COTTON INSECT CONTROL

Phillip M. Roberts, Extension Entomologist

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Aphid (Cotton)	*acetamiprid* 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.
	afidopyropen Sefina 0.42	9D	 3 oz	0.0098	12 H/ 7D	
	dicrotophos Bidrin 8 Dicromax 8	1B	 4–8 oz 4–8 oz	0.25–0.5	3 D/ 30 D	
	flonicamid Carbine 50WG	9C	 1.4–2.8 oz	0.044–0.088	12 H/ 30 D	
	imidacloprid Admire Pro 4.6	4A	 0.9–1.7 oz	0.032–0.061	12 H/ 14 D	
	sulfoxaflor Transform 50 WG	4C	 0.75–1.0 oz	0.023–0.031	24 H/ 14 D	
	thiamethoxam Centric 40 WG	4A	 1.25–2.5 oz	0.031-0.0625	12 H/ 21 D	
Beet Armyworm	*diflubenzuron* 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. Performance of Group 28 insecticides used for beet armyworm management may vary due to insecticide resistance.
	indoxacarb Steward 1.25EC	22	 9.2–11.3 oz	0.09–0.11	12 H/ 14 D	
	methoxyfenozide Intrepid 2F	18	 4–10 oz	0.0625–0.156	4 H/ 14 D	
	novaluron Diamond 0.83EC	15	 6–12 oz	0.039–0.077	12 H/ 30 D	
	chlorantraniliprole Vantacor 5SC	28	 1.2–2.5 oz	0.047–0.098	4 H/ 21 D	
	spinosad Blackhawk	5	 2.4–3.2 oz	0.054–0.072	4 H/ 28 D	
Bollworm/ Tobacco Budworm	**NON-PYRETHROIDS**					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 (¼" or greater in length) are found per 100 plants.
	indoxacarb Steward 1.25EC	22	 11.3 oz	0.11	12 H/ 14 D	
	methomyl Lannate LV 2.4	1A	 1.5–2 pt	0.45–0.6	72 H/ 15 D	
	spinetoram Radiant 1 SC	5	 4.25–8 oz	0.0332–0.0625	4 H/ 28 D	
	chlorantraniliprole Vantacor 5SC	28	 1.2–2.5 oz	0.077–0.098	4 H/ 21 D	
	spinosad Blackhawk	5	 2.4–3.2 oz	0.054–0.072	4 H/ 28 D	

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Bollworm/ Tobacco Budworm (*continued*)	**PYRETHROIDS**					Tobacco budworm is resistant to pyrethroid insecticides. Pyrethroids should not be used for control of tobacco budworm. Performance of pyrethroids used for corn earworm management may vary due to insecticide resistance.
	alpha-cypermethrin Fastac 0.83	3A	2.6–3.6 oz	0.017–0.023	12 H/ 14 D	
	beta-cyfluthrin Baythroid XL 1	3A	1.6–2.6 oz	0.0125–0.02	12 H/ 0 D	
	bifenthrin 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	
	cypermethrin Up-Cyde 2.5EC	3A	2–5 oz	0.04–0.1	12 H/ 14 D	
	esfenvalerate Asana XL 0.66	3A	5.8–9.6 oz	0.03–0.0495	12 H/ 21 D	
	gamma-cyhalothrin Declare 1.25	3A	1.28–2.05 oz	0.0125–0.02	24 H/ 21 D	
	lambda-cyhalothrin 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	
	zeta-cypermethrin Mustang Max 0.8	3A	2.64–3.6 oz	0.0165–0.0225	12 H/ 14 D	
Cutworm (seedling cotton)	*acephate* Orthene 97 Acephate 97	1B	0.75 lb 0.75 lb	0.72	24 H/ 21 D	Apply when stand is threatened. Spot treatment is often adequate.
	chlorantraniliprole Vantacor 5SC	28	1.2–2.5 oz	0.047–0.098	4 H/ 21 D	
	pyrethroids	3A	See Remarks			Pyrethroids provide good control of cutworms at low rates. See insecticide label for use rate.

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Fall Armyworm	*chlorantraniliprole* Vantacor 5SC	28	1.2–2.5 oz	0.047–0.098	4 H/ 21 D	Apply when 15 larvae are found per 100 plants. Control of large larvae (> ½" in length) is difficult; higher rates should be used.
	diflubenzuron Dimilin 2L	15	4–8 oz	0.0625–0.125	12 H/ 14 D	
	indoxacarb Steward 1.25EC	22	9.2–11.3 oz	0.09–0.11	12 H/ 14 D	
	methomyl Lannate LV 2.4	1A	1.5–2 pt	0.45–0.6	72 H/ 15 D	
	methoxyfenozide Intrepid 2F	18	4–10 oz	0.0625–0.156	4 H/ 14 D	
	novaluron 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 ⅛" in length.
	spinosad Blackhawk	5	2.4–3.2 oz	0.054–0.072	4 H/ 28 D	
Plant Bugs and Fleahoppers	*acephate* 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. Cottons containing the ThryvOn trait have activity on tarnished plant bugs. However, tarnished plant bugs may exceed threshold levels and cause economic damage in ThryvOn cottons.
	dicrotophos Bidrin 8 Dicromax 8	1B	4–8 oz 4–8 oz	0.25–0.5	3 D/ 30 D	
	imidacloprid Admire Pro 4.6	4A	0.9–1.7 oz	0.032–0.061	12 H/ 14 D	
	novaluron Diamond 0.83EC	15	9–12 oz	0.058–0.077	12 H/ 30 D	
	oxamyl Vydate C-LV 3.77	1A	8.5–17 oz	0.25–0.50	48 H/ 14 D	
	sulfoxaflor Transform 50 WG	4C	1.5–2.25 oz	0.047–0.071	24 H/ 14 D	
	thiamethoxam Centric 40 WG	4A	2–2.5 oz	0.05–0.0625	12 H/ 21 D	

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Soybean Looper	*indoxacarb* 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.
	methoxyfenozide Intrepid 2F	18	4–10 oz	0.0625–0.156	4 H/ 14 D	
	novaluron Diamond 0.83EC	15	6–12 oz	0.039–0.077	12 H/ 30 D	
	spinosad Blackhawk	5	2.4–3.2 oz	0.052–0.072	4 H/ 28 D	
Spider Mites	*abamectin* Abba 0.15 Abba Ultra 0.3 Agri-Mek 0.7SC	6	8–16 oz 4–8 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.
	etoxazole Zeal 72 WSP	10B	0.66–1 oz	0.03–0.045	12 H/ 28 D	
	fepyroximate Portal 0.4	21A	16–32 oz	0.05–0.1	12 H/ 14 D	
	propargite Comite II 6	12C	1.25–2.25 pt	0.937–1.687	6 D/ 50 D	
	spiromesifen Oberon 2SC	23	8–16 oz	0.125–0.25	12 H/ 30 D	
Stink Bugs	**ORGANOPHOSPHATES**					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.
	acephate Orthene 97 Acephate 97	1B	0.75 lb 0.75 lb	0.72	24 H/ 21 D	
	dicrotophos Bidrin 8 Dicromax 8	1B	4–8 oz 4–8 oz	0.25–0.5	3 D/ 30 D	

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Stink Bugs (*continued*)	**PYRETHROIDS**					
	alpha-cypermethrin Fastac 0.83	3A	 2.6–3.6 oz	0.017–0.023	12 H/ 14 D	
	beta-cyfluthrin Baythroid XL 1	3A	 1.6–2.6 oz	0.0125–0.0205	12 H/ 0 D	
	bifenthrin 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	
	esfenvalerate Asana XL 0.66	3A	 5.8–9.6 oz	0.03–0.0495	12 H/ 21 D	
	gamma-cyhalothrin Declare 1.25	3A	 1.28–2.05 oz	0.0125–0.02	24 H/ 21 D	
	lambda-cyhalothrin 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	
	zeta-cypermethrin Mustang Max 0.8	3A	 2.64–3.6 oz	0.0165–0.0225	12 H/ 14 D	
Thrips (seedling cotton), At-Plant Treatments	*acephate* Orthene 97ST	1B	Commercial Seed Treatment		24 H/ 21 D	
	Orthene 97 Acephate 97		1 lb 1 lb	0.97 0.97		Apply *acephate* as a liquid into the seed furrow at planting.
	aldicarb AgLogic 15GG	1A	 3.5–5 lb	0.525–0.75	48 H/ 90 D	Apply granules in the seed furrow and immediately cover seed and granules with 1" or more of soil.
	imidacloprid Admire Pro 4.6	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.
	imidacloprid Gaucho 600	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. Cottons containing the ThryvOn trait provide very good control of thrips in seedling cotton.
	thiamethoxam Cruiser	4A	Commercial Seed Treatment		12 H/ –	
Thrips (seedling cotton), Foliar Spray	*acephate* 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 in non-ThryvOn cottons.. 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. ThryvOn cottons should be treated for thrips if excessive plant injury and immature thrips are present.
	dicrotophos Bidrin 8 Dicromax 8	1B	 1.6–3.2 oz 1.6–3.2 oz	0.1–0.2	6 H/ 30 D	
	dimethoate Dimethoate 4	1B	 0.25–0.5 pt	0.125–0.25	48 H/ 14 D	
	Spinetoram Hemi 1SC	5	1.5–3 oz	0.1172-0.0234	4H/28D	

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LB ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Whitefly (silverleaf)	*acetamiprid* 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.
	dinotefuron Venom 70WDG	4A	 1–3 oz	0.045–0.134	12 H/ 14 D	
	flupyradifurone Sivanto Prime 1.67	4D	 10.5–14 oz	0.1369–0.1826	4 H/ 14 D	
	pyrifluquinazon PQZ 1.87	9B	 2.4–3.2 oz	0.035–0.047	12 H/ 7 D	
	pyriproxyfen Knack 0.86	7C	8 oz 5 oz fb 5 oz	0.05375 0.033 fb 0.033	12 H/ 28 D	Split application in vegetative cotton; 5 oz followed by 5 oz (see 24(c) Special Local Need label.)
	spiromesifin Oberon 2	23	 8–16 oz	0.125–0.25	12 H/ 30 D	
	buprofezin 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.

bifenthrin, *acetamiprid* (Argyle: 6–9 oz)
bifenthrin, *avermectin* B1 (Athena: 7–17 oz)
bifenthrin, *imidacloprid* (Brigadier: 3.8–7.7 oz)
bifenthrin, *chlorantraniliprole* (Elevest: 5.6–9.6 ozs)
dicrotophos, *bifenthrin* (Bidrin XP II: 8–12.8 oz)
fluopyram, *imidacloprid* (Velum Total: 14–18 oz)
imidacloprid, *cyfluthrin* (Leverage: 2.8–3.2 oz)
lambda-cyhalothrin, *chlorantraniliprole* (Besiege: 5–12.5 oz)
lambda-cyhalothrin, *thiamethoxam* (Endigo: 4.5–6 oz)
methoxyfenozide, *spinetoram* (Intrepid Edge: 4–8 oz)
novaluron, *acetamiprid* (Cormoran 6–12 oz)
spinosad, *gamma-cyhalothrin* (Consero: See label)
zeta-cypermethrin, *bifenthrin* (Hero: 3.6–10.3 oz)

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM[1]	FALL ARMYWORM	BEET ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS[2]	PARASITES[2]	CHEMICAL CLASS (MOA)	REI (Hours)[3]
abamectin Agri-Mek 0.15	—	—	—	—	—	—	—	—	—	1	—	—	—	M	M	6	12
acephate Orthene 97	2	2	5	4	4	5	4	1	5	5	5	2	1	H	H	1B	24
acetamiprid Assail 30SG	4	4	5	5	5	5	5	3	1	5	1	5	3	E	E	4A	12
aldicarb AgLogic 15GG	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1A	48
alpha-cypermethrin Fastac 0.83	2	4	3	3	4	5	4	4	5	5	5	2	4	H	M	3A	12
beta-cyfluthrin Baythroid XL 1	1	3	3	3	3	5	4	4	5	5	5	2	4	H	M	3A	12
bifenthrin Brigade 2, Discipline 2, Fanfare 2	1	2	3	3	3	5	4	4	5	4	4	2	4	H	M	3A	12
buprofezin Courier 40 SC	—	—	—	—	—	—	—	—	—	—	2	—	—	E	E	16	12
chlorantraniliprole Vantacor 5SC	5	5	1	1	2	3	2	5	5	5	4	4	5	E	E	28	4
cypermethrin Up-Cyde 2.5EC	2	4	3	3	4	5	4	4	5	5	5	2	4	H	M	3A	12
dicrotophos Bidrin 8	1	1	5	5	5	5	5	1	3	4	5	5	1	H	H	1B	3 days

Efficacy Ratings: 1—Very Effective; 5—Not Effective

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.

1. Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.
2. Effects on beneficial insects: E—Easy; M—Moderate; and H—Hard
3. Read and follow label directions.

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON (*continued*)

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

Efficacy Ratings: 1—Very Effective; 5—Not Effective

Effects of some insecticides are highly rate sensitive.

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1. Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.
2. Effects on beneficial insects: E—Easy; M—Moderate; and H—Hard
3. Read and follow label directions.

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON (*continued*)

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM[1]	FALL ARMYWORM	BEET ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS[2]	PARASITES[2]	CHEMICAL CLASS (MOA)	REI (Hours)[3]
methomyl Lannate LV 2.4	4	4	3	3	3	4	3	4	4	5	5	3	5	H	M	1A	72
methoxyfenozide Intrepid 2F	5	5	4	4	2	1	2	5	5	5	5	4	5	E	E	18	4
novaluron Diamond 0.83EC	3	3	4	4	1	2	2	3	5	5	4	5	5	M	3	15	12
oxamyl Vydate C-LV 3.77	3	3	5	5	5	5	5	3	5	5	5	5	3	M	M	1A	48
propargite Comite II 6	5	5	5	5	5	5	5	5	5	1	5	5	5	M	E	12C	6 days
pyriproxyfen Knack 0.86	5	5	5	5	5	5	5	5	5	5	1	5	5	E	E	7C	12
spinosad Blackhawk	5	5	2	1	2	2	2	5	5	5	5	4	4	E	M	5	4
spiromesifen Oberon 2 SC	—	—	—	—	—	—	—	—	—	1	2	—	—	E	E	23	12
sulfoxaflor Transform 50 WG	4	4	—	—	—	—	—	1	1	—	4	—	—	E	E	4C	24
thiamethoxam Centric 40 WG	3	4	5	5	5	5	5	2	2	5	4	5	3	M	M	4A	12
zeta-cypermetherin Mustang Max 0.8	1	3	3	3	3	5	4	4	5	5	5	2	4	H	M	3A	12

Efficacy Ratings: 1—Very Effective; 5—Not Effective

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.

1. Pyrethroid resistant tobacco budworm has been observed in Georgia, efficacy may be improved if resistance levels are low.
2. Effects on beneficial insects: E—Easy; M—Moderate; and H—Hard
3. Read and follow label directions.

COTTON DISEASE CONTROL

Bob Kemerait, Extension Plant Pathologist

DISEASE	CHEMICAL	MOA	RATE PER ACRE[1] (38" Row Basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
Seedling Diseases	*azoxystrobin* Quadris 2.08SC	11	5.5–11 fl oz	4 H/ 45 D	Liquids give 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.
	prothioconazole Proline	3	5.7–7.1 fl oz		
	ADDITIONAL SEED TREATMENTS				
	azoxystrobin + fludioxonil + mefenoxam Dynasty CST		3.1–3.95 fl oz/cwt	24 H/ —	**NOTE:** These seed treatments are in addition to fungicide treatments that are already applied to the seed by the supplier.

1. 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.
2. Apply all liquids in 5–10 gal of water/A.

COTTON NEMATODE CONTROL

Bob Kemerait, Extension Plant Pathologist

NEMATICIDE TREATMENT	RATE/ACRE	OZ/1000 FT OF ROW (38" row basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
abamectin + thiamethoxam AVICTA Duo Cotton	seed treatment		48 H/ —	
aldicarb AgLogic 15G	3.5–7 lb			Apply granules in 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.
aldicarb AgLogic 15G sidedress application	5 lb			**Side Dress Application**: 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 *thiodicarb* (nematode control) and *imidacloprid* (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, *Burkholderia rinojensis* BIOST Nematicide 100	seed treatment			The active ingredient is 'Heat Killed' *Burkholderia rinojensis* and spent fermentation media that contains enzymes and toxins that have broad spectrum activity on nematodes and activity on soil-dwelling insects.
fluopyram COPeO Prime	seed treatment			COPeO Prime contains *fluopyram* for the management of nematodes affecting cotton.
fluopyram Velum	5.0–6.84 fl oz		12 H/ 30 D	Velum is also labeled for suppression of Fusarium wilt. Velum will replace Velum Prime as Bayers nematicide. All Velum Total uses in Georgia will switch to the new Velum product. While there may be some Velum Total still available on-farm in 2021, there should not be any Velum Total sold commercially. Note that without the imidicloprid component, Velum will not control thrips.
fluopyram + imidacloprid Velum Total	14–18 fl oz		12 H/ 30 D	**Apply specified dosage in the following methods:** 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 *imidacloprid* or 0.45 lb *fluopyram* active ingredient per acre per year (ai/A/year), including seed treatment, soil, and foliar uses.
Telone II[1]	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.
tioxazefen Acceleron Nemastrike ST				Acceleron Nemastrike ST is a seed treatment nematicide for use on cotton.

1. If Telone II is used for nematode control, you must use an additional chemical for thrips control.
2. AgLogic 15G 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 Kemerait, Extension Plant Pathologist

FUNGICIDE TREATMENT	RATE/ACRE	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
azoxystrobin AzoxyStar	6–9 fl oz	— 45D	
azoxystrobin Quadris	6–9 fl oz	4 H/ 45 D	Maximum rate is 27 fl oz/A/season.
azoxystrobin + *benzobendiflupyr* (solatenol) Elatus	5–7.3 fl oz	12 H/ 45 D	Do not apply more than 14.6 fl oz/A per season.
azoxystrobin + *difenconazole* 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.
difenoconazole + *pydiflumetofen* Miravis Top	13.6 fl oz	12H/ 45D	
flutriafol Topguard	7–14 fl oz	12 H/ 30 D	
flutriafol + *azoxystrobin* TopGuard EQ	5–7 fl oz	12H/ 45 D	
prothioconazole Proline	5.0–5.7 fl oz	12H/	Do not make more than three total applications per season.
pyraclostrobin Headline	6–12 fl oz	12 H/ 30 D	
pyraclostrobin + *fluxapyroxad* Priaxor	4–8 fl oz	12H/ 30 D	Do not apply more than 24 fl oz/A per season.
pyraclostrobin+ *metconazole* Twinline	7–8.5 fl oz	12 H/ 30 D	Maximum rate is 26 fl oz/A/season.

COTTON WEED CONTROL

A. Stanley Culpepper and Jenna Vance, Extension Agronomists—Weed Science

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PRE-PLANT BURNDOWN—ANY VARIETY						
Emerged primrose, wild radish, spiderwort, small horseweed. **All current formulations of *2,4-D* are volatile! The *choline* formulation is generally less volatile than the amine formulation with the ester or acid formulations being the most volatile by far.**	*2,4-D amine* 3.8 S 5.5 S	4	 12–32 fl oz 9–22 fl oz	0.36–0.95	48 H/ N/A	The MOST CONSISTENT and effective burndown program for winter weeds in Georgia is a *2,4-D* application in February that removes troublesome weeds including horseweed, primrose, and radish allowing for an easy burndown just prior to planting. Most, but not all brands, may be applied 30 days prior to planting cotton. PRIMROSE: apply 0.38 lb/A RADISH: apply 0.5–0.75 lb/A HORSEWEED: apply 0.75+ lb/A *GLYPHOSATE*-RESISTANT HORSEWEED: apply 0.95 lb/A
	2,4-D choline Enlist One 3.8 S	4	24–32 fl oz	0.7–0.95	48 H/ N/A	Apply at least 30 days ahead of planting any variety not containing the Enlist trait. *See section below for cotton with the Enlist trait.* **Enlist One requires a boom height of no more than 24" above the target, a 30 foot downwind spray drift buffer for ground applications, and 4 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points.** **Additionally, study the label for spray tip, spray droplet size, wind speeds, and ground speed requirements.** **User also must review website www.enlisttankmix.com for approved adjuvants, drift reduction agents, and tank mixtures.** Current labeling allows mixtures with many products including numerous *glyphosate* formulations, Direx, Valor, and Liberty.
Burndown of mature primrose and morningglory. Inadequate control of immature radish, larger pigweed, or immature grain cover crops. Mixtures with *glyphosate* are often very effective; however, research has shown *glufosinate* to reduce *glyphosate* activity on grasses, wild radish, purslane, and especially goosegrass when compared to glyphosate alone.	*glufosinate* Liberty, others 2.34 SL Liberty Ultra 1.76 SL	10	 29–43 fl oz 19–29 fl oz	0.53–0.79 0.26–0.40	12 H/ N/A	Cotton may be planted anytime after application. **To maximize control:** >15 GPA water volume, thorough spray coverage, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset. For Palmer, lower rate when 2" and higher rate when Palmer reaches 3-4". Only 1 burndown application is allowed. Liberty ULTRA also requires a boom height of no more than 24" above the target, a 10 foot downwind spray drift buffer for ground applications, and 3 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points.
Burndown of emerged annual weeds, but does not adequately control primrose, geranium, large radish, field pansy, resistant horseweed, or resistant Palmer amaranth. Morningglory, nutsedge, and purslane can be challenging. *For ryegrass, glyphosate followed by paraquat 5 to 7 days later is the best approach.*	*glyphosate* 4 S (3 lb ae) 5.4 S (4 lb ae) 5 S (4.17 lb ae) 5.5 S (4.5 lb ae) 5.88 S (4.8 lb ae) 6 S (5 lb ae)	9	 32–96 fl oz 24–72 fl oz 23–68 fl oz 22–64 fl oz 21–60 fl oz 19–58 fl oz	0.75–2.25 (lb ae)	4 H/ N/A	Apply anytime prior to planting. Sequential applications can be made not to exceed 3.7 lb ae/A for burndown. General rate for annual weeds is up to 1.13 lb ae (30 oz/A PowerMax 3), rate for nutsedge and some perennials is up to 2.25 lb ae (60 oz/A PowerMax 3). **Cool nights just before and/or after application will delay and occasionally reduce weed control, especially for a wheat cover crop**. *Control of cover crops:* Wheat < 12": 0.75 lb/A Wheat > 12": 1.13 lb/A Rye < 12": 0.56 lb/A Rye > 12" (no seed head): 1.13 lb/A Rye > 12" (seed head): 0.56 lb/A

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PRE-PLANT BURNDOWN—ANY VARIETY *(continued)*						
Burndown of most emerged weeds. *2,4-D* is more effective than *dicamba* on primrose, radish, and spiderwort; less effective on horseweed and peanut. **All current formulations of *2,4-D* are volatile! The *choline* formulation is generally less volatile than the *amine* formulation with the ester or acid formulations being the most volatile by far.** Alternatively, Enlist One can be used in mixture with approved *glyphosate* formulations.	*glyphosate* + *2,4-D choline* 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	Apply at least 30 days ahead of planting non-Enlist traited cultivars. *See section below for cotton with the Enlist trait.* **Enlist Duo requires a boom height of no more than 24" above the target, a 30 foot downwind spray drift buffer for ground applications, and 4 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points.** **Additionally, study the label for spray tip, spray droplet size, wind speeds, and ground speed requirements.** **Users also must review website www.enlisttankmix.com for approved adjuvants, drift reduction agents, and tank mixtures.**
	glyphosate + *2,4-D* 3.8 S 5.5 S	9 + 4	see *glyphosate* + 12–32 fl oz 9–22 fl oz	0.75–2.25 (lb ae) + 0.36–0.95	48 H/ N/A	Most, but not all, brands of *2,4-D* may be applied at least 30 days ahead of planting. For primrose, *2,4-D* at 0.38 lb/A will provide control. For *glyphosate*-resistant horseweed, *2,4-D* at 0.95 lb/A will control small plants. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). ***Amine* formulations are less volatile than ester or acids.**
Most weeds, exceptions may include large glyphosate- resistant horseweed and Canadian horseweed.	2,4-D amine 3.8 S + *glyphosate* many brands + *flumioxazin* Valor SX 51 WDG Valor EZ 4 SC	4 + 9 + 14	 16-24 fl oz + see glyphosate + 2 oz 2 fl oz	0.5–0.7 + 0.75–2.25 + 0.063	48H/NA	One of the most effective options to control common emerged weeds while offering residual control if reaching the soil and being activated. Most brands of 2,4-D must be applied 30 or more days prior to planting; see the plant back restrictions regarding Valor's GA state label on row just below. DO NOT APPLY near sensitive plants or crops as off-target movement through drift and volatility can occur. DO NOT APPLY VALOR at more than 2 oz/A if planting occurs within 60 days.

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE: AMOUNT OF FORMULATION	BROADCAST RATE/ACRE: LBS ACTIVE (AI or AE)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
PRE-PLANT BURNDOWN—ANY VARIETY *(continued)*						
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. The addition of *2,4-D* improves control of radish and primrose; follow most restrictive plant-back interval. For PPO-resistance management, make only 3 applications of Reflex or Valor (including generics) on a field in 3 years. **DO NOT APPLY OVER 2 OZ/A OF VALOR FOR COTTON BURNDOWN WITHIN 60 DAYS OF PLANTING!**	*glyphosate* + *flumioxazin* Valor SX 51 WDG Valor EZ 4 SC	9 + 14	see *glyphosate* + 2 oz 2 fl oz	0.75–2.25 (lb ae) + 0.063	12 H/ N/A	**A Section 24c Georgia Special Local Need Label** allows reduced plant-back intervals for Valor. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the following use patterns: **In strip-till cotton** where the strip till rig (including a ripper shank running at least 12" deep) is run after application and before planting, Valor plant-back intervals are as follows: 1) >30% ground cover = 7 days 2) 10–30% ground cover = 14 days plus 0.5" rain/irrigation 3) <10% ground cover or tillage = 21 days plus 1" rain/irrigation **In no-tillage production** or when the strip is implemented prior to application. Valor plant-back interval should be a minimum of 28 days, AND 0.5" (>10% ground cover) or 1" (<10% ground cover) rainfall is required. **If Reflex (or generic) will be applied PRE, data suggest adding an additional 7 days to planting intervals.** Add a nonionic surfactant or crop oil concentrate (preferred), regardless of *glyphosate* brand. Carefully follow label directions for cleaning sprayer after each use. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3).
Diuron improves control of emerged Palmer amaranth and offers residual control if activated on the soil. The addition of *2,4-D* or Valor will likely improve weed control; follow most restrictive plant-back interval.	*glyphosate* + *diuron* Direx 4L	9 + 7	see *glyphosate* + 1–1.5 pt	0.75–2.25 (lb ae) + 0.5–0.75	12 H/ N/A	**The state label described below expired in 2025, efforts to get the label back for 2026 are going well at time of editing but check with your extension agent to ensure the label is in place before following uses defined for the state. A Section 24(c) Georgia Special Local Need Label** allows Direx to be applied without a plant back interval as long as a strip-till rig with a ripper shank is run after application and before planting. If Direx is applied and a strip-till implement is not run then the plant back interval is 7 days. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). Other labeled *diuron* formulations require application 15–45 days ahead of planting. Label prohibits *diuron* use on soils with less than 1% organic matter. Suggest not to apply another application of *diuron* or Cotoran within 21 days.
Aim improves control of emerged morningglory, tropical spiderwort, and very small (< 1") *glyphosate*-resistant Palmer amaranth.	*glyphosate* + *carfentrazone* Aim 2 EC	9 + 14	see *glyphosate* + 0.5–1.6 fl oz	0.75–2.25 (lb ae) + 0.008–0.025	12 H/ N/A	May be applied as a burndown treatment anytime prior to planting. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). Aim does not provide residual weed control.

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PRE-PLANT BURNDOWN—ANY VARIETY *(continued)*						
Burndown of most weeds is not very effective with *dicamba* at 0.25 lb ai/A. *2,4-D* is more effective on primrose, radish, and spiderwort.	*glyphosate* + *dicamba* Clarity, other 4S	9 + 4	see *glyphosate* + 8 oz	0.75–2.25 (lb ae) + 0.25	12 H/ N/A	**Comments are for non-XtendFlex cotton; see section below for XtendFlex cotton!** Dicamba can be applied alone with little effect on the level of small grain biomass produced. Annual weeds = 1.13 lb/A glyphosate (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). For Clarity: after a minimum of 1" of rainfall, a waiting period of at least 21 days is required before planting. DO NOT INLCUDE AMS IN THIS MIX.
ET improves control of emerged morningglory and small (<1") *glyphosate*-resistant Palmer amaranth.	*glyphosate* + *pyraflufen ethyl* ET 0.208 EC ETX 0.335 L	9 + 14	see *glyphosate* + 0.5–2 fl oz 0.3–1.25 fl oz	0.75–2.25 (lb ae) + 0.0008–0.003	12 H/ N/A	May be applied as a burndown treatment anytime prior to planting. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). ET does not provide residual weed control.
Improved control of henbit, chickweed, Carolina geranium, and wild radish compared to *glyphosate* alone. For curly dock, suggest using Harmony Extra. FirstShot does not provide consistently effective residual Palmer amaranth control.	*glyphosate* + *thifensulfuron* + *tribenuron* FirstShot SG 50 SG	9 + 2 + 2	see *glyphosate* + 0.5–0.8 oz	0.75–2.25 (lb ae) + 0.008–0.013 + 0.008–0.013	12 H/ N/A	Apply at least 14 days prior to planting except for on sands and loamy sands where the interval should be at least 21 days. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3).
	glyphosate + *thifensulfuron* + *tribenuron* Harmony Extra SG or Harmony Extra 75 WDG	9 + 2 + 2	see *glyphosate* + 0.75 oz 0.5 oz	0.75–2.25 (lb ae) + 0.0156 + 0.0078	12 H/ N/A	
Improved control of wild radish, morningglory, and small Palmer amaranth compared to *glyphosate* alone.	*glyphosate* + *tiafenacil* Reviton 2.83 SC	9 + 14	see *glyphosate* + 1–2 fl oz	0.75–2.25 (lb ae) + 0.022–0.044	12 H/ N/A	Cotton can be planted in 7 days following 1 oz/A of Reviton and 14 days following 2 oz/A. Annual weeds = 1.13 lb/A *glyphosate* (30 oz/A PowerMax 3); nutsedge and some perennial weeds: can go up to 2.25 lb/A (60 oz/A PowerMax 3). Reviton can only be applied one time as a preplant burndown and the addition of MSO or crop oil may improve control on some weeds, see label.

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WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PRE-PLANT BURNDOWN—ANY VARIETY *(continued)*						
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, *glyphosate* followed by *paraquat* 5–7 days later is the best approach.	*paraquat* 3 SL	22	1.7–2.7 pt	0.63–1	48 H/ N/A	**EPA has restricted the use of *paraquat* to certified applicators ONLY and applicators must take a specialized training before use.** 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. Mixtures with *diuron* are usually far more effective.
Burndown of emerged annual weeds and provides residual control if *diuron* 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.	*paraquat* 3 SL + *diuron* Direx 4L	22 + 7	1.7–2.7 pt + 1.5–2 pt	0.63–1 + 0.75–1	48 H/ N/A	**EPA has restricted the use of *paraquat* to certified applicators ONLY and applicators must take a specialized training before use.** **The state label described below expired in 2025, efforts to obtain a 2026 label are going well at time of editing. Consult with your Extension agent to confirm a new label is available for 2026.** **A Section 24(c) Georgia Special Local Need Label** allows Direx to be applied without a plant back interval as long as a strip-till rig with a ripper shank is run after application and before planting. If Direx is applied and a strip-till implement is not run then the plant back interval is 7 days. Other labeled *diuron* formulations require application 15–45 days ahead of planting. Label prohibits use on soils with less than 1% organic matter. Suggest to not apply another application of *diuron* or Cotoran within 21 days. Add crop oil concentrate at 1 gal/100 gal spray mix. Applications to mature weeds are more effective than to immature weeds.
Paraquat mixtures with *diuron* are more effective on emerged Palmer amaranth; however, Valor is more effective in providing residual pigweed control. The addition of *diuron* is suggested if pigweed is larger than 3". For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years. **DO NOT APPLY OVER 2 OZ/A OF VALOR FOR COTTON BURNDOWN WITHIN 60 DAYS OF PLANTING!**	*paraquat* 3 SL + *flumioxazin* Valor SX 51 WDG Valor EZ 4 SC	22 + 14	1.7–2.7 pt + 2 oz 2 fl oz	0.63–1 + 0.063	48 H/ N/A	**EPA has restricted the use of *paraquat* to certified applicators ONLY and applicators must take a specialized training before use.** **Section 24c Georgia Local Special Need Label** allows reduced plant-back intervals for Valor. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the following use patterns: **In strip-till cotton** where the strip rig (including a ripper shank running at least 12" deep) is run after application and before planting, Valor plant back intervals are as follows: 1) >30% ground cover = 7 days 2) 10–30% ground cover = 14 days plus 0.5" rain/irrigation 3) <10% ground cover or tillage = 21 days plus 1" rain/irrigation **In no-tillage production** or when the strip is implemented prior to application. Valor plant-back interval should be a minimum of 28 days, AND 0.5" (>10% ground cover) or 1" (<10% ground cover) rainfall is required. **If Reflex (or generic) will be applied PRE, data suggests 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.

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
ADDITIONAL PRE-PLANT BURNDOWN OPTIONS—ENLIST VARIETIES ONLY						
Most weeds when *2,4-D* is mixed with *glyphosate*; may miss Carolina geranium and Palmer amaranth should be < 3". **All current formulations of *2,4-D* are volatile! The *choline* formulation is generally less volatile than the *amine* formulation with the ester or acid formulations being the most volatile by far.** **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.**	*2,4-D choline* Enlist One 3.8 S	4	24–32 fl oz	0.7–0.95	48 H/ N/A	**Enlist Varieties Only** 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. **Enlist One and Enlist Duo require a boom height of no more than 24" above the target, a 30 foot downwind spray drift buffer for ground applications, and 4 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points.** **Additionally, study the label for spray tip, spray droplet size, wind speeds, and ground speed requirements. Also, one must review the website (www.enlisttankmix.com) for approved adjuvants, drift reduction agents, and tank mixtures.**
	glyphosate + *2,4-D choline* Enlist Duo	9 + 4	3.5–4.75 pt	0.74–1.0 (lb ae) + 0.7–0.95	48 H/ N/A	
ADDITIONAL PRE-PLANT BURNDOWN OPTIONS—ENLIST VARIETIES ONLY						
Horseweed, fleabane, and most other weeds; **research suggests this is the preferred treatment in Enlist cotton.** *2,4-D* is needed to control emerged plants while Valor provides residual control. **All current formulations of *2,4*-D are volatile! The *choline* formulation is generally less volatile than the *amine* formulation with the ester or acid formulations being the most volatile by far.** **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.**	*2,4-D choline* Enlist One 3.8 S + approved *glyphosate* + *flumioxazin* Valor SX 51 WDG Valor EZ 4 SC	4 + 9 + 14	24–32 fl oz + see *glyphosate* + 2 oz 2 fl oz	0.7–0.95 + 0.75–1.13 + 0.063	48 H/ N/A	**Enlist Varieties Only** Enlist One label allows application any time prior to planting; see and follow Valor plantback restrictions. **Enlist One has both downwind buffer restrictions and runoff mitigation measures that applicators must follow. Additionally, study the label for the following requirements: spray tip, spray droplet size, wind speeds, ground speeds, and boom height. Also, one must review the website (www.enlisttankmix.com) for approved adjuvants, drift reduction agents, and tank mixtures.**

1. 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: AMOUNT OF FORMULATION	BROADCAST RATE/ACRE: LBS ACTIVE (AI or AE)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
ADDITIONAL PRE-PLANT BURNDOWN OPTIONS—XTENDFLEX VARIETIES ONLY						
May not control geranium or spiderwort completely; Palmer amaranth should be < 3". **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.**	approved *glyphosate* + *dicamba*	9 + 4	see *glyphosate* + ---	0.75–2.25 (lb ae) + 0.5	24 H/ N/A	**Preplant applications in *dicamba*-resistant varieties only.** At time of editing, significant efforts to once again obtain registration for Xtendimax and Engenia for burndown in dicamba-resistant cotton are underway. Currently, labels have not been approved by the US EPA. Consult with your local Extension agent for the latest details.
PRE-PLANT INCORPORATED—ANY VARIETY						
Annual grasses, pigweeds and Florida pusley. Controls *glyphosate*-resistant Palmer amaranth much more effectively than when applied preemergence.	*pendimethalin* Prowl 3.3 EC Prowl H20 3.8 AS	3	 1.2–2.4 pt 2 pt	 0.5–1 0.95	24 H/ N/A	Soil incorporate to a depth of 2" in moist soil ideally within 24 hours of application; consider mixing with Reflex. Application/ incorporation within a week of planting is preferred. *Pendimethalin* is less volatile than trifluralin thus is a better option if incorporation is delayed, delayed incorporation will reduce control. For Treflan 4 L, rate should not exceed 1.5 pt/A for most fields. The addition of a preemergence herbicide is critical.
	trifluralin Treflan HFP, others 4 L	3	 1–1.5 pt	0.5–0.75	12 H/ N/A	
PRE-PLANT INCORPORATED—ANY VARIETY (*Continued*)						
Glyphosate-resistant Palmer amaranth and suppresses yellow nutsedge **For PPO-resistance management,** make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	*fomesafen* Reflex 2 S	14	 12–16 fl oz	0.19–0.25	24 H/ N/A	**A Section 2 (ee) Georgia Label** allows a pre-plant application by incorporating Reflex to a 2" or less depth while the soil is moist; research suggests including *pendimethalin* or *trifurualin*. The label suggests 16 oz/A but injury can occur on sandy soils with intense irrigation. The addition of a preemergence herbicide as noted with the split program below is critical; **reduce Reflex rate accordingly if implementing split PPI and PRE program.** For Palmer amaranth, less control is noted with Reflex alone incorporated when compared to preemergence 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.

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE: AMOUNT OF FORMULATION	BROADCAST RATE/ACRE: LBS ACTIVE (AI or AE)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
SPLIT PROGRAM WITH PRE-PLANT INCORPORATED (PPI) FOLLOWED BY PREEMERGENCE (PRE) APPLICATIONS—ANY VARIETY						
The SINGLE MOST consistently effective approach for the control of Palmer amaranth in dryland production. **For PPO-resistance management,** make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	**PPI:**					**PPI:** **A Section 2 (ee) Georgia Label** allows shallow (2") incorporation to activate the herbicide; soil moisture is required for activation. The label suggests 12 oz/A but injury can occur with this program if rates are too high on sandy soils with intense irrigation. Plant within 1 week of application and incorporation if possible. Numerous formulations of *fomesafen* are available; however, their labels do not support this use pattern.
	trifluralin or *pendimethalin* + *fomesafen* Reflex 2S	3 + 14	See rates in pre-plant incorporated + 10–12 fl oz	See rates in pre-plant incorporated + 0.16–0.19	24 H/ N/A	
	PRE:					**PRE:** 1. Be sure to include *paraquat* PRE if Palmer is emerged. 2. Warrant offers greater residual control when compared to *diuron* while *diuron* offers greater control of emerged weeds. 3. If mixing Reflex + Warrant + Diuron, research suggests the rate of *diuron* for most fields should not exceed 12 oz/A. Numerous formulations of *fomesafen* and *diuron* are available.
	fomesafen Reflex 2S + *acetochlor* Warrant 3ME OR *diuron* Direx, Diuron 4 L	14 + 15 OR 7	8–10 fl oz + 32 fl oz OR 10–20 fl oz	0.125–0.16 + 0.75 OR 0.31–0.63	24 H/ N/A	

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			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PREEMERGENCE WEED CONTROL—ANY VARIETY						
Residual control of annual grasses, Palmer amaranth, and tropical spiderwort. **This product is important to consider for a successful goosegrass management program.**	*acetochlor* Warrant 3 ME	15	2–3 pt	0.75–1.125	12 H/ N/A	The manufacturer recommends 3 pt/A; however, UGA research suggests a rate of 2 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. Warrant should be applied in combination with fomesafen (Reflex, others), *diuron*, Brake, or Cotoran depending on Palmer population and technology grown; add *paraquat* and adjuvant if Palmer is up. Apply within 24 hr of planting and irrigate within 24 hr of application if possible.
Residual control of annual grasses and Palmer amaranth.	*acetochlor* Enversa 3ME	15	2.5–3 pt	0.94–1.12	12 H/ NA	Label notes optimum rate is 3 pt/A. However, if activated within 4 days of application, Palmer control will be much less than that by Warrant applied at 2 pt/A. If applying this product, a very good tank mix partner is strongly encouraged.
Residual control of many annual grasses and broadleaves including Palmer amaranth and tropical spiderwort; suppression of yellow nutsedge.	*acetochlor* + *fomesafen* Warrant Ultra 3.45 CS	15 + 14	36–48 fl oz	0.77–1.03 + 0.175–0.233	24 H/ N/A	Manufacturer recommends 48 to 60 oz/A; however, UGA research suggests 36 oz/A providing 2 pt/A of Warrant and 0.175 lb ai of *fomesafen* (equivalent to 11 oz/A of Reflex) when applying on light soil textures or when using intense irrigation or expecting heavy rains during the first 2 weeks after planting. Apply within 24 hr of planting and irrigate within 24 hr of application if possible. Add paraquat plus adjuvant if Palmer is up.
Residual suppression of annual broadleaf weeds and grasses. More effective than Cotoran on pigweed, less effective on most other weeds. Less residual activity than Warrant on grasses including goosegrass, spiderwort, and pigweed.	*diuron* Direx, others 80 DF Direx, others 4 L	7	0.38–0.78 lb 10–20 fl oz	0.31–0.62	12 H/ N/A	*Diuron* should be applied in combination with *fomesafen* (Reflex, others), Warrant, or Brake depending on Palmer population and technology grown; add *paraquat* and adjuvant if Palmer is up. Apply within 24 hr of planting and irrigate within 24 hr of application if possible. See label for specific rate but in general use lower rate on sandier soils and/or under intense irrigation. Label restricts use on soils with < 1% organic matter and on sand/loamy sand soils. Suggest avoiding *diuron* and Cotoran 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 *diuron* on Palmer amaranth.	*fluometuron* Cotoran 4 L	7	2–3 pt	1–1.5	24 H/ N/A	Cotoran should be applied in combination with *fomesafen* (Reflex, others), Warrant, or Brake depending on Palmer population and technology grown; add *paraquat* and adjuvant if Palmer is up. Apply within 24 hr of planting and irrigate within 24 hr of application if possible. A lower rate may be needed 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. In mixture with an effective tank mix partner, can provide very broad weed control. Very effective on goosegrass in one study during 2025.	*fluridone* 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. Research has noted 16 oz/A of Brake mixed with Reflex, Warrant, or *diuron* can be very effective. 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 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. Research notes Brake often requires 0.5" of irrigation or rainfall to become fully activated. Research also notes Brake is quite stable through heavy rains.

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			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
PREEMERGENCE WEED CONTROL—ANY VARIETY *(continued)*						
Excellent residual for Palmer amaranth; good control of poinsettia and suppression of yellow nutsedge. For PPO resistance management, make only 3 applications of *fomesafen* or Valor (including generics) on a field in 3 years.	*fomesafen* 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 *paraquat* and adjuvant if Palmer is up. Apply within 24 hr of planting and irrigate within 24 hr of application if possible. The manufacturer recommends 1 to 1.5 pt/A on coarse textured soils; however, research suggests 12 oz/A is an appropriate rate when mixed with other effective residuals 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. Numerous brands are available.
Annual grasses and Florida pusley; suppression of Palmer amaranth only. Irrigation or rainfall needed within 24 hours.	*pendimethalin* Prowl 3.3 EC Prowl H20 3.8 AS	3	1.5–2.4 1.5–2 pt	0.62–0.99 0.71–0.95	24 H/ N/A	Preemergence applications without immediate irrigation/rainfall are far less consistent than incorporated treatments; tank mixtures usually needed. **Wet/moist conditions during emergence (rainfall or irrigation) can cause significant plant stunting, leaf/stem malformation, and stem swelling with eventual breaking; especially if used in combination with Reflex (or generic).** Numerous brands are available. Apply within 24 hr of planting and irrigate within 24 hr of application if possible. Add paraquat plus adjuvant if Palmer is up.
Controls non-ALS resistant pigweeds, lambsquarters, prickly sida, spurge, and smartweed. Suppresses morningglory, except tall.	*pyrithiobac* Staple LX 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, one should consider a delayed PRE or early POST use of Staple. Label notes not to apply on soils with less than 0.5% organic matter or on coarse soils such as sands or loamy sands. Can tank mix with *diuron*, Cotoran, *pendimethalin*, or Reflex; apply within 24 hr of planting and irrigate within 24 hr of application if possible. Add *paraquat* plus adjuvant if Palmer is up.

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			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
POSTEMERGENCE OVERTOP GRASS CONTROL—ANY VARIETY						
Annual grasses Goosegrass must be less than 3" for adequate control and one should apply the maximum rate.	*clethodim* *clethodim*, others 2 EC Select Max 0.97 EC	1	 6–8 fl oz 12–16 fl oz	0.09–0.13	24 H/ 60 D	Apply to actively growing grasses not under stress. Mixtures with herbicides other than *glyphosate* will likely reduce grass control. Do not cultivate within 7 days of application and do not apply a broadleaf herbicide within 3 days.
	fluazifop p-butyl Fusilade DX 2 EC	1	 8–12 fl oz	0.125–0.188	12 H/ 90 D	**For Select:** Add crop oil concentrate at 1 qt/A; 2 applications may be made. **For Select Max:** Add nonionic surfactant at 1 qt/100 gal solution or crop oil concentrate at 1 gal/100 gal solution. Do not apply more than 64 oz/A per year.
	quizalofop p-ethyl Assure II 0.88 EC	1	 8–10 fl oz	0.6–0.7	12 H/ 80 D	
	sethoxydim Poast 1.53 EC	1	 16–24 fl oz	0.19–0.29	12 H/ 40 D	**For Fusilade:** Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt /100 gal solution. Do not exceed 48 oz/A per year and 14 days is needed between applications. **For Assure:** Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution. May make 2 applications per year. **For Poast:** Add crop oil concentrate at 1 qt/A. Do not exceed 7.5 pt/A per year. Numerous generic formulations for each active ingredient are available.
Perennial grasses	*clethodim* *clethodim*, others 2 EC Select Max 0.97 EC	1	 8–16 fl oz 16–32 fl oz	0.13–0.25	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 crop oil concentrate at 1 qt/A. Do not mix with other herbicides. Do not cultivate within 7 days of application and do not apply a broadleaf herbicide within 3 days.
	fluazifop p-butyl Fusilade DX 2 EC	1	 10–12 fl oz	0.156–0.188	12 H/ 90 D	Apply when johnsongrass is 8–18" and before boot stage 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" or when bermudagrass stolon (runner) regrowth or new plants are 4–8". 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. Maintain a minimum of 14 days between applications and do not exceed 48 oz/A per year. Do not cultivate within 7 days of application.
	quizalofop p-ethyl Assure II 0.88 EC	1	 10–12 fl oz	0.07–0.08	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 up to 7 fl oz/A when johnsongrass reaches 6–10" or bermudagrass reaches 3–6"; do not exceed 18 fl oz/A per year. 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 7 days of application and do not apply a broadleaf herbicide within 3 days.
	sethoxydim Poast 1.53 EC	1	 24 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 6–12" and bermudagrass reaches 3–6". Add 1 qt of crop oil concentrate/A and do not exceed 7.5 pt/A per year. Do not tank mix with other herbicides. Do not cultivate within 7 days of application and do not apply a broadleaf herbicide within 3 days.

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WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
POSTEMERGENCE OVERTOP WEED CONTROL—ANY VARIETY (*continued*)						
Non-ALS resistant pigweed less than 1", morningglory (excluding tall mg), coffee senna, and redweed. At most, suppresses sicklepod. Provides good residual control of many species if it reaches the soil and is activated.	*pyrithiobac* Staple LX 3.2S	2	2.7–3 fl oz	0.06–0.07	4 H/ 60 D	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. 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. Suggest not mixing with grass control herbicides. May mix with most insecticides, but do not tank mix with any product containing malathion. **Do not mix with any Dual product or Warrant.** Separate Staple and Dual/Warrant applications by 3 or more days. See label for rotational restrictions.
Annual broadleaf weeds including sicklepod, *Ipomoea* morningglory, and nutsedge. Will not control smallflower morningglory or ALS-resistant pigweed, jimsonweed, copperleaf, or prickly sida. Critical tool to include within the system for fields heavily infested with nutsedge.	*trifloxysulfuron* Envoke 75 WDG	2	0.1–0.15 oz	0.0047–0.007	12 H/ 60 D	Label allows directed or overtop application after cotton has at least 5 true leaves up until 60 days of harvest at a rate of 0.1 to 0.15 oz/A. Sloppy directed application encouraged for less injury and improved weed coverage in larger cotton. Add nonionic surfactant at 1 qt/100 gal; do not use other types of adjuvants. Mix only with approved tank mix partners; avoid mixtures with other products including plant growth regulators. 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. Provides some residual control of sensitive weeds if contacts soil and is activated.
Many broadleaf weeds. Poor control of tropic croton, copperleaf and ALS-resistant pigweed. Good residual of sensitive weeds if contacts soil and is activated.	*trifloxysulfuron* Envoke 75 WDG + *pyrithiobac* Staple LX 3.2 S	2 + 2	0.1 oz + 1.3–1.9 fl oz	0.0047 + 0.03–0.05	12 H/ 60 D	Sloppy directed application encouraged for less injury and improved weed coverage in larger cotton. Label allows overtop or directed application after cotton has at least 5 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.
Bulk fertilizer application only. If applied uniformly and activated, Zidua will provide residual activity on pigweeds, annual grasses, and many other species.	*pyroxasulfone* Zidua 4.17SC	15	2.5–3.5 fl oz	0.081–0.11	12 H/ N/A	May apply as a broadcast spread of impregnated dry bulk fertilizer to cotton from 2-leaf stage to beginning bloom stage. Apply in a minimum of 250 pounds dry bulk fertilizer per acre. Research notes excellent crop tolerance as long as the cotton plant is not wet during application, but less weed control is observed with a fertilizer application compared to a spray application; higher pounds of fertilizer per acre will lessen this difference. Do not apply using ammonium nitrate, sodium nitrate, or powdered limestone dry bulk fertilizers.

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			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLUFOSINATE (LIBERTY, ETC.) AND GLYPHOSATE (ROUNDUP, ETC.)						
Control of pusley, spiderwort, and goosegrass are not expected. In general, other broadleaf weeds should be < 3" and grasses < 2". Excellent control of morningglory including moonflower. For Palmer, lower rate when 2" and higher rate when at 3-4". When mixed with a grass herbicide, one should expect less grass control than when the grass herbicide is applied alone. **Suggest no more than 2 applications per year on a field.**	*glufosinate* Liberty, others 2.34 SL Liberty Ultra 1.76 SL	10	 29–43 fl oz 19–29 fl oz	 0.53–0.79 0.26–0.4	12 H/ 70 D	Applications may be made from emergence through early bloom; directed applications after 8 leaf cotton suggested for improved weed control. For Liberty Ultra, apply 19-29 fl oz/A up to 3 times with a minimum of 10 days between applications and a maximum of 58 fl oz/A for the year. For 2.34 lb products, do not exceed 43 oz/A per application or 87 oz/A per year with a maximum of 3 applications per year. Liberty ULTRA also requires a boom height of no more than 24" above the target, a 10 foot downwind spray drift buffer for ground applications, and 3 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points. Ammonium sulfate (AMS) can be used at 1.5 to 3 lb/A; it may improve control of difficult to control weeds occasionally. **To maximize control:** > 15 GPA water volume, thorough spray coverage with medium to coarse spray droplets, 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 advised. 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. Numerous brands are available, rain fast in 4 hours.
Mixing *glyphosate* with Liberty will not influence control by Liberty; however, control of grasses especially goosegrass, wild radish, and purslane will often be more than Liberty alone but less than that by *glyphosate* alone.	*glufosinate* Liberty, others 2.34 SL Liberty Ultra 1.76 SL + *glyphosate* numerous brands	10 + 9	 29–43 fl oz 19–29 fl oz + see *glyphosate*	 0.53–0.79 0.26–0.4 + 0.75–1.13 lb ae	12 H/ 70 D	See comments for *glufosinate* and *glyphosate* alone. Injury on Glytol LibertyLink is almost always negligible; injury on Enlist and XtendFlex is often increased slightly above *glufosinate* applied alone. 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.
Staple may improve emerged pigweed control (non ALS-resistant) and provides residual activity on sensitive weeds if spray contacts soil and is activated.	*glufosinate* Liberty, others 2.34 SL Liberty Ultra 1.76 SL + *pyrithiobac* Staple LX 3.2 SL	10 + 2	 29–43 fl oz 19–29 fl oz + 1.9 fl oz	 0.53–0.79 0.26–0.4 + 0.03–0.05	12 H/ 70 D	See information for *glufosinate* and *pyrithiobac* alone. 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 *metolachlor* (Dual) product or Warrant.
Zalo offers a premix of *glufosinate* (Liberty, etc.) and *quizalofop* (Assure II). This mixture is more effective than *glufosinate* applied alone on grasses.	*glufosinate* + *quizalofop* Zalo 2.52 SL	10 + 1	 32–43 fl oz	0.573–0.769 + 0.058–0.077	12 H/80 D	Zalo at 32 oz/A = 32 oz/A Liberty + 8.4 oz of Assure II; Zalo at 43 oz/A = 43 oz/A Liberty + 11.2 oz/A of Assure II. May make two applications per year not to exceed a total of 69 oz/A; intervals between applications must be at least 10 days. Do not apply within 14 days of bloom. An adjuvant and nitrogen fertilizer are required to maximize weed control. Label suggests petroleum oil concentrate (COC) at 1% v/v (1 gallon/100 gallons water); non-ionic surfactant with at least 90% ai at 0.25 0.5% v/v; or methylated seed oil at 1% v/v. Additionally, always add spray grade ammonium sulfate (AMS) at 3 lbs/A or liquid equivalent.

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			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLUFOSINATE (LIBERTY, ETC.) AND GLYPHOSATE (ROUNDUP, ETC.) *(continued)*						
Residual herbicides provide control of annual grasses including goosegrass, spiderwort, pigweeds, purslane, and pusley if spray contact soil and is activated. Dual and Outlook are activated more easily and quickly; Warrant is slower to be activated but more stable waiting on activation even out to 11 days. For Palmer, lower glufosinate rate when 2" and higher rate when at 3-4". Injury level often increases as *glufosinate* rate increases with these mixtures.	*glufosinate* Liberty, others 2.34 SL Liberty Ultra 1.76 SL + *acetochlor* Warrant 3 ME Enversa 3 ME	10 + 15	29–43 fl oz 19–29 fl oz + 2 pt 2.5–3 pt	0.53–0.79 0.26–0.4 + 0.75 0.75–1.13	12 H/ 70 D or first bloom (most restrictive)	See information above or labels for details on *glufosinate*. **Warrant** mixture can be applied from fully emerged cotton through first bloom; label allows use rates up to 3 pt/A although injury is a concern at this rate. Do not exceed 4 qt/A per year. **Enversa** label notes optimum rate of Enversa is 3 pt/A and the application should be made from fully emerged cotton through first bloom. If activated within 4 days of application, residual control of Palmer will be much less than that by Warrant at 2 pt/A. **Dual Magnum** mixture can be applied from fully emerged cotton through 100 days before harvest if applied overtop or 80 days before harvest if directed. Do not apply on sand or loamy sand soils and do not exceed 2.6 pt/A per year. **Outlook** mixture can be applied from 1-leaf cotton through second week of bloom. Directed applications after 8-leaf cotton will reduce injury and improve weed control. 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. Several products containing *metolachlor* (not *S-metolachlor*) are available. *Metolachlor* products are less effective per unit of formulated product than those with *S-metolachlor*. In general, it takes 1.5 pt of a *metolachlor* product to give the activity one gets from 1 pt of *S-metolachlor*.
	glufosinate Liberty, others 2.34 SL Liberty Ultra 1.76 SL + *S-metolachlor* Dual Magnum 7.62 EC	10 + 15	29–43 fl oz 19–29 fl oz + 1 pt	0.53–0.79 0.26–0.4 + 0.95	24 H/ 100 D	
	glufosinate Liberty, others 2.34 SL Liberty Ultra 1.76 SL + *dimethenamid-P* Outlook 6 EC	10 + 15	29–43 fl oz 19–29 fl oz + 12–16 fl oz	0.53–0.79 0.26–0.4 + 0.56–0.75	12 H/ 70 D or 2nd week after initial bloom (most restrictive)	
Controls most annual weeds; exceptions include *glyphosate*-resistant Palmer amaranth and horseweed, dayflower, Florida pusley, tropical spiderwort, doveweed, and hemp sesbania. Morningglory, nutsedge, and purslane can be challenging. Goosegrass is very difficult to control and must be less than 3" when treated. Rarely should *glyphosate* be applied alone.	*glyphosate* 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 5.88S (4.88 lb ae) 6S (5 lb ae)	9	32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 21–30 fl oz 19–29 fl oz	0.75–1.12 (lb ae)	4 H/ 7 D	Roundup PowerMax 3 (4.88 lb ae) may be applied overtop or directed to Roundup Ready Flex technology anytime from cotton emergence until 7 days prior to harvest. The maximum rate for any single application between emergence and 60% open bolls is 30 fl oz (1.13 lb ae). Do not exceed a total of 120 fl oz (4.5 lb ae) applied from emergence through 60% open bolls. Do not exceed a maximum of 40 fl oz (1.55 lb ae) applied between layby and 60% open bolls. Do not exceed a maximum of 40 fl oz between 60% open bolls and harvest.

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WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLUFOSINATE (LIBERTY, ETC.) AND GLYPHOSATE (ROUNDUP, ETC.) *(continued)*						
Residual herbicides provide control of annual grasses including goosegrass, spiderwort, pigweeds, purslane, and pusley if spray contact soil and is activated. Avoid topical applications when heavy dew, saturated soils, or extreme heat is present as injury is magnified.	*glyphosate* + *acetochlor* Warrant 3 ME Enversa 3 ME	9 + 15	see *glyphosate* + 2 pt 2.5–3 pt	0.75–1.12 + 0.75 0.94–1.13	12 H/ do not apply after first bloom	See comments for glyphosate alone. Apply overtop once cotton is fully emerged through bloom. For improved weed control and less injury after 8-leaf cotton, apply as a directed spray. Warrant rate can be increased to 3 pt/A but injury is a concern when applied topically. Do not mix with Staple and do not exceed 3 lbs acetochlor per acre for all uses. **When activated within 4 days, residual control of Palmer by Warrant is far greater than that by Enversa.**
	glyphosate + *S-metolachlor* Dual Magnum 7.62 EC Dual II Magnum 7.64 EC	9 + 15	see *glyphosate* + 1 pt 1 pt	0.75–1.12 + 0.95	24H/ 100D	See comment for *glyphosate* alone. Apply overtop of cotton after fully emerged through 100 days before harvest; do not mix with Staple. For improved weed control and less injury after 8-leaf cotton, apply as a directed spray with a Dual rate up to 1.33 pt/A having a pre-harvest interval of 80 days. Many products containing *metolachlor* (not *S-metolachlor*) are available. *Metolachlor* products are less effective per unit of formulated product. In general, it takes 1.5 pt of metolachlor to give the same control as 1.0 pt of *S-metolachlor.*
	glyphosate + *S-metolachlor* Sequence 5.25 L	9 + 15	 2.5 pt/A	0.7 + 0.94	24H/ 100 D	Label allows application from cotyledon stage cotton to the 10-leaf stage but not to exceed 12 inches in height. See comments above for *glyphosate* + Dual Magnum. Rate can be increased on cotton between 5 and 10 leaf but injury can be severe (2-3.5 pt/A is the range provided on the label). Do not mix with Staple.
	glyphosate + *dimethenamid* Outlook 6 EC	9 + 15	see *glyphosate* + 12–16 fl oz	0.75–1.12 + 0.56–0.75	12H/ 2nd week after bloom	See comments for *glyphosate* alone. Apply overtop from 1st cotton leaf through 2nd week of bloom; do not mix with Staple. Two applications may be made not to exceed 31 oz/A per year. For improved weed control and less injury after 8-leaf cotton, apply as a directed spray.
Staple improves control of hemp sesbania, morningglory, tropical spiderwort, and *glyphosate*-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. **Will not control ALS + *glyphosate* resistant Palmer.**	*glyphosate* + *pyrithiobac* Staple LX 3.2 SL	9 + 2	see *glyphosate* + 2–3 fl oz	0.75–1.12 + 0.05–0.07	4 H/ 60 D	See comments for *glyphosate* and Staple alone. Apply overtop from full cotton cotyledonary stage until 60 days prior to harvest. For improved weed control and less injury, apply as a directed spray after 8-leaf cotton. 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/*metolachlor* products or Warrant. For Palmer amaranth, suggest applying 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 and for control of emerged morningglory, a rate of 2.1 oz/A should perform very well.

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE: AMOUNT OF FORMULATION	BROADCAST RATE/ACRE: LBS ACTIVE (AI or AE)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLUFOSINATE (LIBERTY, ETC.) AND GLYPHOSATE (ROUNDUP, ETC.) ***(continued)***						
Envoke improves *Ipomoea* morningglory and nutsedge control. Also provides some residual control of sensitive weeds if it reaches the soil and is activated. Best option for control of non-STS soybean although 0.1 oz/A of Envoke only provides fair control; higher rates are more effective.	*glyphosate* + *trifloxysulfuron* Envoke 75 WDG	9 + 2	see *glyphosate* + 0.1 oz	0.75–1.12 + 0.0047	12 H/ 60 D	See comments for *glyphosate* and Envoke applied alone. Tank mix can be applied from 5-leaf stage until 60 days of harvest; however, directed application strongly encouraged for improved weed control and much less injury. Label allows the rate of Envoke to be increased to 0.15 oz/A when applying overtop. If directing, rate range for Envoke is 0.1-0.25 oz/A. If applying topically, gain experience with a few acres first ensuring injury level is within your acceptable range. Will not control ALS + *glyphosate* resistant pigweed.
Volunteer Roundup Ready corn in Roundup Resistant cotton. Also these mixtures should be considered for the control of goosegrass where the highest rate should be applied.	*glyphosate* + *clethodim* Clethodim, others 2 EC Select Max 0.97EC	9 + 1	see *glyphosate* + 4–8 fl oz 8–16 fl oz	0.75–1.12 + 0.06–0.13	24 H/ 60 D	**See comments for *glyphosate* alone.** ***Clethodim*:** For Select Max: 8-12 oz/A for 12" corn, 12-14 oz/A for 24" corn, and 16 oz/A for 36" corn. For 2 lb products: 4-6 oz/A for 12" corn; 6-8 oz for 24" corn, and 8 oz/A for 36" corn. Add 2.5 lb/A *ammonium sulfate* or equivalent and make sure *glyphosate* brand used contains adjuvant. **Fusilade DX:** Apply 4 oz for corn less than 12". Increase rate to 6 oz for corn up to 24". Add 0.25% by volume of crop oil concentrate. **Assure II:** Apply at 4 oz to corn up to 12", 5 oz for corn up to 18", and 8 oz to corn up to 30". Add 0.25% nonionic surfactant by volume.
	glyphosate + *fluazifop–p–butyl* Fusilade DX 2 EC	9 + 1	see *glyphosate* + 4–6 fl oz	0.75–1.12 + 0.06–0.09	12 H/ 90 D	
	glyphosate + *quizalofop–p–ethyl* Assure II 0.88 EC	9 + 1	see *glyphosate* + 4–8 fl oz	0.75–1.12 + 0.03–0.05	12 H/ 80 D	

1. 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: AMOUNT OF FORMULATION	BROADCAST RATE/ACRE: LBS ACTIVE (AI or AE)	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO 2,4-D (ENLIST ONE OR DUO)						
2,4-D is extremely effective on many broadleaf weeds including spiderwort and morningglory; pigweed needs to be less than 3" and sequential applications are often needed. **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.** **All current formulations of *2,4-D* are volatile! The *choline* formulation is generally less volatile than the *amine* formulation with the ester or acid formulations being the most volatile by far.**	*2,4-D choline* Enlist One 3.8 S + approved *glyphosate* *or* approved *glufosinate*	9	32 fl oz + see *glyphosate* *or* see *glufosinate*	0.95 + see *glyphosate* *or* see *glufosinate*	48 H/ first bloom	**Enlist Variety Only:** Enlist One or Enlist Duo are the only brands of *2,4-D* currently approved for this use. Apply anytime from cotton emergence to first bloom. May apply twice, allow 12 days between applications. Suggest applications after the 8-leaf stage of cotton be directed for reduced drift, reduced injury potential, and increased weed control. For Enlist One, label currently allows tank mixtures with several herbicides including several *glyphosate* and *glufosinate* products, Enversa, Warrant, or Dual Magnum. **Enlist One and Enlist Duo require a boom height of no more than 24" above the target, a 30 foot downwind spray drift buffer for ground applications, and 4 points of runoff mitigation to meet ESA requirements; see the label for methods to reduce buffer distance and achieve runoff mitigation points.** **Additionally, study the label for spray tip, spray droplet size, wind speed, and ground speed requirements.**
	glyphosate + *2,4-D choline* Enlist Duo 3.3 S	9 + 4	4.75 pt	1 (lb ae) + 0.95	48 H/ first bloom	
ADDITIONAL POSTEMERGENCE WEED CONTROL OPTIONS FOR COTTON RESISTANT TO DICAMBA						
At time of editing, significant efforts to once again obtain registration for Xtendimax, Engenia, and Tavium use in dicamba-resistant cotton are underway. Currently, labels have not been approved by the US EPA. Consult with your local Extension agent for the latest details regarding potential use in 2026.						

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
POSTEMERGENCE DIRECTED—ANY VARIETY						
Control of many broadleaf weeds including spiderwort and nutsedge; residual control of many weeds if activated. Grasses should be < 1" or a *glyphosate* mixture would be in order. ***Diuron* plus *MSMA* is the best directed option to control emerged *glyphosate*-resistant Palmer amaranth.** *Diuron* is better on emerged pigweed than Caparol, Cotoran, or Valor. Valor provides more effective residual control of pigweed.	*diuron* Direx, Diuron, other 4 L + *MSMA* (several brands) 6 lb/gal 6.6 lb/gal	7 + 17	1.6–2.4 pt + 2 pt 2 pt	0.8–1.2 + 1.5–1.65	12 H/ 1st Bloom	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. If soil type allows, apply 2 pt/A of *diuron* for control of emerged Palmer amaranth. Label prohibits applying *MSMA* after 1st bloom. **To improve emerged morningglory and nutsedge control consider adding Envoke at 0.1 oz/A, which has no additional injury concern.** **To improve spiderwort, pigweed, and grass residual control consider adding:** 1) Dual Magnum 1.0–1.33 pt/A; 2) Warrant 2–3 pt/A; 3) Zidua 4.17 SC 2.5–3.5 fl oz/A with cotton having > 5 leaves; or 4) Outlook 12–16 oz/A. Numerous formulations of *diuron* and *MSMA* are available.
Controls many broadleaf weeds and nutsedge; grasses should be < 0.5". Palmer amaranth should be < 2". Residual control of many weeds if activated. If grasses are present, a *glyphosate* mixture would be in order. *Diuron* is better on emerged pigweed than Caparol, Cotoran, or Valor; however, Valor provides the best residual control by far.	*flumioxazin* Valor SX 51WDG Valor EZ 4 SC + *MSMA* (several brands) 6 lb/gal 6.6 lb/gal	14 + 17	2 oz 2 fl oz + 2.6 pt 2.4 pt	0.064 + 2	12 H/ 1st Bloom	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. 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 *MSMA* after 1st bloom. IN HOODED APPLICATIONS when no crop contact occurs; consider the addition of Dual or Warrant for managing tropical spiderwort and Palmer amaranth. Outflank, Panther, and Rowel perform similarly to Valor. **For PPO-resistance management**, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.
The single best layby mixture for control of both emerged *glyphosate*-resistant Palmer amaranth and extended residual control. Grass must be < 0.5". Be careful, mixture is "hot."	*flumioxazin* Valor SX 51 WDG Valor EZ 4 SC + *diuron* Direx, others 4 L + *MSMA* (several brands) 6 lb/gal 6.6 lb/gal	14 + 7 + 17	1–2 oz 1–2 oz + 1–2 pt + 2 pt 2 pt	0.032–0.064 + 0.5–1.0 + 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. See and follow restrictions just above for *diuron* + *MSMA* or *flumioxazin* + *MSMA* mixtures. Experiment with this mixture on limited acreage as crop injury is of some concern. 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 *MSMA* 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 compared to *flumioxazin* + *MSMA* but better residual control is expected.	*flumioxazin* + *pyroxasulfone* Fierce EZ 3.04 SC + *MSMA* 6 lb/gal 6.6 lb/gal	14 + 15 + 17	6 fl oz + 2.6 pt 2.4 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 as long as no crop contact. 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 *MSMA* after 1st bloom.

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

WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
POSTEMERGENCE DIRECTED—ANY VARIETY *(continued)*						
Effective control of many broadleaf weeds, nutsedge, and small annual grasses. Residual control of many weeds. Less effective than *diuron* mix for emerged pigweed and less residual on pigweed than *diuron* or Valor but safer to the cotton.	*fluometuron* Cotoran 4 L + *MSMA* (several brands) 6 lb/gal 6.6 lb/gal	7 + 17	2–3 pt + 2.6 pt 2.4 pt	1–1.5 + 2	12 H/ 1st Bloom	Apply as a directed spray to cotton at least 3" tall; cotton has very good tolerance. Labels suggests the need for 0.5% v/v of surfactant and prohibits applying *MSMA* after 1st bloom. Cotoran may be applied by itself overtop of cotton but expect significant injury. **To improve emerged morningglory and nutsedge control consider adding** Envoke at 0.1 oz/A after cotton reaches the 5-leaf stage. **To improve spiderwort, pigweed, and grass residual control consider adding:** 1) Dual Magnum 1.0–1.33 pt/A; 2) Warrant 2–3 pt/A; 3) Zidua 4.17 SC 2.5–3.5 fl oz/A with cotton having >5 leaves; or 4) Outlook 12–16 oz/A.
Effective control of many broadleaf weeds, nutsedge, and small annual grasses. Less effective than *diuron* mix in controlling emerged pigweed and less residual on pigweed than *diuron* or Valor.	*prometryn* Caparol 4 L + *MSMA* (several brands) 6 lb/gal 6.6 lb/gal	5 + 17	1.3–2.4 pt + 2.6 pt 2.4 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 *MSMA* after 1st bloom. **To improve emerged morningglory and nutsedge control consider adding** Envoke at 0.1 oz/A after cotton reaches the 5-leaf stage. **To improve spiderwort, pigweed, and grass residual control consider adding:** 1) Dual Magnum 1.0–1.33 pt/A; 2) Warrant 2–3 pt/A; 3) Zidua 4 SC 1.25–2.5 fl oz/A with cotton having >5 leaves; or 4) Outlook 12–16 oz/A.
ADDITIONAL POSTEMERGENCE DIRECTED WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLYPHOSATE (ROUNDUP, ETC.)						
Controls most annual weeds; exceptions include resistant Palmer amaranth and horseweed, dayflower, doveweed, Florida pusley, tropical spiderwort, and hemp sesbania. Morningglory, nutsedge, and purslane can be challenging. Goosegrass is very difficult to control and should be less than 3".	*glyphosate* 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 5.88S (4.8 lb ae) 6S (5 lb ae)	9	32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 21–30 fl oz 19–29 fl oz	0.75–1.12 lb ae	4 H/ 7 D	*Glyphosate* should almost 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.
Mixing *diuron* with *glyphosate* improves morningglory, spiderwort, 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 *glyphosate* alone.	*glyphosate* + *diuron* Direx, Diuron 4 L	9 + 7	see *glyphosate* + 1–1.5 pt	0.75–1.12 + 0.5–0.75	12 H/ 7 D	Use 1 pt/A of diuron on cotton 8–12" and up to 1.5 pt/A of diuron on cotton greater than 12". Label prohibits use of diuron on sand or loamy sand soils, or any soils with less than 1% organic matter. **To improve spiderwort, pigweed, and grass residual control consider adding:** 1) Dual Magnum 1–1.33 pt/A; 2) Warrant 2–3 pt/A; 3) Zidua 4.17 SC 2.5–3.5 fl oz/A with cotton having >5 leaves; or 4) Outlook 12–16 oz/A. **To improve morningglory and nutsedge consider adding** Envoke 0.1 oz/A with no additional restrictions. **To improve morningglory control and provide excellent residual control of many weeds consider adding** 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 diuron at this rate often lasts 7–10 days.

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WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
ADDITIONAL POSTEMERGENCE DIRECTED WEED CONTROL OPTIONS FOR COTTON RESISTANT TO GLYPHOSATE (ROUNDUP, ETC.) (*continued*)						
Mixing Valor with *glyphosate* improves morningglory and tropical spiderwort control and provides residual control of many broadleaf weeds including pigweeds, purslane, and Florida pusley. Often poor control of *glyphosate*-resistant Palmer amaranth over 1" but excellent residual control.	*glyphosate* + *flumioxazin* Valor SX 51WDG Valor EZ 4SC	9 + 14	see *glyphosate* + 1–2 oz 1–2 fl 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. **The addition of *diuron* will improve control of emerged pigweed.** Add nonionic surfactant at 1 qt/100 gal spray mix but only if *glyphosate* 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. **For PPO-resistance management**, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.
Provides similar post-emergence control as *glyphosate* + Valor but provides greater residual control for many weeds including spiderwort and Palmer amaranth.	*glyphosate* + *flumioxazin* + *pyroxasulfone* Fierce EZ 3.04 SC	9 + 14 + 15	see *glyphosate* + 6 fl oz	0.75–1.12 + 0.063 + 0.08	12 H/ 60 D	Cotton should be 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.
Mixing Caparol with *glyphosate* improves morningglory control and provides residual control of sensitive species; although morningglory must still be small for adequate control. The tank mix may give less grass control than *glyphosate* alone.	*glyphosate* + *prometryn* Caparol 4 L	9 + 5	see *glyphosate* + 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 *glyphosate* brand requires it. **To improve spiderwort, pigweed, and grass residual control consider adding:** 1) Dual Magnum 1–1.33 pt/A; 2) Warrant 2–3 pt/A; 3) Zidua 4.17 SC 2.5-3.5 fl oz/A with cotton having >5 leaves; or 4) Outlook 12–16 oz/A. **To improve morningglory and nutsedge control consider adding** Envoke 0.1 oz/A, no additional restrictions **To improve morningglory control and improve residual control of many weeds consider adding** 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 *prometryn* throughout the plant.
Mixing Anthem Flex with *glyphosate* will improve control of morningglory and spiderwort while providing residual control of sensitive species.	*glyphosate* + *pyroxasulfone* + *carfentrazone* Anthem Flex 4 SE	9 + 15 + 14	see *glyphosate* + 1.36–2.7 fl oz	0.75–1.12 + 0.04 + 0.003–0.079 + 0.006	12 H/ 7 D	Suggest cotton at least 18" (label allows application as long as cotton is over 12"; see label). Direct spray to the lower 2" of a barky cotton stem; do not contact the green portion of the cotton stem, foliage, or blooms. Gain experience before significant use.
Mixing Envoke with *glyphosate* improves *Ipomoea* morningglory, non-STS soybeans, and nutsedge control and provides some residual control of sensitive species.	*glyphosate* + *trifloxysulfuron* Envoke 75 WDG	9 + 2	see *glyphosate* + 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. Excellent tolerance when directed. The addition of *diuron* will improve control of emerged pigweed.

1. 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)		
POSTEMERGENCE—HOODED ROW MIDDLE—ANY CULTIVAR						
Glyphosate 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 as reduced control of some weeds is expected.	*glyphosate* 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 5.88 (4.8 lb ae) 6S (5 lb ae)	9	 32–48 fl oz 24–36 fl oz 23–34 fl oz 22–32 fl oz 21–30 fl oz 19–29 fl oz	0.75–1.12	4 H/ 7 D	In varieties not resistant to *glyphosate*, 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 *glyphosate* to improve weed control. Follow application restrictions as provided on labels.
Annual grass and broadleaf weeds; suppression of nutsedge. Mixtures with *diuron* would be the most effective option to control emerged pigweed and most other broadleaf weeds in row middles.	*paraquat* 3 SL	22	 13–21 fl oz	0.3–0.5	48 H/ 3 D	SALVAGE APPLICATION! DO NOT CONTACT COTTON STEMS OR FOLIAGE. **EPA has restricted the use of *paraquat* 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 *diuron* mixed with *paraquat* will likely improve control of emerged weeds and provide residual control. **If *paraquat* contacts the cotton stem severe damage is to be expected!**
Timing for pigweed and grasses are critical. Control of pusley, spiderwort, and goosegrass is usually not good. Generally, treat broadleaf weeds prior to 3" and grasses prior to 2". Excellent control of morningglory including moonflower morningglory. *Diuron* plus *MSMA or paraquat is* more effective on Palmer.	*glufosinate-ammonium* Liberty, others 2.34 SL Liberty Ultra 1.76 SL	10	 29–43 fl oz 19–29 fl oz	 0.53–0.79 0.26–0.40	12 H/ 70 D	On non-*glufosinate* tolerant cotton, keep hoods close to ground to avoid contact with cotton stem. Suggest cotton be at least 8". The addition of *diuron* or other residual herbicide strongly encouraged. Ammonium sulfate (AMS) at 1.5 to 3 lb/A may be used; improves control of difficult to manage weeds occasionally. Apply no more than 58 oz/A of Liberty Ultra or 87 oz/A of the 2.34 lb products per acre per year. To maximize control: ≥15 GPA water volume, thorough spray coverage, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 2 hours of sunset. **For resistance management:** suggest no more than two applications of *glufosinate* in a field per year.

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WEED	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)		
HARVEST AID						
Mature morningglory	*carfentrazone-ethyl* Aim 2 EC	14	up to 1.6 fl oz	up to 0.025	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). Label advises adding NIS during warmer conditions and COC in cooler conditions. See cotton defoliation section for potential negative influence on defoliation activity.
	pyraflufen ethyl ET 0.208 EC ETX 0.335 EC	14	1.5–2.75 fl oz 0.9–1.7 fl oz	0.0024–0.0045	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).Label does not discuss adjuvant. See cotton defoliation section for potential negative influence on defoliation activity. Label suggests 20-30 GPA for improved coverage.
Desiccation of most weeds. Regrowth of many weeds occurs soon after application.	*paraquat* Gramoxone 3 SL	22	0.7–1.3 pt	0.26–0.487	24 H/ 3 D	**EPA has restricted the use of *paraquat* to certified applicators ONLY and applicators must take a specialized training before use.** Defoliate cotton as normal. After at least 85% of bolls are open, the remainder of bolls expected to harvest are mature, and most of the cotton leaves have dropped, apply *paraquat* in a minimum of 10 GPA understanding 20 GPA will likely be far more effective. Label suggests waiting 3–7 days after defoliation to minimize leaf sticking. 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. Be aware of potential pine tree and other sensitive crop/plant injury with drift.
Annual grasses and broadleaf weeds	*glyphosate* 4 S (3 lb ae) 5.4 S (4 lb ae) 5 S (4.17 lb ae) 5.5 S (4.5 lb ae) 5.88 S (4.8 lb ae) 6 S (5 lb ae)	9	 32–64 fl oz 24–48 fl oz 23–46 fl oz 22–44 fl oz 21–40 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 defoliants. See label and defoliant section. May apply in cotton with R R Flex Technology up until 7 days before harvest. Will not improve defoliation of tolerant cotton.

1. 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[1, 2, 3]										
	2,4-D	*GLYPHOSATE*	*GLYPHOSATE* + *2,4-D*	*GLYPHOSATE* + *DICAMBA*	*GLYPHOSATE* + AIM OR ET	*GLYPHOSATE* + DIREX	*GLYPHOSATE* + HARMONY EXTRA	*GLYPHOSATE* + REVITON	*GLYPHOSATE* + VALOR SX	*PARAQUAT*	*PARAQUAT* + DIREX
GRASSES / SEDGES											
annual bluegrass	N	E	E	E	E	E	E	E	E	G–E	E
bermudagrass	N	F	F	F	F	F	F	F	F	P	P
crabgrass	N	E	G–E	G–E	E	G	E	E	E	F–G	G
goosegrass	N	G	F	P–F	F–G	P–F	G	F–G	F–G	P–F	F
Italian ryegrass	N	G[6]	F–G[6]	F[6]	G[6]	F–G[6]	G[6]	G[6]	G[6]	F	F
johnsongrass	N	G–E	G	G	G–E	F–G	G–E	G–E	G–E	P	P
little barley	N	E	E	E	E	E	E	E	E	G	G–E
sandbur	N	E	G–E	G–E	E	G	E	E	E	G	G
Texas panicum	N	E	G–E	G–E	E	G–E	E	E	E	G	G–E
volunteer corn-*glyphosate* resistant	N	N	N	N	N	N–P	N	N	P	F	F–G
purple nutsedge	N	F–G	F–G	F	F–G	F–G	F–G	F–G	G	P–F	F
yellow nutsedge	N	F	P–F	P–F	F	F	F	F	F	P–F	F
BROADLEAVES											
bristly starbur	G	E	E	E	E	E	E	E	E	E	E
buttercup	G	E	E	E	E	E	E	E	E	E	E
Carolina geranium	F	P–F	F–G	G	F–G	G	G–E	F	G	G–E	E
chickweed	P	E	E	E	E	E	E	E	E	E	E
citronmelon	F	G–E	E	E	E	G–E	G–E	G–E	E	F	G
cocklebur	E	E	E	E	E	E	E	E	E	G–E	E
coffee senna	G	E	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	G–E	E	F–G	G–E
cowpea	G	E	E	E	E	E	E	E	E	E	E
cudweed	P	E	E	E	E	E	E	E	E	F–G	G
curly dock	P–F	F	F–G	G	F	P–F	E	F	F	N–P	P
cutleaf primrose	E	P–F	E	G	F	F–G	F	F–G	F–G	F[4]	G–E[4]
eclipta	P	G–E	E	E	G–E	G–E	G–E	G–E	G–E	F	F

WEED SPECIES	BURNDOWN TREATMENT[1, 2, 3]										
	2,4-D	*GLYPHOSATE*	*GLYPHOSATE* + *2,4-D*	*GLYPHOSATE* + *DICAMBA*	*GLYPHOSATE* + AIM OR ET	*GLYPHOSATE* + DIREX	*GLYPHOSATE* + HARMONY EXTRA	*GLYPHOSATE* + REVITON	*GLYPHOSATE* + VALOR SX	*PARAQUAT*	*PARAQUAT* + DIREX
BROADLEAVES *(continued)*											
Florida beggarweed	P–F	E	E	E	E	E	E	E	E	E	E
Florida pusley	F	P–F	G	G	G	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	G–E	G[4]	E[4]
horseweed	G–E[5]	G–E[6]	E[6]	E[6]	G–E[6]	G–E[6]	G–E[6]		G–E[6]	P–F	F–G
lambsquarters	G–E	F–G	E	E	G–E	G–E				F–G	G
morningglory, *Ipomoea*	G–E	F	E	E	E	G	F	E	E	F–G	G–E
morningglory, smallflower	F–G	G	E	E	G–E	G–E	G		E	P	F–G
Palmer amaranth	F	E	E	E	E	E	E	E	E	F–G	G–E
Palmer amaranth (*glyphosate*-resistant)	F	N	F–G	F–G	P–F	G	P	F	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	F	G–E	G–E	F–G	G	F		G	G	G–E
ragweed	E	G	E	E	G–E	G		G–E		G	G
redweed	F	G	G–E	G–E	G–E	G				F	G
shepherdspurse	G	G	G–E	G–E	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

1. Application rates per acre: Dicamba: 0.5 lb ai; *2,4-D*: 1–1.5 pt; Aim: 1 oz; ET: 1–2 oz; *diuron*: 0.5–1.0 lb ai; *glyphosate*: 1.13 lb ae; *paraquat*: 0.75–1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Reviton: 1–2 oz; Valor: 2 oz.
2. Mixing herbicides with *glyphosate* occasionally reduces grass control (including cover crops). This is more likely with large weeds in dry conditions.
3. Numerous burndown herbicides have plant-back intervals that must be followed to avoid crop injury; this information can be obtained from the cotton weed control section or the herbicide label.
4. This level of control requires plants to be in full bloom with seed forming when treated.
5. This level of control requires 2 pt of *2,4-D* (3.8 lb ai per gallon product).
6. *Glyphosate* will not control *glyphosate*-resistant horseweed and ryegrass.
7. Small grain must have visible seedheads for this level of control.

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON

WEED SPECIES	BURNDOWN TREATMENT[1, 2, 3]										
	2,4-D	*GLYPHOSATE*	*GLYPHOSATE* + *2,4-D*	*GLYPHOSATE* + *DICAMBA*	*GLYPHOSATE* + AIM OR ET	*GLYPHOSATE* + DIREX	*GLYPHOSATE* + HARMONY EXTRA	*GLYPHOSATE* + REVITON	*GLYPHOSATE* + VALOR SX	*PARAQUAT*	*PARAQUAT* + DIREX
BROADLEAVES *(continued)*											
sicklepod	F–G	G–E	E	E	G–E	E	G–E	G–E	E	G–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	G–E	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	G	F–G	F–G	F	P–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	F–G	G	G	E	G	G	F–G	G–E
COVER CROPS											
clover	F	F	F–G	G–E	F	F–G		G	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	E	G[7]	G–E[7]
vetch	E	F	E	E	F	F–G	G		F–G	P–F[4]	F–G[4]

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.

1. Application rates per acre: Dicamba: 0.5 lb ai; *2,4-D*: 1–1.5 pt; Aim: 1 oz; ET: 1–2 oz; *diuron*: 0.5–1.0 lb ai; *glyphosate*: 1.13 lb ae; *paraquat*: 0.75–1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Reviton: 1–2 oz; Valor: 2 oz.
2. Mixing herbicides with *glyphosate* occasionally reduces grass control (including cover crops). This is more likely with large weeds in dry conditions.
3. Numerous burndown herbicides have plant-back intervals that must be followed to avoid crop injury; this information can be obtained from the cotton weed control section or the herbicide label.
4. This level of control requires plants to be in full bloom with seed forming when treated.
5. This level of control requires 2 pt of *2,4-D* (3.8 lb ai per gallon product).
6. *Glyphosate* will not control *glyphosate*-resistant horseweed or ryegrass.
7. 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	PREEMERGENCE							
	PROWL, TREFLAN, OTHERS	PROWL[1]	BRAKE + REFLEX	COMMAND	COTORAN	DIREX	REFLEX	STAPLE	WARRANT
PERENNIALS									
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	N–P
purple nutsedge	N	N	N–P	N	N	N	P	F	N–P
ANNUAL GRASSES									
broadleaf signalgrass	G	F	G	E	P	P	F	P	G
crabgrass	E	G	G	E	F–G	F	F	P	E
crowfootgrass	E	G		G	F–G	F	F		E
fall panicum	G	F–G	F	G–E	F	P	F	P–F	G
foxtails	E	G		E	F–G		F	P	E
goosegrass	E	G	G–E	E	F	F	F	P–F	E
johnsongrass (seedling)	E	G		G	P	P	F	F–G	F
sandbur	E	G	G	F–G	G	G	F		F–G
Texas panicum	G	F	G	F	P	P	F	N	P–F
ANNUAL BROADLEAVES									
bristly starbur	N	N	G–E	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	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.

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

WEED RESPONSE TO BURNDOWN WEED RESPONSE TO HERBICIDES USED IN COTTON

WEED SPECIES	PRE-PLANT INCORPORATED	PREEMERGENCE							
	PROWL, TREFLAN, OTHERS	PROWL[1]	BRAKE + REFLEX	COMMAND	COTORAN	DIREX	REFLEX	STAPLE	WARRANT
ANNUAL BROADLEAVES *(continued)*									
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	N		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
morninglories									
Ipomoea	P	P	F	P–F[2]	G	F	P–F	F[3]	P
smallflower	P	P	G–E	P	G–E	G	G	E	P
Palmer amaranth	F–G	P–F	E	N–P	P–F	F–G	E	G–E[3]	G
pigweed: redroot or smooth	G–E	F–G	E	P	G	G–E	E	E	G–E
prickly sida	N	N	G	E	G	F	F–G	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	N	N	F	N	G	G		G	
Pennsylvania	N	N	F	E	G	G		G	
sicklepod	N	N	P	P	F–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	P	F	F	P–F	N	P	E
volunteer peanuts	N	N	P	N	P–F	P	P	P	N
wild poinsettia	N	N	G–E	F	N	N	G–E	G	P

Key:

E—90% or better control

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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.

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

WEED SPECIES	RESIDUAL CONTROL BY POST APPLIED HERBICIDES (Assuming soil contact and activation)			
	DUAL MAGNUM	STAPLE	ENVOKE	WARRANT
PERENNIALS				
bermudagrass	N	N	N	N
johnsongrass (rhizome)	P	N	N	P
yellow nutsedge	F	P–F		P
purple nutsedge	P	F		P
ANNUAL GRASSES				
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
ANNUAL BROADLEAVES				
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
morninglories				
Ipomoea	P	F[3]		P
smallflower	P	E	P–F	P
Palmer amaranth	G	G–E[3]	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		G		
Pennsylvania		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–F	P	N
wild poinsettia	P	G		P

Key:

E—90% or better control

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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.

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

WEED RESPONSE TO HERBICIDES USED IN COTTON

WEED SPECIES	POST OVER-THE-TOP								
	ASSURE II	FUSILADE	POAST	SELECT/ SELECT MAX	*MSMA*	COTORAN	STAPLE	ENVOKE	ENVOKE + STAPLE
PERENNIALS									
bermudagrass	F–G	F–G	F	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
ANNUAL GRASSES									
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	P	P–F	N–P	N–P	N–P
goosegrass	F	F	F–G	F–G	P	P	N–P	N–P	N–P
johnsongrass (seedling)	E	G–E	G–E	E	P	P	P	P	P–F
sandbur	G	G	G	G	P	P	P		
Texas panicum	G	G	E	E	N–P	N	N	N–P	P
ANNUAL BROADLEAVES									
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		

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 SPECIES	POST OVER-THE-TOP								
	ASSURE II	FUSILADE	POAST	SELECT/ SELECT MAX	*MSMA*	COTORAN	STAPLE	ENVOKE	ENVOKE + STAPLE
ANNUAL BROADLEAVES *(continued)*									
jimsonweed	N	N	N	N	P	G	E	N	
lambsquarters	N	N	N	N	P	G	N	G	
Ipomoea morninglories	N	N	N	N	P–F	F–G	G[1]	G	G–E
Smallflower morningglory	N	N	N	N	P–F	G	E	N	E
Palmer amaranth	N	N	N	N	N–P	P–F	F	P–F	F
Palmer amaranth (ALS resistant)	N	N	N	N	N–P	P–F	N	N	N
pigweed: smooth and redroot	N	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	

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.

1. Staple does not control tall morningglory.

WEED RESPONSE TO HERBICIDES USED IN COTTON

WEED SPECIES	POST OVER-THE-TOP							
	LIBERTY	LIBERTY + ENLIST ONE	LIBERTY + STAPLE	*GLYPHOSATE*	*GLYPHOSATE + 2,4-D CHOLINE*	*GLYPHOSATE* + ENGENIA or XTENDIMAX[3]	*GLYPHOSATE* + STAPLE	*GLYPHOSATE* + ENVOKE
PERENNIALS								
bermudagrass	N	N	N	F	F	F	F	F
johnsongrass (rhizome)	F[1]		F[1]	G–E	G–E	G–E	G–E	G–E
purple nutsedge	P	P	P–F	F–G	F–G	F	F–G	G–E
yellow nutsedge	P	P	P–F	F	F	P–F	F–G	G–E
ANNUAL GRASSES								
broadleaf signalgrass	G	G	G	E	G–E[2]	G–E[2]	E	E
crabgrass	G	G	G	E	G–E[2]	G–E[2]	E	E
crowfootgrass	G	G	G	E	G–E[2]	G–E[2]	E	E
fall panicum	G	G	G	E	G–E[2]	G–E[2]	E	E
foxtails	G	G	G	E	G–E[2]	G–E[2]	E	E
goosegrass	P	P	P	G	F	P–F	F–G	F–G
johnsongrass (seedling)	G	G	G	E	G–E[2]	G–E[2]	E	E
sandbur	G	G	G	E	G–E[2]	G–E[2]	E	E
Texas panicum	G	G	G	E	G–E[2]	G–E[2]	E	E
ANNUAL BROADLEAVES								
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:

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.

1. This level of johnsongrass control can be obtained with two applications of Liberty.
2. For the higher level of control, grasses must be less than 3".
3. Engenia, XtendiMax, and Tavium labels were vacated during 2024. At the time of print, no in-crop *dicamba* formulations are labeled for use in *dicamba*-resistant cotton. Check with your local extension agent for the latest details.

WEED SPECIES	POST OVER-THE-TOP							
	LIBERTY	LIBERTY + ENLIST ONE	LIBERTY + STAPLE	*GLYPHOSATE*	*GLYPHOSATE + 2,4-D CHOLINE*	*GLYPHOSATE* + ENGENIA or XTENDIMAX[3]	*GLYPHOSATE* + STAPLE	*GLYPHOSATE* + ENVOKE
ANNUAL BROADLEAVES *(continued)*								
Florida pusley	F	G	F	F–G	G	G	F–G	F–G
hemp sesbania	G–E	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
Ipomoea morninglories	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 (*glyphosate*-resistant)	F–G	G–E	G	N	G	G	F	P–F
Palmer amaranth (*glyphosate*- and ALS-resistant)	F–G	G–E	G	N	G	G	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	G–E	G	F	G–E	F	G	F–G
volunteer peanuts	G	G	G–E	F–G	F–G	E	G	F–G
wild poinsettia	P	G	F	G–E	G–E	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.

1. This level of Johnsongrass control can be obtained with two applications of Liberty.
2. For the higher level of control, grasses must be less than 3".
3. Engenia, XtendiMax, and Tavium labels were vacated during 2024. At the time of print, no in-crop dicamba formulations are labeled for use in dicamba-resistant cotton. Check with your local extension agent for the latest details.

WEED RESPONSE TO HERBICIDES USED IN COTTON

WEED SPECIES	POSTEMERGENCE-DIRECTED						
	MSMA	COTORAN + *MSMA*	CAPAROL + *MSMA*	DIREX + *MSMA*	COBRA + *MSMA*	VALOR + *MSMA*	DIREX + *MSMA* + ENVOKE
PERENNIALS							
bermudagrass	N	N	N	N	N	N	N
johnsongrass (rhizome)	P	P	P	P	P	P	P
purple nutsedge	F	F	F	F	F	F–G	E
yellow nutsedge	F–G	F–G	F–G	G	F–G	G	E
ANNUAL GRASSES							
broadleaf signalgrass	F	F	F	F–G	P–F	F	F–G
crabgrass	F	F	F–G	F–G	P–F	F	F–G
crowfootgrass	F	F	F–G	F–G	P–F	F	F–G
fall panicum	F	F	F–G	F–G	P–F	F	F–G
foxtails	F	F	F–G	F–G	P–F	F	F–G
goosegrass	F	F	F–G	F–G	P–F	F	F–G
johnsongrass (seedling)	F	F	F–G	F–G	P–F	F	F–G
sandbur	F	F	F–G	F–G	P–F	F	F–G
Texas panicum	P	P	F	F	P	P–F	F
ANNUAL BROADLEAVES							
bristly starbur	P–F	G	G	G	G	G	G–E
burgherkin	F	F–G	G	G	G		
citronmelon	F	G	F–G	G	G		G–E
cocklebur	E	E	E	E	E	E	E
coffee senna	F	G	G	G	F	G	
cowpea	F–G	G	G	G	F–G	G	E
crotalaria	G	G	G	G	G		E
eclipta		G	G	E	E	E	E
Florida beggarweed	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 SPECIES	POSTEMERGENCE-DIRECTED (*continued*)						
	MSMA	COTORAN + *MSMA*	CAPAROL + *MSMA*	DIREX + *MSMA*	COBRA + *MSMA*	VALOR + *MSMA*	DIREX + *MSMA* + ENVOKE
ANNUAL BROADLEAVES *(continued)*							
Florida pusley	P	F	F	F	F	F–G	F-G
hemp sesbania	N	P–F	P–F	P–F	F		
jimsonweed	F	G–E	G	G	G–E	E	G
lambsquarters	P–F	G	G	G	F	F–G	G–E
morningglories	P–F	F–G	G	G	E	E	E
Palmer amaranth	P	F	F	G–E	F	F–G	G–E
pigweed: redroot or smooth	P–F	G	G	G–E	G	G–E	E
prickly sida	P	F–G	G–E	G–E	G–E	G–E	G–E
purslane	P–F	F–G	F–G	G	G	G	G–E
ragweed, common	F	G–E	E	E	E	G–E	E
redweed	N	F–G	G	G–E	F		
sicklepod	F	G	G–E	G–E	P–F	G	E
smartweed: ladysthumb and Pennsylvania	P	G	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)		
spurge	N	P–F	G	G	G	G	
tropic croton	F	G	G	G	E	E	G–E
tropical spiderwort	F	G	F–G	G–E	F–G	G	E
volunteer peanuts	P–F	F–G	F–G	G	P–F	F–G	G
wild poinsettia	P–F	F	P–F	P–F	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.

WEED RESPONSE TO HERBICIDES USED IN COTTON

WEED SPECIES	POSTEMERGENCE-DIRECTED (*continued*)						HOOD
	GLYPHOSATE	*GLYPHOSATE* + *DIURON*	*GLYPHOSATE* + DIREX + ENVOKE	*GLYPHOSATE* + DIREX + DUAL MAGNUM	*GLYPHOSATE* + VALOR	LIBERTY	GRAMOXONE + DIREX
PERENNIALS							
bermudagrass	F	F	F	F	F	N	P
johnsongrass (rhizome)	G–E	G	G–E	G	G–E	F	P
purple nutsedge	F–G	F–G	G–E	F–G	F–G	P	P–F
yellow nutsedge	F	F	G–E	F–G	F–G	P	P–F
ANNUAL GRASSES							
broadleaf signalgrass	E	G–E	G–E	G–E	E	G	G
crabgrass	E	G–E	G–E	G–E	E	G	G
crowfootgrass	E	G–E	G–E	G–E	E	G	G
fall panicum	E	G–E	G–E	G–E	E	G	G
foxtails	E	G–E	G–E	G–E	E	G	G
goosegrass	G	F–G	F–G	F–G	F–G	P	G
johnsongrass (seedling)	E	G–E	F–G	G–E	E	G	G
sandbur	E	G–E	G–E	G–E	E	G	G
Texas panicum	E	G–E	G–E	G–E	E	G	G
ANNUAL BROADLEAVES							
bristly starbur	G–E	G–E	G–E	G–E	E	G	E
burgherkin	G	G	G	G			F
citronmelon	G–E	G–E	E	E	E	G	G
cocklebur	E	E	E	E	E	E	G
coffee senna	E	E	E	E	E	G	F
cowpea	G–E	G–E	E	G–E	E	G	G
crotalaria	G	G	G	G			
eclipta	E	E	E	E	E	G	F
FL beggarweed	E	E	E	E	E	G	E
Florida pusley	P–G	G	G–E	G–E	G–E	F	P–F
hemp sesbania	P–F						

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 SPECIES	POSTEMERGENCE-DIRECTED (*continued*)						HOOD
	GLYPHOSATE	*GLYPHOSATE* + *DIURON*	*GLYPHOSATE* + DIREX + ENVOKE	*GLYPHOSATE* + DIREX + DUAL MAGNUM	*GLYPHOSATE* + VALOR	LIBERTY	GRAMOXONE + DIREX
ANNUAL BROADLEAVES (*continued*)							
jimsonweed	E	E	E	E	E	E	G
lambsquarters	G	G–E	G–E	G–E	G–E	E	F
morning glory—Ipomoea	F–G	G	E	G	E	E	F–G
morningglory—smallflower	G	E	E	E	E	E	P–F
Palmer amaranth	E	E	E	E	E	F–G	G–E
Palmer amaranth (*glyphosate*-resistant)	N	G	G	G–E	P–F	F–G	G–E
Palmer amaranth (*glyphosate* & ALS resis.)	N	G	G	G–E	P–F	F–G	G–E
pigweed: redroot or smooth	E	E	E	E	E	G	G–E
prickly sida	F–G	G	G	G	G–E	F–G	P–F
purslane	F–G	G–E	G–E	G–E	G–E	F–G	G
ragweed, common	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	G–E
smartweed	G	G	E	G	G	G–E	G
spider flower					G		
spurge	G	G–E	G–E	G–E	G	F–G	
tropic croton	E	E	E	E	E	G	F
tropical spiderwort	P–F	G	G–E	G–E	G	P–F	E
volunteer peanuts	F	G	G	G	F–G	G–E	P
wild poinsettia	G	G	E	G	G–E	P–F	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.

COTTON DEFOLIATION / HARVEST AID OPTIONS

Camp Hand and Stanley Culpepper, Extension Agronomy and Weed Science

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. Defoliants 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 (The rates below are given in the broadcast amount per acre unless otherwise noted)			REMARKS AND PRECAUTIONS
		EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	LATE-SEASON* (highs below 80°F, lows below 60°F)	
Defoliation Only (combinations provide more consistent defoliation than a single product)	*carfentrazone ethyl* Aim 2.0EC	0.75–1 fl oz	0.75–1 fl oz	1 fl oz	Add non-ionic surfactant at 0.25% v/v during early-season and with 1 oz/A rate; add COC for 0.75 oz rate mid-season. The potential for leaf sticking is greater during periods of high temperatures.
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	Up to 1 fl oz	Up to 1 fl oz	Up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4-6 fl oz	4-6 fl oz	4-6 fl 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. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	0.5–0.6 fl oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	1 fl oz	Add crop oil at 0.5% v/v early-season and increase rate to 1% in cooler conditions. The potential for leaf sticking is greater during periods of high temperatures. Label allows rate up to 2.75 oz/A.
	sodium chlorate Defol 5SL, others	3 lb ai	4 lb ai	4 lb ai	Apply to mature foliage only. Do not mix with products containing *tribufos* or *ethephon*. Label allows a maximum use rate of 6 lb ai.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	1–1.5oz	Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	tribufos Folex 6EC, others	1–1.5 pt	1–1.5 pt	X	Reduce rate to 1.25 pt if above 94°F.
	thidazuron + *diuron* Ginstar 1.5EC, others	X	X	8–10 oz	Limited data are available.
	tribufos Folex 6EC + *paraquat* Gramoxone 3S, others	X	X	1.5 pt + 2–8 oz	May cause crop desiccation and damage to unopened bolls.

*Late-season defoliations may require a preconditioning treatment to be successful (see preconditioning section).

X = denotes product not suggested during those environmental conditions.

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted)		REMARKS AND PRECAUTIONS
		EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	
Regrowth control and defoliation	*thidiazuron* Dropp 4SC, others	3.2 fl oz	3.2 fl oz	For **maximum** regrowth control. *Thidiazuron* is sensitive to wash-off when rain occurs within 24 hours and may be vulnerable through 12 hours after application. Addition of *tribufos* (4–8 oz) or *ammonium sulfate* (2 lb/A) enhances rain fastness.
	thidiazuron + *diuron* Ginstar 1.5EC, others	6.4–8 fl oz	6.4–8 fl oz	Limited data are available on these products. Regrowth control is minimal when these products are applied at rates below 6.4 fl oz.
	thidiazuron Dropp 4SC, others + **ONE OF THE FOLLOWING:**	1.6–2.5 fl oz +	2–2.5 fl oz +	Label allows rate to be increased to 3.2 fl oz.
	carfentrazone ethyl Aim 2.0EC	0.75 fl oz	0.75–1 fl oz	Add non-ionic surfactant at 0.25% v/v during early-season and with 1 oz/A rate; add COC for 0.75 oz rate mid-season. The potential for leaf sticking is greater during periods of high temperatures.
	tribufos Folex 6EC, others	4–16 fl oz	1 pt	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 tribufos by 10–20% when temperatures exceed 94°F. Maximum use rate when mixed with Dropp is 24 fl oz/A.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	up to 1 fl oz	up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4–6 fl oz	4–6 fl oz	Add crop oil at 1 pt/A during early-season and 1–2 pt/A during mid-season. Limited data, use precaution. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	Add crop oil at 1 pt/A. Limited data, use precaution. The potential for leaf sticking is greater during periods of high temperatures.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	Add 0.5% v/v crop oil during early-season and 1% during mid-season. Label allows rate up to 2.75 fl oz.

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted) EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	LATE-SEASON* (highs below 80°F, lows below 60°F)	REMARKS AND PRECAUTIONS
Boll Opening and Defoliation	*ethephon* Prep 6SC, others	2–2.67 pt	2–2.67 pt	2–2.67 pt	
	ethephon Prep 6SC, others + **ONE OF THE FOLLOWING:**	1.33–1.5 pt +	1.5–2 pt +	2–2.67 pt +	
	Carfentrazone ethyl Aim 2.0EC	0.75 fl oz	0.75–1 fl oz	1 fl oz	Add 0.25% v/v non-ionic surfactant at the 0.75 oz rate when conditions are warm/hot. Use crop oil 1% v/v when cooler.
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	up to 1 fl oz	up to 1 fl oz	up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4–6 fl oz	4–6 fl oz	4–6 fl oz	Add 1–2 pt/A crop oil. Limited data, use precaution. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	0.5–0.6 fl oz	Add 1 pt/A crop oil. Limited data, use precaution.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	1 fl oz	Add 0.5% v/v crop oil during early season and 1% during mid- and late-season. Label allows rate up to 2.75 fl oz.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	1.5 fl oz	Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	tribufos Folex 6EC, others	1–1.25 pt	1–1.25 pt	1–1.25 pt	
	thidiazuron Dropp 4SC, others	1.6 fl oz	1.6 fl oz	X	Label allows rate to be increased to 3.2 fl oz/A
	thidiazuron + *diuron* Ginstar 1.5EC, others	4–6 oz	6.4 fl oz	6.4 fl oz	Likelihood of "leaf sticking" is increased when applied at or above 5 oz in combinations of defoliants during early season conditions; rate of 4 oz suggested during periods of high temperatures.

*Late-season defoliations may require a preconditioning treatment to be successful (see preconditioning section).

X = denotes product not suggested during those environmental conditions.

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted) EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	LATE-SEASON* (highs below 80°F, lows below 60°F)	REMARKS AND PRECAUTIONS
Boll Opening and Defoliation (*continued*)	*ethephon* + *urea sulfate* FirstPick 2.28SC + **ONE OF THE FOLLOWING:**	1.75–2 qt +	2 qt +	X	Likelihood of leaf sticking is increased during periods of high temperatures.
	carfentrazone ethyl Aim 2.0EC	0.75 fl oz	0.75–1 fl oz	X	
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	up to 1 fl oz	up to 1 fl oz	X	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4–6 fl oz	4–6 fl oz	X	Add 1–2 pt/A crop oil. Limited data, use precaution. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	X	Add 1 pt/A crop oil. Limited data, use precaution.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	X	Add 0.5% v/v crop oil during early season and 1% during mid- and late-season. Label allows rate up to 2.75 fl oz.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	1.5 oz	Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	tribufos Folex 6EC, others	4–6 fl oz	6–8 fl oz	X	FirstPick label allows one to increase Folex rate up to 12 oz/A but be careful to avoid leaf sticking.
	thidiazuron Dropp 4SC, others	1.6 fl oz	1.6 fl oz	X	Label allows rate to be increased up to 3.2 fl oz/A.
	thidiazuron + *diuron* Ginstar 1.5EC, others	4–6 fl oz	5–6 fl oz	X	Likelihood of "leaf sticking" is increased when applied at or above 5 oz in combinations of defoliants during early season conditions; rate of 4 oz suggested during periods of high temperatures.

*Late-season defoliations may require a preconditioning treatment to be successful (see preconditioning section).

X = denotes product not suggested during those environmental conditions.

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted) EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	LATE-SEASON* (highs below 80°F, lows below 60°F)	REMARKS AND PRECAUTIONS
Boll Opening and Defoliation (*continued*)	*ethephon* + *cyclanilide* Finish 6 PRO + **ONE OF THE FOLLOWING:**	1.33–1.5 pt +	1.33–1.5 pt +	1.75–2 pt +	
	carfentrazone ethyl Aim 2.0EC	0.75 fl oz	0.75–1 fl oz	1 fl oz	Add 0.25% v/v non-ionic surfactant at the 0.75 oz rate when conditions are warm/hot. Use crop oil 1% v/v when cooler.
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	up to 1 fl oz	up to 1 fl oz	up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4–6 fl oz	4–6 fl oz	4–6 fl oz	Add 1–2 pt/A crop oil. Limited data, use precaution. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	0.5–0.6 fl oz	Add 1 pt/A crop oil. Limited data, use precaution.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	1 fl oz	Add 0.5% v/v crop oil during early season and 1% during mid- and late-season. Label allows rate up to 2.75 fl oz.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	1.5 oz	Remarks and precautions: Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	tribufos Folex 6EC, others	4–6 fl oz	6–8 fl oz	8–12 fl oz	
	thidiazuron Dropp 4SC, others	1.6 fl oz	1.6 fl oz	X	
	thidiazuron + *diuron* Ginstar 1.5EC, others	4–6 fl oz	5 fl oz	6 fl oz	Likelihood of "leaf sticking" is increased when applied at or above 5 oz in combinations of defoliants during early season conditions; rate of 4 oz suggested during periods of high temperatures.

*Late-season defoliations may require a preconditioning treatment to be successful (see preconditioning section).

X = denotes product not suggested during those environmental conditions.

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted) EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	REMARKS AND PRECAUTIONS
Boll Opening, Regrowth Control, and Defoliation	*ethephon* Prep 6SC, others + **ONE OF THE FOLLOWING:**	1.33–1.5 pt +	1.5–2 pt +	Limited data are available for some products. *Thidiazuron* rate may be increased to 3.2 fl oz. Regrowth control is minimal when *thidiazuron* + *diuron* is applied at rates below 6.4 fl oz.
	thidiazuron Dropp 4SC, others	2–2.5 fl oz	2–2.5 fl oz	
	thidiazuron + *diuron* Ginstar 1.5EC, others	6.4 fl oz	6.4–8 fl oz	
	ethephon Prep 6SC, others + *thidiazuron* Dropp 4SC, others + **ONE OF THE FOLLOWING:**	1.33–1.5 pt + 2–2.5 fl oz +	1.5–2 pt + 2–2.5 fl oz +	*Thidiazuron* rate may be increased to 3.2 fl oz
	carfentrazone ethyl Aim 2.0EC	0.75 fl oz	0.75–1 fl oz	Add non-ionic surfactant at 0.25% v/v during early-season and with 1 oz/A rate; add COC for 0.75 oz rate mid-season. The potential for leaf sticking is greater during periods of high temperatures.
	tiafenacil Reviton	0.5 oz	0.75–1 oz	Remarks and precautions: Label recommends a crop oil or methylated seed oil be included at 1% v/v, or a nonionic surfactant at 0.25% v/v. Label allows a maximum use rate of 3 oz/acre in a single application, and only 6 oz/acre per season.
	tribufos Folex 6EC, others	6–12 fl oz	8–12 fl oz	
	carfentrazone ethyl + *fluthiacet-methyl* Display 2.05EC	up to 1 fl oz	up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	flumiclorac Resource 0.86EC	4 fl oz	4 fl oz	Add crop oil at 1–2 pt/A; lower rate under hot conditions. Limited data, use precaution. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	0.5–0.6 fl oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	pyraflufen ethyl ETX 0.335 EC	1 fl oz	1 fl oz	Add 0.5% v/v crop oil during early-season and 1% during mid-season. Label allows rate up to 2.75 fl oz.

HARVEST-AID FUNCTION	HERBICIDE	BROADCAST RATE/ACRE (The rates below are given in the broadcast amount per acre unless otherwise noted) EARLY-SEASON (highs 90°F plus, lows 70°F plus)	MID-SEASON (highs 80–89°F, lows 60–70°F)	REMARKS AND PRECAUTIONS
Boll Opening, Regrowth Control, and Defoliation (*continued*)	*ethephon + urea sulfate* FirstPick 2.28SC **OR** *ethephon + cyclanilide* Finish 6 PRO + **ONE OF THE FOLLOWING:**	1.75–2 qt **OR** 0.33–1.5 pt +	2 qt **OR** 1.5–2 pt +	Likelihood of "leaf sticking" is increased when temperatures exceed 94°F.
	thidiazuron Dropp 4SC, others	1.6–2 fl oz	2–2.5 fl oz	
	thidiazuron + diuron Ginstar 1.5EC, others	6.4 fl oz	6.4–8 fl oz	Limited data are available with some of these products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.

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 (The rates below are given in the broadcast amount per acre unless otherwise noted)
Initial Preconditioning Treatment	*carfentrazone-ethyl* Aim 2.0EC	1 fl oz	Add 1% v/v crop oil.
	carfentrazone-ethyl + fluthiacet-methyl Display 2.05EC	up to 1 fl oz	Limited data, adhere to label restrictions, use precaution.
	ethephon Prep 6SC, others	0.67–1.33 pt	
	flumiclorac Resource 0.86EC	4 fl oz	Add 1–2 pt crop oil. Label allows rate up to 8 fl oz.
	fluthiacet-methyl Blizzard 0.91EC	0.5–0.6 fl oz	Add 1 pt crop oil.
	pyraflufen ethyl ET 0.208EC	0.5 fl 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.
	tribufos Def/Folex 6EC	0.5–1.25 pt	
Follow-up Treatments	**Should include products containing ethephon with harvest aid mixtures listed in the previous table.**		

HARVEST AID WEED MANAGEMENT

Camp Hand and Stanley Culpepper, Extension Agronomy and Weed Science

HERBICIDE	BROADCAST RATE/ ACRE	REMARKS AND PRECAUTIONS (The rates below are given in the broadcast amount per acre unless otherwise noted.)
carfentrazone-ethyl Aim 2.0EC	1 fl oz	Add 1% v/v crop oil. Effective on morningglory, coffee senna, and tropical spiderwort.
carfentrazone-ethyl + fluthiacet-methyl Display 2.05EC	up to1 fl oz	Limited data, adhere to label restrictions, use precaution.
glyphosate Roundup Powermax 3 5.88S, others	up to 2.5 pts	Use in combination with defoliants.
paraquat Gramoxone 3S, others Gramoxone Inteon 2S	 1–4 fl oz 3–5 fl oz	Use in combinations with standard defoliation applications. May cause crop desiccation and damage to unopened bolls.
pyraflufen ethyl ET 0.208EC	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. Label allows rate to be increased to 2.75 fl oz/A.
Follow-up Treatments Desiccants *paraquat* or *sodium chlorate*	See Desiccants for Cotton Harvest Preparation (below).	

DESICCANTS FOR COTTON HARVEST PREPARATION

Camp Hand and Stanley Culpepper, Extension Agronomy and Weed Science

DESICCANT	FORMULATION (lb ai/gal)	BROADCAST RATE/ ACRE (amount of formulation)	SPRAY VOLUME (gal/A)		REMARKS AND PRECAUTIONS (The rates below are given in the broadcast amount per acre unless otherwise noted.)
			GROUND	AIR	
paraquat					For addition to defoliant mixtures in cotton at least 85% open. Improves activity in colder, late-season conditions. May cause crop desiccation and damage to unopened bolls.
Firestorm	3	5.4 fl oz	10–20	5	
Gramoxone Inteon	2	3–5 fl oz	10–20	5	
Gramoxone Max	3	1–4 fl oz	10–20	5	
Parazone	3	5.4 fl oz	10–20	5	
paraquat					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 (3 to 5 days ideally) to minimize bark problems. May cause crop desiccation and damage to unopened bolls.
Gramoxone Max	3	5.5 oz–1.5 pt	10–20	5	
Firestorm	3	0.7–1.3 pts	10–20	5	
Parazone	3	0.7–1.3 pts	10–20	5	
Gramoxone Inteon	2	1–2 pt	10–20	5	
sodium chlorate	4–6	3–6 lb ai	10–20	5–10	

PERFORMANCE RATING OF HARVEST AIDS BY FUNCTION

Camp Hand and Stanley Culpepper, Extension Agronomy and Weed Science

CHEMICAL NAME	FUNCTION				
	REMOVAL OF MATURE FOLIAGE	REMOVAL OF JUVENILE FOLIAGE	BOLL OPENING	REGROWTH SUPPRESSION	WEED DESICCATION
ethephon (Numerous brands)	F–G	F	E	P	P
ethephon + urea sulfate First Pick	G	G	E+	P	F
ethephon + cyclanilide Finish 6 Pro	G–E	F–G	E+	F	P
paraquat Gramoxone Max, Gramoxone Inteon, Parazone, Firestorm	F	F	P–F	P	G
PPO inhibitors Aim, ETX, Resource, Blizzard	G	F	P	P	F
sodium chlorate	F	P	P	P	F–G
thidiazuron (Numerous brands)	G–E	G	P	G–E	P
thidiazuron + diuron (Numerous brands)	G–E	G	P	G–E	P
tribufos Def/Folex	G–E	P–F	P	P	P

P—Poor, F—Fair, G—Good, E—Excellent

UGA "THREE-WAY" DEFOLIATION MIXTURE RECOMMENDATIONS BY TEMPERATURE

Camp Hand and Stanley Culpepper, Extension Agronomy and Weed Science

SEASON (TEMPERATURES)	*ETHEPHON* (PREP 6SC)	*THIDIAZURON* (DROPP 4SC)	*TRIBUFOS* (FOLEX 6EC)
	BROADCAST RATE/ACRE		
Early Season (highs >90° F, lows >70° F)	21–24 fl oz	1.6–3.2 fl oz	6–12 fl oz
Mid-Season (highs 80–89° F, lows 60–70° F)	24–32 fl oz	2-4 oz	8–12 fl oz
Late-Season (highs <80° F, lows <60° F)	32–42 fl oz	X	16–20 fl oz

Ethephon—Higher rates necessary with cooler temperatures to increase boll opening.

Thidiazuron—Increase rates for greater regrowth potential, less activity when lows are less than 65°F for 3 days.

Tribufos—Higher rates necessary for cooler temperatures, however too high can dessicate.

X = denotes product not suggested during these environmental conditions.