves control of emerged morningglory and small (&lt; 1”) <i>glyphosate</i>-resistant Palmer amaranth.</p>	<p><i>glyphosate</i> + <i>pyraflufen ethyl</i> ET 0.208 EC</p>	<p>9 + 14</p>	<p>see <i>glyphosate</i> + 0.5-2 fl oz</p>	<p>0.75-2.25 (lb ae) + 0.0008-0.003</p>	<p>12 H/ N/A</p>	<p>May be applied as a burndown treatment anytime prior to planting.</p> <p>ET does not provide residual weed control.</p>

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT BURNDOWN – ANY VARIETY (continued)</b>						
Improved control of henbit, chickweed, Carolina geranium, and wild radish compared to <i>glyphosate</i> alone. Use Harmony Extra or Nimble to improve control of curly dock.	<i>glyphosate</i> +	9 +	see <i>glyphosate</i> +	0.75-2.25 (lb ae) +	12 H/ N/A	Apply at least 14 days prior to planting.  Include nonionic surfactant at 1 qt/100 gal spray or crop oil concentrate at 1 gal/100 gal spray.
	<i>thifensulfuron</i> + <i>tribenuron</i> FirstShot SG 50 SG	2	0.5-0.8 oz	0.008-0.013 +	0.008-0.013	
	<i>glyphosate</i> +	9 +	see <i>glyphosate</i> +	0.75-2.25 (lb ae) +	12 H/ N/A	
	<i>thifensulfuron</i> +	2 +		0.0156 +		
	<i>tribenuron</i> Harmony Extra SG with TotalSol 50 SG or Harmony Extra, Nimble 75WDG	2	0.75 oz  0.5 oz	0.0078		
Burndown of emerged annual weeds 3" or less. Does not control immature primrose, large horseweed, curly dock, swinecress, immature radish, or large grasses. For ryegrass, spray <i>glyphosate</i> first and <i>paraquat</i> 5-7 days later.  <b>Mixtures with <i>diuron</i> are usually far more effective.</b>	<i>paraquat</i> Gramoxone 2S Firestorm, Parazone 3S	22	2.5-4 pt 1.7-2.7 pt	0.63-1	24 H/ N/A	<b>EPA has restricted the use of <i>paraquat</i> to certified applicators ONLY and applicators must take a specialized training before use.</b>  Apply anytime prior to planting. Add nonionic surfactant at 2 pt/100 gal or crop oil concentrate at 1 gal/100 gal of spray mix.  Apply 0.63 lb ai for wheat and 0.5 lb ai for rye cover crop; cover crops must be mature (seedheads present) for adequate control.  Numerous other brands of <i>paraquat</i> are also available.
Burndown of emerged annual weeds and provides residual control if <i>diuron</i> is activated on soil. Effective on mature primrose and wild radish. BY FAR the most effective option for emerged pigweed.  If extended residual control is desired, consider adding Valor to the mixture but follow appropriate plant-back interval.	<i>paraquat</i> Gramoxone 2S Firestorm, Parazone 3S + <i>diuron</i> Direx 4F	22 + 7	2.5-4 pt 1.7-2.7 pt + 1.5-2 pt	0.63-1 + 0.75-1	24 H/ N/A	<b>EPA has restricted the use of <i>paraquat</i> to certified applicators ONLY and applicators must take a specialized training before use.</b> Federal label requires Direx application 15-45 days ahead of planting. Check with your Extension agent and see if a state label has been approved that "allows applications up to the day ahead of planting if a strip-tillage implement with ripper shank is run between Direx application and planting, and if no tillage occurs between Direx application and planting then one should wait at least 10 days prior to planting."  Label prohibits use on soils with less than 1% organic matter. Do not apply another application of <i>diuron</i> or Cotoran within 21 days.  Add crop oil concentrate at 1 gal/100 gal spray mix.  Applications to mature weeds are much more effective than to immature weeds. Numerous other <i>diuron</i> brands are available but may not include a shortened plant back interval.

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.



**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT BURNDOWN – ANY VARIETY (continued)</b>						
<p><i>Paraquat</i> mixtures with <i>diuron</i> are more effective on emerged Palmer amaranth; however, Valor is more effective in providing residual pigweed control.</p> <p>The addition of <i>diuron</i> is suggested if pigweed is larger than 3".</p> <p>For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.</p>	<p><i>paraquat</i> Gramoxone 2 SL</p>	22		0.63-1	12 H/ N/A	<p><b>EPA has restricted the use of paraquat to certified applicators ONLY and applicators must take a specialized training before use.</b> A Georgia 24 c Valor label allows reduced plant-back intervals. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the following use patterns:</p> <p><b>In strip-till cotton</b> where the strip rig (including ripper shank) is run after application and before planting, Valor plant back intervals are as follows:</p> <p>1) &gt; 30% ground cover = 7 days                  2) 10-30% ground cover = 14 days and 0.5 inch rain/irrigation                  3) &lt;10% ground cover or tillage = 21 days plus 1" rain/irrigation</p> <p><b>In no-tillage production</b> or when the strip is implemented prior to application, Valor plant-back interval should be 28 days. Additionally, 0.5" (&gt;10% ground cover) or 1" (&lt;10% ground cover) rainfall/irrigation is needed.</p> <p>If Reflex (or generic) will be applied PRE; suggest an additional 7 days to planting intervals. Add a nonionic surfactant or crop oil concentrate (preferred). Carefully follow label directions for cleaning sprayer after each use.</p>
	<p>Firestorm, Parazone 3 SL</p> <p>+ <i>flumioxazin</i> Valor SX 51 WDG</p>	14	<p>2.5-4 pt 1.7-2.7 pt + 2 oz</p>	+	0.063	
<p>Winter annual broadleaf weeds such as henbit, chickweed, small wild radish, and curly dock.</p> <p>DO NOT anticipate residual control for Palmer amaranth.</p>	<p><i>rimsulfuron</i> +</p> <p><i>thifensulfuron</i> Leadoff 33 SG</p>	2 + 2		0.0156 + 0.0156	4 H/ N/A	<p>Apply at least 30 days prior to planting. Can increase rate to 2 oz/A if applying at least 60 days prior to planting. Also suggest at least 1 inch of rain accumulation prior to planting.</p> <p>Adding <i>2,4-D</i> will improve control of problematic weeds such as radish, primrose, and horseweed. May also mix with <i>glyphosate</i> for improved control of numerous weed species.</p>
<b>ADDITIONAL PRE-PLANT BURNDOWN OPTIONS – ENLIST VARIETIES ONLY</b>						
<p>Most weeds when <i>2,4-D</i> is mixed with <i>glyphosate</i>; may miss Carolina geranium, and Palmer amaranth should be &lt; 3".</p> <p>Off-target movement of <i>2,4-D</i> poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</p>	<p><i>2,4-D choline</i> Enlist One 3.8 S</p>	4	24-32 fl oz	0.7-0.95	48 H/ N/A	<p><b>Enlist Varieties Only: Make certain the appropriate training requirements have been fulfilled before applying these products in 2020.</b></p> <p>Label allows application any time prior to planting or behind planter. Regardless of labeling, all winter weeds and cover crops (exception could be cereal grains) should be killed at least 10 days prior to planting. Currently, Enlist One allows more tank mix options than Enlist Duo; visit <a href="http://Enlisttankmix.com">Enlisttankmix.com</a> for the latest.</p> <p>GA data suggests the choline formulation of <i>2,4-D</i> has reduced volatility potential when compared to other <i>2,4-D</i> formulations; however, volatility can still occur. Be certain to study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, and boom heights. Also one must review the website (<a href="http://Enlisttankmix.com">Enlisttankmix.com</a>) for approved adjuvants, drift reduction agents, and other tank mixtures.</p>
	<p><i>glyphosate</i> +</p> <p><i>2,4-D choline</i> Enlist Duo</p>	9 + 4		3.5-4.75 pt	0.74-1.0 (lb ae) + 0.7-0.95	

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>ADDITIONAL PRE-PLANT BURNDOWN OPTIONS – ENLIST VARIETIES ONLY (continued)</b>						
<p>Horseweed and Fleabane preferred treatment in Enlist cotton.</p> <p>2,4-D is needed to control emerged plants while Valor provides residual control.</p> <p>Off-target movement of 2,4-D poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</p>	2,4-D choline	4			48 H/ N/A	<p><b>Enlist Varieties Only: Make certain the appropriate training requirements have been fulfilled before applying this product in 2020.</b></p> <p>Enlist One label allows application anytime prior to planting; see Valor plantback restrictions above.</p> <p>GA data suggests the choline formulation of 2,4-D has reduced volatility potential when compared to other 2,4-D formulations; however, volatility can still occur. One must study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, and boom heights. Also, one must review the website (Enlisttankmix.com) for approved adjuvants, drift reduction agents, and other tank mixtures.</p>
	Enlist One 3.8 S	+	2 pt	0.95		
	+	9	+	+		
	glyphosate	+	see glyphosate	0.75-1.13		
	+	14				
	flumioxazin		+	+		
	Valor SX 51 WDG		2 oz	0.063		
<b>ADDITIONAL PRE-PLANT BURNDOWN OPTIONS – XTENDFLEX VARIETIES ONLY</b>						
<p>Most emerged weeds when dicamba is mixed with glyphosate. May not control geranium or spiderwort completely; Palmer amaranth should be &lt; 3".</p> <p>Off-target movement of dicamba poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</p>	dicamba	4		0.5	12 H/ N/A	<p><b>Dicamba Tolerant Variety Only: All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b></p> <p>Engenia, FeXapan, and XtendiMax are the only brands of dicamba currently approved for this rate and timing. Can apply anytime prior to planting or behind the planter. Regardless of labeling, all winter weeds and cover crops (exception could be cereal grains) should be killed at least 10 days prior to planting.</p> <p>GA data suggests these are the least volatile formulations of dicamba currently available; however, volatility can still occur. Be certain to study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, sprayer speeds, and boom heights.</p> <p>Also, review the website for approved adjuvants, drift reduction agents, and other tank mixtures (Xtendimaxapplicationrequirements.com or Engeniatankmix.com).</p>
	Engenia 5 SL or XtendiMax 2.9 SL		12.8 fl oz or 22 fl oz			
<p>Horseweed and Fleabane preferred treatment in XtendFlex cotton.</p> <p>Dicamba is needed to control emerged resistant horseweed while Valor provides residual control.</p> <p>Off-target movement of dicamba poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</p>	dicamba	4			24 H/ N/A	<p><b>Dicamba Tolerant Variety Only: All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b></p> <p>Engenia, FeXapan, and XtendiMax are the only brands of dicamba currently approved for this rate and timing. Label currently allows Engenia or XtendiMax application anytime prior to planting. However, follow the plant-back interval for Valor as noted above!</p> <p>GA data suggests these dicamba products are the least volatile formulations of dicamba available; however, volatility can still occur. Be certain to study the label regarding requirements for trainings, buffers, wind speeds, spray tip requirements, sprayer speeds, and boom heights. Also, review the website for approved adjuvants, drift reduction agents, and other tank mixtures (Xtendimaxapplicationrequirements.com or Engeniatankmix.com).</p>
	Engenia or XtendiMax	+	12.8 or 22 fl oz	0.5		
	+	9	+	+		
	glyphosate	14	see glyphosate	0.75-2.25		
	+					
	flumioxazin		+	+		
	Valor SX 51 WDG		2 oz	0.063		

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-PLANT INCORPORATED – ANY VARIETY</b>						
Annual grasses, pigweeds and Florida pusley.  Controls <i>glyphosate</i> -resistant Palmer amaranth much more effectively than when applied pre-emergence.	<i>pendimethalin</i> Prowl 3.3 EC Prowl H <sub>2</sub> O 3.8 AS	3	1.2-2.4 pt 2 pt	0.5-1 0.95	24 H/ N/A	Soil incorporate in top 2” of the soil within 24 hours of application; consider mixing with Reflex. Application and incorporation within a week of planting is preferred.  <i>Pendimethalin</i> is less volatile than <i>trifluralin</i> and is a better option if incorporation is delayed, delayed incorporation will reduce control.
	<i>trifluralin</i> Treflan, others 4 EC	3	1-2 pt	0.5-1	12 H/ N/A	For Treflan 4 L, rate should not exceed 1.5 pt/A for most fields.  The need for a PRE herbicide as noted with the split program below is critical in controlling Palmer amaranth.
<i>Glyphosate</i> -resistant Palmer amaranth and yellow nutsedge  <b>For PPO-resistance management</b> , make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	<i>fomesafen</i> Reflex 2S	14	12-16 fl oz	0.19-0.25	24 H/ N/A	A Georgia Section 2 (ee) Reflex label allows a pre-plant application by incorporating Reflex to a SHALLOW (2” or less) depth while the soil is moist; suggest including <i>pendimethalin</i> or <i>trifluralin</i> . The need for a PRE herbicide as noted with the split program below is critical; <b>reduce Reflex rate accordingly if implementing split PPI and PRE program.</b>  For Palmer amaranth, less control is noted with Reflex alone incorporated when compared to pre-emergence applications if activated immediately by rainfall or irrigation; less injury potential is also noted with incorporated application. Thus the split program, below, is usually the best option.
<b>SPLIT PROGRAM WITH PRE-PLANT INCORPORATED (PPI) FOLLOWED BY PRE-EMERGENCE (PRE) APPLICATIONS – ANY VARIETY</b>						
The SINGLE MOST effective approach for the control of Palmer amaranth; especially in dryland production.  <b>For PPO-resistance management</b> , make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	<b>PPI:</b>					<b>PPI:</b> Shallow (2”) incorporation is required. Plant within 1 week of application and incorporation if possible.  Numerous formulations of fomesafen are available; however, their labels may not support this use pattern.
	<i>trifluralin</i> or <i>pendimethalin</i>	3	See rates in pre-plant incorporated	See rates in pre-plant incorporated	24 H/ N/A	
	+ <i>fomesafen</i> Reflex 2S	+ 14	+ 10-12 fl oz	+ 0.16-0.19		
	<b>PRE:</b>					<b>PRE:</b> 1. Be sure to include <i>paraquat</i> PRE if Palmer is emerged. 2. Warrant offers greater residual control when compared to <i>diuron</i> while <i>diuron</i> offers greater control of emerged weeds. 3. If mixing Reflex + Warrant + Diuron, the rate of <i>diuron</i> for most fields should not exceed 10 oz/A.  Numerous formulations of <i>fomesafen</i> and <i>diuron</i> are available.
	<i>fomesafen</i> Reflex 2S	14	8-10 fl oz	0.125-0.16	24 H/ N/A	
+ <i>acetochlor</i> Warrant 3ME	+ 15	+ 32 fl oz	+ 0.75			
OR <i>diuron</i> Direx, Diuron 4F	OR 7	OR 10-20 fl oz	OR 0.31-0.63			

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## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-EMERGENCE WEED CONTROL – ANY VARIETY</b>						
Residual control of annual grasses, Palmer amaranth, and tropical spiderwort.	<i>acetochlor</i> Warrant 3 ME	15	2-3 pt	0.75-1.125	12 H/ N/A	Warrant should be applied in combination with <i>fomesafen</i> (Reflex, others), <i>diuron</i> , Brake, or Cotoran depending on Palmer population and technology grown; add <i>paraquat</i> and adjuvant if Palmer is up. Apply within 24 hours of planting. The manufacturer recommends 3 pt/A; however, UGA research suggests a rate of 2-2.5 pt/A is in order when 1) tank mixing with another effective residual herbicide, 2) applying on light soil textures, and/or 3) using intense irrigation or expecting heavy rains during the first 2 weeks of planting.
Residual control of many annual grasses and broadleaves including Palmer amaranth and tropical spiderwort; suppression of yellow nutsedge.	<i>acetochlor</i> + <i>fomesafen</i> Warrant Ultra 3.45 CS	15 + 14	2.24 pt	0.77 + 0.175	24 H/ N/A	Apply within 24 hr of planting; add <i>paraquat</i> plus adjuvant if Palmer is up. Warrant Ultra at 2.24 pt/A provides 2 pt of Warrant and 0.175 lb ai of <i>fomesafen</i> (equivalent to 11 oz/A of Reflex). This rate is ideal for lighter soil textures, under intense irrigation, and when used in <i>dicamba</i> or 2,4-D-based programs that includes a directed layby. On heavier soils, the addition of Warrant at 0.5-1 pt/A may be in order.
Residual suppression of annual broadleaf weeds and grasses. More effective than Cotoran on pigweed, less effective on most other weeds.	<i>diuron</i> Direx, others 80 DF Direx, others 4L	7	0.38-0.78 lb 10-20 oz	0.31-0.62	12 H/ N/A	<i>Diuron</i> should be applied in combination with <i>fomesafen</i> (Reflex, others), Warrant, or Brake depending on Palmer population and technology grown; add <i>paraquat</i> and adjuvant if Palmer is up. Apply within 24 hr of planting. See label for specific rate but in general use lower rate on sandier soils and/or intense irrigation. Label restricts use on soils with < 1% organic matter. Avoid <i>diuron</i> PRE if applied burndown within 21 days of planting. Numerous generic formulations are available.
Residual suppression of annual broadleaf weeds and annual grasses. The most effective single residual material for sicklepod, cocklebur, and morningglory control. Less effective than <i>diuron</i> on Palmer amaranth.	<i>fluometuron</i> Cotoran 4F	7	2-3 pt	1-1.5	12 H/ N/A	Cotoran should be applied in combination with <i>fomesafen</i> (Reflex, others) or Warrant depending on Palmer population and technology grown; add <i>paraquat</i> and adjuvant if Palmer is up. Apply within 24 hr of planting. See label for specific rate on soils; in general use lower rate on sandier soils and/or with intense irrigation.  A maximum of 2 pt/A is ideal for many GA soils.
Excellent residual control of Palmer amaranth once activated. New herbicide chemistry for cotton growers.	<i>fluridone</i> Brake 1.2 F	12	16-32 fl oz	0.15-0.3	48 H/ N/A	Tank mix Brake with another residual herbicide when using less than 21 oz/A. Data shows that if one does not mix Brake with another effective herbicide, Palmer amaranth will often emerge prior to Brake activation. Do not apply fluridone more than 2 years in a row in a field. Also study rotational restrictions on label; for rates of 16-21 oz/A carryover of 4 months for soybean, 8 months for wheat/rye/peanut, 12 months for corn/sorghum, and 18 months for sunflower, pepper, tomato, and tobacco is noted.

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>PRE-EMERGENCE WEED CONTROL – ANY VARIETY (continued)</b>						
Excellent residual for Palmer amaranth; good control of poinsettia and suppression of yellow nutsedge.  For PPO resistance management, make only 3 applications of <i>fomesafen</i> or Valor (including generics) on a field in 3 years.	<i>fomesafen</i> Reflex, Dawn 2S	14	10-16 fl oz	0.16-0.25	24 H/ N/A	Reflex or generics should be applied in combination with Warrant, Diuron, Brake, or Cotoran depending on Palmer population and technology grown; add <i>paraquat</i> and adjuvant if Palmer is up. Apply within 24 hr of planting.  Research suggests 12 oz/A is an appropriate rate when mixed with Warrant or <i>diuron</i> on most soils; lower rates on lighter, low organic-matter soil and/or when using intense irrigation.  Injury more often occurs when initial rains or irrigation occurs as cotton is emerging. Good residual pigweed control even if the first rain does not occur until 15 days after treatment. Pigweed that emerges before activation will not be controlled. Reflex and Dawn have been tested intensely; other brands are available.
Annual grasses and Florida pusley; suppression of Palmer amaranth only. Irrigation or rainfall needed within 24 hours.	<i>pendimethalin</i> Prowl 3.3 EC Prowl H20 3.8 AS	3	1.8-3.6 pt 2-3 pt	0.75-1.5 0.95-1.42	24 H/ N/A	Pre-emergence applications are far less consistent than incorporated treatments; tank mixtures are needed. Wet/moist conditions during emergence (rainfall or irrigation) can cause significant plant stunting, leaf/stem malformation, and stem swelling with eventual breaking; <i>especially if used in combination with Reflex (or generic)</i> . Apply within 24 hours of planting.
Controls non-ALS resistant pigweeds, lambsquarters, prickly sida, spurge, and smartweed. Suppresses morningglory, except tall.	<i>pyrithiobac</i> Staple LX, Pyrimax 3.2S	2	1.7-2.1 fl oz	0.0425-0.053	4 H/ N/A	Has excellent residual herbicide activity but cotton injury, especially on irrigated light textured soils, is a serious concern. Thus, a delayed PRE or early POST use of Staple is recommended.  Do not apply on soils with less than 0.5% organic matter. Can tank mix with <i>diuron</i> , <i>fluometuron</i> , <i>pendimethalin</i> , or Reflex; apply within 24 hr of planting. Include <i>paraquat</i> or <i>glyphosate</i> if weeds are emerged.

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## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP WEED CONTROL – ANY VARIETY</b>						
<p>Non-ALS resistant pigweed less than 1<sup>st</sup>, morningglory (excluding tall mg), coffee senna, and redweed. At most, suppresses sicklepod.</p> <p>Provides good residual control of many species if it reaches the ground and is activated.</p>	<p><i>pyrithiobac</i> Staple LX, Pyrimax 3.2S</p>	2	2.7-3 fl oz	0.06-0.07	4 H/ 60 D	<p>Apply overtop of cotton from cotyledonary stage up to 60 days of harvest. Avoid applying during periods of cool, wet weather. Include nonionic surfactant at 1 qt/100 gal spray mix. Label allows 2 applications per year, not exceeding a total of 5.1 fl oz. Label also allows increasing rate of an application to 3.8 fl oz but injury is a concern.</p> <p>Residual control of non-ALS resistant Palmer has been good even if the first activating rain does not occur for 15 days after application, plants emerging before activation will not be controlled.</p> <p>Do not mix with grass control herbicides. May mix with most insecticides, but do not tank mix with any product containing malathion. <b>Do not mix with any Dual product or Warrant.</b> Separate Staple and Dual/Warrant applications by 5 or more days. See label for rotational restrictions.</p>
<p>Annual broadleaf weeds including sicklepod, Ipomoea morningglory, and nutsedge.</p> <p>Will not control smallflower morningglory or ALS-resistant pigweed, jimsonweed, copperleaf, or prickly sida.</p>	<p><i>trifloxysulfuron</i> Envoke 75 WDG</p>	2	0.1 oz	0.0047	12 H/ 60 D	<p>Directed application strongly encouraged for less injury and improved weed coverage on larger cotton. Label allows directed or overtop application after cotton has at least 6 (prefer 7) true leaves up until 60 days of harvest. Add nonionic surfactant at 1 qt/100 gal; do not use other types of adjuvants. Do not mix with other pesticides including plant growth regulators.</p> <p>In an attempt to avoid injury, do not apply to cotton under stress, such as very dry, wet, or cool conditions. Envoke may be directed to cotton 6" or larger at rates of 0.1-0.25 oz/A. See label for details and rotational restrictions. Rainfast in 3 hours.</p> <p>Provides residual control of sensitive weeds if contacts soil and is activated.</p>
<p>Most broadleaf weeds. Poor control of tropic croton, copperleaf and ALS-resistant pigweed. Good residual if contacts soil and is activated.</p>	<p><i>trifloxysulfuron</i> Envoke 75 WDG + <i>pyrithiobac</i> Staple LX 3.2 SL</p>	2 + 2	0.1 oz + 1.3-1.9 fl oz	0.0047 + 0.03-0.05	12 H/ 60 D	<p>Directed application strongly encouraged for less injury and improved weed coverage on larger cotton. Label allows overtop or directed application after cotton has at least 6 (prefer 7) true leaves up until 60 days of harvest. Add nonionic surfactant at 1 qt/100 gal spray mix. See comments and restrictions for each product applied alone.</p>

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST, GLYTOL LIBERTYLINK, or XTENDFLEX VARIETIES ONLY</b>						
<p>An at-plant residual herbicide should always be used in a Liberty system.</p> <p>Control of pusley, spiderwort, and goosegrass are not consistent. In general, broadleaf weeds should be &lt;3" and grasses &lt; 2".</p> <p>Excellent control of morningglory including moonflower.</p> <p>For Palmer amaranth, apply 29 oz/A when less than 3"; 32 oz/A when 3"; 36 oz/A when 4"; and 43 oz/A when taller than 4".</p> <p><b>Do not make more than 2 applications per year on a field;</b> include two herbicides PRE, residual mixtures POST, and a directed layby.</p>	<p><i>glufosinate</i> Liberty 2.34S</p>	10	29-43 fl oz	0.53-0.79	12 H/ 70 D	<p><b>Enlist, Glytol LibertyLink, or XtendFlex variety</b></p> <p>Label allows application from emergence through early bloom; however, UGA recommends applications directed after 8 leaf cotton to minimize injury while improving weed control. Do not exceed 43 fl oz/A per application. Also, do not exceed 87 fl oz/A per season with individual applications of 29 fl oz/A or less, and do not exceed 72 oz/A per season if any individual application greater than 29 oz/A is made. Sequential applications can be made but label requires applications 10 to 14 days after each other.</p> <p><b>To maximize control:</b> &gt; 15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset. Mixtures with residual herbicides are usually needed to assist in the control of grasses, pusley, spiderwort, and pigweed.</p> <p>Cheetah and Interline are formulations of <i>glufosinate</i> that have been tested; other brands are available. Research has shown in some environments, especially saturated soils, injury from Liberty is greatest in XtendFlex cotton followed by Enlist cotton and least with Glytol LibertyLink cotton.</p> <p>Rain fast within 4 hours. Do not tank mix with grass herbicides.</p>
<p>Mixing <i>glyphosate</i> with Liberty will not influence control by Liberty; however, grass control will often be more than Liberty alone but less than that by <i>glyphosate</i> alone.</p> <p><b>Do not make more than 2 applications per year on a field;</b> include two herbicides PRE, residual mixtures POST, and a directed layby.</p>	<p><i>glufosinate</i> Liberty 2.34 S + <i>glyphosate</i> numerous brands</p>	10 + 9	32 fl oz + see <i>glyphosate</i>	0.59 + 0.75	12 H/ 70 D	<p><b>Enlist, Glytol LibertyLink, and XtendFlex variety</b></p> <p>See comments for Liberty and <i>glyphosate</i> alone. Injury on Glytol LibertyLink is almost always negligible; injury on Enlist and XtendFlex is often increased slightly above <i>glufosinate</i> applied alone.</p> <p>Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures, during times of saturated soils, or when mixed with insecticides or adjuvants.</p>
<p>Staple may improve emerged pigweed control (non ALS-resistant) and provides residual activity on sensitive weeds if spray contacts soil and is activated.</p> <p><b>Do not make more than 2 applications of <i>glufosinate</i> per year in a field;</b> include 2 herbicides PRE and a directed layby.</p>	<p><i>glufosinate</i> Liberty 2.34S + <i>pyrithiobac</i> Staple LX 3.2 SL</p>	10 + 2	29 fl oz + 1.9 fl oz	0.53-0.58 + 0.03-0.05	12 H/ 70 D	<p><b>Enlist, Glytol LibertyLink, or XtendFlex variety</b></p> <p>See information for <i>glufosinate</i> alone in remarks and precautions above.</p> <p>Leaf speckling/burn/chlorosis will occur. Avoid dew, extremely high temperatures, saturated soils, and mixtures with other pesticides or adjuvants to reduce injury potential. Do not mix with any <i>metolachlor</i> (Dual) product or Warrant.</p> <p>Research has shown in some environments, especially saturated soils, that injury from Liberty is greatest on XtendFlex cotton followed by Enlist cotton and least on Glytol LibertyLink cotton.</p>

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## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST, GLYTOL LIBERTYLINK, or XTENDFLEX VARIETIES ONLY (continued)</b>						
<p>Dual or Warrant provides residual control of grasses, spiderwort, and pigweeds if spray contacts soil and is activated. Outlook provides residual control of grasses and pigweeds; spiderwort has not been fully studied.</p> <p>Comparing Dual and Warrant, Dual activity begins more quickly with immediate activation while Warrant is more stable waiting on activation.</p> <p>For Palmer amaranth, apply Liberty at 29 oz/A when less than 3"; 32 oz/A when 3"; 36 oz/A when 4"; and 43 oz/A when taller than 4".</p> <p><b>Do not make more than 2 applications of glufosinate per year in a field;</b> include 2 herbicides PRE and a directed layby.</p>	<i>glufosinate</i> Liberty 2.34S + <i>acetochlor</i> Warrant 3 ME	10 + 15	29-43 fl oz + 2-3 pt	0.53-0.79 + 0.75-1.125	12 H/ 70 D	<p><b>Enlist, Glytol LibertyLink, or XtendFlex variety</b></p> <p>Warrant mixture can be applied from cotton being fully emerged through early bloom. Dual Magnum mixture can be applied from cotton being fully emerged through 100 days before harvest if applied otop, up to 80 days before harvest if directed or early bloom, whichever is more restrictive. Outlook mixture can be applied from 1-leaf cotton through second week of bloom.</p> <p><b>UGA research strongly encourages these mixtures to be directed after 8-leaf cotton for reduced injury and better weed control.</b></p> <p>Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures, saturated soils, or when mixed with insecticides or adjuvants. Research has shown in some environments, especially saturated soils, that injury from Liberty is greatest on XtendFlex cotton followed by Enlist cotton and least on Glytol LibertyLink cotton.</p> <p><b>To maximize control:</b> &gt; 15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset.</p> <p>Several products containing <i>metolachlor</i> (not <i>S-metolachlor</i>) are available. <i>Metolachlor</i> products are less effective per unit of formulated product than those with <i>S-metolachlor</i>. In general it takes 1.5 pt of a <i>metolachlor</i> product to give the activity one gets from 1 pt of <i>S-metolachlor</i>.</p> <p>Cheetah and Interline are available formulations of <i>glufosinate</i> that have been tested; other brands are available.</p>
	<i>glufosinate</i> Liberty 2.34S + <i>S-metolachlor</i> Dual Magnum 7.62 EC	10 + 15	29-43 fl oz + 1 pt	0.53-0.79 + 0.95	24 H/ 100 D	
	<i>glufosinate</i> Liberty 2.34S + <i>dimethenamid-P</i> Outlook 6 EC	10 + 15	29-43 fl oz + 12-16 fl oz	0.53-0.79 + 0.56-0.75	12 H/ 70 D	
<b>POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST, GLYTOL LIBERTYLINK, ROUNDUP READY FLEX, or XTENDFLEX VARIETIES</b>						
Controls most annual weeds; exceptions include <i>glyphosate</i> -resistant Palmer amaranth, dayflower, Florida pusley, tropical spiderwort, doveweed, and hemp sesbania. Timely applications critical for purslane and morningglory.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	32-48 oz 24-36 oz 23-34 oz 22-32 oz 19-29 oz	0.75-1.12 (lb ae)	4 H/ 7 D	<p>WeatherMax or PowerMax (4.5 lb ae) may be applied otop or directed to Flex cotton anytime from cotton emergence until 7 days prior to harvest. The maximum rate for any single application between emergence and 60% open bolls is 32 fl oz (1.12 lb ae). Do not exceed a total of 128 fl oz (4.5 lb ae) applied from emergence through 60% open bolls. Do not exceed a maximum of 44 fl oz (1.55 lb ae) applied between layby and 60% open bolls. Do not exceed a maximum of 44 fl oz between 60% open bolls and harvest.</p> <p>A <i>glyphosate</i>-based program should include: 1) no weeds emerged at planting; 2) two residual herbicides at planting; 3) residual herbicides with Roundup POST and 4) a conventional directed layby.</p>

<sup>1</sup> Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.



**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST, GLYTOL LIBERTYLINK, ROUNDUP READY FLEX, or XTENDFLEX VARIETIES (continued)</b>						
Warrant provides residual control of grasses, pigweeds, and tropical spiderwort, if it contacts the soil and is activated.	<i>glyphosate</i> + <i>acetochlor</i> Warrant 3 ME	9 + 15	see <i>glyphosate</i> + 2-3 pts	0.75-1.12 + 0.075-1.125	12 H/ do not apply after 2nd wk of bloom	See comments for <i>glyphosate</i> alone. Label allows a topical application once cotton is completely emerged until it reaches bloom; however, UGA research suggests making directed applications after the 8-leaf stage to reduce injury potential while improving weed control. A topical and directed application may be made as long as Warrant was not applied PRE; if Warrant was applied PRE then one POST application can be made.  Use loaded <i>glyphosate</i> formulation; do not add adjuvants or other pesticides including Staple. Avoid heavy dew on cotton plant, saturated soils, and extreme, hot conditions.
Outlook provides residual control of annual grasses and pigweeds if it reaches the soil and is activated; more data needed on spiderwort.	<i>glyphosate</i> + <i>dimethenamid-P</i> Outlook 6 EC	9 + 15	see <i>glyphosate</i> + 12-16 fl oz	0.75-1.12 + 0.56-0.75	12 H/ do not apply after 2nd wk of bloom	See comments for <i>glyphosate</i> alone. Label allows a topical application from 1-leaf cotton through 2nd week of bloom; however, UGA research suggests making directed applications after the 8-leaf stage to reduce injury potential while improving weed control. Only one application of Outlook per year.  Suggested rate is 12 oz/A on coarse soils or under intense irrigation. Some leaf speckling/burn will likely occur. Avoid heavy dew on cotton plant, saturated soils, and extreme, hot conditions.
Staple improves control of hemp sesbania, morningglory, tropical spiderwort, and <i>glyphosate</i> -resistant Palmer amaranth.  Staple will provide residual control of pigweeds, prickly sida, smartweed, spurred anoda, and velvetleaf if it contacts the soil and is activated.  <b>Will not control ALS + <i>glyphosate</i> resistant Palmer.</b>	<i>glyphosate</i> + <i>pyrithiobac</i> Staple LX, Pyrimax 3.2SL	9 + 2	see <i>glyphosate</i> + 2-3 fl oz	0.75-1.12 + 0.05-0.07	4 H/ 60 D	See comments for <i>glyphosate</i> and Staple alone. Apply overtop from cotton cotyledonary stage until 60 days prior to harvest. However, UGA research suggests making directed applications after the 8-leaf stage to reduce injury potential while improving weed control.  Some leaf speckling/burn will likely occur. Avoid heavy dew on cotton plant, saturated soils, and extreme, hot conditions. Do not mix with any Dual/ <i>metolachlor</i> products or Warrant.  For Palmer amaranth, apply Staple at 2.5-3 oz/A when Palmer is 2" or less; rate can be increased to 3.8 oz/A but injury is a concern. For residual control, a rate of 1.9-2.1 oz/A should perform very well.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST, GLYTOL LIBERTYLINK, ROUNDUP READY FLEX, or XTENDFLEX VARIETIES (continued)</b>						
<p><i>Metolachlor</i> controls annual grasses, pigweeds, doveweed, Florida pusley, tropical spiderwort, and suppresses yellow nutsedge if it contacts the soil and is activated.</p> <p>Several products containing <i>metolachlor</i> (not <i>S-metolachlor</i>) are available and labeled. <i>Metolachlor</i> products are less effective per unit of formulated product than those with <i>S-metolachlor</i>. In general it takes 1.5 pt of a <i>metolachlor</i> product to give the activity one gets from 1 pt of <i>S-metolachlor</i>.</p>	<p><i>glyphosate</i> + <i>S-metolachlor</i> Dual Magnum 7.62 EC</p>	<p>9 + 15</p>	<p>see <i>glyphosate</i> + 1 pt</p>	<p>0.75-1.12 + 0.95</p>	<p>24 H/ 100 D</p>	<p>See comments for <i>glyphosate</i> alone. Dual Magnum can be applied overtop of cotton until 100 days before harvest and directed until 80 days of harvest. UGA research suggests making directed applications after the 8-leaf stage to reduce injury potential and improve weed control.</p> <p>Some leaf speckling/burn will likely occur. Avoid heavy dew on cotton plant, saturated soils, and extreme, hot conditions.</p> <p>Do not mix with Staple or apply within 5 days of Staple.</p>
	<p><i>glyphosate</i> + <i>S-metolachlor</i> Sequence 5.25L</p>	<p>9 + 15</p>	<p>2.5 pt</p>	<p>0.7 + 0.94</p>	<p>24 H/ 100 D</p>	<p>Label allows application from cotyledon stage cotton to the 10 leaf stage (not to exceed 12" tall). Do not harvest within 100 days of application. See comments above for <i>glyphosate</i> + Dual Magnum.</p>
<p>Envoke improves Ipomoea morningglory and nutsedge control. Also provides some residual control of sensitive weeds if it reaches the soil and is activated.</p> <p><b>Effective option for non-STS soybean.</b></p>	<p><i>glyphosate</i> + <i>trifloxysulfuron</i> Envoke 75 WDG</p>	<p>9 + 2</p>	<p>see <i>glyphosate</i> + 0.1 oz</p>	<p>0.75-1.12 + 0.0047</p>	<p>12 H/ 60 D</p>	<p>See comments for <i>glyphosate</i> and Envoke applied alone. Tank mix can be applied from 6 (prefer 7) leaf stage until 60 days of harvest; however, directed application strongly encouraged for improved weed control and much less injury.</p> <p>Injury from topical applications is a concern.</p> <p>Will not control ALS + <i>glyphosate</i> resistant pigweed.</p>
<p>Volunteer Roundup Ready corn in Roundup Tolerant cotton</p>	<p><i>glyphosate</i> + <i>clethodim</i> Select 2 EC Select Max 0.97EC</p>	<p>9 + 1</p>	<p>see <i>glyphosate</i> + 4-8 fl oz 6-12 fl oz</p>	<p>0.75-1.12 + 0.06-0.09</p>	<p>24 H/ 60 D</p>	<p><b>See comments for <i>glyphosate</i> alone. Numerous generics available.</b></p> <p><b>Clethodim:</b> For corn up to 12" tall, apply 4-6 oz of Select or 6 oz of Select Max; for corn up to 24" tall, apply 6-8 oz of Select or 9 oz of Select Max; for corn up to 36" tall, apply 12 oz of Select Max. Add 2.5 lb/A <i>ammonium sulfate</i> or equivalent and make sure <i>glyphosate</i> brand used contains adjuvant.</p> <p><b>Fusilade DX:</b> Apply 4 oz Fusilade for corn less than 12". Increase rate to 6 oz for corn up to 24". Add 0.25% by volume of crop oil concentrate.</p> <p><b>Assure II:</b> Apply Assure at 4 oz to corn up to 12", 5 oz for corn up to 18", and 8 oz to corn up to 30". Add 0.125% nonionic surfactant by volume.</p>
	<p><i>glyphosate</i> + <i>fluazifop-p-butyl</i> Fusilade DX 2 EC</p>	<p>9 + 1</p>	<p>see <i>glyphosate</i> + 4-6 fl oz</p>	<p>0.75-1.12 + 0.06-0.09</p>	<p>12 H/ 90 D</p>	
	<p><i>glyphosate</i> + <i>quizalofop-p-ethyl</i> Assure II 0.88 EC</p>	<p>9 + 1</p>	<p>see <i>glyphosate</i> + 5-8 fl oz</p>	<p>0.75-1.12 + 0.03-0.05</p>	<p>12 H/ 80 D</p>	

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>ADDITIONAL POST-EMERGENCE OVERTOP WEED CONTROL FOR ENLIST VARIETIES</b>						
<p><i>2,4-D</i> is extremely effective on many broadleaf weeds including spiderwort and morningglory; pigweed needs to be less than 3" and sequential applications are often needed.</p> <p><b>Off-target movement of <i>2,4-D</i> poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</b></p>	<p><i>2,4-D choline</i> Enlist One 3.8 S</p>	9	24-32 fl oz	0.7-0.95	48 H/ mid-bloom	<p><b>Enlist Varieties Only: Make certain the appropriate training requirements have been fulfilled before applying these products in 2020.</b></p> <p>Enlist One or Enlist Duo are the only brands of <i>2,4-D</i> currently approved for this use. Apply anytime from cotton emergence to mid-bloom. May apply twice, allow 12 days between applications. Suggest both applications be prior to the 9-leaf stage of cotton; direct applications afterward for reduced injury potential and increased weed control. For Enlist One, label currently allows tank mixtures with several herbicides including <i>glyphosate</i> products, Liberty, Warrant, or Dual Magnum; visit <a href="http://Enlisttankmix.com">Enlisttankmix.com</a> for the latest.</p> <p>GA data suggests the choline formulation of <i>2,4-D</i> has reduced volatility potential when compared to other <i>2,4-D</i> formulations; however, volatility can still occur. Be certain to study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, and boom heights. Also, one must review the website (<a href="http://Enlisttankmix.com">Enlisttankmix.com</a>) for approved adjuvants, drift reduction agents, and other tank mixtures.</p>
	<p><i>glyphosate</i> + <i>2,4-D choline</i> Enlist Duo 3.3 S</p>	9 + 4	3.5-4.75 pt	0.74-1 (lb ae) +	48 H/ mid-bloom	
<b>ADDITIONAL POST-EMERGENCE OVERTOP WEED CONTROL FOR XTENDFLEX VARIETIES</b>						
<p><i>Dicamba</i> is extremely effective on many broadleaf weeds including morningglory; pigweed needs to be less than 3 inches and sequential applications are often needed.</p> <p><b>Off-target movement of <i>dicamba</i> poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</b></p>	<p><i>glyphosate</i> + <i>dicamba</i> Engenia 5 S or XtendiMax 2.9 S</p>	9 + 4	<p>see label +</p> <p>12.8 fl oz or 22 fl oz</p>	<p>0.75-1.13 +</p> <p>0.5</p>	<p>24H/ 60 D after plant</p>	<p><b>Dicamba Tolerant Varieties Only: All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b></p> <p>Engenia, FeXapan, and XtendiMax are the only brands of <i>dicamba</i> currently approved for this use. Two in-crop applications can be made from emergence up to mid-bloom or no more than 60 days after planting, whichever occurs first. Applications must be made in at least 15 gallons of water per acre. Suggest both applications be prior to the 9-leaf stage of cotton; direct applications afterward for reduced injury potential and increased weed control. Separate sequential applications by at least 7 days.</p> <p>Data suggests these are the least volatile formulations of <i>dicamba</i> available. Be certain to study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, sprayer speeds, and boom heights. Also, review the website for approved adjuvants, drift reduction agents, and other tank mixtures (<a href="http://Xtendimaxapplicationrequirements.com">Xtendimaxapplicationrequirements.com</a> or <a href="http://Engeniatankmix.com">Engeniatankmix.com</a>).</p>

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## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>ADDITIONAL POST-EMERGENCE OVERTOP WEED CONTROL FOR XTENDFLEX VARIETIES (continued)</b>						
Premix of <i>dicamba</i> + <i>S-metolachlor</i> . <i>Dicamba</i> is extremely effective on many broadleaf weeds while <i>S-metolachlor</i> will provide residual control of many small-seeded broadleaf weeds and grasses if activated by timely rain or irrigation.	<i>dicamba</i> + <i>S-metolachlor</i> <i>Tavium</i>	4 + 15	56.5 fl oz	0.5 + 1.0	24H/ 60 D after plant	<p><b>Dicamba Tolerant Varieties Only: All applicators must be certified AND fulfill training requirements before applying Tavium in 2020.</b></p> <p>In-crop applications can be made over-the-top through 6-leaf cotton or within 60 days of planting, whichever is first. Significant injury has been noted in some environments, similar to previous experience with tank mixing these two herbicide active ingredients in the past.</p> <p>Be certain to study the label regarding requirements for training, buffers, wind speeds, spray tip requirements, sprayer speeds, and boom heights. Also, review the website for approved adjuvants, drift reduction agents, and other tank mixtures. Tank mixtures with <i>glyphosate</i> are usually needed. Go to <a href="http://www.TaviumTankMix.com">www.TaviumTankMix.com</a> for approved mixtures.</p> <p><b>Off-target movement of <i>dicamba</i> poses the greatest threat to the survival of this technology; steward these herbicides with the utmost level of respect or use alternative control methods.</b></p>
<b>POST-EMERGENCE OVERTOP GRASS CONTROL FOR ANY VARIETY</b>						
Annual grasses	<i>clethodim</i> Select, others 2 EC Select Max 0.97 EC Tapout 0.97 EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.13 0.07-0.12 0.07-0.12	24 H/ 60 D	<p>Apply to actively growing grasses not under stress. Mixtures with herbicides other than <i>glyphosate</i> will likely reduce grass control. Do not cultivate within 5 days of application. A 2<sup>nd</sup> application may be made.</p> <p><b>For Select:</b> Add crop oil concentrate at 1 qt/A.</p> <p><b>For Select Max:</b> Add nonionic surfactant at 1 qt/100 gal solution or crop oil concentrate at 1 gal/100 gal solution.</p> <p><b>For Fusilade:</b> Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution.</p> <p><b>For Assure:</b> Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution.</p> <p><b>For Poast:</b> Add crop oil concentrate at 1 qt/A.</p> <p>Numerous generic formulations for each active ingredient are available.</p>
	<i>fluazifop p-butyl</i> Fusilade DX 2 EC	1	8-12 fl oz	0.125-0.188	12 H/ 90 D	
	<i>quizalofop p-ethyl</i> Assure II 0.88 EC	1	7-8 fl oz	0.05-0.06	12 H/ 80 D	
	<i>sethoxydim</i> Poast 1.53 EC Poast Plus 1 EC	1	16 fl oz 24 fl oz	0.19	12 H/ 40 D	

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE OVERTOP GRASS CONTROL FOR ANY VARIETY (continued)</b>						
Perennial grasses	<i>clethodim</i> Select, others 2 EC Select Max 0.97 EC Tapout 0.97 EC	1	8-16 fl oz 12-32 fl oz 12-32 fl oz	0.13-0.25 0.09-0.24 0.09-0.24	24 H/ 60 D	Apply to actively growing johnsongrass 12-24" tall or to bermudagrass with runners up to 6". A second application at the provided rates may be made to bermudagrass when regrowth is up to 6" or when johnsongrass has regrowth of 6-18". Add adjuvant as provided above in annual grass section. Do not mix with other herbicides. Do not cultivate within 5 days of application.
	<i>fluzifop p-butyl</i> Fusilade DX 2 EC	1	10-12 fl oz	0.156-0.188	12 H/ 90 D	Apply when johnsongrass is 8-18" or when bermudagrass runners are 4-8". If needed, make a second application of 8 fl oz/A when johnsongrass regrowth or new plants are 6-12" inches or when bermudagrass stolon (runner) regrowth or new plants are 3-6". Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution. Do not mix with other herbicides. Do not cultivate within 5 days of application.
	<i>quizalofop p-ethyl</i> Assure II 0.88 EC	1	10 fl oz	0.07	12 H/ 80 D	Apply when johnsongrass is 10-24" or bermudagrass runners are 3-6". A second application for treating regrowth or new plants can be made with 7 fl oz/A when johnsongrass reaches 6-10" or bermudagrass reaches 3-6". Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution. Do not mix with other herbicides. Do not cultivate within 5 days of application.
	<i>sethoxydim</i> Poast 1.53 EC Poast Plus 1 EC	1	24 fl oz 36 fl oz	0.28	12 H/ 40 D	Apply to johnsongrass up to 25" and before bermudagrass runners exceed 6". If regrowth occurs or new plants emerge, make a second application of 16 fl oz/A of Poast when johnsongrass reaches 6-10" and bermudagrass reaches 3-6". Add 1 qt of crop oil concentrate/A. Do not tank mix with other herbicides. Do not cultivate within 5 days of application.

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## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE DIRECTED – ANY VARIETY</b>						
<p>Control of many broadleaf weeds and nutsedge; residual control of many weeds if activated. If grasses are present, a <i>glyphosate</i> mixture would be in order.</p> <p>Grasses should be &lt; 1”.</p> <p><b>Diuron plus MSMA is the best directed option to control emerged <i>glyphosate</i>-resistant Palmer amaranth.</b></p> <p><i>Diuron</i> is better on emerged pigweed than Cotoran or Valor.</p> <p>Valor provides more effective residual control of pigweed.</p>	<p><i>diuron</i> Direx, Diuron, other 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal</p>	<p>7 + 17</p>	<p>1.6-2.4 pt + 2 pt 2 pt</p>	<p>0.8-1.2 + 1.5-1.65</p>	<p>12 H/ 1st Bloom</p>	<p>Apply as directed spray to cotton at least 12” tall. Addition of crop oil concentrate is strongly encouraged. Label prohibits use on sand or loamy sand soils, or any soils with less than 1% organic matter. Higher rates of <i>diuron</i> provide greater residual weed control but have extended rotational concerns. See label.</p> <p>If soil type allows, use at least 2 pt/A of <i>diuron</i> for control of emerged Palmer amaranth. Label prohibits applying <i>MSMA</i> after 1st bloom.</p> <p>To improve emerged morningglory control consider adding Envoke at 0.1 oz/A which has no additional injury concern.</p> <p>To improve spiderwort and grass residual control consider adding:</p> <ol style="list-style-type: none"> <li>1) Dual Magnum 1 pt/A; or</li> <li>2) Warrant 2-3 pt/A; or</li> <li>3) Zidua 0.75-1.5 oz/A as long as cotton has at least 7 leaves.</li> </ol> <p>Numerous formulations of <i>diuron</i> and <i>MSMA</i> are available.</p>
<p>Controls many broadleaf weeds and nutsedge; grasses should &lt; 1”. Palmer amaranth should be &lt; 2”. Residual control of many weeds if activated. If grasses are present, a <i>glyphosate</i> mixture would be in order.</p> <p><i>Diuron</i> is better on emerged pigweed than Cotoran or <i>flumioxazin</i>; <i>flumioxazin</i> provides the best residual control by far.</p>	<p><i>flumioxazin</i> Valor SX 51WDG + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal</p>	<p>14 + 17</p>	<p>2 oz + 2.67 pt 2.5 pt</p>	<p>0.064 + 2</p>	<p>12 H/ 1st Bloom</p>	<p>Apply as a directed spray to cotton at least 18” tall. Apply to the lower 2” of the cotton stem and do not contact the green portion of the cotton stem. May apply to 6” cotton under a hood with no crop contact.</p> <p>Add nonionic surfactant at 1 qt/100 gal spray mix. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying <i>MSMA</i> after 1st bloom.</p> <p>IN HOODED APPLICATIONS when no crop contact occurs; the addition of Dual or Warrant is recommend for managing tropical spiderwort and Palmer amaranth.</p> <p>Outflank, Panther, and Rowel perform similarly to Valor.</p> <p><b>For PPO-resistance management</b>, make only 3 applications of Valor or Reflex (including generics) in 3 years.</p>

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**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE DIRECTED – ANY VARIETY (continued)</b>						
The single best layby mixture for control of both emerged <i>glyphosate</i> -resistant Palmer amaranth and extended residual control. Grass must be < 0.5".  Be careful, mixture is "hot".	<i>flumioxazin</i> Valor SX, others 51 WDG + <i>diuron</i> Direx, others 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	14 + 7 + 17	2 oz + 1 pt + 2 pt 2 pt	0.064 + 0.5 + 1.5 1.65	12 H/ 1st Bloom	Cotton should be at least 20" tall. Apply as a directed spray to the lower 2" of the barky portion of the cotton stem. Do not contact any green portion of the stem.  Experiment with this mixture on limited acreage as crop injury is of some concern. Add nonionic surfactant at 1 qt/100 gal spray mix. <b>DO NOT</b> use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying <i>MSMA</i> after 1st bloom.
Effective control of many broadleaf weeds and nutsedge; grasses should be < 0.5" and Palmer < 2".  Will not improve control of emerged weeds but better residual control compared to <i>flumioxazin</i> + <i>MSMA</i> but better residual control is likely.	<i>flumioxazin</i> + <i>pyroxasulfone</i> Fierce 76 WDG + <i>MSMA</i> 6 lb/gal 6.6 lb/gal	14 + 15 + 17	3 oz + 2.67 pt 2.5 pt	0.063+0.08 + 2	12 H/ 1st Bloom	Apply as a directed spray to cotton at least 18" tall. Direct spray to the lower 2" of a barky cotton stem; do not contact the green portion of the cotton stem. May apply to 6" cotton under a hood hood as long as no crop contact.  Add nonionic surfactant at 1 qt/100 gal spray mix. <b>DO NOT</b> use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying <i>MSMA</i> after 1st bloom.
Effective control of many broad- leaf weeds, nutsedge, and small annual grasses. Residual control of many weeds.  Less effective than <i>diuron</i> mix for emerged pigweed and less residual on pigweed than <i>diuron</i> or Valor.	<i>fluometuron</i> Cotoran 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	7 + 17	2-3.2 pt + 2.67 pt 2.5 pt	1-1.6 + 2	12 H/ 1st Bloom	Apply as a directed spray to cotton at least 3" tall; cotton has very good tolerance. Label prohibits applying <i>MSMA</i> after 1st bloom. The addition of Envoke at 0.1 oz/A will improve morningglory control and can be added as long as cotton has at least 6" tall.  The addition of a Dual type product or Warrant is recommended for managing tropical spiderwort and Palmer amaranth.
Effective control of many broadleaf weeds, nutsedge, and small annual grasses.  Less effective than <i>diuron</i> mix in controlling emerged pigweed and less residual on pigweed than <i>diuron</i> or Valor.	<i>prometryn</i> Caparol 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	5 + 17	1.3-2.4 pt + 2.67 pt 2.5 pt	0.65-1.2 + 2	12 H/ 1st Bloom	Apply as a directed spray. Use 1.3 pt/A Caparol in 8-12" cotton and up to 2.4 pt/A in cotton at least 12". Add nonionic surfactant at 2 qt/100 gal spray solution. Label prohibits applying after 1st bloom.  The addition of Envoke at 0.1 oz/A will improve morningglory control.  The addition of a Dual-type product or Warrant is recommended for providing additional residual control for managing tropical spiderwort.

<sup>1</sup> Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE DIRECTED – ENLIST, GLYTOL LIBERTY LINK, ROUNDUP READY FLEX, OR XTENDFLEX VARIETIES</b>						
Controls most annual weeds; exceptions include resistant Palmer amaranth, dayflower, doveweed, Florida pusley, tropical spiderwort, and hemp sesbania. Morningglory and purslane can be challenging.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 19-29 fl oz	0.75-1.12 lb ae	4 H/ 7 D	<i>Glyphosate</i> should never be applied alone. Label allows directed application up to 7 days prior to harvest. Improved weed coverage with a directed application generally occurs after 8-leaf cotton.  A <i>glyphosate</i> -based program should include: 1) no weeds emerged at planting; 2) two residual herbicides at planting; 3) residual herbicides with Roundup POST; and 4) a directed layby including conventional chemistry.
Mixing <i>diuron</i> with <i>glyphosate</i> improves morningglory and Palmer amaranth control; although morningglory control may still not be acceptable. Also provides residual control of some broadleaf weeds, such as pigweed. The tank mix may give less grass control than <i>glyphosate</i> alone.	<i>glyphosate</i> + <i>diuron</i> Direx, Diuron 4F	9 + 7	see <i>glyphosate</i> + 1-1.5 pt	0.75-1.12 + 0.5-0.75	12 H/ 7 D	Use 1 pt/A of <i>diuron</i> on cotton 8-12" and up to 1.5 pt/A of <i>diuron</i> on cotton greater than 12".  <b>To improve spiderwort, pigweed, and grass residual control consider adding:</b> 1) Dual Magnum 1 pt/A; 2) Warrant 2-3 pt/A; 3) Zidua 0.75-1.5 oz/A as long as cotton has at least 7 leaves; or 4) Outlook 12-16 oz/A.  <b>To improve morningglory control consider adding:</b> 1) Envoke 0.1 oz/A, no additional restrictions; or 2) Valor 1-1.5 oz/A, cotton should be at least 18" tall with spray contacting only bottom 2" of barky stem.  Residual Palmer control by <i>diuron</i> often lasts 7-10 days.
Mixing Valor with <i>glyphosate</i> improves morningglory and tropical spiderwort control and provides residual control of many broadleaf weeds including pigweeds, purslane, and Florida pusley.  Often poor control of <i>glyphosate</i> -resistant Palmer amaranth over 1" but excellent residual control.	<i>glyphosate</i> + <i>flumioxazin</i> Valor SX 51WDG	9 + 14	see <i>glyphosate</i> + 1-2 oz	0.75-1.12 + 0.031-0.063	12 H/ 60 D	Cotton should be at least 18". Direct spray to the lower 2" of barky cotton stem. Do not allow spray to contact green portion of stem.  <b>The addition of <i>diuron</i> will improve control of emerged pigweed.</b>  Add nonionic surfactant at 1 qt/100 gal spray mix but only if <i>glyphosate</i> brand requires adjuvant. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvants, or any adjuvant product containing these.  Outflank, Panther, and Rowel perform similarly to Valor.  <b>For PPO-resistance management</b> , make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.
Provides similar post-emergence control as <i>glyphosate</i> + Valor but provides greater residual control for many weeds including spiderwort and Palmer amaranth.	<i>glyphosate</i> + <i>flumioxazin</i> + <i>pyroxasulfone</i> Fierce 76 WDG	9 + 14 + 15	see <i>glyphosate</i> + 3 oz	0.75-1.12 + 0.063 + 0.08	12 H/ 60 D	Apply as a directed spray to cotton at least 18" tall. Direct spray to the lower 2" of a barky cotton stem; do not contact the green portion of the cotton stem. May apply to 6" cotton under a hood as long as no crop contact.  Add nonionic surfactant according to the Fierce label. DO NOT use crop oil concentrate, methylated seed oil, organosilicone adjuvant, or any adjuvant containing any of these.

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.



## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE DIRECTED – ENLIST, GLYTOL LIBERTY LINK, ROUNDUP READY FLEX, OR XTENDFLEX VARIETIES (continued)</b>						
Mixing Caparol with <i>glyphosate</i> improves morningglory control and provides residual control of sensitive species.  The tank mix may give less grass control than <i>glyphosate</i> alone.	<i>glyphosate</i> + <i>prometryn</i> Caparol 4F	9 + 5	see <i>glyphosate</i>  +  1-2 pt	0.75-1.12  +  0.5-1	12 H/ –	Cotton should be at least 8” for Caparol rate between 1-1.3 pt and at least 12” for Caparol rate above 1.3 pt. Add surfactant but only if <i>glyphosate</i> brand requires it.  <b>To improve spiderwort, pigweed, and grass residual control consider adding:</b> 1) Dual Magnum 1 pt/A; 2) Warrant 2-3 pt/A; 3) Zidua 0.75-1.5 oz/A as long as cotton has at least 7-leaf; or 4) Outlook 12-16 oz/A.  <b>To improve morningglory control consider adding:</b> 1) Envoke 0.1 oz/A, no additional restrictions; or 2) Valor 1-1.5 oz/A, cotton should be at least 18” tall with spray contacting only bottom 2” of barky stem.  Occasionally, directed applications to succulent cotton stems cause chlorosis from <i>prometryn</i> throughout the plant.
Mixing Envoke with <i>glyphosate</i> improves <i>Ipomoea</i> morningglory and nutsedge control and provides some residual control of sensitive species.	<i>glyphosate</i> + <i>trifloxysulfuron</i> Envoke 75 WDG	9 + 2	see <i>glyphosate</i>  +  0.1-0.2 oz	0.75-1.12  +  0.005-0.009	12 H/ 60 D	Direct to cotton from 6” tall through layby; minimize contact on small cotton. Add nonionic surfactant according to Envoke label. Excellent tolerance when directed.  The addition of <i>diuron</i> will improve control of emerged pigweed.
<b>ADDITIONAL POST-EMERGENCE DIRECTED: XTENDFLEX VARIETIES ONLY</b>						
<i>Dicamba</i> can be extremely effective on many broadleaf weeds but tank mixtures are needed for effective control.  <i>Glyphosate, diuron, and/ or flumioxazin</i> are currently approved for mixtures, visit websites in comment section to confirm. Follow the most restrictive application restrictions for mixtures.	<i>dicamba</i> Engenia 5 S or XtendiMax 2.9 S	4	12.8 fl oz or 22 fl oz	0.5	24H/ 7D	<b><i>Dicamba</i> Tolerant Varieties Only: All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b>  Engenia and XtendiMax are the only brands of <i>dicamba</i> currently approved for this use through a state 24(c) label which must be in hand at time of application..  Applications may be made with any standard spray tip as long as the system generates droplets that are coarse (>341 microns vmd) and the release point is less than 10” from the soil in cotton that is at least 20” tall. Spray tip must be angled downward to the soil. A maximum of 6 mph ground speed is required as is a carrier volume of at least 15 gallons of water/A.  (Xtendimaxapplicationrequirements.com or Engeniatankmix.com)

<sup>1</sup>Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

## COTTON WEED CONTROL

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>POST-EMERGENCE – HOODED SPRAYER – ANY CULTIVAR</b>						
<i>Glyphosate</i> as a hooded application is especially effective for prostrate, running species such as citron, burgherkin, and annual grasses. SUGGEST NOT USING LIQUID NITROGEN AS ENTIRE CARRIER.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 19-29 fl oz	0.75-1.12	4 H/ 7 D	In varieties not resistant to <i>glyphosate</i> , hoods should be kept as close to the ground as possible preventing spray from contacting stems or foliage. Apply in 5-10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Suggest that cotton be at least 8” tall.  Other herbicides such as Aim, Caparol, Diuron, Dual Magnum, Envoke, ET, Fierce, Staple, Valor, Warrant or Zidua should be mixed with <i>glyphosate</i> to improve weed control. Follow application restrictions as provided on labels.
Annual grass and broadleaf weeds; suppression of nutsedge.  Mixtures with <i>diuron</i> would be the most effective option to control emerged pigweed in row middles.	<i>paraquat</i> Gramoxone 2S	22	19-38 fl oz	0.3-0.6	24 H/ 3 D	<b>SALVAGE APPLICATION! DO NOT CONTACT COTTON STEMS OR FOLIAGE.</b> EPA has restricted the use of <i>paraquat</i> to certified applicators ONLY and applicators must take a specialized training before use. Apply in a minimum of 10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Hoods should be kept on the ground. Cotton should be at least 8”. Add nonionic surfactant at 2 pt/100 gal of spray mix or crop oil concentrate at 1 gal/100 gal spray mix.  Caparol, Cotoran, or <i>diuron</i> (Direx, Diuron) mixed with <i>paraquat</i> will likely improve control of emerged weeds and provide residual control.  <b>If <i>paraquat</i> contacts the cotton stem severe damage is to be expected!</b>
Timing for pigweed and grasses are critical. Control of pusley, spiderwort, and goosegrass is not good. Generally, treat broadleaf weeds prior to 3” and grasses prior to 2”.  Excellent control of morningglory including moonflower morningglory.	<i>glufosinate-ammonium</i> Liberty 2.34 S	10	29 fl oz	0.53	12 H/ 70 D	On non- <i>glufosinate</i> tolerant cotton, keep hoods close to ground to avoid contact with cotton stem. Suggest cotton be at least 8”. The addition of <i>diuron</i> or other residual herbicide strongly encouraged. Adjuvant not needed.  <b>To maximize control:</b> > 15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset.  Palmer amaranth should be less than 3” when treated with <i>glufosinate</i> at this rate; <i>diuron</i> + <i>MSMA</i> is more effective on emerged pigweed.  Numerous other brands of <i>glufosinate</i> are available.  <b>Make no more than 2 applications of Liberty in a field per year.</b>
<b>ADDITIONAL POST-EMERGENCE HOODED SPRAYER: XTENDFLEX VARIETIES ONLY</b>						
<i>Dicamba</i> can be extremely effective on many broadleaf weeds but tank mixtures are needed for effective control.  <i>Glyphosate, diuron,</i> and/or <i>flumioxazin</i> are currently approved for mixtures, visit websites in comment section to confirm. Follow the most restrictive application restrictions for mixtures.	<i>dicamba</i> Engenia 5 S or XtendiMax 2.9 S	4	12.8 fl oz or 22 fl oz	0.5	24H/ 7D	<b>Dicamba Tolerant Varieties Only: All applicators must be certified AND fulfill training requirements before applying Engenia or XtendiMax in 2020.</b> Engenia and XtendiMax are the only brands of dicamba currently approved for this use through a state 24(c) label which must be in hand at time of application.  Applications may be made with any standard spray tip as long as the system generates droplets that are coarse (>341 microns vmd) and the hoods remain in contact with the soil while applying the herbicide in cotton at least 15” tall. A maximum of 6 mph ground speed is required as is a carrier volume of at least 15 gallons of water/A  (Xtendimaxapplicationrequirements.com or Engeniatankmix.com)

<sup>1</sup> Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

**COTTON WEED CONTROL**

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
<b>HARVEST AID</b>						
Mature morningglory	<i>carfentrazone-ethyl</i> Aim 2 EC	14	up to 1.5 fl oz	up to 0.024	12 H/ 7 D	Apply as a harvest aid when 60-70% of the cotton bolls are open AND when the morningglory are mature (seedpods are visible). See label for addition of adjuvant. See cotton defoliation section for potential negative influence on defoliation activity.
	<i>pyraflufen ethyl</i> ET 0.208 EC	14	up to 2.75 oz	up to 0.0044	12 H/ 7 D	Apply as a harvest aid when 60-70% of the cotton bolls are open AND when the morningglory are mature (seedpods are visible). See label for addition of adjuvant. See cotton defoliation section for potential negative influence on defoliation activity.
Desiccation of most weeds.  Regrowth of many weeds occurs soon after application.	<i>paraquat</i> Gramoxone 2S	22	16-32 fl oz	0.25-0.5	24 H/ 3 D	EPA has restricted the use of <i>paraquat</i> to certified applicators ONLY and applicators must take a specialized training before use. Defoliate cotton as normal. After at least 75% of bolls are open, the remainder of bolls expected to harvest are mature, and most of the cotton leaves have dropped, apply <i>paraquat</i> in a minimum of 20 GPA. Add nonionic surfactant at 1 pt/100 gal spray mix. Wait 3-5 days and pick the cotton as soon as possible. Expect additional trash. An additional option is to add 2-6 oz of Gramoxone Inteon with standard defoliation mixtures. <b>Be aware of potential pine tree and other sensitive crop/plant injury with drift.</b> Generic brands of <i>paraquat</i> containing 3 lb ai/gal may be labeled. These products would be applied at 11-21 fl oz for 0.25-0.5 lb ae, respectively. See cotton defoliation section.
Annual grasses and broadleaf weeds	<i>glyphosate</i> 4 SL (3 lb ae) 5.4 SL (4 lb ae) 5 SL (4.17 lb ae) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	32-64 fl oz 24-48 fl oz 23-46 fl oz 22-44 fl oz 19-38 fl oz	0.75-1.5 (lb ae)	4 H/ 7 D	Apply after at least 60% of bolls are open in non-Roundup Ready cotton. May be tank mixed with defoliant. See label and defoliant section. Include nonionic surfactant according to the label of <i>glyphosate</i> brand used.  May apply in R R Flex, XtendFlex, Enlist, or Glytol LibertyLink cotton until 7 days before harvest. See cotton defoliation section.

<sup>1</sup> Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

# WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON

A. Stanley Culpepper, Extension Agronomist – Weed Science

WEED SPECIES	BURNDOWN TREATMENT <sup>1</sup>									
	2,4-D <sup>3</sup>	glyphosate	glyphosate <sup>2</sup> + 2,4-D <sup>3</sup>	glyphosate <sup>2</sup> + dicamba <sup>4</sup>	glyphosate <sup>2</sup> + Aim or ET	glyphosate <sup>2</sup> + Direx <sup>7</sup>	glyphosate <sup>2</sup> + Harmony Extra <sup>5</sup>	glyphosate <sup>2</sup> + Valor SX <sup>6</sup>	paraquat	paraquat + Direx <sup>7</sup>
<b>GRASSES / SEDGES</b>										
annual bluegrass	N	E	E	E	E	E	E	E	G-E	E
bermudagrass	N	F	F	F	F	F	F	F	P	P
crabgrass	N	E	G-E	G-E	E	G	E	E	F-G	G
goosegrass	N	E	G-E	G-E	E	G	E	E	F-G	G
Italian ryegrass	N	G	F-G	F-G	G	F	G	G	F	F-G
johnsongrass	N	G-E	G	G	G-E	F-G	G-E	G-E	P	P
little barley	N	E	E	E	E	E	E	E	G	G-E
sandbur	N	E	G-E	G-E	E	G	E	E	G	G
Texas panicum	N	E	G-E	G-E	E	G	E	E	G	G-E
volunteer corn (not RR vol.corn)	N	E	E	E	E	E	E	E	F	F-G
purple nutsedge	N	F-G	F-G	F-G	F-G	F-G	F-G	G	P-F	F
yellow nutsedge	N	P-F	P-F	P-F	P-F	F	P-F	F	P-F	F
<b>BROADLEAVES</b>										
bristly starbur	G	E	E	E	E	E	E	E	E	E
buttercup	G	E	E	E	E	E	E	E	E	E
Carolina geranium	F	P-F	F-G	G	F-G	G	G-E	G	G-E	E
chickweed	P	E	E	E	E	E	E	E	E	E
citronmelon	F	G-E	E	E	E	G-E	G-E	E	F	G
cocklebur	E	E	E	E	E	E	E	E	G-E	E
coffee senna	G	E	E	E	E	E	E	E	F	G
corn spurry	P-F	G-E	G-E	G-E	G-E	G-E	G-E	E	F-G	G-E
cowpea	G	E	E	E	E	E	G-E	E	E	E
cudweed	P	E	E	E	E	E	E	E	F-G	G
curly dock	P-F	F	F-G	G-E	F	P-F	E	F	N-P	P
cutleaf primrose	E	P-F	E	G	F	F-G	F	F-G	F <sup>8</sup>	G-E <sup>8</sup>
eclipta	P	G-E	E	E	G-E	G-E	G-E	G-E	F	F

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON (continued)

WEED SPECIES	BURNDOWN TREATMENT <sup>1</sup>									
	2,4-D <sup>3</sup>	glyphosate	glyphosate <sup>2</sup> + 2,4-D <sup>3</sup>	glyphosate <sup>2</sup> + dicamba <sup>4</sup>	glyphosate <sup>2</sup> + Aim or ET	glyphosate <sup>2</sup> + Direx <sup>7</sup>	glyphosate <sup>2</sup> + Harmony Extra <sup>5</sup>	glyphosate <sup>2</sup> + Valor SX <sup>6</sup>	paraquat	paraquat + Direx <sup>7</sup>
<b>BROADLEAVES (continued)</b>										
Florida beggarweed	P-F	E	E	E	E	E	E	E	E	E
Florida pusley	F	P-F	G	G	G	F-G	F	F-G	F	F-G
field pansy	P-F	F	F-G	F-G			F	G	G	G-E
hemp sesbania	G-E	P-F	E		G-E	F-G			F	F-G
henbit	P	F	F-G	G	F-G	G	E	G-E	G <sup>8</sup>	E <sup>8</sup>
horseweed	G-E <sup>9</sup>	G-E <sup>10</sup>	E <sup>10</sup>	E <sup>10</sup>	G-E <sup>10</sup>	G-E <sup>10</sup>	G-E <sup>10</sup>	G-E <sup>10</sup>	P-F	F-G
lambsquarters	E	F-G	E	E	G-E	G-E			F-G	G
morningglory, <i>Ipomoea</i>	G-E	F	E	E	E	G	F	E	F-G	G-E
morningglory, smallflower	F-G	G	E	E	G-E	G-E	G	E	P	F-G
Palmer amaranth	F <sup>9</sup>	E	E	E	E	E	E	E	F-G	G-E
Palmer amaranth (glyphosate-resistant)	F <sup>9</sup>	N	F-G <sup>9</sup>	F-G	P-F	G	P	P-F	F-G	G-E
Pennsylvania smartweed	F	G	G	E	G-E	G	E		P-F	F-G
prickly sida	F-G	F-G	G	G	F-G	F-G	F-G		P-F	F-G
purslane	G-E	F	G-E	G-E	F-G	G	F	G	G	G-E
ragweed	E	G	E	E	G-E	G			G	G
redweed	F	G		G-E	G-E	G			F	G
shepherdspurse	G	G		G	G				G	G

Key:  
 E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control.

**Note:** Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

- <sup>1</sup> Application rates per acre: Clarity (*dicamba*): 0.5 pt; 2,4-D: 1 pt; Aim: 1 oz; ET: 1-2 oz; diuron: 0.5-1.0 lb ai; glyphosate acid: 1.12 lb ae; paraquat: 0.75-1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Valor: 2 oz.
- <sup>2</sup> Mixing herbicides with *glyphosate* occasionally reduces grass control (including covercrops). This is more likely with large weeds in dry conditions.
- <sup>3</sup> Apply 2,4-D at least 30 days ahead of planting, except for varieties with the Enlist trait where planting can occur any time after application.
- <sup>4</sup> Following application of *dicamba* and a minimum of 1” of rainfall, a minimum 21-day waiting period before planting is required, except for varieties with the XtendFlex trait where planting can occur any time after an an Engenia or XtendiMax application.
- <sup>5</sup> Harmony Extra should be applied at least 14 days prior to planting.
- <sup>6</sup> See plant-back restrictions noted in the previous section or on the label for Valor.
- <sup>7</sup> See previous cotton section on state label for reduced plant back interval for Direx.
- <sup>8</sup> This level of control requires plants to be in full bloom with seed forming when treated.
- <sup>9</sup> This level of control requires 2 pt of 2,4-D (4 lb ai product).
- <sup>10</sup> *Glyphosate* will not control *glyphosate*-resistant horseweed, see previous section on controlling this weed.
- <sup>11</sup> Small grain must have visible seedheads for this level of control.

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON (continued)

WEED SPECIES	BURNDOWN TREATMENT <sup>1</sup>									
	2,4-D <sup>3</sup>	glyphosate	glyphosate <sup>2</sup> + 2,4-D <sup>3</sup>	glyphosate <sup>2</sup> + dicamba <sup>4</sup>	glyphosate <sup>2</sup> + Aim or ET	glyphosate <sup>2</sup> + Direx <sup>7</sup>	glyphosate <sup>2</sup> + Harmony Extra <sup>5</sup>	glyphosate <sup>2</sup> + Valor SX <sup>6</sup>	paraquat	paraquat + Direx <sup>7</sup>
<b>BROADLEAVES (continued)</b>										
sicklepod	F-G	G-E	E	E	G-E	E	G-E	E	E	E
speedwell	P-F	E	E	E	E	E	E	E	G	E
spurred anoda	F-G	G			G	G			F-G	F-G
swinecress	F	F-G	G	F-G	F-G	G	G-E	F-G	P-F	F-G
tropic croton	F	G-E	G-E	G-E	G-E	G-E		E	F	F-G
tropical spiderwort	G-E	P	G-E	F	Aim = G-E ET = P-F	F	P	G	G	G-E
velvetleaf	F-G	G			G-E	G			P	P
vines (maypop, trumpet creeper)	F	P-F			P-F	F			P	P
Virginia pepperweed	G-E	G	E	G-E	G	G	G	G-E	G	G
volunteer peanuts	P	P-F	P-F	F-G	F-G	F-G	F	F-G	P	P-F
wild lettuce	G	G-E	G-E	G-E	G-E	G-E	G-E	E	P	F
wild poinsettia	F-G	G			G-E	G-E			G-E	G-E
wild radish	G-E	F-G	E	G-E	G	G	E	G	F-G	G-E
<b>COVER CROPS</b>										
clover	F	F	F-G	G-E	F	F-G			F-G	G-E
lupine	G	G	G		G	G			F-G	F-G
small grains	N	E	E	E	E	F-G	E	E	G <sup>11</sup>	G-E <sup>11</sup>
vetch	E	F	E	E	F	F-G	G	F-G	P-F <sup>8</sup>	F-G <sup>8</sup>

Key:  
E – 90% or better control  
G – 80-90% control  
F – 60-80% control  
P – 30-60% control  
N – < 30% control.  
**Note:** Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

- <sup>1</sup> Application rates per acre: Clarity (*dicamba*): 0.5 pt; 2,4-D: 1 pt; Aim: 1 oz; ET: 1-2 oz; *diuron*: 0.5-1.0 lb ai; *glyphosate* acid: 1.12 lb ae; *paraquat*: 0.75-1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Valor: 2 oz.
- <sup>2</sup> Mixing herbicides with *glyphosate* occasionally reduces grass control (including covercrops). This is more likely with large weeds in dry conditions.
- <sup>3</sup> Apply 2,4-D at least 30 days ahead of planting, except for varieties with the Enlist trait where planting can occur any time after application.
- <sup>4</sup> Following application of *dicamba* and a minimum of 1" of rainfall, a minimum 21-day waiting period before planting is required, except for varieties with the XtendFlex trait where planting can occur any time after an Engenia or XtendiMax application.
- <sup>5</sup> Harmony Extra should be applied at least 14 days prior to planting.
- <sup>6</sup> See plant-back restrictions noted in the previous section or on the label for Valor.
- <sup>7</sup> See previous cotton section on state label for reduced plant back interval for Direx.
- <sup>8</sup> This level of control requires plants to be in full bloom with seed forming when treated.
- <sup>9</sup> This level of control requires 2 pt of 2,4-D (4 lb ai product).
- <sup>10</sup> *Glyphosate* will not control *glyphosate*-resistant horseweed, see previous section on controlling this weed.
- <sup>11</sup> Small grain must have visible seedheads for this level of control.

# WEED RESPONSE TO HERBICIDES USED IN COTTON

A. Stanley Culpepper, Extension Agronomist – Weed Science

WEED SPECIES	PRE-PLANT INCORPORATED	PRE-EMERGENCE							
	Prowl, Treflan, others	Prowl <sup>1</sup> , others	Brake F16	Command	Cotoran	Direx, others	Reflex, Dawn	Staple, Pyrimax	Warrant
<b>PERENNIALS</b>									
bermudagrass	N	N	N	P-F	N	N	N	N	N
johnsongrass (rhizome)	P	P	N	N	N	N	N	N	P
yellow nutsedge	N	N	F-G	N	N	N	F-G	F	P
purple nutsedge	N	N	P-F	N	N	N	P-F	F	P
<b>ANNUAL GRASSES</b>									
broadleaf signalgrass	G	F	F-G	E	P	P	F-G	P	G
crabgrass	E	G	F-G	E	F-G	F-G	F-G	P	E
crowfootgrass	E	G		G	F-G	F-G			E
fall panicum	G	F-G	F	G-E	F	P	F	P-F	G
foxtails	E	G		E	F-G			P	E
goosegrass	E	G		E	F	F		P-F	E
johnsongrass (seedling)	E	G		G	P	P		F-G	F
sandbur	E	G		F-G	G	G			F-G
Texas panicum	G	F		F	P	P	F	N	P-F
<b>ANNUAL BROADLEAVES</b>									
bristly starbur	N	N		P	G-E	F-G	G-E	F-G	P
burgherkin	N	N		P	F-G	F		F-G	P
citronmelon	N	N		P	F-G	F		F-G	P
cocklebur	N	N	G	F	F-G	F	G	N-P	P
coffee senna	N	N		P	F-G	F	N	G	P
cowpea	N	N		N-P	P	P		F-G	P
crotalaria	N	N			G	G			P

Key:  
 E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control

Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

<sup>1</sup> Assumes irrigation or rainfall occurs within 48 hrs.

<sup>2</sup> Fair on pitted morningglory.

<sup>3</sup> Staple does not control tall morningglory or ALS-resistant Palmer amaranth.

WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)

WEED SPECIES	PRE-PLANT INCORPORATED	PRE-EMERGENCE							
	Prowl, Treflan, others	Prowl <sup>1</sup> , others	Brake F16	Command	Cotoran	Direx, others	Reflex, Dawn	Staple, Pyrimax	Warrant
<b>ANNUAL BROADLEAVES (continued)</b>									
eclipta	P	P	G-E		G		G-E		
Florida beggarweed	P	P		F-G	G-E	G	P	G	P
Florida pusley	E	F-G		F-G	P-F	P	F	G	G-E
hemp sesbania	N	F		P	P	P	P	P	N
jimsonweed	N	N		G	G	G		F-G	N
lambsquarters	G-E	G	E	G	G-E	G-E	E	G	P-F
morningglories <i>Ipomoea</i> smallflower	P P	P P	F G-E	P-F <sup>2</sup> P	G G-E	F G	P-F G-E	F <sup>3</sup> E	P P
Palmer amaranth	F-G	P-F	E	N-P	F	G	E	G-E <sup>3</sup>	G
pigweed: redroot or smooth	G-E	F-G	E	P	G-E	G-E	E	E	G-E
prickly sida	N	N	G	E	G	F		G	P-F
purslane	E	G		G-E	E	E	G	G	G
ragweed	N	N		G	E	G	G	N-P	P
redweed	N	N		G-E	E	G-E		G-E	
smartweed: ladysthumb Pennsylvania	N N	N N	F F	N E	G G	G G		G G	
sicklepod	N	N	P	P	G	F	P	P-F	P
spurge	N	N		N	P-F	F		G	P-F
tropic croton	N	N	G	E	F-G	F-G	F-G	F-G	P
tropical spiderwort	N	N		F	F	P-F	N	P	E
volunteer peanuts	N	N	P	N	P-F	P	P	P	N
wild poinsettia	N	N		F	N	N	G-E	G	P

Key:  
E – 90% or better control  
G – 80-90% control  
F – 60-80% control  
P – 30-60% control  
N – < 30% control

Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

- <sup>1</sup> Assumes irrigation or rainfall occurs within 48 hrs.
- <sup>2</sup> Fair on pitted morningglory.
- <sup>3</sup> Staple does not control tall morningglory or ALS-resistant Palmer amaranth.



**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	Residual Control by POST Applied Herbicides (Assuming soil contact and activation)			
	Dual Magnum	Staple	Envoke	Warrant
<b>PERENNIALS</b>				
bermudagrass	N	N	N	N
johnsongrass (rhizome)	P	N	N	P
yellow nutsedge	F	P-F		P
purple nutsedge	P	F		P
<b>ANNUAL GRASSES</b>				
broadleaf signalgrass	G	P	P	G
crabgrass	E	P	P	E
crowfootgrass	E		P	E
fall panicum	G	P-F	P	G
foxtails	E	P	P	E
goosegrass	E	P-F	P	E
johnsongrass (seedling)	F	F	P	F
sandbur	F-G		P	F-G
Texas panicum	P-F	N	P	P-F
<b>ANNUAL BROADLEAVES</b>				
bristly starbur	P	G	G-E	P
burgherkin	P	F-G		P
citronmelon	P	F-G		P
cocklebur	P	N-P		P
coffee senna	P	G		P
cowpea	P	F-G		P
crotalaria	P			P
eclipta	P-F			
Florida beggarweed	P-F	G	F-G	P-F
Florida pusley	G-E	F	P-F	G-E
hemp sesbania	P	P		P
jimsonweed		F-G		
lambsquarters	P-F	G		P-F
morningglories <i>Ipomoea</i> smallflower	P P	F <sup>3</sup> E	 P-F	P P

WEED SPECIES	Residual Control by POST Applied Herbicides (Assuming soil contact and activation)			
	Dual Magnum	Staple	Envoke	Warrant
<b>ANNUAL BROADLEAVES (continued)</b>				
Palmer amaranth	G	G-E <sup>3</sup>	P-F	G
pigweed: redroot or smooth	G-E	G-E	F	G-E
prickly sida	P-F	G		P-F
purslane	G	G		G
ragweed	P	N-P		P
redweed		G-E		
smartweed: ladysthumb Pennsylvania		G G		
sicklepod	P	P	P-F	P
spurge	P-F	G		P-F
tropic croton	P	F		P
tropical spiderwort	E	P		E
volunteer peanuts	N	P	P	N
wild poinsettia	P	G		P

**Key:**

E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control.

Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

<sup>1</sup> Assumes irrigation or rainfall occurs within 48 hrs.

<sup>2</sup> Fair on pitted morningglory.

<sup>3</sup> Staple does not control tall morningglory or ALS-resistant Palmer amaranth.

**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	POST OVER-THE-TOP								
	Assure	Fusilade	Poast	Select/Select Max	MSMA	Cotoran	Staple, Pyrimax	Envoke	Envoke + Staple
<b>PERENNIALS</b>									
bermudagrass	G	G	F	G	N	N	N	N	N
johnsongrass (rhizome)	E	G-E	G	G-E	P	N	N-P	P	N-P
purple nutsedge	N	N	N	N	N-P	N	P-F	F-G	F-G
yellow nutsedge	N	N	N	N	P	N	P-F	G	G
<b>ANNUAL GRASSES</b>									
broadleaf signalgrass	G	G-E	E	E	P	P	N	N	N
crabgrass	G	G	G-E	G-E	P	P-F	N	P	P
crowfootgrass	G	F	F-G	G	P	P-F	N	N	N
fall panicum	G-E	G-E	E	E	P	P-F	N	N-P	P
foxtails	E	E	E	E			N-P	N-P	N-P
goosegrass	G	G	G-E	G-E	P	P-F	N-P	N-P	N-P
johnsongrass (seedling)	E	G-E	G-E	E	P	P	P	P	P-F
sandbur		G	G	G	P	P	P		
Texas panicum	G	G	E	E	N-P	N	N	N-P	P
<b>ANNUAL BROADLEAVES</b>									
bristly starbur	N	F-G	N	N	P	G	G	G-E	G-E
burgherkin	N	N	N	N	P-F	F-G	G		
citronmelon	N	N	N	N	P-F	G	G-E	G-E	G-E
cocklebur	N	N	N	N	E	F-G	G	G-E	E
coffee senna	N	N	N	N	P-F	F-G	G		
cowpea	N	N	N	N	F	F-G	G	G	G-E
crotalaria	N	N	N	N	F	G			
eclipta	N	N	N	N			G	P-F	
Florida beggarweed	N	N	N	N	E	G	G	G-E	G-E
Florida pusley	N	N	N	N	N-P	P-F	N-F	P	P
hemp sesbania	N	N	N	N			G-E		

<p>Key:</p> <p>E – 90% or better control</p> <p>G – 80-90% control</p> <p>F – 60-80% control</p> <p>P – 30-60% control</p> <p>N – &lt; 30% control.</p>	<p>Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.</p>
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WEED RESPONSE TO HERBICIDES USED IN COTTON (*continued*)

WEED SPECIES	POST OVER-THE-TOP								
	Assure	Fusilade	Poast	Select/Select Max	MSMA	Cotoran	Staple, Pyrimax	Envoke	Envoke + Staple
<b>ANNUAL BROADLEAVES (<i>continued</i>)</b>									
jimsonweed	N	N	N	N	P	G	E	N	
lambsquarters	N	N	N	N	P	G	N	G	
<i>Ipomoea</i> morningglories	N	N	N	N	P-F	G	G <sup>1</sup>	G	G-E
Smallflower morningglory	N	N	N	N	P-F	G	E	N	E
Palmer amaranth	N	N	N	N	P	P-F	F	P-F	F
Palmer amaranth (ALS resistant)	N	N	N	N	N	N	N	N	
pigweed: smooth and redroot	N	N	N	N	P	F	G	F-G	G
prickly sida	N	N	N	N	P	F-G	F	N	F
purslane	N	N	N	N	P-F	F-G	F		
ragweed	N	N	N	N	P-F	G	P	G	
redweed	N	N	N	N	N	F-G	G		
sicklepod	N	N	N	N	P-F	F-G	P-F	E	E
smartweed: ladysthumb Pennsylvania	N N	N N	N N	N N	N-P N-P	F-G F-G	G G	G G	
spider flower	N	N	N	N		F			
spurge	N	N	N	N	N	P-F	F-G		
tropic croton	N	N	N	N	F	F-G	P	P-F	P-F
tropical spiderwort	N	N	N	N	P	P	P	P-F	F
volunteer peanuts	N	N	N	N	P	F	P	P-F	
wild poinsettia	N	N	N	N	P	F	F	G	

<p>Key:  E – 90% or better control  G – 80-90% control  F – 60-80% control  P – 30-60% control  N – &lt; 30% control.</p>	<p><sup>1</sup> Staple does not control tall morningglory.</p> <p>Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.</p>
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**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	POST OVER-THE-TOP							
	Liberty <sup>2</sup>	Liberty <sup>2</sup> + Enlist One	Liberty <sup>2</sup> + Staple	glyphosate	glyphosate + 2,4-D choline	glyphosate + Engenia or XtendiMax	glyphosate + Staple, Pyrimax	glyphosate + Envoke
<b>PERENNIALS</b>								
bermudagrass	N	N	N	F	F <sup>3</sup>	F <sup>3</sup>	F	F
johnsongrass (rhizome)	F <sup>4</sup>		F <sup>4</sup>	G-E	G-E	G-E	G-E	G-E
purple nutsedge	P	P	P-F	F-G	F-G <sup>3</sup>	F-G <sup>3</sup>	F-G	G
yellow nutsedge	P	P	P-F	F	P-F <sup>3</sup>	P-F <sup>3</sup>	F-G	G-E
<b>ANNUAL GRASSES</b>								
broadleaf signalgrass	G	G	G	E	E	E	E	E
crabgrass	G	G	G	E	E	E	E	E
crowfootgrass	G	G	G	E	E	E	E	E
fall panicum	G	G	G	E	E	E	E	E
foxtails	G	G	G	E	E	E	E	E
goosegrass	P	P	P	E	E	E	E	E
johnsongrass (seedling)	G	G	G	E	E	E	E	E
sandbur	G	G	G	E	E	E	E	E
Texas panicum	G	G	G	E	E	E	E	E
<b>ANNUAL BROADLEAVES</b>								
bristly starbur	G	G-E	G-E	E	E	E	E	E
burgherkin				G-E	E	E	G-E	G-E
citronmelon	G	G-E	G-E	G-E	E	E	E	E
cocklebur	E	E	E	E	E	E	E	E
coffee senna	G	G-E	G-E	E			E	E
cowpea	G	E	E	E	E	E	E	E
crotalaria		G	G	G			G	G
eclipta	G	E	E	E	E	E	E	E
Florida beggarweed	G	G	G-E	E	E	E	E	E

**Key:**

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 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control.

**Note:** Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

<sup>1</sup> Staple does not control tall morningglory.

<sup>2</sup> *Glufosinate* (Liberty, others) should be applied only to tolerant cotton.

<sup>3</sup> Good control with 2 applications including *glyphosate*.

<sup>4</sup> Johnsongrass control can be obtained with two applications of Liberty.

<sup>5</sup> Sequential applications in a system with PRE herbicides and a layby should provide excellent control.

WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)

WEED SPECIES	POST OVER-THE-TOP							
	Liberty <sup>2</sup>	Liberty <sup>2</sup> + Enlist One	Liberty <sup>2</sup> + Staple	glyphosate	glyphosate + 2,4-D choline	glyphosate + Engenia or XtendiMax	glyphosate + Staple, Pyrimax	glyphosate + Envoke
<b>ANNUAL BROADLEAVES (continued)</b>								
Florida pusley	F	G	F	P-G	G	G	P-G	P-G
hemp sesbania	G-E	E		P-F	E	E	G-E	
jimsonweed	E	E	E	E	E	E	E	E
lambsquarters	E	E	E	G	E	E	G	E
<i>Ipomoea</i> morningglories	E	E	E	F-G	E	E	G-E	E
Smallflower morningglory	E	E	E	G	E	E	E	G
Palmer amaranth	F-G	G-E	G	E	E	E	E	E
Palmer amaranth ( <i>glyphosate</i> -resistant)	F-G	G-E	G	N	G <sup>5</sup>	G <sup>5</sup>	F	P-F
Palmer amaranth ( <i>glyphosate</i> - and ALS-resistant)	F-G	G-E	G	N	G <sup>5</sup>	G <sup>5</sup>	N	N
pigweed: smooth and redroot	G	E	G-E	E	E	E	E	E
prickly sida	F-G	G	F-G	F-G	G	G	F-G	G
purslane	F	F-G	F-G	F-G	G	G	G	G
ragweed, common	E	E	E	E	E	E	E	E
redweed				E			E	
sicklepod	E	E	E	E	E	E	E	E
smartweed: ladysthumb Pennsylvania	G-E G-E	G-E G-E	G-E G-E	G G	G G	E E	E E	E E
spider flower								
spurge	F-G			G	G		G	G
tropic croton	G	E	G	E	E	E	E	E
tropical spiderwort	P-F	G-E	G	P-F	G-E	F	G	P-G
volunteer peanuts	G-E	E	G-E	F-G	G	E	F-G	F-G
wild poinsettia	P	G	F	G-E			G-E	E

Key:

E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control.

**Note:** Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

<sup>1</sup> Staple does not control tall morningglory.

<sup>2</sup> *Glufosinate* (Liberty, others) should be applied only to tolerant cotton.

<sup>3</sup> Good control with 2 applications including *glyphosate*.

<sup>4</sup> Johnsongrass control can be obtained with two applications of Liberty.

<sup>5</sup> Sequential applications in a system with PRE herbicides and a layby should provide excellent control.

**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	POST-EMERGENCE-DIRECTED							
	<i>MSMA</i>	Cotoran + <i>MSMA</i>	Caparol + <i>MSMA</i>	Direx, others + <i>MSMA</i>	Direx + Linex + <i>MSMA</i>	Cobra + <i>MSMA</i>	Valor, others + <i>MSMA</i>	Suprend + <i>MSMA</i>
<b>PERENNIALS</b>								
bermudagrass	N	N	N	N	N	N	N	N
johnsongrass (rhizome)	P	P	P	P	P	P	P	P
purple nutsedge	F	F	F	F	F	F	F-G	E
yellow nutsedge	F-G	F-G	F-G	G	G	F-G	G	E
<b>ANNUAL GRASSES</b>								
broadleaf signalgrass	F	F	F	G	G	P-F	F	F-G
crabgrass	F	F	F-G	G	G	P-F	F	F-G
crowfootgrass	F	F	F-G	F-G	F-G	P-F	F	F-G
fall panicum	F	F	F-G	F-G	F-G	P-F	F	F-G
foxtails	F	F	F-G	F-G	F-G	P-F	F	F-G
goosegrass	F	F	F-G	F-G	F-G	P-F	F	F-G
johnsongrass (seedling)	F	F	F-G	F-G	F-G	P-F	F	F-G
sandbur	F	F	F-G	F-G	F-G	P-F	F	F-G
Texas panicum	P	P	F	F	F	P	P-F	F
<b>ANNUAL BROADLEAVES</b>								
bristly starbur	P-F	G	G	G	G	G	G	G-E
burgherkin	F	F-G	G	G	G	G		
citronmelon	F	G	F-G	G	G	G		
cocklebur	E	E	E	E	E	E	E	E
coffee senna	F	G	G	G	G	F	G	
cowpea	F-G	G	G	G	G	F-G	G	E
crotalaria	G	G	G	G	G	G		E
eclipta		G	G	E	E	E	E	E
Florida beggarweed	E	E	E	E	E	E	E	E

Key:  
 E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control

Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	POST-EMERGENCE-DIRECTED							
	<i>MSMA</i>	Cotoran + <i>MSMA</i>	Caparol + <i>MSMA</i>	Direx, others + <i>MSMA</i>	Direx + Linex + <i>MSMA</i>	Cobra + <i>MSMA</i>	Valor, others + <i>MSMA</i>	Suprend + <i>MSMA</i>
<b>ANNUAL BROADLEAVES (continued)</b>								
Florida pusley	P	F	F	F	F	F	F-G	F
hemp sesbania	N	P-F	P-F	P-F	P-F	F		
jimsonweed	F	G-E	G	G	G	G-E	E	G
lambsquarters	P-F	G	G	G	G	F	F-G	G-E
morningglories	P-F	F-G	G	G	G-E	E	E	E
Palmer amaranth	P	F	F	G-E	G-E	F	F-G	G-E
pigweed: redroot or smooth	P-F	G	G	G-E	G-E	G	G-E	G-E
prickly sida	P	F-G	G-E	G-E	G-E	G-E	G-E	G-E
purslane	P-F	F-G	F-G	G	G	G	G	
ragweed, common	F	G-E	E	E	E	E	G-E	E
redweed	N	F-G	G	G-E		F		
sicklepod	F	G	G-E	G-E	G-E	P-F	G-E	E
smartweed: ladysthumb and Pennsylvania	P	G	F	F	F	F	G	
spider flower	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)		
spurge	N	P-F	G	G		G	G	
tropic croton	F	G	G	G	G	E	E	G-E
tropical spiderwort	F	G	F-G	G	G	F-G	G-E	F-G
volunteer peanuts	P-F	F-G	F-G	G	G	P-F	F-G	G
wild poinsettia	P-F	F	P-F	P-F		G	G	

<p>Key:  E – 90% or better control  G – 80-90% control  F – 60-80% control  P – 30-60% control  N – &lt; 30% control</p>	<p>Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.</p>
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**WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)**

WEED SPECIES	POST-EMERGENCE-DIRECTED							HOOD
	<i>glyphosate</i> <sup>1</sup>	<i>glyphosate</i> <sup>1</sup> + Direx, diuron	<i>glyphosate</i> <sup>1,3</sup> + Direx + Engenia or XtendiMax	<i>glyphosate</i> <sup>1</sup> + Envoke	<i>glyphosate</i> <sup>1</sup> + Staple, Pyrimax	<i>glyphosate</i> <sup>1</sup> + Valor, others	Liberty <sup>2</sup> others	Gramoxone + Direx, diuron
<b>PERENNIALS</b>								
bermudagrass	F	F	F	F	F	F	N	P
johnsongrass (rhizome)	G-E	G	G	E	G-E	G-E	F	P
purple nutsedge	F-G	G	F-G	E	F-G	G	P	P-F
yellow nutsedge	F	F-G	F	E	F-G	G	P	P-F
<b>ANNUAL GRASSES</b>								
broadleaf signalgrass	E	G-E	E	E	E	E	G	G-E
crabgrass	E	G-E	E	E	E	E	F-G	G
crowfootgrass	E	G-E	E	E	E	E	G	G
fall panicum	E	G-E	E	E	E	E	G	G
foxtails	E	G-E	E	E	E	E	G	G
goosegrass	E	G-E	E	E	E	E	P	G
johnsongrass (seedling)	E	G-E	E	E	E	E	G	G
sandbur	E	G-E	E	E	E	E	G	G
Texas panicum	E	G-E	E	E	E	E	G	G
<b>ANNUAL BROADLEAVES</b>								
bristly starbur	G-E	G-E	E	G-E	G-E	E	G	E
burgherkin	G	G	G-E		G			F
citronmelon	G-E	G-E	E	E	E	E	G	G
cocklebur	E	E	E	E	E	E	E	G
coffee senna	E	E	E	E	E	E	G	F
cowpea	G-E	G-E	E	G-E	G-E	E	G	G
crotalaria	G	G	G-E		G			
eclipta	E	E	E	E	E	E	G	F
FL beggarweed	E	E	E	E	E	E	G	E
Florida pusley	P-G	G	G-E	P-G	P-G	G-E	F	P-F
hemp sesbania	P-F		E		G-E			

Key:  
 E – 90% or better control  
 G – 80-90% control  
 F – 60-80% control  
 P – 30-60% control  
 N – < 30% control

Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.

- <sup>1</sup> *Glyphosate* should be applied only to *glyphosate*-resistant cotton.
- <sup>2</sup> *Glyfosinate* (Liberty, others) should be applied only to tolerant cotton.
- <sup>3</sup> Engenia or XtendiMax should be applied only to *dicamba* tolerant cotton.



WEED RESPONSE TO HERBICIDES USED IN COTTON (continued)

WEED SPECIES	POST-EMERGENCE-DIRECTED							HOOD
	<i>glyphosate</i> <sup>1</sup>	<i>glyphosate</i> <sup>1</sup> + Direx, diuron	<i>glyphosate</i> <sup>1,3</sup> + Direx + Engenia or XtendiMax	<i>glyphosate</i> <sup>1</sup> + Envoke	<i>glyphosate</i> <sup>1</sup> + Staple, Pyrimax	<i>glyphosate</i> <sup>1</sup> + Valor, others	Liberty <sup>2</sup> others	Gramoxone + Direx, diuron
<b>ANNUAL BROADLEAVES (continued)</b>								
jimsonweed	E	E	E	E	E	E	E	G
lambsquarters	G	G-E	E	G-E	G-E	G-E	E	F
morning glory - <i>Ipomoea</i>	F-G	G-E	E	G-E	G-E	E	E	F-G
morningglory - smallflower	G	E	E	G	E	E	E	P-F
Palmer amaranth	E	E	E	E	E	E	F-G	G-E
Palmer amaranth ( <i>glyphosate</i> -resistant)	N	G	G-E	P	F	P-F	F-G	G-E
Palmer amaranth ( <i>glyphosate</i> & ALS resis.)	N	G	G-E	N	N	P-F	F-G	G-E
pigweed: redroot or smooth	E	E	E	E	E	E	G	G-E
prickly sida	F-G	G	G	F-G	G	G-E	F-G	P-F
purslane	F-G	G-E	G-E			G-E	F-G	G
ragweed, common	E	E	E	E	E	E	E	F
redweed	G-E	G-E	G-E		G-E			F-G
sicklepod	E	E	E	E	E	E	E	G-E
smartweed	G	G	G-E	E	E	G	G-E	G
spider flower						G		
spurge	G	G-E	G-E	G	G	G	F-G	
tropic croton	E	E	E	E	E	E	G	F
tropical spiderwort	P-F	F-G	G-E	P-F	F-G	G-E	P-F	G-E
volunteer peanuts	F	G	G	F-G	F	F-G	G-E	P
wild poinsettia	G	G	G-E	E	G	G-E	P-F	G

<p>Key:  E – 90% or better control  G – 80-90% control  F – 60-80% control  P – 30-60% control  N – &lt; 30% control</p>	<p>Note: Ratings based on average to good soil and weather conditions for herbicide performance and on proper application rate, technique, and timing.</p>
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<sup>1</sup> *Glyphosate* should be applied only to *glyphosate*-resistant cotton.  
<sup>2</sup> *Glufosinate* (Liberty, others) should be applied only to tolerant cotton.  
<sup>3</sup> Engenia or XtendiMax should be applied only to *dicamba* tolerant cotton.

# COTTON DEFOLIATION / HARVEST AID OPTIONS

Jared Whitaker, Extension Agronomist, and Guy Collins, Extension Agronomist

The following are basic guidelines for harvest aid application. Rates indicated are amount per acre. Specific rates should be adjusted according to temperature, humidity, day-length, plant leaf condition and maturity, expected weather, and desired effects such as defoliation, regrowth control, boll opening, and/or weed control. Defoliant should be applied in a minimum spray volume of 5 gal/A by air and 10-20 gal/A by ground.

Reduced performance issues are often related to low spray volume and poor canopy penetration. Fields should fit into one of the following categories based on temperature and harvest aid function. Preparing cotton for harvest is often difficult and is influenced by many factors, therefore the guidelines below should be considered as basic recommendations. Always observe label restrictions before using cotton harvest aids.

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>EARLY-SEASON (highs 90°F plus, lows 70°F plus)</b>			
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add non-ionic surfactant at 0.25% v/v. The potential for leaf sticking is greater during periods of high temperatures.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add crop oil at 1-2 pt/A. Limited data, use precaution. The potential for leaf sticking is greater during periods of high temperatures.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add crop oil at 0.5% v/v. The potential for leaf sticking is greater during periods of high temperatures.
	<i>sodium chlorate</i>	3 lb ai	Apply to mature foliage only. Do not mix with products containing <i>tribufos</i> or <i>ethephon</i> .
	<i>tribufos</i> Def/Folex	1.5 pt	Reduce rate to 1.25 pt if above 94°F.
Regrowth Control and Defoliation	<i>thidiazuron</i> (Numerous brands)	3.2 oz	For <b>maximum</b> regrowth control. <i>Thidiazuron</i> is sensitive to wash-off when rain occurs within 6-12 hours after application. Addition of <i>tribufos</i> (4-8 oz) or <i>ammonium sulfate</i> (2 lb/A) enhances rainfastness.
	<i>thidiazuron</i> (Numerous brands) + <i>tribufos</i> Def/Folex	1.6-2.5 oz + 4-16 oz	For <b>maximum</b> regrowth control apply <i>thidiazuron</i> at 1.6 oz plus <i>tribufos</i> at 8-12 oz. For good regrowth control apply <i>thidiazuron</i> at 2.5 oz plus <i>tribufos</i> at 8-12 oz. For superior regrowth control apply <i>thidiazuron</i> at 3.2 oz plus <i>tribufos</i> at 6-8 oz.  These combinations may cause “leaf sticking” when temperatures exceed 94°F, when combined with spray adjuvants, or when calibration errors occur. Consider reducing higher rates of <i>tribufos</i> by 10-20% when temperatures exceed 94°F. Regrowth control or suppression is minimal when <i>thidiazuron</i> is applied at rates below 1.6 oz. Higher rates (2.5-3.2 oz) or sequential applications increase time of effectiveness.
	<i>thidiazuron</i> (Numerous brands) + <b>ONE OF THE FOLLOWING:</b>	1.6-2.5 oz +	
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add crop oil at 1 pt/A. Limited data, use precaution. The potential for leaf sticking is greater during periods of high temperatures.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>EARLY-SEASON (highs 90°F plus, lows 70°F plus) (continued)</b>			
Regrowth Control and Defoliation <i>(continued)</i>	<i>thidiazuron + diuron</i> (Numerous brands)	6.4-8 oz	Limited data are available with these products. Regrowth control is minimal when some brand products are applied at rates below 6.4 oz. Likelihood of leaf sticking may occur when temperatures exceed 94°F or when high rates are used.
	<i>glyphosate</i> (Numerous brands) + <i>tribufos</i> Def/Folex	1.2-2 pt + 8-16 oz	<i>Glyphosate</i> WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
Boll Opening and Defoliation	<i>ethephon</i> (Numerous brands)	2-2.67 pt	
	<i>ethephon</i> (Numerous brands) + <b>ONE OF THE FOLLOWING:</b>	1.33-1.5 pt +	
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.
	<i>tribufos</i> Def/Folex	1-1.25 pt	
	<i>thidiazuron</i> (Numerous brands)	1.6 oz	
	<i>thidiazuron + diuron</i> (Numerous brands)	4-6 oz	Likelihood of “leaf sticking” is increased when applied at or above 5 oz in combinations of defoliant. Rate of 4 oz suggested during periods of high temperatures.
	<i>ethephon + urea sulfate</i> FirstPick + <b>ONE OF THE FOLLOWING:</b>	1.75-2 qt +	Likelihood of leaf sticking is increased during periods of high temperatures.
	<i>carfentrazone</i> Aim EC	0.75 oz	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	
<i>thidiazuron</i> (Numerous brands)	1.6 oz		
<i>thidiazuron + diuron</i> (Numerous brands)	4-6 oz	Likelihood of “leaf sticking” increases when applied at or above 5 oz in combinations of defoliant. Rate of 4 oz recommended during early season.	
<i>tribufos</i> Def/Folex	4-6 oz		

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>EARLY-SEASON (highs 90°F plus, lows 70°F plus) (continued)</b>			
Boll Opening and Defoliation <i>(continued)</i>	<i>ethephon + cyclanilide</i> Finish 6 Pro <b>+ ONE OF THE FOLLOWING:</b>	1.33-1.5 pt +	
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.
	<i>thidiazuron</i> (Numerous brands)	1.6 oz	
	<i>thidiazuron + diuron</i> (Numerous brands)	4-6 oz	Likelihood of “leaf sticking” increases when applied at or above 5 oz in combinations of defoliant. Rate of 4 oz recommended during early season.
<i>tribufos</i> Def/Folex	4-6 oz		
Boll Opening, Regrowth Control, and Defoliation	<i>ethephon</i> (Numerous brands) <b>+ ONE OF THE FOLLOWING:</b>	1.33-1.5 pt +	Limited data are available for some products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.
	<i>thidiazuron</i> (Numerous brands)	2-2.5 oz	
	<i>thidiazuron + diuron</i> (Numerous brands)	6.4 oz	
	<i>ethephon</i> (Numerous brands) +	1.33-1.5 pt +	
	<i>thidiazuron</i> (Numerous brands) +	2-2.5 oz +	
	<b>ONE OF THE FOLLOWING:</b>		
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.	
<i>tribufos</i> Def/Folex	6-12 oz		

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>EARLY-SEASON (highs 90°F plus, lows 70°F plus) (continued)</b>			
Boll Opening, Regrowth Control, and Defoliation  (continued)	<i>ethephon + urea sulfate</i> FirstPick <b>OR</b>	1.75-2 qt 1	Likelihood of “leaf sticking” is increased when temperatures exceed 94°F.
	<i>ethephon + cyclanilide</i> Finish 6 Pro <b>+ ONE OF THE FOLLOWING:</b> <i>thidiazuron</i> (Numerous brands) ----- <i>thidiazuron + diuron</i> (Numerous brands)	0.33-1.5 pt + 1.6-2 oz ----- 6.4 oz	Limited data are available with some products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.
<b>MID-SEASON (highs 80-89°F plus, lows 60-70°F)</b>			
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 1% v/v crop oil for 0.75 oz rate. Add 0.25% non-ionic surfactant for 1 oz rate.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>sodium chlorate</i>	4 lb ai	Apply to mature foliage only. Do not mix with products containing <i>tribufos</i> or <i>ethephon</i> .
	<i>tribufos</i> Def/Folex	1-1.5 pt	
Regrowth Control and Defoliation	<i>thidiazuron</i> (Numerous brands)	3.2 oz	
	<i>thidiazuron</i> (Numerous brands) <b>OR</b>	2-2.5 oz	<i>Glyphosate</i> WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
	<i>glyphosate</i> <b>+ ONE OF THE FOLLOWING:</b>	1.2-2 pt +	
	<i>carfentrazone</i> Aim EC	0.75-1 oz	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
<i>tribufos</i> Def/Folex	1 pt	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.	
<i>thidiazuron + diuron</i> (Numerous brands)	6.4-8 oz	Limited data are available with these products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.	

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>MID-SEASON (highs 80-89°F plus, lows 60-70°F) (continued)</b>			
Boll Opening and Defoliation	<i>ethephon</i> (Numerous brands)	2-2.67 pt	
	<i>ethephon</i> (Numerous brands) + <b>ONE OF THE FOLLOWING:</b>	1.5-2 pt +	
	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>tribufos</i> Def/Folex	1-1.25 pt	
	<i>thidiazuron</i> (Numerous brands)	1.6 oz	
	<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	6.4 oz	Limited data are available with some of these products
	<i>ethephon</i> + <i>urea sulfate</i> FirstPick +	2 qt +	
	<b>ONE OF THE FOLLOWING:</b>		
	<i>carfentrazone</i> Aim EC	0.75-1 oz	
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	
<i>thidiazuron</i>	1.6 oz		
<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	5 oz	Limited data are available with some of these products.	
<i>tribufos</i> Def/Folex	6-8 oz		

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>MID-SEASON (highs 80-89°F plus, lows 60-70°F) (continued)</b>			
Boll Opening and Defoliation <i>(continued)</i>	<i>ethephon</i> + <i>cyclanilide</i> Finish 6 Pro +	1.33-1.5 pt +	
	<b>ONE OF THE FOLLOWING:</b> <i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>tribufos</i> Def/Folex	6-8 oz	
	<i>thidiazuron</i> (Numerous brands)	1.6 oz	
<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	5 oz	Limited data are available with some of these products.	
Boll Opening, Regrowth Control, and Defoliation	<i>ethephon</i> (numerous brands) +	1.5-2 pt +	
	<b>ONE OF THE FOLLOWING:</b> <i>thidiazuron</i> (Numerous brands)	2-2.5 oz	
	<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	6.4-8 oz	Limited data are available with some of these products.
	<i>ethephon</i> (Numerous brands) +	1.5-2 pt +	
	<i>thidiazuron</i> (Numerous brands) +	2-2.5 oz +	
	<b>ONE OF THE FOLLOWING:</b> <i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
<i>tribufos</i> Def/Folex	8-12 oz		

**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>LATE-SEASON (highs below 80°F, lows below 60°F)</b> In these conditions, proper defoliation may require a preconditioning treatment (see preconditioning section)			
Boll Opening, Regrowth Control, and Defoliation  <i>(continued)</i>	<i>ethephon + urea sulfate</i> FirstPick <b>OR</b>	2 qt	
	<i>ethephon + cyclanilide</i> Finish 6 Pro + <b>ONE OF THE FOLLOWING:</b>	1.5-2 pt +	
	----- <i>thidiazuron</i> (Numerous brands)	2-2.5 oz	
	----- <i>thidiazuron + diuron</i> (Numerous brands)	6.4-8 oz	Limited data are available with some of these products.
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	1 oz	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	
	<i>sodium chlorate</i>	4 lb ai	
	<i>thidiazuron + diuron</i> (Numerous brands)	8-10 oz	Limited data are available with some of these products.
<i>tribufos</i> Def/Foalex + <i>paraquat</i> (Numerous brands)	1.5 pt + 1-6 oz	May cause crop desiccation and damage to unopened bolls.	



**COTTON DEFOLIATION / HARVEST AID OPTIONS**

<b>HARVEST-AID FUNCTION</b>	<b>HERBICIDE</b>	<b>BROADCAST RATE/ACRE</b>	<b>REMARKS AND PRECAUTIONS</b> <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
<b>LATE-SEASON (highs below 80°F, lows below 60°F) (continued)</b> In these conditions, proper defoliation may require a preconditioning treatment (see preconditioning section)			
Boll Opening and Defoliation	<i>ethephon</i> (Numerous brands)	2-2.67 pt	
	<i>ethephon</i> (Numerous brands) + <b>ONE OF THE FOLLOWING:</b>	2-2.67 pt +	
	<i>tribufos</i> Def/Folex	1-1.25 pt	
	<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	6 oz	Limited data are available with some of these products.
	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>ethephon</i> + <i>cyclanilide</i> Finish 6 Pro + <b>ONE OF THE FOLLOWING:</b>	1.75-2 pt +	
	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.	
<i>thidiazuron</i> + <i>diuron</i> (Numerous brands)	6 oz		
<i>tribufos</i> Def/Folex	8-12 oz	Limited data are available with some of these products.	

## COTTON DEFOLIATION / HARVEST AID OPTIONS

**PRECONDITIONING:** Fields with a dense canopy of foliage and significant numbers of green bolls may require two applications. The goal is to remove much of the foliage with an initial application, exposing un-open bolls to sunlight and improving air circulation within the canopy. The follow-up application should be

made 7-10 days later when sufficient leaf drop has occurred to allow spray coverage with boll opening products containing *ethephon*. However, premature preconditioning or defoliation may increase the risk of halting development of younger or immature bolls, rendering them unharvestable.

TREATMENT	HERBICIDE	BROADCAST RATE/ ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
Initial Preconditioning Treatment	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>ethephon</i> (Numerous brands)	0.67-1.33 pt	
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt crop oil.
	<i>fluthiacet-methyl</i> Blizzard	0.5 oz	Add 1 pt crop oil
	<i>glyphosate</i> (Numerous brands)	1.2-2 pt	<i>Glyphosate</i> WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil when temperatures are above 90°F. Add 1% v/v crop oil when temperatures are 89°F or below.
	<i>tribufos</i> Def/Folex	0.5-1.25 pt	
Follow-up Treatments	<b>Should include products containing <i>ethephon</i> with harvest aid mixtures listed in the previous table.</b>		

## HARVEST AID WEED MANAGEMENT

HERBICIDE	BROADCAST RATE/ ACRE	REMARKS AND PRECAUTIONS <i>The rates below are given in the broadcast amount per acre unless otherwise noted.</i>
<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil. Effective on morningglory, coffee senna, and tropical spiderwort.
<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
<i>glyphosate</i> (Numerous brands)	1.2-2 pt	Use in combination with Def/Folex, <i>dimethipen</i> (Harvade) and/or <i>ethephon</i> .  <i>Glyphosate</i> provides fair regrowth suppression of cotton. However, <i>glyphosate</i> WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
<i>paraquat</i> Gramoxone Max, Firestorm, or Parazone	1-4 oz	Use in combinations with standard defoliation applications. May cause crop desiccation and damage to unopened bolls.
Gramoxone Inteon	3-5 oz	
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil when temperatures are above 90°F. Add 1% v/v crop oil when temperatures are 89°F or below. Effective on morningglory.
<i>Follow-up Treatments</i> Desiccants <i>paraquat</i> or sodium chlorate	See “Desiccants for Cotton Harvest Preparation” next page.	

## DESICCANTS FOR COTTON HARVEST PREPARATION

DESICCANT	FORMULATION (lb ai/gal)	BROADCAST RATE/ ACRE (AMOUNT OF FORMULATION)	SPRAY VOLUME (gal/A)		REMARKS AND PRECAUTIONS <i>The rates below are given in the broadcast amount per acre unless otherwise noted.</i>
			Ground	Air	
<i>paraquat</i> Firestorm	3				For addition to defoliant mixtures in cotton at least 75% open. Improves activity in colder, late-season conditions. May cause crop desiccation and damage to unopened bolls.
Gramoxone Inteon	2	3-5 oz	10-20	5	
Gramoxone Max	3	1-4 oz	10-20	5	
Parazone	3				
<i>paraquat</i> Gramoxone Max	3	5.5 oz-1.5 pt	10-20	5	For desiccation of weeds and cotton regrowth after defoliation. Add surfactant at 1-2 qt/100 gal of spray solution. Be prepared to harvest in a timely manner to minimize bark problems. May cause crop desiccation and damage to unopened bolls.
Firestorm	3				
Parazone	3				
Gramoxone Inteon	2	1-2 pt	10-20	5	
<i>sodium chlorate</i>	4-6	3-6 lb ai	15-30	5-10	

## PERFORMANCE RATING OF HARVEST AIDS BY FUNCTION

CHEMICAL NAME	FUNCTION				
	Removal of Mature Foliage	Removal of Juvenile Foliage	Boll Opening	Regrowth Suppression	Weed Desiccation
<i>ethephon</i> (Numerous brands)	F-G	F	E	P	P
<i>ethephon</i> + urea sulfate First Pick	G	G	E+	P	F
<i>ethephon</i> + cyclanilide Finish 6 Pro	G-E	F-G	E+	F	P
<i>paraquat</i> Gramoxone Max, Gramoxone Inteon, Parazone, Firestorm	F	F	P-F	P	G
<i>PPO inhibitors</i> Aim, ET, Resource, Blizzard	G	F	P	P	F
<i>sodium chlorate</i>	F	P	P	P	F-G
<i>thidiazuron</i> (Numerous brands)	G-E	G	P	G-E	P
<i>thidiazuron</i> + diuron (Numerous brands)	G-E	G	P	G-E	P
<i>tribufos</i> Def/Folex	G-E	P-F	P	P	P

P – Poor, F – Fair, G – Good, E – Excellent